



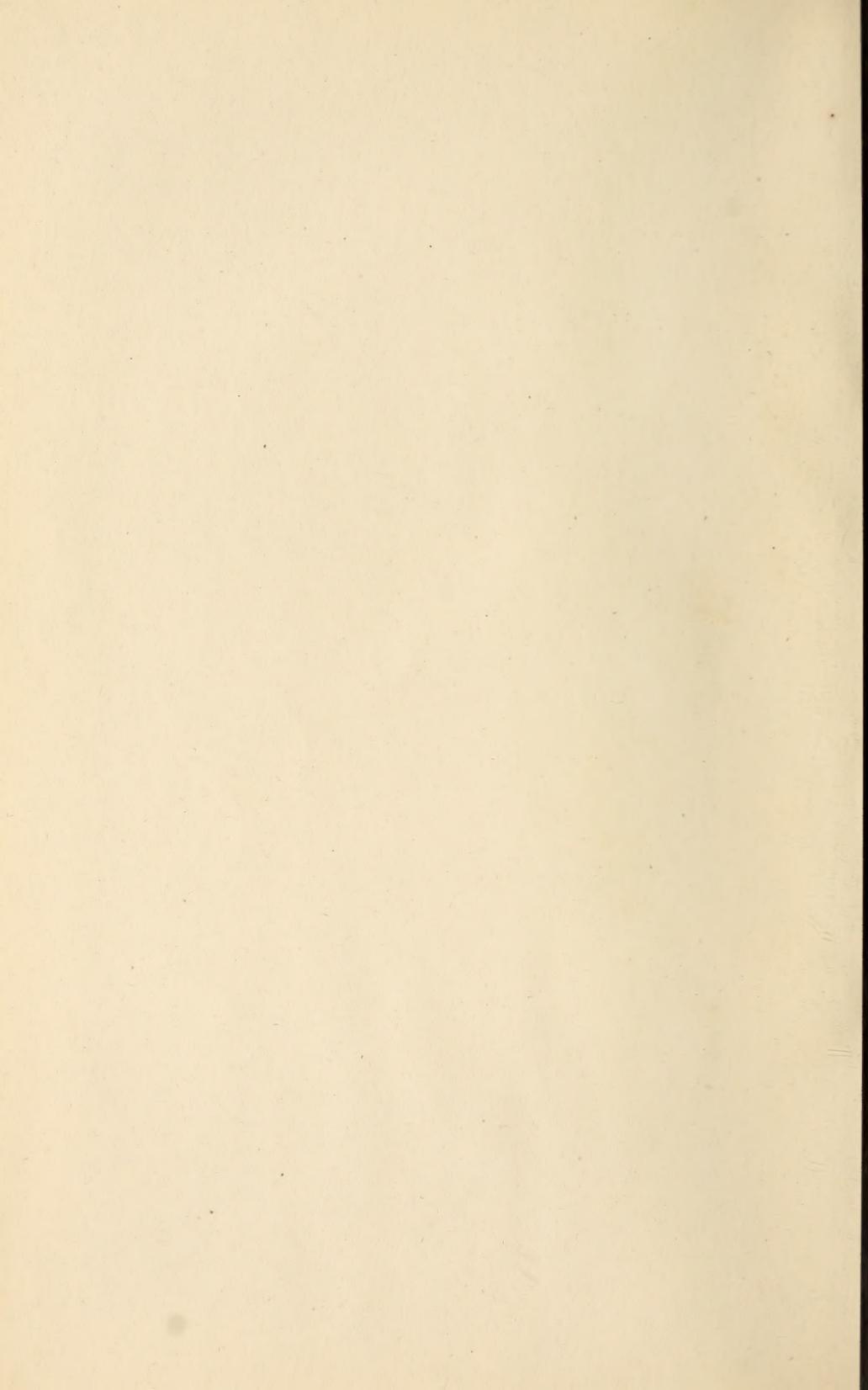
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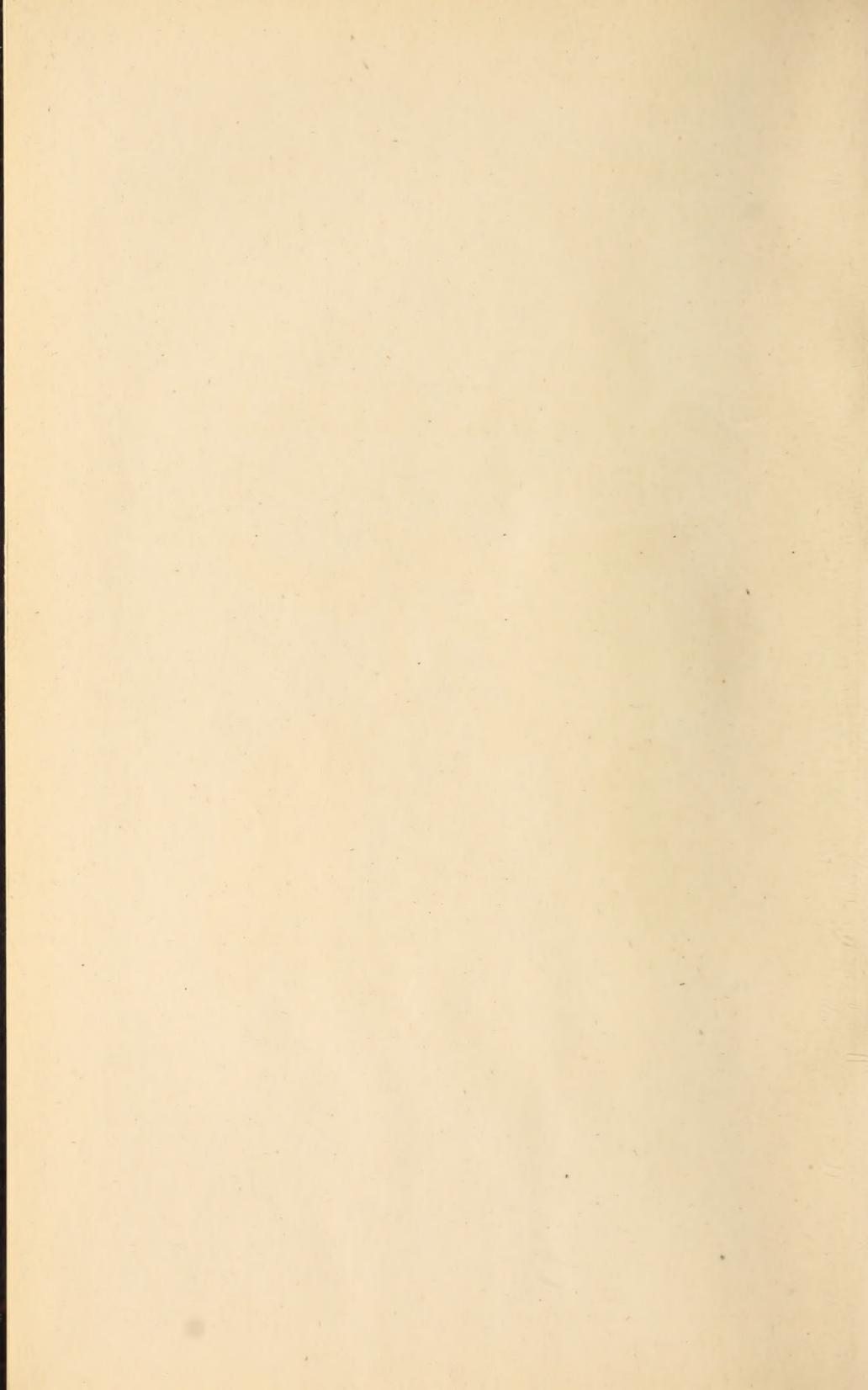
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Report of the
Semi-Annual
Meeting of the
California
AVOCADO
Association



Los Angeles Oct. 23rd. 1915

Yearbook

REPORT

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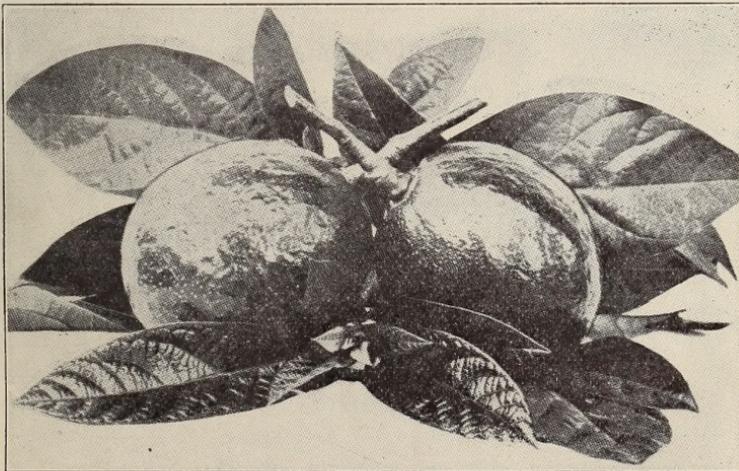
OF THE

FIRST SEMI-ANNUAL MEETING

OF THE

CALIFORNIA AVOCADO ASSOCIATION

Society



LOS ANGELES

October 23, 1915

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CALIFORNIA AVOCADO ASSOCIATION

Offices, 917-923 Union Oil Building

LOS ANGELES

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PREFACE

The California Avocado Association was organized at an advertised meeting held May 15, 1915, at the Alexandria Hotel in Los Angeles. At that meeting directors were elected and tentative by-laws formulated. At a subsequent meeting of the directors, the present officers were elected and committees appointed, and definite steps were taken to place the Association on a sound basis.

This meeting held October 23, 1915, is one of the first results of the perfected organization. Semi-annual exhibition meetings will be held hereafter at times that will give the best opportunity to acquaint the public with the different varieties of avocados and their value. These meetings will also afford opportunities to the growers to exchange information gained by experiments, and to hear papers prepared by experts who are making a deep study of the industry.

Exhibits

A great variety of thin skinned avocados were displayed, of which at least two were small, seedless types. A large portion were promising seedlings, some of which may have a bright future in a commercial way. Other varieties that have been the staple thin skins for some time, were shown in abundance.

Several budded nursery trees of different varieties were exhibited. They were dormant buds of late fall of 1914, beginning to grow in the spring of 1915. With seven months' growth these buds had made beautiful, well formed, strong stocked trees of an exceptionally vigorous growth, averaging about five feet in height.

A box of thin skinned fruit, containing several varieties, was placed on display after having been shipped to Chicago and return. Different methods of packing were used in this shipment, some of them with poor results, still it demonstrated that some of the thin skinned type, properly packed, would stand such a shipment without injury.

The mid-day display of prepared avocado dishes was worthy the fruit it introduced. Sliced avocados, dainty avocado sandwiches, avocado cocktails and mixed avocado salads, with beautiful decorations, and in quantities sufficient to give everybody a general sample, held the attention of even the initiated.

Little folders, with recipes for the preparation of a large number of avocado dishes, were distributed, and these may be had free at any time by applying to the offices of the Association.

The exhibit of fruit did not include any of the larger, hard shelled, or thick skinned type, as fruits of these varieties are not available from local trees after the first of October. An exception to this rule was one large thick skinned fruit—a Sharpless—held over especially for this meeting.

The larger heavy skinned types will be in evidence at the spring exhibition to be held about May 1st, 1916.

Systematic study of the avocado industry is new in the United States, but has been taken up on a broad scale and given extended thought in Southern California. Experienced horticulturists have planted seed and budded the best varieties obtainable. Some of these varieties have originated from seedlings in this state, others have been brought from Florida, and many different foreign countries, especially Mexico.

The great value as a food product and the commercial possibilities of the avocado have been recognized by both the United States Department of Agriculture and the State University. These institutions are broadly extending their work of introduction of foreign varieties and general experimentation.

Every endeavor will be made by the Avocado Association, assisted by these government agencies, to hold in check any undue "booming" of the infant industry, or misrepresentation as to its general possibilities. This may be necessary because of the extraordinary individual tree records attained in the past.

The proceedings of this meeting are published on account of the valuable information contained therein. Copies will be mailed upon application and the payment of 35 cents each, which is the approximate cost of publication and mailing.

Address all communications to

CALIFORNIA AVOCADO ASSOCIATION,
917-923 Union Oil Building,
Los Angeles.

FIRST SEMI-ANNUAL MEETING OF THE CALIFORNIA
AVOCADO ASSOCIATION HELD AT THE HOTEL
ALEXANDRIA, LOS ANGELES,
OCTOBER 23, 1915.

At 10 a. m. Mr. Edwin G. Hart, President of the Association, called the meeting to order. He spoke of the disappointment felt at the absence, through illness, of Judge Charles Silent, who had intended to address the meeting on the very important subject of "Educating the Public."

While the time for discussion would be limited, he said an opportunity would be afforded for questions following the various addresses, and at the conclusion of the regular program there would be a general discussion. He suggested that notes be made during the addresses, of matters to be brought up in the general discussion.

THE ASSOCIATION AND ITS PURPOSES

Mr. Edwin G. Hart, San Marino, President California Avocado Association

The chairman's address on "The Association and Its Purposes," while not delivered until the end of the program, is printed here in order that the objects of the organization be made clear in their relation to subjects discussed by other speakers.

The purpose of this organization can hardly be more succinctly stated than by quoting the second by-law of the Association: "The purpose of the Association is the improvement of the culture, production and marketing of the Ahuacate."

The accomplishment of this purpose cannot be obtained by individual effort, however intelligent and persevering. Many here remember the first crude efforts at organization in the citrus industry of California. The perfecting of the present organization in that industry was long and painful. During this period there was tremendous waste of individual effort. Land not adapted to citrus culture was often planted to citrus fruit. Poor varieties

were planted and unscientific methods were frequently used in the raising and handling of the fruit. Even after the crop was harvested the market facilities were poor, and for many years, therefore, an industry, sound in itself, had the appearance of being uncertain and speculative. You know how, by intelligent **co-operative effort**, most of those difficulties were finally overcome.

The purpose of this Association might be said to be to avoid the mistakes and profit by the experience of those engaged in similar kinds of fruit culture. To this end co-operation is absolutely necessary. The combining into association of the many nursery men, orchard growers, experimenters and scientists interested in this new industry makes it possible to accumulate, and hold accessible to members the result of work of the various individuals. This will prevent duplication of endeavor and serious failures.

Publicity:

The association once favorably recognized in the eyes of the public, will be able to secure the kind of publicity that cannot be purchased for money, which will enable it to greatly assist in educating the public as to the merits of the ahucate, and the best method of selection and preparation for the table. Even as young as it is, the association has secured a great deal of favorable notice and distributed considerable educational literature.

Frauds:

One of the greatest benefits that the association confers upon its members and everyone interested in Southern California, is the protection it is giving the public against the class of boomers who made the raising of eucalyptus and spineless cactus a craze. The fabulous profits actually derived from certain trees of this section have opened a field to the unscrupulous promoter that he is sure to exploit, unless prevented by an organization that is able to distinguish between the legitimate and fraudulent, and the practical and impractical in our business.

Work of Association:

The association is gathering and compiling for the benefit of its members, statistics as to the nursery stock now on hand, acreage planted in orchard, fruit produced, and fruit expected between now and the end of next spring, with details as to varieties, methods

of budding, qualities of fruit, etc. This work will be broadened as the industry develops. The University of California through Dr. Coit, and Professors Condit and Jaffa has co-operated with this association in every way possible and is now carrying on many investigations that will be of great benefit. The University of Southern California, of this city, through Prof. Stabler, head of their chemical department, a man who has had much practical experience in vegetable oils, is making a thorough test of the avocado oil and its best method of production.

We expect to distribute 10,000 of the folders giving recipes and directions for selecting fruit. A large number will be sent out by the fruit houses handling the avocado.

An exhibition of fruit which we hope will be more extensive than today's, and which will bring out the larger thick-skinned type of fruit, will be held under the direction of this association in the coming spring. We expect to make these meetings and exhibitions semi-annual affairs.

The association will have compiled a complete report on today's meeting, one copy of which will be mailed free of charge to each member of this association. Additional copies will be mailed to any one on application and payment of cost of printing and mailing, estimated at 35 cents.

We believe that all interested in the avocado should become members of our organization, first, because they will receive direct benefits in the way of information, access to statistics, assistance in either buying or selling fruit or nursery stock, and whatever other advice or assistance we can give. Second, because they are receiving and will continue to receive, a great indirect benefit from the educational work we are doing, which is, in the eyes of the public, lifting our business from the position of a fad to the rank of a legitimate agricultural industry. We need the help of all of you, not only because we need the membership fees, but fully as much we want the strength of yourselves as individuals in our organization. We want to stand in reality and in the eyes of the public as a strong organization, a unit for the sane advancement of the most promising young agricultural industry started since the introduction of the walnut, orange and lemon.

NEW ITEMS OF INTEREST

Professor Ira J. Condit, College of Agriculture, University of California, Berkeley

As the title of my paper indicates, the subject matter will be more or less disconnected, but I wish to offer some notes on the avocado in Central and Northern California, a few observations on diseases and insects, a report of preliminary experiments on by-products and some general notes on varieties.

In the interior valleys of California as most of you are aware, the avocado is being planted more or less extensively and it will be exceedingly interesting to watch the behavior of the different varieties under similar local conditions. The large seedling growing in Visalia is about twelve years old at the present time. According to information recently received, the seed which produced this tree was brought from Mexico and the seedling was kept for two or three years in the cellar to protect it from the cold. Having left the tree out one cold night with no injurious results the owner decided to plant the tree in the yard. Previous to the cold weather of 1913, when it was frozen back severely, it grew thriftily and bore small fruit having a long narrow neck. The tree is again in a thriving condition, however, although it did not bear any fruit in 1914.

There are two avocado trees growing at the Dallidet place in the city of San Luis Obispo, one 25, the other 20 feet high. They were grown from the seeds of some purplish-green fruits obtained from Mexico eleven years ago. Neither tree has ever fruited, but both were in bloom for the first time when the big freeze came in 1913. They were rather severely cut back and, of course, set no fruit that year. They are now growing vigorously and bid fair to be large trees before many years. The seeds came from the highlands of Mexico (Chihuahua) and they should be of a hardy type; the trees were no more injured by frost than were old seedling orange trees nearby.

I have recently been informed that there is a large avocado tree twenty years old, growing on the old Meissner place near Yountville, the seed having been brought from Central America.

There is a large avocado tree at least 25 feet high, growing on the University campus at Berkeley near the Center Street entrance. So far as I have been able to learn it has never blossomed, a fault

which cannot be blamed on the climatic conditions at Berkeley, for seedlings often show this characteristic in more favored localities. It may be the same tree mentioned in the California Station Report for 1882, as follows: "The aguacate has now for three years withstood the winter frosts in a sheltered position and proves, perhaps, more strikingly than anything else grown here, how little we can foretell what will prove hardy."

At the Napa Soda Springs in Napa County a large avocado tree has been growing for some twenty-five years. The tree is about forty feet high and is rather slender, being surrounded by other tall-growing trees. The fruit, of which a few were produced both in 1914 and 1915, is bright green even when ripe, and is said to be of good quality.

A bearing avocado tree of the thin-skinned type is located at Los Gatos, Santa Clara County. It is a seedling obtained from Santa Barbara nine years ago. The tree is now about fifteen feet high and during the past four years has produced fair crops of small, purplish-black fruits.

The success of these old seedling trees in such widely scattered localities presages successful results with plantings on a larger scale, and numerous inquiries are received by the Experiment Station regarding climatic conditions, cultural methods, and promising varieties. Commercial plantings have already been made in the foothills of Tulare County, in Sutter, Butte, and Glenn Counties, as well as in a few other localities of central and northern California. One fact has been clearly demonstrated by some of these plantings, namely, that water must be withheld in the fall and the trees properly hardened before the cold weather sets in, otherwise the tender growth will be cut back. It is this fact which renders it difficult to gather data on the frost resistance and hardiness of any tree, but especially of evergreen fruit trees which have several periods of growth during the season. Their hardiness depends to a large extent upon the degree of dormancy of the new growth. The fact that one grower finds the tree of a certain variety of avocado to be badly injured by ten degrees of frost, while another reports no injury, means little until all the circumstances are known, including the condition of the tree in each case, the state of the weather before and after the cold spell, and the duration of the low temperature. A variety should not therefore be condemned

on account of one or two instances of frost damage unless these facts have been taken into consideration. The original tree of the Meserve avocado was frozen back more or less severely in the winter of 1912-'13, but practically everyone is agreed that the damage was due to the sappy condition of wood induced by copious watering of the asparagus bed near which the tree is growing.

Another point which may be emphasized is the maintenance of healthy growth in the tree by proper cultivation and judicious fertilization. There is little, if any, evidence to show that an avocado and a citrus tree require any different fertilizing elements. Since the foraging power of the roots is dependent upon the physical condition of the soil, the importance of keeping it well supplied with humus and of maintaining a good soil texture cannot be over-emphasized. For young trees as well as for old trees the basin-mulch system seems practicable. By keeping the basin well supplied with strawy manure and other decaying vegetable matter, both the humus content and the proper texture of the soil can be economically maintained. Experiments in other countries have shown that the avocado tree responds to judicious fertilizing, although excessive amounts of nitrogen appear to increase the fiber content of the fruit. Liquid cow manure has been found good for seedlings. Wester, in the Philippines, uses the following formula for many kinds of tropical plants, applied at intervals of two or three weeks:

Nitrate of Soda.....	275 grams
Sulphate of potash, 49 per cent.....	125 grams
Acid phosphate, 16 per cent.....	350 grams
Water	100 liters (105 qts.)

We frequently receive complaints and specimens of a leaf trouble in which the leaves begin to turn brown and die back at the tip and along the edges, and occasionally the twigs are affected in a similar manner. Specimens received for examination ordinarily show no fungus present, but in a moist chamber there develops an organism, determined by Mrs. Flora Patterson of Washington, D. C., as *Colletotrichum gleosporioides*, the same fungus which attacks mango, avocado, and citrus trees in Florida and the West Indies. In California this fungus appears to be of little practical importance, for although it has long been present in the citrus districts, it very rarely attacks healthy trees as an active parasite, although it may cause tear-staining and decay of the fruit. On senile leaves or younger leaves weakened by sunburn, frost or oth-

erwise, it causes the well-known dead spots, on the surface of which may be seen the minute black fruiting bodies of the fungus. This leaf trouble of the avocado is undoubtedly primarily due to physiological rather than pathological causes. By remedying unfavorable soil or moisture conditions and promoting a vigorous growth of the trees it would seem that this weakness can be more or less overcome.

Some specimens of the Chappelow avocado received in September, 1915, were thoroughly ripe, and two showed signs of a peculiar softening evidently due to the action of some fungus. The fruit was therefore submitted to Prof. Horne of the Division of Pathology, Berkeley, who later submitted this report, which I wish to include with my paper:

REPORT ON FUNGUS ROT

"On the first two fruits brought to me on September 21st it was very evident that several types of decay were active and several organisms present. The most frequent type of decay consisted of small, slightly sunken spots, which looked as though there had been simply a dent made by rather small fingertips, and some white fungus was growing in the hollow. These spots were of rather frequent occurrence, scattered over both of the fruits submitted. I have not yet been able to determine in a way satisfactory to myself whether this type of rot is due in all cases to the same organism, or whether several kinds of fungi may cause the same kind of injury. The fungi growing in these spots and on the surface of the fruit seem to be rather numerous and varied. I have cultivated a **Fusarium** of a rather peculiar type, an **Alternaria**, which, so far as I can tell up to the present time, might be identical with the fungus causing black heart of oranges, and a small fungus producing very definite fruiting bodies in which no spores have yet formed, which might be some form of **Phoma**. There were also developed on the fruits which were kept in a moist dish, some **Penicillium**, **Cladosporium**, **Acremonium** or **Sporotrichum**, and some other fungi not certainly recognized. It will be seen that the number of fungus forms which appear on overripe avocados are very numerous.

"In addition to the fungi which developed on the fruits in moist chamber, bacteria of several kinds also developed. The form of bacteria which has come to predominate in these spots is one which forms a copious sticky brown mass, and when it becomes slightly dry, a wrinkled pellicle on the surface. The odor is offensive but not exceedingly strong, nor is it like the odors given off by putrifying meat or vegetables, such as cabbage and turnips.

"From examination of the decaying fruits it appears that neither

the fungi mentioned nor the bacteria penetrate in great quantity into the fruit, nor do they appear to have a very rapid or pronounced effect in causing softening and decomposition of the flesh. While they would doubtless spoil the fruit for market purposes, they represent rather superficial decays, and the fruit could be utilized after they had commenced to make their appearance on the surface without great loss, provided they did not become very active until time when the fruit was ready to use. As to whether any of these organisms cause the spoiling of the flesh in the early stages of their attack, I have not been able to determine as yet.

"However, one of the fruits brought to me on September 21st had a rot which from its appearance would lead very promptly to the suggestion that it might be a very important matter for the avocado grower. The fruit of this set was Chappelow and specimens were very nicely developed individuals of this very attractive little variety. The spot in question was about one and one-half inches in diameter, with the center located near the base of the neck of the fruit. The color was a dull greenish, considerably lighter than the fine deep purple of the normal fruit. In the center of the spot about half the area was rough and somewhat wrinkled and blackish, while the outer part of the spot was wrinkled somewhat, as though the flesh below had sunken and the skin become thinner and more transparent, but is still as glossy as in the healthy condition. Some whitish tufts of fungus were emerging here and there over the surface, especially near the center of the spot, and it is almost certain that more than one kind of fungus was growing in this area. It seemed apparent at once that we had to do here with some specific rot of the avocado fruit of a rather more violent nature than in the spots which were thickly scattered over the surface of the fruits.

"On microscopic examination some fruiting bodies were found below the surface in this large rotted area, and spores were found in them which were very pale yellowish, one-celled and formed on short pedicels.

"In order to discover the cause of this peculiar rot the surface of the fruit in the outer area of the spot was sterilized by washing with formalin, and with hot needles a little of the flesh was removed from below the surface and planted in an artificial culture medium. Some of this same material examined microscopically showed large fungus threads here and there passing through the flesh. Bacteria were not recognized in the deeper layers. Bacteria cultures were also made from this flesh by macerating some of it in water and diluting by the ordinary bacterial methods. Only one set of such cultures was made, but absolutely no bacteria grew, indicating that this decaying flesh does not contain bacteria. In two days after planting the pieces of decayed flesh in artificial medium vigorous growth of a strong fungus mycelium developed from every

one of the plantings. This fungus has been studied in several different culture media and has been inoculated in three different avocado fruits to date. One of these fruits was already well advanced with other types of infection when inoculated, and satisfactory results were not secured.

"One fruit, which was a very beautiful ripe specimen of the Topa Topa, was inoculated on October 13th at two points by introducing some of the fungus below the skin. At this writing, October 18th, these two spots are showing distinctly lighter areas about an inch in diameter, and it is very evident that the fungus is producing in this fruit the same type of rot as was found in the original fruit of the Chappelow. We have, therefore, apparently proven that this particular fungus is the cause of the very menacing-looking case which was making its appearance on the Chappelow fruit.

"That this decay is a serious matter is very evident from the rapidity with which it spreads in the fruit and its effect in the flesh. Several days after the first examination the original spot was cut into and it was found that the flesh was affected to the axis of the fruit. Although not very strikingly changed in appearance, this flesh darkened more rapidly than the unaffected part of the fruit and had a very disagreeable, mildly bitter and disgusting flavor.

"It will be of great interest to know what this fungus shall prove to be from further study. According to present indications it is not distinguishable from the fungus causing the black rot of apples in the middle states. The same fungus also causes a very destructive type of canker on the twigs and limbs of apple trees, and from reports received from orchardists and friends in the middle states I judge it constitutes one of the most important factors in the killing out of the farm orchards in that region. The same fungus has been found in twigs of apple by Mr. Carrol Rodgers, of Watsonville, and cultivated and studied by him while a student in our laboratory. Apparently owing to the climatic conditions prevailing in California, this fungus is not so destructive here as in the middle states, but it is evident that it exists here. Abundant moisture and warmth at the same time are conditions which probably favor its development, and a combination of moisture with cool weather is probably not so favorable to it.

"Professor Fawcett has called attention some years ago to the fact that this black rot fungus of the apple is closely related to the very destructive decay organism of citrus fruits which causes the greenish black rot of lemons and other citrus fruits. It is also interesting to notice that in a recent report by Professor Earle and Mr. Rogers, from the Isle of Pines, this second fungus is reported as the most serious one with which they have to deal in the Isle of Pines on citrus fruits, causing a stem-end infection of the fruit and

a rapid decay, as well as infection of branches and destruction of upper parts of the tree. They also call attention to the fact that the same results may be brought about by infection with the bitter rot fungus of the apple, and seriously question whether there is much, if any, distinction to be made between the two fungi. It should be understood that we are not stating that the rot fungus obtained from the avocado is identical with the two fungi mentioned, *Sphaeropsis malorum* and *Diplodia natalensis*, but that the fungus from the avocado has developed spores in pycnidia in exactly the same manner as in the other fungi, and the growth of the avocado fungus is not distinguishable in character from the growth of *Sphaeropsis malorum* which is being cultivated in our laboratory by one of our students, Mr. Hahn, and which has been submitted to Mr. Hesler, of Cornell University, and is in his judgment the true *Sphaeropsis malorum*. Inoculations on avocado fruit with the fungus from apple have not yet produced exactly the same result as inoculations with the avocado fungus, but there is still time for the same conditions to develop.

"It may be permissible to remark that the decay processes concerned in the avocado will be of an entirely different character from decay processes in the more watery and acid fruits, being more comparable to the decays of bananas than to those, for instance, of oranges and peaches, or still more like those of olives. Bacteria of various kinds will be able to grow in the avocado flesh in all probability, not being restrained by the presence of acids, and it does not seem probable that we shall have many organisms which will cause the rapid collapse of the avocado flesh, as do various fungi affecting citrus fruits and the acid deciduous fruits. However, we have seen enough to realize that there will be something for the plant pathologist to study in connection with the fungus and bacterial infection of avocado fruits in connection with their harvesting and delivery to the consumer.

"Let us hope that these fungi are not able to gain entrance easily into the avocado flesh, since the fruits will doubtless be more acceptable to the consumer in their fully ripened condition than in a condition of partial ripeness. We should not, however, relax our vigilance, so that we may be able at the earliest possible moment to cope with any problem of this nature which may arise. It is hoped that studies here described may be carried a little farther, so that we may know definitely the character of the rot produced by each particular type of organism, and some other facts which may be of practical interest. It is not contemplated, however, to proceed with what may be considered a thorough investigation of this subject at the present time, but only to give some preliminary idea of some of the problems which may be involved."

(Signed)

"WM. T. HORNE."

INSECT PESTS

The number of insect pests attacking avocado trees so far in California is small. The list includes the mealybug, greedy and black scales in Ventura and the southern coast counties; the omnivorous looper on seedlings at Berkeley; the twig borer, *Polycaon confertus*, and a chafer, *Serica alternata*, on nursery trees in Ventura County, and an unidentified miner, the galleries of which have been noticed in the bark of tender branches in various parts of Southern California. According to the horticultural commissioner of Ventura County, the work of the twig borer was similar to that on other trees, namely, boring into the tree at the forks of the branches. In some cases where the trees were small the cavities made were equal to about half the diameter of the limbs on which the insects were working. In such cases the trees were so weakened that a heavy wind would break them off. Digging out the beetles by hand proved the surest remedy. The *Serica* was found working on avocado foliage in the Fillmore section, where it is found very commonly on walnut trees. It feeds only at night, burying itself in the ground during the daytime. Some of the avocado trees were almost defoliated. Arsenical sprays did not prove effective as a remedy, so the young trees were covered with muslin as a temporary protection. On large trees the damage done by these chafers would seldom be appreciated.

In all countries where the avocado is produced its principal use is as a fresh fruit. A few recipes are given in which the pulp is cooked with vegetables; it is also commonly used to flavor soups. The subject of by-products has received some attention in other countries, and recently experiments have been made at the University of California to see if some methods could be worked out by which the pulp and seeds of the small seedling could be utilized. Naturally the possibilities of producing a commercial oil from the fruit have been first considered.

The Florida Experiment Station in 1902 made some preliminary investigations of avocado oil, but owing to a change in the station staff about 1903, the work was dropped and has never been taken up since. Brant, in his "Animal and Vegetable Fats and Oils," 1897, states that the oil is of a slightly dark greenish-brown color and consists of 30 parts of olein and 70 parts of lauro-stearin and palmitin. Olein is liquid and the other two fats are solids,

stearin having the higher melting point. Therefore the larger the proportion of olein contained in a fat, the softer it is, while the greater the proportion of stearin, the higher its melting point. In olive oil the proportions are just reversed, the average sample containing 28 per cent of palmitin and stearin and 72 per cent of olein, which accounts for its greater liquidity. The oils from different varieties of olives vary considerably in the percentage of olein present; some are therefore more liquid than others. Whether this same variation occurs in the oil of different varieties of avocados has not been investigated, but it is not likely to be sufficient to materially affect the quality of the product. In his book on "Vegetable Fats and Oils," 1902, Andes includes avocado oil in the list of fats of no commercial importance. In foreign countries it is known under various names, such as Huile de avocatier, Avocado oil, alligator pear oil, grasa persea, and advogatofett. It has been used medicinally to a small extent in Brazil and elsewhere. Alligator pear soap is manufactured in Guatemala and can be purchased in this country. Cheaper forms of fat, however, are ordinarily available for soap-making, and such a product probably contains only a small percentage of avocado oil. According to Collins (Bulletin 77, U. S. D. A.), the ladies of Guatemala sometimes extract oil from avocados by pressure. They never use it in cooking, but say it is fine for the hair.

In the preliminary experiments at the University by Mr. Mitra, a graduate student, it was found difficult to press out the oil in an ordinary press, since the flesh is so soft and fine the two will not separate readily. The slices of flesh were therefore dried in an oven, the pieces ground up and then put in a press. By the ordinary method of pressure it was found that only about 15 per cent of the oil could be obtained. The resulting oil, samples of which I have with me, is fairly clear, dark green in color, somewhat bitter but not unpleasant to the taste. It is doubtful whether the oil will be of much commercial value. Larger quantities may be extracted by ether, gasoline, or other solvents, but the resulting oil is affected both in color and flavor. The process of extraction is a little more expensive than by pressure.

Some experiments have been made in the production of a paste, but they have not progressed sufficiently to be conclusive. This form of by-product looks promising, however, its success depend-

ing upon proper sterilization of the pulp so that the flavor will not be affected. The addition of salt, lemon juice, vinegar, or similar flavoring materials, is advisable.

Another by-product for which a demand might be created is avocado flour. For this purpose the seed is removed and pieces of the pulp dried in an oven. Slow drying in the sun is not advisable, as this is liable to develop a rancid flavor. Thin-skinned fruits need not be peeled, as the taste of the skin is not objectionable; dark skins will, of course, make a dark-colored flour. The dried pulp is ground finely, seasoned with salt, sterilized, and preserved in a sealed can. It may be used for flavoring soups or cooked vegetables of different kinds.

The seeds of the avocado, when fresh, contain a liquid which turns red when exposed to the air, and some writer a century or more ago stated that for this reason the juice could be used as indelible ink to mark cloth. This statement has been copied by numerous writers ever since, but it is doubtful whether the seeds were ever used to any extent for this purpose, even in Mexico. The bitter taste may be removed from the seeds by boiling, after which they have a not unpleasant nutty flavor. By successive treatments in sugar solutions of increasing strength a confectionery may be prepared from these boiled seeds. A few samples made in this manner have a pleasing flavor and suggest a means of utilizing the seed. In Brazil the seeds are said to make a good powder that can be used in the preparation of soup. It is doubtful, however, whether they will be of much value for this purpose in comparison with the flour from the pulp.

In conclusion, I wish to present a few general notes regarding varieties. I think it especially important in this early stage of the industry to caution growers and nurserymen against needless multiplication of varieties. A seedling tree which comes into bearing should not be propagated and distributed as a distinct variety unless either the fruit or the tree has characters as good as or better than some other variety already existing. There will probably always be room for improvement with fruit varieties, and it is very desirable to get avocado fruits with a greater proportion of flesh and less of seed, with richer flavor, less fiber, better shipping and keeping qualities. Characteristics of the tree, such as productiveness, hardiness, resistance to disease, and lengthened season of

bearing fruit, should also be watched for and improvements noted. Unless a seedling does show some such improvement it should be budded over, unless the owner wishes to sell the fruit as seedlings, just as some oranges are still sold.

For the reasons just mentioned, it seems desirable to have some systematic method of judging the fruit of any variety of avocado. I have therefore devised the following score card, which, I believe, will serve for all types of the fruit. It is only tentative, however, and I invite discussion:

Score Card for Avocados

Size (uniformity).....	10
Form	5
Stem	2
Skin	33
Color	10
Finish	5
Surface	6
Freedom from blemish.....	12
Flesh	40
Color	5
Thickness and amount.....	10
Flavor	5
Texture	5
Quality	10
Freedom from fiber.....	5
Seed	10
Size	8
Condition in cavity.....	2
Total	100

Avocado Standards

Size. Avocados may be of any size from small, 2 or 3 inches in diameter, to large, 5 inches or more. Medium sizes are most desirable, those weighing from $\frac{3}{4}$ to $1\frac{1}{2}$ pounds. Sizes should be uniform among the fruits of any one variety submitted for exhibit or judging.

Form. Fruit must have shape typical of the variety. Round and pear-shaped fruits are more desirable than bottle-necked or elongated.

Stem. Stem should show a smooth cut. It should be well set and firm. Deduct one point for each missing stem.

Skin. Color should be attractive, whether green or purplish-

black. The skin should have a good finish, glossiness and clearness of coloring being desirable. The surface need not be perfectly smooth, but warty or exceedingly rough fruits should be discounted. Fruit should be free from blemishes such as cracks, wind scars, or abrasions.

Flesh. The flesh should be of a good butter color, with very little green near the skin. The largest possible amount of flesh is desirable. The flavor should be rich and nutty, the texture soft and buttery, and the quality as high as possible. The less fiber the better.

Seed. The seed should be small and tight in the cavity.

FOOD VALUE OF THE AVOCADO

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It is admitted by all that the avocado has a food value, and I wish to offer some data which will tend to emphasize this fact and to indicate that the avocado should not be considered merely as a relish.

One of the best definitions of food is, "Food is that which when taken into the body either builds tissue or yields energy." In accordance with this definition, water is not considered as a nutrient in that water cannot build protein, fat or mineral matter as such. At the same time it is agreed to by all that water is absolutely necessary for the maintenance of life, health and activity. So is fresh air.

Does the avocado meet either or both of the requirements of the foregoing definition? The answer is, "It certainly does." The next question is, how? Let us compare the avocado with other fruits.

A reference to the composition of fresh fruits in general shows that the amount of water is large, in many instances above 80 per cent, and in the case of melons above 90 per cent. The avocado shows upon an average only 70 per cent of water. Therefore the amount of total dry matter or solids is far greater in the avocado than is noted for any other fruit.

The protein content of fruits is low, varying from .02 per cent as an average for the loquat to 2.5 per cent for the olive. The

stone fruits contain on an average less than 1 per cent. The average for the avocado with respect to this nutrient is 2 per cent. The minimum figure for protein, 1.30 per cent, is nearly equal to the maximum indicated for fresh fruit, 1.5 per cent, noted for figs and currants. The maximum, 3.7 per cent, corresponds somewhat closely to the protein content of some dried fruits. In three varieties the protein is present in excess of 3 per cent; in ten varieties considerably above 2 per cent; while the average for 28 varieties is 2.08 per cent. It, therefore, may be said that so far as protein in fresh fruits is concerned the avocado stands far in the lead.

The availability of this protein, however, for the avocado has not been ascertained, but there is no reason for considering that it is any less digestible than the protein of other fruits.

The carbohydrate in fresh fruits, consisting mainly of sugar, exceeds the corresponding ingredient in the avocado. At the same time the average for a large number of varieties analyzed is between 7 and 8 per cent. This figure includes what is termed crude fibre, the least valuable of all component parts of any food. In the avocado this nutrient is present to the extent of about 1.75 per cent, comparing favorably with the content of fibre in other fresh fruits.

The figures for the mineral matter of ash in fresh fruits are in general much lower than the corresponding data for meats or grain. The average for meat is about 1 per cent, while for fruit it is much less.

It must not be forgotten, however, that while the amount of ash is small, the percentage of potassium, so essential to the animal economy, is high. This is a very valuable base-forming element which is necessary in the maintenance of the normal neutrality of the blood and tissues. The importance of the mineral matter in nutrition and the necessity of carefully selecting the dietary so as to secure a proper balance between the base-forming and acid-forming elements is becoming more and more apparent.

It is of decided interest to note that the mineral matter in the avocado is much greater than that found in any fresh fruit. Just how much importance can be attached to this fact can better be stated after the conclusion of the detailed analysis of the ash, which will indicate the per cent of potassium, calcium, phosphoric acid, iron, etc. The results of the ash analyses will be published later on.

The minimum per cent of ash, 0.60 per cent, noted for the variety, Cardinal, from Florida, exceeds the per cent of ash determined for apples, apricots, grapes, blackberries, oranges, pears and plums, and fully equals the corresponding figure for cherries, figs, melons and prunes.

The minimum per cent of ash noted for a variety grown in California is .80 per cent, exceeding that found in any of the fresh fruits. The average for 28 varieties is 1.26 per cent, only slightly below the ash percentage in dates.

The foregoing discussion clearly indicates that so far as protein and ash in fresh fruits are concerned, the avocado stands at the head of the list, and with reference to the carbohydrates, contains on an average fully 50 per cent of that found in many fresh fruits. These facts alone would warrant due consideration being given to the value of the avocado as a fresh fruit.

The chief value of the avocado as food, however, is due to its high content of fat. This varies from a minimum of 9.8 per cent to a maximum of 29.1 per cent, with an average of 20.1 per cent.

Reviewing the analytical data at hand, it is seen that ten varieties show more than 23 per cent fat and seven other varieties an excess of 18 per cent.

The only fruit comparable with the avocado in this respect is the olive. In this connection, it is of interest to compare, as shown in the following table, the fat percentages of the edible portion of ten varieties of the olive.

Showing percentage of fat or oil in the avocado or olive:

Avocado

VARIETY	EDIBLE PORTION	
	ORIGINAL MATERIAL	WATER FREE
	Water %	Fat %
Chappelow	62.84	29.10
Seedling No. 1.....	62.65	27.89
Northrup	61.08	27.60
Mattern	61.55	25.70
Ganter	63.86	25.60
Blake	65.80	25.50
Miller	66.60	23.70
Seedling No. 3.....	65.10	23.40
Unnamed	65.50	23.10
Northrup	66.31	23.00

Olive

VARIETY	EDIBLE PORTION
	ORIGINAL MATERIAL
	Oil %
Corregiolo	27.68
Nigerina	26.16
Nevadillo Blanco.....	22.92
Mission	22.51
Rubra	22.01
Pendulina	21.36
Redding Picholine.....	20.83
Macrocarpa	20.41
Manzanaillo	19.73
Columbella	19.54

The figures in this table indicate that the avocado ranks higher in fat or oil than the average or commonly used olive. The latter fruit also has the disadvantage of requiring special treatment before it is ready for consumption and should really rank as a processed fruit rather than a fresh one. The data in the table show that when considering the dry matter, only, the Chappelow shows the highest percentage of fat.

While it is true that the real value of any food is not always represented by the heat units or calories, at the same time the total food value is so indicated. This difference between the real value and total food value is not always properly understood. For instance, the energy value of a pound of sugar is 1820 calories, while the corresponding value for lean meat is less than 1000 calories. Yet we would hardly say that the real value of a pound of sugar was 1.8 times that of a pound of lean meat, if the question of growth were under consideration. When, however, the matter of energy is being discussed the case is entirely different, and the value of a food as a source of energy varies directly with its caloric value.

The energy values of the edible portion of the commonly used fresh fruits are low, ranging from a minimum of 175 calories to a possible maximum of 400 calories per pound.

An inspection of the following table shows that the avocado has a far higher value in this respect; the average of 26 varieties being 984 calories per pound, or more than twice the maximum noted for other fruits. The minimum figure, 597, is also in excess of this maximum. The maximum, 1325 calories per pound,

approaches that noted for some varieties of dried fruits. It corresponds to about 75 per cent of the fuel value of the cereals and is about the same as that noted for average lean meat:

Table Showing the Energy Value of the Avocado.

Variety—	Energy Value Per Lb. Calories.
Ganter	1,194
Harman	923
Miller	1,107
Walker	952
Sharpless	741
Chappelow	1,325
Blake	1,147
Chappelow	867
Carton .....	.....
Carton .....	.....
Unnamed	1,115
Topa Topa.....	778
Mattern	1,240
Northrup	1,303
Seedling No. 1.....	1,282
Seedling No. 2.....	812
Seedling No. 3.....	1,132
Seedling No. 4.....	1,019
Seedling No. 5.....	846
Seedling No. 6.....	948
Harman	852
White	722
Fowler	987
Cardinal	597
Northrup	1,101
Trapp	599
Azusa	1,042
Bread	1,200
Meat (medium).....	1,000
Sugar	1,820
Cheese	2,000
Butter	3,000

Until recently it was considered that the digestion coefficients of the nutrients in fruits were low, thereby indicating a low nutritive value. Metabolic experiments carried on at the University of California have disapproved this* and have shown that the diges-

tion coefficients for protein are practically equal to those obtained for graham bread while the digestion coefficients for the carbohydrates, fat and mineral matter compare very favorably with those obtained for the mixed diet. As previously stated no metabolism experiments have been carried on in connection with the avocado, yet it is only fair to assume that this fruit is as easily digested as any other whose coefficients have been ascertained.

The dietic value of fruit, aside from the actual nutrients which it contains, lies in its succulency—its minerals and organic acids. If gauged by its nutritive value alone, fruit would seem to be an expensive form of nourishment, but when its hygienic qualities are considered its money value to the consumer is difficult to estimate. Some fruits carry more nourishment with their hygienic properties than others. Some contain minerals which are more valuable to the system or less commonly distributed than others. Therefore, while there are general properties which are common to all fruits, each has special properties which justify individual consideration.

While the special dietetic value of a food cannot always be forecast by the chemical analysis, it is certainly permissible to suggest the possibilities which are indicated through such investigation. It is always necessary that such theory be confirmed by clinical experience.

Judging from its composition, the avocado should perhaps prove to have laxative qualities of a peculiar or individual type, possessing as it does the combination of the usual "fruit principles," and that of fat or oil. The laxative properties of most fruits depend upon the stimulating effects of the fibre upon the wall of the intestine and partly upon the organic acids and minerals. Oil has a tendency to soothe and to lubricate the intestine even while it acts as a mild laxative. The avocado is a natural combination of these two types of foods—as if fruit and olive oil had been chemically combined by nature. Whether or not there is any special advantage in this natural combination over that made by a proper selection of foods remains to be proved. There are no clinical data on the subject, but future experimental work may give some interesting results.

Fat is very important in the diet and should not be overlooked. It has different process of digestion from other sub-classes of the non-nitrogenous group and separate channels of absorption. The

failure to use fat overworks the organs engaged in the digestion of starch and sugar and further throws out of commission the fat digesting apparatus and it is well-known that the disuse of any organ tends to weaken it.

It was formerly considered, as far as digestibility and growth are concerned, that one fat was practically as good as another. In view, however, of the studies of Osborne and Mendel, McCollum and Hart, and others, the old ideas have materially changed. According to results of their experiments, it would appear that milk fat, egg fat, cod liver oil, have a higher nutritive value as far as growth is concerned than has either lard, almond oil or olive oil.

The avocado oil has not been investigated and it might be that as far as growth is concerned in the very young this may not be as valuable as milk fat. At the same time experiments might indicate that the avocado oil would be just as valuable as those fats yielding positive results in the above referred to experiments. In other words, there is offered several opportunities for metabolic investigations with reference to the use of the avocado.

Summarizing, then, it would appear that the avocado may be said to be, as far as fruits are concerned, in a class by itself, containing on the average a far higher caloric value than any other fresh fruit with the exception of the olive and in view of the fact that the avocado ranks higher in fat or oil than the average or commonly used olive, it outranks even this fruit with respect to its total food value.

Varieties of Hard-Shelled Avocados

	% Oil		% Edible Portion		% Seed		% Skin	
Solano	3.8		84.5		9.8		5.5	
Sharpless.....	15.8		78.1		13.7		8.2	
Senor	17.0		77.8		13.8		8.4	
Royal.....	15.6		73.6		15.8		10.6	
Blakeman.....	16.35		72.8		16.0		11.2	
Taft.....	17.4		71.8		17.5		10.7	
Trapp.....	9.8		71.5		20.3		8.2	
Champion	16.5		70.1		18.6		11.3	
Dickey A.....	16.4		69.7		13.1		17.2	
Beauty.....	15.2		66.1		21.9		12.0	
Lyon.....	16.3		65.8		25.1		9.1	
Ultimate.....	14.5		65.5		22.2		12.3	
Challenge	9.4		65.4		25.9		8.7	
Miller.....	23.7		64.2		16.3		19.5	
Brodia	10.8		63.2		21.7		15.1	
Rhoad.....	9.7		63.0		20.4		16.6	
Walker.....	18.7		62.9		25.1		12.0	
Rita.....	14.1		57.3		26.1		16.6	
Purple Prolific.	19.9		54.1		33.3		12.6	

THE AVOCADO IN FLORIDA AND OTHER LANDS

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To you who are growing the avocado here in California, a discussion of the culture and importance of this fruit in Florida and other regions may not be entirely without interest. While local conditions must largely control your methods and practices, the experience gained in other regions, especially in Florida, where a few men have been digging away at this problem for fifteen years, cannot fail to throw some light on certain questions which are arising in California. Naturally enough it will require the test of time to determine how far you can go in applying the methods of Florida and other more strictly tropical countries.

The proximity of this region to the avocado growing districts of Mexico has enabled you to come in close contact with the varieties, the cultural practices, and the superstitions of that country. It will probably be better for me, therefore, to limit my remarks to observations which I have made during the last three years in other parts of tropical America, principally in the West Indies, and most important of all, in Florida. It is in Florida only that there has been real development of avocado culture along modern lines, if one excepts the few budded orchards which have been planted in Cuba and the Isle of Pines. One cannot marvel at the lack of commercial avocado orchards in tropical America, for it must be remembered that in the tropics generally there is an astonishing lack of systematically cultivated groves of every kind, with the exception of those few fruits, such as the banana, whose culture has been undertaken on an extensive scale to supply the ever increasing demand of northern markets.

Recently we have been hearing a great deal regarding the unusual food value of the avocado. We have always known that it ranked high among food products, but when we see analyses, such as some of those which have recently been made at Berkeley, showing that in certain varieties the oil content is as high as 30 per cent, we are inclined to ask why was not the extraordinary value of this fruit earlier recognized, and why were not orchards planted years ago to supply the markets with it? To the first

query I believe we can truly say that its food value has been fully recognized by those peoples who are intimately familiar with it, such as the Cubans, the Mexicans, the natives of tropical America generally and those northerners who have lived or traveled in the tropics. But it was never realized here because until very recently we did not know we could grow the avocado—indeed we scarcely knew there was such a fruit.

One can scarcely appreciate the importance of this fruit to the peoples of tropical America until he visits some such region as Cuba, and sees the enormous quantities of avocados piled in the markets, and finds how universally the people are using them as a substantial addition to almost every meal. It was only last summer that I had this matter brought home to me, while traveling through the island of Cuba in company with a young Cuban from the Experiment Station at Santiago de las Vegas. We ate avocados and we ate them every day. Being accustomed to take mine with a little seasoning, I called for salt and lemon juice. He scorned the idea of adding anything to the avocado, and after cutting the fruit in slices, mixed it with whatever dish he happened to be eating at the time. He was especially partial to a mixture of fried eggs and avocado. Certainly, from the point of view of food value, this was a rich combination. The Cubans sometimes take a little salt with their avocado, and they are by no means averse to a guacamole—avocado salad—but I do not think any true Cuban believes, right down in the bottom of his heart, that you can improve the avocado very much by adding anything to it.

Why has not the avocado been more extensively planted in tropical America on a commercial scale? There are, I believe, two principal reasons for this. In the first place there are very few fruits that have ever been cultivated in the tropics on a commercial scale, as we understand that term, and secondly, there is the difficulty of propagating the avocado asexually and thus obtaining in quantity trees of known, desirable varieties which would fulfill in a reasonable degree the demands of the market. We cannot, of course, assume that had some easy means of vegetative propagation been known to the Mexicans, they would have been flooding our markets years ago with splendid avocados; this would probably not have been the case, but if the avocado had been propagated like the banana and the pineapple I believe its culture would

have been much more extensive in the tropics than it is at the present time. Cuba, with all her seedling avocados, probably does not grow one-half the amount that could be consumed, and would be consumed were choice fruits available in quantity at a reasonable price. It takes, of course, energy and organization to develop a great avocado industry, just as it has to develop a great banana industry, and so far the requisite energy and organization have not been forthcoming in the tropics. After all these years are California and Florida going to step in and take the matter out of the hands of our tropical neighbors? It appears so. The beginning which has been made in Florida, and which will be spoken of in detail later on, has served to demonstrate the possibilities that lie in avocado culture, when it is put upon the same modern and substantial basis as the culture of our important temperate fruits. The beginning which is now being made in California will, I feel sure, further illustrate the splendid future of the avocado in this country, a future for which many of us have the most sanguinary hopes.

It is somewhat peculiar that the avocado is not more abundant in Porto Rico. While it is one of the common fruits, it does not seem to be nearly so abundant as it is in Cuba, and I do not believe the seedlings will compare well in quality with those of Cuba, though they are all of the same type, i. e., the South American. I have heard of no commercial plantations of budded trees in the island, but some of the American colonists are contemplating the planting of small orchards. Porto Rico probably has several advantages over Florida, chiefly in the matter of better soil, but it will take experimentation to determine the best varieties for commercial cultivation. There seems to be no reason why Porto Rico may not compete with Florida in the markets of the eastern United States at some future time.

Next to Mexico, Cuba is certainly one of the greatest avocado regions of tropical America. The superiority of Cuban seedlings to those of many other regions has been noted by several observers; Prof. F. S. Earle considers that the best Cuban avocados have no superiors in the tropics. This is, of course, looking at the matter from the Cuban standpoint, for everyone knows by this time that Cuban avocados are not the ones to grow in California. It is from Cuba, however, that Florida has obtained practically all her

varieties. Walking through any one of the large Havana markets during August and September one can find an endless variety of avocados, some of them excellent, others fair, but very few which are really inferior. They are all of the South American type, which is, I believe, the only one grown in Cuba, if one excepts the few trees of the Mexican and Guatemalan types recently introduced from California. These fruits are produced by seedling trees scattered by the roadsides, in backyards and fence corners, and in all sorts of odd places which are not usually occupied by fruit trees in the United States. I believe it can truthfully be said that the avocado tree which receives systematic care in Cuba is very rare. Most of the trees receive no cultivation whatever, but the soil is excellent, and they seem to thrive. Propagation is by seed, but in recent years the government and some of the most progressive horticulturists of the island have taken up budding with fairly good results.

The fruits which go to market are picked usually before they are fully ripe, and when they reach Havana they are still hard. They are packed in sacks, boxes, or often hauled into town in a cart without any packing whatever. I have stood in the Tacón market at Havana and seen these fruits which were brought in from the country sorted into piles of different sizes, and then thrown from the ground into nearby wooden bins, a procedure which would certainly have been disastrous to a fruit commencing to ripen, and which can scarcely be recommended under any circumstances. For export, the Cubans pack the fruits in empty kerosene boxes, orange crates, or barrels, using no wrapping paper or packing material of any kind. The method is rather crude, and one hears a good many reports of Cuban fruit reaching New York in poor condition. In some cases, however, the loss is due more to other conditions than to careless packing, such as picking over-ripe and allowing the fruit to heat in transit.

There are a few good groves of Trapp avocados in the island, and also in the Isle of Pines. These have been planted by Americans, and have only recently come into bearing. They have demonstrated that the fruit will not hang on the tree so long in Cuba as it does in Florida, and also that the trees will make much more rapid growth. Failure to remain on the tree until late in the fall is something of a drawback, inasmuch as the highest prices are

obtained in late fall and winter. The Guatemalan avocado may solve the problem, however, and supply fruits during the winter and early spring. I saw at Guanajay, about an hour's ride from Havana, several young Guatemalan trees imported from California which were bearing their first fruits, and seemed to be making splendid growth. This type of avocado promises to be of immense value in Cuba as well as in Florida, because of its habit of ripening in winter and early spring. It is much earlier in Florida than it is in California, as will be mentioned later on.

The future of avocado culture in Cuba probably lies in the cultivation of winter and spring-fruiting varieties. The profits from shipments of summer-ripening fruits certainly cannot be great, when one considers the loss in transit and the low prices obtained during the summer season in New York and other eastern markets. When good avocados can be purchased wholesale at \$12 to \$25 per thousand, as they are in Havana during August and September, they can be shipped north and a profit made, even with considerable loss of fruit in transit, but the big possibilities of the future seem to lie almost exclusively in the winter bearing type.

In south Florida we have an entirely different state of affairs. There are plenty of seedling avocados, and lots of cheap fruit during the summer months, but the present avocado industry has been built upon a more substantial and profitable basis. There are approximately 200 acres of budded trees now in bearing, with about an equal area recently planted. Of this acreage, more than 95 per cent is planted to the Trapp variety. It can be truthfully said that the late-fruiting habits of this avocado have made possible the present development of the industry. The Trapp, however, is not an especially choice avocado. I am convinced that we can find a number of others in Cuba which will be just as late, and considerably better in quality. On this latter point opinions differ. A good many of the Florida growers think the Trapp the acme of perfection; a few others, who are entirely unprejudiced in their opinions, feel that the Trapp might to advantage have a smaller seed and richer flavor. Probably it will be superseded some day by a better fruit, but in the meantime Florida is going to grow Trapps, and rightly so, for past experience seems to show very plainly that in matters of this kind it is poor economy to search indefinitely for the ideal fruit and produce nothing in the mean-

time. Credit must be given to that indefatigable pioneer, George B. Cellon, for having shown considerable sagacity when he picked out the Trapp. Undoubtedly it was the best seedling available in south Florida at the time it was chosen. The Guatemalan varieties bid fair to take first rank in the near future, and Mr. Cellon was the first orchardist to see it. Two years ago, when the seedling Guatemalan avocados came into fruit at our Miami Plant Introduction Garden Mr. Cellon saw the trees and was interested. Somewhat skeptical at first, he sent to California for budwood of the best Guatemalan varieties of local origin as well as a number of the imported ones. He cut back a young orchard of Trapp avocados and top worked them to Guatemalans. Today, less than two years from the insertion of the buds, he has fruit on seven or eight of those trees, representing five varieties, and when I last saw him in September he remarked to me, "The other fellows can wait if they want to, but I am going to plant Guatemalan avocados." And suiting the action to the word, he has already set out two or three acres, all that he had stock to plant. We have three seedling trees of the Guatemalan type at our Miami Garden, one of them from a tree here in Los Angeles. They have been in fruit two or three years, and there is every indication that this type is admirably suited to south Florida conditions. A point of almost greater interest is that all these trees ripen their fruit a month to two months earlier than most of your varieties here in California, and I suspect the warmer climate of Florida is going to result in changing the season, making it more nearly what it is in Mexico and Guatemala. We will know in another year or two. Mr. Cellon is counting on this feature to eliminate competition between Florida and California in the eastern markets. He believes they can supply the late fall trade with Trapps and the winter trade with Guatemalans. Late spring and summer, he says, will be left to California. It is up to you to say whether you are going to stand for this or not!

Nearly all of the budded avocado orchards of Florida are to be found in the vicinity of Miami. On the West coast there are a few plantings, notably at Sarasota, a short distance below Tampa, and at Fort Myers. The real avocado region, however, is the Miami limestone belt, which is a narrow strip of land along the East coast between Fort Lauderdale on the north and the upper-

most keys on the south. Its greatest width is not over nine miles, and the maximum elevation is about 20 feet. When I first went to Florida from California two years ago this country looked rather uninviting to me, but I have become accustomed to it now, and the more I see of it the more I like it. It has its drawbacks, of course, but I am convinced that it is destined to be a great avocado region one of these days.

The surface of the land is rough, jagged limestone, sometimes overlaid with as much as a foot of sand, sometimes almost bare, with only a little soil in the potholes. Where the dense native growth called hammock has been cleared off it is richer, and below Miami, from Larkin to Homestead, there is a superficial layer of reddish clay, which is, I believe, the best avocado soil in this region. During this past spring and summer, it has been impressed on me that the groves south of Miami, on this heavier soil, are doing better than are those north of Miami, where there is nothing but light sand over the rock. The thing resolves itself into this: The avocado likes a deep, heavy loam, with plenty of moisture. We cannot supply this in Florida, but the nearer we can approach it the better, and I believe the reddish soils below Miami, even though shallow, are the best for the avocado. It does not seem to be at all objectionable to have the rock close to the surface; there is strong evidence, in fact, to indicate that the presence of the rock serves to control the moisture supply, and the trees do not suffer during a period of drought as they do on deep sand. I really think it would surprise you to see the excellent growth made by some of the groves south of Miami. It takes a little fertilizer to turn the trick, but there are a good many trees, especially seedlings, that get very little of it indeed, and still they give a pretty good account of themselves.

There are very few diseases or pests which cause the orchardists much concern. There is one difficulty, however, which has been puzzling everyone, and has probably caused more loss than all other factors combined. The young trees, especially of the Trapp variety (which seems to be weaker constitutionally than Pollock and others), will frequently fail to "take hold" when set in the orchard, and after struggling for awhile, and making a few growths with small, ill-shapen leaves, will die back from the ends of the branches and eventually have to be replaced. This trouble

sometimes attacks trees which have made good growth for several years, and are apparently healthy. They commence to die at the ends of the branches, the leaves drying up and the bark turning brown, and after a short time the old wood is reached. There have been many attempts to explain this peculiar disease, some blaming it on lack of sufficient plant food, others thinking that it might be caused by the anthracnose fungus (*Colletotrichum gleosporioides*). The subject needs further investigation, but it begins to look very much as though it was due to drought more than anything else, for it has been noted to be most prevalent in seasons when there was a shortage of rainfall, and has been much more troublesome on dry sandy soils north of Miami than on the clay soils around Homestead and Larkin. Is it not probable that the browning of avocado leaves which is so common here in California may be due to the same cause? Perhaps it is the dryness of the atmosphere rather than of the soil which usually affects the trees here, since they are ordinarily well irrigated and the soil is retentive of moisture.

In most of the Florida groves the trees are planted about 24 by 24 feet. Sometimes this distance is decreased to 20 feet, so that the trees will shade the ground sooner; sometimes it is increased to 26 feet, so as to allow more room for ultimate development. They undoubtedly require more room on heavy soils than on light, and for this reason it will doubtless be necessary to plant at greater distances here in California. Experience has shown that the young trees should be kept heavily mulched; weeds, grass, palm leaves and seaweed are used for this purpose. During the winter season the mulch is sometimes removed, and the surface given very shallow cultivation; on the approach of summer the mulch is replaced, and cow peas or velvet beans are often planted between the rows. A mulch should be kept around the tree until it is at least 3 or 4 years old, when the shade of its foliage and the accumulation of fallen leaves upon the ground may serve as sufficient protection from the sun.

There is no established practice in regard to fertilizing avocados, each grower having his own ideas on the subject, as a rule. Opinions generally agree, however, that nitrogen should be from an organic source, and blood and bone is one of the favorite fertilizers. The first year after the grove is planted five or six

pounds are usually given to each tree, in five or six applications during the year. During the second year the amount may well be increased to 12 pounds per tree, and the third year to 24 pounds per tree. In the old Bliss grove, now in its eleventh year, each tree receives approximately 50 pounds per year, in four applications. The last application in the fall is given about the end of November; no more fertilizer is then applied until after the fruit has formed in the spring.

Some of you may know S. B. Bliss, who planted the Bliss grove. He spends part of his time here in California and is almost as much of a Californian as he is a Floridan. He had the foresight to start out in an early day, when the planting of budded avocados was looked upon as a rather precarious undertaking, and plant an orchard of nearly twenty acres. The first few years were not without their problems, but the enterprise survived all vicissitudes and is today paying handsome returns. We have no \$30,000 trees in Florida, such as the newspapers report here in California, but a property like the Bliss grove, if it continues to pay as well as it has the past two years, should liberate a man from financial worries.

Probably you would be interested to learn some of the actual returns from these Florida groves. I have it from an authoritative source that the average return from one large grove, which shipped over 1400 crates of Trapps during the fall of 1914, was \$5.50 per crate net. In another grove the entire crop was marketed at a net price of \$5.25 per crate. In this grove the trees produced an average of one and one-half crates of fruit, and there were 70 trees to the acre; the net profit was, therefore, \$550 per acre. The yield per tree seems low, and has, I believe, been exceeded in several other instances. W. J. Krome of Homestead, who grows Trapps extensively and who has kept careful crop records, tells me that a tree should yield four crates of fruit at five years of age. This has been a fair average for his trees; some of them have fallen as low as 2 or 3 crates, while the average of 4 has been considerably exceeded in other instances. Mr. Cellon says some of his Trapps, which are now 8 or 10 years old, produce from 6 to 10 crates. The average pack is 40 fruits per crate, the extremes being about 23 and 54. At the beginning of the season, i. e., in October, Trapps bring about \$2 per crate. By Thanksgiving

the price is considerably higher and from that time until after Christmas it is excellent. The last few crates from one grove the past season brought \$36 per crate of 36 fruits; this was in early February.

Trapps have been shipped without difficulty to all parts of the United States. The past season one grower sent small consignments—a crate or two—every day during a large part of the shipping season to Seattle, Wash., and told me he did not receive a single complaint of a crate being received in bad order. These shipments were on the road eight days, and were not sent in cold storage. I do not know of any instances in which avocados have been shipped from Florida in cold storage. The usual method is to ship by express.

At the present time most of the crop goes to the markets of the eastern United States—Washington, Philadelphia, New York and Boston each taking a good share. There seems to be quite a demand in the Middle West, however, and I understand a good many shipments are made to Chicago, St. Louis, Cincinnati and even as far west as Denver.

The shipping qualities of Trapp are much better than the average seedling. One grower told me that last year he received a report of several cases of Trapps being received in bad order in one of the northern cities; he thought it peculiar, and upon investigation found that his man had put in a number of seedling fruits which looked like Trapps, and it was these that had spoiled in transit. Some attention should be given to this subject here in California, though it may not be of such great importance with the Guatemalan type as it is with the South American.

Best results in picking avocados have been obtained when orange clippers were used. The stem is usually swollen just above the point of attachment with the fruit, and it is severed with the clippers just above this swollen portion. Seedlings are sometimes picked before they are fully ripe, a thing which should not be encouraged, for these fruits, when they soften up and are sold in northern cities; are certain to be flat and tasteless, and if they should fall into the hands of those who were trying the avocado for the first time they would give a very bad impression. Trapps are left on the tree as long as possible; when they begin to change from bright green to yellowish green they must be picked or they

will drop. Sometimes they are picked only a day or two before they would drop, and in such cases they are certain to ripen up in transit and reach the market in an over-ripe condition. To prevent this Mr. Cellon tells me it is his custom to lay aside any doubtful fruits as soon as picked and leave them 24 hours; if at the end of this time they are still firm he concludes that they will stand shipment.

The standard package for avocados in Florida is the tomato crate, which measures about 12x12x24 inches. It is sometimes used with a partition in the center, sometimes without. Excelsior is used above and below each layer of fruits as a cushion. Some growers wrap each fruit in tissue paper, but it is coming to be generally believed that it is better not to wrap them at all. The fruits seem to heat more quickly when wrapped, and as heating greatly hastens the ripening process it must be avoided as much as possible.

Now as to varieties and types. Trapp is the only one which is at all extensively grown, as has already been mentioned. There are several others, however, which deserve a word or two. Trapp commences to ripen in late September, at the time when most varieties are just about going out of season. Many of the fruits must be picked in October or November or they will drop. A few hang on until New Year's, and an occasional one until February. Several other varieties have appeared in Florida which show the same tendency to carry their fruits very late, but as yet none of these has assumed any prominence. I believe we may obtain a seedling one of these days, however, which may prove to be just as late as Trapp, of fully as good or better quality, with a smaller seed, and of a stronger constitution. We will probably have to depend upon the South American type to furnish varieties for fall and early winter, after which the Guatemalan type will hold sway. Pollock ranks next in importance to Trapp, yet the total number of trees grown in the vicinity of Miami is small. It is a magnificent fruit; large, attractive and of as good quality as any Florida avocado I have eaten. Though it ripens in late summer, Mr. Cellon has found that it sells well in northern markets, bringing a sufficiently higher price than seedling fruits to more than offset the small crop which it produces. It shows a strong tendency to fruit in alternate years, and never bears very heavily.

The tree is a strong grower and suffers less from die-back than Trapp.

Beyond Trapp and Pollock there are no varieties cultivated on a commercial scale. Quite a number of good avocados have appeared within the past 10 years, and some of them have been propagated to a limited extent, but the demand has been for a fruit which would ripen late, and Trapp has been the only one to meet this demand. One who wants a good summer fruit, however, can choose between a number of good varieties, smaller than Pollock, but more prolific. Wester is one of the best of these, but it is a maroon-colored fruit, and there is strong prejudice among some of the growers against reddish or purple fruits, if they are to be marketed. Mr. Cellon has persistently affirmed that a purple avocado would not go in northern markets, and he will not give serious consideration to a variety of this color. Cardinal is another good summer fruit, of an attractive bright crimson-red color. Family has been propagated to a certain extent, more at Palm Beach than at Miami, I believe. It commences to ripen early but carries some fruits well toward the end of the season. It is prolific, but is generally considered to be very much below the standard in quality.

The question is often asked: Which section grows the best avocados, Florida or California? No doubt the reply to this is largely a matter of personal preference; to some palates the South American type may be preferable, to others one of the types grown in California. I do not believe the question can be answered in few words. Personally, I do not consider the South American seedlings, grown in Florida and Cuba, nearly as good, on the average, as the Guatemalan seedlings grown in California. A fruit such as Pollock, however, certainly puts a somewhat different aspect on the thing. Comparing the South American and Guatemalan types, one finds that the latter is characterized by a slightly richer, more nutty flavor, on the whole, and I prefer it to any other. I had an opportunity to test it under favorable conditions at Miami last spring, and I believe that the best California varieties, such as Taft and Blakeman, will be of just as good quality when grown in Florida as they are here in California. This question has sometimes been argued on a rather unsound basis, I think; it is not so much a question of whether the South Amer-

ican type is as good as the Guatemalan type, as it is a question of whether Florida will produce as good fruits of a given variety as California. Of course, the same variety when grown under widely different conditions will often exhibit slight differences of texture, color or flavor, but I do not believe that the difference between Florida grown and California grown avocados of the Guatemalan type are going to be great enough to merit attention..

Questions on the subject matter of the above paper elicited the following from Mr. Popenoe: That the Trapp bears heavily in Florida, and that they prune very little. The trees are stocky and dwarfed in stature,—a ten year old tree there being no larger than a five year old tree in California,—and it is customary to plant about seventy trees to the acre. Practically no irrigation is used.

On being questioned about it, Mr. Popenoe produced a Trapp fruit which he described as having a thick leathery skin, not hard like the thick skins of California, but pliable, yellowish green in color when ripe, smooth meat of good flavor, but with a comparatively large seed which is loose in the cavity in about one-half of the fruits. The tree blooms from November to March, and fruit is marketed in summer.

As to experiences of the Florida growers, he thinks they will be of little value to the California growers, on account of the difference in soil and climatic conditions. Their trees are often grown on soil only one foot in depth. The young trees will stand a temperature of 30 to 32 degrees, older ones about 28 without being hurt.

Supply and Demand

Queries brought out the fact that the supply of good fruit never equaled the demand. In the Trapp season there has by no means been an excessive supply, and at present they are the greatest source of commercial fruit. California has an open field in the eastern markets from January to July when Florida Trapps are not in competition, but the latter state may come in later with a Guatemalan variety.

The avocado is produced now the whole year round, but Mr. Popenoe could think of no hard shelled fruit ripening in California in January or February.

A gentleman of the audience stated that he knew of a hard shell variety that ripens in January, and discussion brought out the fact that this was the Spinks fruit, a specimen of which weighed 37½ ounces, and was grown by Mr. Wm. A. Spinks at Duarte.

On further questioning Mr. Popenoe stated that he felt that the best soil was a rich, sandy loam, although in Florida he found that trees do better on the heavier soil. In Cuba, where he had seen some very good groves, they have a great deal of red clay.

President Hart adjourned the meeting a little before noon, in order to give the audience an opportunity to see the exhibits of fruit and trees, and sample the various dishes of avocado that had been prepared in different forms. Adjourned to 1:45 p. m.

AFTERNOON SESSION

INDIVIDUAL TREE RECORDS

A. D. Shamel, U. S. Department of Agriculture, attached to the Riverside Experimental Station

Ladies and gentlemen: Mr. Popenoe has asked me to say a word, or make a suggestion, as to keeping individual tree records of the avocado trees which you are planting now. I have not had the opportunity, Mr. President, of making any observations or carrying on any work with avocados, nor do I expect to have an opportunity. The Department of Agriculture, however, has just appointed a young man, Mr. L. B. Scott, who was associated with me for four years in citrus work, to carry on individual tree records with the avocado similarly to the individual tree records we are carrying on with the citrus trees.

It seems to me that the avocado industry at this time offers a splendid opportunity for individual tree work. If you could visit the citrus orchards we visit and find, as we do, that many of them have from fifty to seventy per cent. trees of an inferior type, I think you gentlemen who are the pioneers in the avocado industry would be more interested in individual tree records as a basis for propagation. My suggestion would be to every grower of the avocado to number his trees and keep a record of the number and weight of fruits taken from each tree, together with the time of picking.

This information will, in time, constitute a performance record from which your association, or you yourselves, can intelligently pick out the best trees for budding.

All sorts of mistakes that have been made in the propagation of citrus and other fruits through the selection of poor trees for propagation, even as to varieties so well established, can be avoided and it seems to me to be a work of surpassing interest among avocado growers to keep individual tree records as a basis for the selection of trees for propagation.

My suggestion would be to have these records handled through your association, and the records kept by the association for the members of the association. Perhaps that might be the best plan. In any event, if any avocado growers desire to undertake this work before the association is ready to care for the records, we will be glad to co-operate to the extent of keeping these records for you together with our citrus individual tree performance records. It means a tremendous lot in the avocado industry. The problem is varied. There is a variety of means of selection from seedlings and other trees, and the intelligent selection of these trees, you know, can only be done through some definite individual tree knowledge. It seems to me this information is well worth while now. It is a practical thing you can take up at this stage of the industry, and I believe is well worth doing. I thank you.

The chairman stated that Mr. Shamel's ideas were directly in line with what the association is attempting to do at this time, and asked that individual tree records be forwarded to the association. Such records will be carefully tabulated and kept on file for the benefit of members.

In answer to a query in regard to the confusion in the nomenclature of the varieties, the chairman expressed the opinion that within the next six months it will be possible to appoint a committee to pass on names and register with the association in such a way that members can get definite information as to varieties.

VARIETIES OF THE AVOCADO

F. O. Popenoe, President of West India Gardens, Altadena, Cal.

I believe it can safely be said that the most important problem which we avocado growers of California are facing at the present time is the question of varieties. I have just had this brought home to me very forcibly by finding, when I came to prepare a list of all the varieties which had been planted in California, that the number totals well above eighty. How is the prospective planter to know which of these are best suited to his needs? And how are we to reduce this enormous number to the 10 or 15 choice varieties which we will ultimately want to cultivate?

Our experience in California with avocados is as yet limited, but we are getting more data every year, and we begin to feel, in regard to certain varieties, that they can be planted with a sufficient degree of safety to make a practical horticultural enterprise. Every fruit grower knows that there is a constant shifting and changing of varieties, and rarely can we settle down to cultivate any one permanently. We are seeing orchards budded over every year, because the owner was not satisfied with the variety he was growing. It is hopeless, I suppose, for us to expect that we can settle down upon any limited number of avocado varieties for a long time to come, but we can and must cut down the number to as few as possible, and be able to recommend those which will be absolutely the best obtainable. This association can, I believe, be of great assistance to the public in this connection, by disseminating information concerning the most desirable varieties and eliminating the inferior ones.

Just now it seems to be a fad for any one who has a seedling avocado tree which is bearing fruits of even fairly good quality, to give the variety a name and propagate it. That is why we have 86 varieties growing in California today. Of course, it is highly desirable that we test as many varieties as possible, as it is only in this way that we can ever hope to standardize the very best, but let us try to avoid burdening ourselves unnecessarily. Most of all, let us avoid confusing the mind of the prospective planter by forcing him to choose between a horde of unknown sorts, some of which may be absolutely inferior. Let us keep this industry freed from the confusion caused by numberless varieties.

Different Types.

I do not believe the people of California have yet reached an understanding concerning the different types of avocados which we are cultivating, and it will be well if we can get these clearly established at once so that we may all use the same terms and language in speaking of the types. At the present time, many nurserymen are classifying avocados in their catalogues as "thin-skinned" and "thick-skinned" or "hard-shelled." This is scarcely sufficient for accuracy, and I would like to point out the characteristics of the types cultivated in California, as I have seen them and as they are beginning to be generally recognized by pomologists.

Considering all the avocados which are cultivated in the United States, we find them naturally falling into the following three groups:

1. The WEST INDIAN or SOUTH AMERICAN type. This appears to be the most tropical in character of all the types we have tested in California, and I only know of one instance in which it has fruited in this state. C. P. Taft of Orange has grown a number of seedlings from Cuba, two of which have borne fruit. Trees of the South American type are more susceptible to frost than those of the Guatemalan type, and vastly more so than the thin-skinned, small fruited Mexican type. In character of foliage it is often difficult to distinguish this type from the Guatemalan, but as a rule the leaves are somewhat smaller here in California, are crowded more closely together on the branches, and the wood is of lighter color. The foliage, too, is usually of a lighter shade of green. The fruits of this type vary in form as do those of the others, being pear-shaped, oval or round. In color they are usually yellowish green or maroon. The skin is leathery, and separates readily from the flesh, but it is not so thick nor so woody as in the Guatemalan type. The flesh is often rather watery in seedlings, and not so richly flavored as in the Guatemalan type, but in some of the best varieties the quality is good. There is one defect which is not usually found in the Guatemalan type, i. e., the seed is large and often loose in the cavity. It appears at the present time as though this type would not become of any importance in California. It is the principal one cultivated in Florida, the well-known varieties, Trapp and Pollock being representatives of

it. It is the one cultivated in Cuba and other West Indian Islands, and along the coast of Central and South America.

2. The GUATEMALAN type. Commercially this is doubtless the most valuable type cultivated in California, and it is the one which is being at present most extensively planted. It is peculiar in that it carries its fruits through the winter and into the following summer, thus requiring 12 to 16 months to ripen them. While the Mexican type blooms in winter and ripens its fruits the following summer, and the West Indian type blooms in spring and ripens its fruits in summer, the Guatemalan type blooms in late spring and carries its fruits over the following winter and sometimes as late as September and October of the following year. The varieties of this type at present cultivated in California ripen from February to September. For fall and early winter other types must be grown, unless we obtain, later on, varieties of the Guatemalan type which will extend the season.

The California representatives of this type have originated in Guatemala and in Southern Mexico, principally in the vicinity of Atlixco, state of Puebla, Mexico, at an altitude of nearly 6000 feet. A large proportion of the varieties which have originated here in California came from seeds imported from Atlixco by John Murrieta of Los Angeles about 1900. Mr. Murrieta's work has probably had a more profound influence on California avocado culture than that of any one else up to the present time.

Because of the Mexican origin of several of our Guatemalan varieties, some have thought this name inappropriate. Inasmuch as these thick-skinned Mexican varieties belong to the Guatemalan type, however, they should certainly be called by this name, as it serves to show their relationship to other varieties of the same type.

The characteristics which distinguish this type from the others are several and as a rule quite dependable, though it is sometimes difficult to distinguish one of the thinner skinned Guatemalan fruits with an almost smooth surface from a fruit of the West Indian type. When the texture of the skin does not serve to identify the fruit to a certainty, the Guatemalan can usually be distinguished by the color of the fruit and by the character of the seed and its coats.

The tree is easily distinguished from that of the Mexican type by the entire lack of anise-like fragrance in the leaves. The type

seems to be about midway in hardness between the West Indian and the Mexican. There is a slight difference in hardness among the different Guatemalan varieties.

The fruits of this type have a thick skin, frequently woody and brittle. The surface is usually more or less rough, sometimes covered with wart-like protuberances around the base, but in a few cases nearly smooth. The flesh is usually free from fiber, and of good flavor. It is scarcely as rich and oily as the average fruit of the Mexican type, but is very pleasant and of satisfactory quality from every point of view. The seed is usually not large in proportion to the size of the fruit, and is almost never loose in the cavity. The keeping and shipping qualities are remarkably good, and I believe this type to be the true commercial fruit.

3. The MEXICAN type. This is the hardiest type in cultivation and at present the only one we have which ripens during late fall and early winter. It was introduced to California from Mexico, where it appears to be by far the commonest and most abundant type. Some varieties are of unusually rich flavor and excellent quality; in others there is an objectionable amount of fiber in the flesh. The oil content runs as high as 33%, and averages considerably higher than in any other type.

The tree is usually vigorous of growth, very hardy, withstanding in some instances temperatures as low as 18 or 20 degrees without injury. As the fruits are usually under one-half pound in weight, the tree is able to carry an immense number of them, 4000 sometimes being produced in a single crop. The fruits are usually oval or pear-shaped, ranging from 3 to 10 ounces in weight, and green or dark purple in color. The skin is about as thick as that of an apple. The seed is sometimes loose in the cavity, with loose seed coats.

The plant is characterized by an anise-like odor, which is sometimes found even in the ripe fruit.

If picked at the proper time, fruits of this type can be shipped reasonable distances without difficulty, but they do not hold up so well in market as do the thick skinned sorts. They are excellent fruits for home use, and as they ripen at a season when no other type is in market, they must also receive attention from a commercial standpoint, in a limited way.

The tree comes into bearing earlier than that of the other

types, sometimes at two or three years from seed, and in the case of budded trees, usually within two years. The Guatemalan on the other hand, does not bear as a rule until about five to seven years old when grown from seed, and at about three or four years from the time of budding.

Specific Varieties.

Of the Mexican type the best which are now being propagated would seem to be the Ganter and Harman, green in color, and the Chappelow, Northrop and Carton, all purple. These are about all equally vigorous in growth, they have the same tendency to bear early and prolifically, and are in a general way of the same quality. The Harman and Ganter are the largest, and I would pick them as the favorites but for the fact that many of the fruits develop upon ripening a soft or decayed spot at the lower end, which is a severe handicap when offered on the market. It is possible that we may find some method of remedying this defect. If so, these two varieties would stand out as the best produced in California up to the present time.

Of the Guatemalan type, the consensus of present opinion favors the Taft as the best variety of local origin. This is an excellent fruit, and one which we all feel safe in planting. While it may maintain its lead it is being closely pushed by the Sharpless and Blakeman, two unusually fine fruits. Colorado, one of the best fruits produced by Mr. Murrieta, is another excellent variety, and Meserve, which originated at Long Beach, is also being quite extensively propagated. All of these have good commercial characteristics and are well worth planting. Other Guatemalan varieties which have been receiving a great deal of attention are Challenge, which has produced some enormous crops and is a fruit of perfect form, but with a large seed and not of the highest oil content; Walker, the most prolific of all Guatemalan varieties grown in California, but rather small and with a large seed; Lyon, a prolific and very precocious variety, but not a very strong grower, and seeming to be rather susceptible to frost; and Solano, one of the largest fruits grown in California and very handsome, but not rich in oil.

In another category must be placed Dickey, Royal and Murrieta. These are all splendid fruits, but it has been found that the young budded trees are exceedingly difficult to rear. After the buds have taken, and perhaps made a growth of two or three feet,

many of the plants turn yellow and die. We have not as yet discovered the cause of this trouble. It seems to be a constitutional weakness, and it may be very difficult to remedy. When top-worked on old stumps these varieties usually grow well and do not show the tendency to die which the young budded trees do.

All of these varieties, and others, will be found described in the accompanying list. This list is intended to include practically all the varieties which have been propagated in California since the inception of the industry some five or six years ago. In compiling it, an effort has been made to have the spelling of the varietal names accurate and to bring the nomenclature into accord with the rules of the American Pomological Society, the standard in such matters. The descriptions are designed to convey, in as few words as possible, an accurate idea of the important characteristics of the fruit, as well as the habit of growth, productiveness and hardiness of the tree. Synonyms, where there are any, are given immediately after the variety name, following which is the name of the town or district where the variety originated, and the year when it was first propagated by budding or grafting. These dates may not be absolutely correct in every instance, but they will serve to show approximately when the variety came into existence as a horticultural form. This list was submitted for criticism to Edwin G. Hart, C. P. Taft, W. A. Spinks and D. W. Coolidge, directors of this association, and to T. U. Barber of Hollywood.

KEY TO THE TYPES.

Mexican Type

A. Leaves usually anise-scented; skin of fruit rarely thicker than that of an apple.

Guatemalan Type

AA. Leaves not anise-scented; skin of fruit thick.

B. Surface of fruit slightly roughened to warty, dark green or dark purple in color; skin 1-16 to $\frac{1}{8}$ -inch thick, often coarsely granular and woody; seed coats thin, both adhering closely to the seed; cotyledons nearly smooth.

West India Type

BB. Surface of fruit smooth or nearly so, light green, yellowish, or maroon in color; skin rarely as much as 1-16 inch thick, pliable and leathery; seed coats thicker, rarely closely attached to the seed, frequently distinct with the outer one adhering to the wall of the seed cavity, the inner one loosely surrounding the seed; cotyledons usually rough.

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All the varieties included in the list are here given in alphabetical order, without reference to type, the numbers referring to the positions they hold in the list. Synonyms are printed in italics, followed by the number of the variety under which they will be found.

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MEXICAN TYPE.**a. Varieties of California Origin.**

1. **AZUSA.** Azusa, 1914. An elongated, pear-shaped fruit, not distinctly necked, measuring about $4\frac{1}{2}$ inches in length and weighing 6 to 8 ozs. It is glossy purplish-black in color, with cream-yellow flesh of rich nutty flavor, containing by analysis 21% of fat. The tree is a vigorous grower, hardy and productive. It blooms in January and ripens its fruit in November and December.

2. **BLAKE.** Pasadena, 1910. Slender pyriform, with a rather long neck, sometimes curved. Length, about 4 inches, weight, about 6 ozs. The skin is smooth, light green, with numerous yellowish dots. Flesh creamy yellow, smooth, of very rich flavor. Seed conical, rather small, often loose in the cavity. An analysis has shown that this variety contains 25% of fat. The tree is very hardy, moderately vigorous in growth, productive, the season October.

3. **CARTON.** San Fernando, 1913. Slender pyriform, rarely distinctly necked, about 4 inches in length and 6 to 8 ozs. in weight. Skin smooth, purplish black in color, very glossy. The flesh is creamy yellow in color, of smooth, buttery texture, and rich flavor. Analysis has shown it to contain 19% of fat. The seed is rather large, sometimes loose in the cavity. The tree is hardy, a vigorous grower, flowering from January to March and ripening its fruit in October and November.

4. **CHAPPELOW.** Monrovia, about 1902. A slender pyriform fruit, distinctly necked, about 4 inches in length and 5 to 8 ozs. in weight. The surface is smooth, glossy, deep purplish black in color with reddish dots and scars. Flesh pale greenish yellow, buttery, free from fiber, and of very rich flavor, containing 29% of fat according to one analysis. Seed rather small, about 1 oz. in weight, tight in the cavity. The tree is vigorous, hardy, blooming from November to March and ripening its fruit from August to November. The average crop of the parent tree during the last 11 years is said to have been 518 fruits, which entitles it to be considered fairly productive.

5. **FOWLER.** Pasadena, 1910. Form oblong-oval to obovate, about 4 inches in length and 4 to 8 ozs. in weight. The

surface is smooth, glossy, light green overspread with russet on one side. Flesh yellow, buttery, sometimes slightly fibrous, of very rich, nutty flavor, containing 21% of fat, according to one analysis. Seed rather large, oblong-conical, tight in the cavity. The tree is a vigorous grower, hardy, but not very productive. It ripens its fruit from August to October.

6. GANTER. Whittier, 1908. An oval to obovate fruit, 3 to 4 inches long, weighing 4 to 9 ozs. The surface is smooth, only slightly glossy, green, with numerous yellowish dots. The flesh is cream-colored, sometimes slightly fibrous, of rich, nutty flavor, containing 25% of fat by one analysis. The seed is small to medium-sized, loose in the large cavity. The tree is a very vigorous grower, hardy, precocious, very prolific, flowering in January and ripening its fruit from October to December. While still on the tree, the fruit shows a tendency to decay at the apex.

7. HARDY (Syn. *Taft Hardy*, not to be confused with *Taft*.) Orange, 1913. A small, obovate fruit, about $2\frac{1}{2}$ inches in length and 3 to 5 ozs. in weight. The surface is smooth, green in color. Seed rather large. Flavor rich. The tree is precocious, hardy, and a prolific fruiter, but of insufficient value to merit propagation. Though it originated in the orchard of C. P. Taft it has been neither named nor propagated by him, and he considers it of no value.

8. HARMAN. Sherman, 1910. Form obliquely obovate, length 3 to $4\frac{1}{2}$ inches, weight 5 to 10 ozs. The surface is smooth, glossy, greenish purple in color, with large yellowish dots. Flesh cream-yellow, of fine, buttery texture, free from fiber, and of very rich flavor. Analysis has shown it to contain 18% of fat. The seed is large, loose in a large cavity. The plant is unusually vigorous in growth, making an erect, strong tree; it is a prolific bearer, and blooms from November to March, ripening its fruit from October to December. When fully ripe, the fruit shows a strong tendency to burst or decay at the apex.

9. HATHAWAY. Hollywood, 1913. An oval to obovate fruit, 3 to 4 inches long, weighing 5 to 8 ozs. The skin is light green, the flesh pale cream-colored, somewhat fibrous, of rich flavor. The tree is vigorous, prolific, flowering in January and ripening its fruit in September and October. Hardy.

10. HOLLLENBECK. Los Angeles, 1912 or 1913. Form oval or obovate, about 3 inches in length and 4 to 8 ozs. in weight. Surface smooth, green, washed with russet or maroon. Flesh yellow, slightly fibrous, of rich flavor. Seed rather large. Tree vigorous, hardy, not very productive, ripening its fruit about October.

11. HORN. Sherman, 1910. An inferior fruit, no longer being propagated.

12. KNOWLES. Santa Barbara, 1915. A small, pyriform fruit, scarcely necked, weighing 5 or 6 ozs. The skin is very smooth, glossy, purplish black in color. The flesh is yellow, somewhat fibrous, oily, of rich flavor, containing, by one analysis, 33% of fat. The seed is medium-sized, rarely loose in the cavity. The tree is vigorous, hardy, and at about eight years of age produced 1000 fruits in one crop. It ripens from December to February, unusually late for this type.

13. MATTERN. Los Angeles, 1912. A small pyriform, purplish bronze fruit, weighing only 3 or 4 ozs. It is of good quality and rich flavor, containing by one analysis 25% of fat, but too small to be worthy of general planting.

14. MONROVIA. Monrovia, 1912. Pyriform, about 4 to 8 ozs. in weight. Surface glossy, smooth, dark purple in color. Flesh free from fiber and of rich flavor. The tree is hardy, a strong, thrifty grower, but inclined to be irregular in bearing and not very prolific. It ripens its fruit in the fall.

15. NORTHROP. (Syn. *Eells*). Santa Ana, 1911. In form this fruit varies from obovate to pyriform, sometimes distinctly necked. It measures about 4 inches in length, and weighs from 4 to 7 ozs. The surface is smooth, glossy, purplish black, the flesh cream-yellow in color, fine, smooth, almost free from fiber, and of rich flavor, analyzing 25% of fat. The seed is medium-sized, tight in the cavity. The tree is very hardy, of vigorous growth, and has the habit of producing two crops annually, the main crop ripening in October and November, the second crop, which is much smaller, in April and May.

16. PICO. Hollywood, 1910. A small, obovate fruit, not over 3 inches long, and weighing 3 to 5 ozs. It is deep glossy pur-

ple in color, with cream-yellow, smooth flesh of rich flavor. The seed is rather large, tight in the cavity. It is hardy, a prolific bearer, ripening from September to November. Its small size makes it of comparatively little importance.

17. RAINNEY. Santa Barbara, 1912. A rather slender pyriform fruit, with a pronounced neck, measuring about 4 inches in length, and weighing 4 to 6 ozs. The flesh is pale yellow, slightly fibrous, but of fairly rich and pleasant flavor. The seed is medium-sized, completely filling the cavity. Tree vigorous, hardy, and fairly productive.

18. RODOLF. Monrovia, 1913. A slender pyriform or oblong pyriform fruit, with a long neck. Color, size and other characteristics of fruit similar to those of Chappelow, of which the variety is a seedling. The tree is hardy, prolific, commencing to ripen its fruit in August and continuing through the fall months. It is considered to be more productive than its parent.

19. SKINNER. Los Angeles, 1913. Described as similar to the Northrop, but not quite so large nor so richly flavored. Said to be very hardy.

20. TOPA TOPA. Nordhoff, 1913. An elongated fruit, almost oblong-pyriform, about 4 inches in length, weighing 6 to 10 oz. The skin is smooth, deep glossy purple in color. Flesh cream-yellow, very slightly fibrous, of pleasant flavor, containing by one analysis 15% of fat. The seed is long and slender, completely filling the cavity. The tree is vigorous, hardy, fairly productive, blooming in January and ripening its fruit in September and October.

21. WHITE. Santa Barbara, 1910. Oblong-pyriform, not distinctly necked, and somewhat oblique at base and apex. Length about 4½ inches, weight 6 to 8 ozs. The surface is smooth, glossy, dark purple, sometimes tinged with green. Flesh cream-colored, slightly fibrous, flavor pleasant but not particularly rich, showing, by one analysis, about 15% of fat. Seed large, conical, completely filling the cavity. The tree is hardy and a vigorous grower, coming into bearing early and producing good crops. It ripens its main crop from September to December, showing a strong tendency to mature a few fruits at other times of the year.

b. Varieties of Foreign Origin.

22. CANYADA. Canyada, Queretaro, Mexico, 1911. (West India Gardens No. 9). An oval to pyriform fruit, of large size for this type, the skin rather thick, the surface nearly black in color. Flesh yellow, of smooth texture and rich flavor. Seed medium-sized, tight in the cavity. The tree is erect, stocky, of rapid growth but the branches are inclined to be slender and straggling. Hardy, and said to fruit prolifically, ripening in July and August at Canyada.

23. PLATA. Santa Maria del Rio, San Luis Potosi, Mexico, 1911. (West India Gardens No. 2). A small fruit, about $3\frac{1}{2}$ inches long, green in color and of good quality. It produces its fruits abundantly in clusters, the main crop in August and another crop in February. Tree a strong grower, erect in habit, hardy.

24. QUERETARO. Canyada, Queretaro, Mexico, 1911. (West India Gardens No. 11). An oval fruit, 5 inches in length, somewhat rough and black in color. The skin is rather thick and tough, separating readily from the yellow, richly flavored flesh. Seed medium small, completely filling the cavity. The tree is a strong grower, hardy, and characterized by an unusually heavy tomentum on the lower surface of the leaves. It is said to be prolific, the fruit ripening from August to October at Canyada.

25. SAN SEBASTIAN. Queretaro, Qto., Mexico, 1911. (West India Gardens No. 7). An oval fruit, 6 inches in length and weighing 12 to 16 ounces. The skin is rather thick, black in color, separating from the yellow flesh of rich flavor. Seed medium sized, tight in the cavity. The tree is erect, stocky, of rapid growth and has proved to be unusually hardy. It is said to be prolific, the fruit ripening in March at Queretaro.

26. VAL DE FLOR. Oaxaca, Mexico, 1912. A slender pyriform fruit, with a very long neck, about 5 inches in length and 6 to 8 ounces in weight. The surface is deep purple in color, the skin thick for this type. Flesh free from fiber and of rich flavor. Seed small. Tree vigorous, very hardy and prolific, the parent tree producing 2000 fruits in a single crop. It is said to fruit twice a year, the principal crop ripening October to December.

GUATEMALAN TYPE

a. Varieties of California Origin.

27. BEAUTY. Orange, 1911. An obovate fruit, about $4\frac{1}{2}$ inches long and 1 pound in weight. The surface is slightly roughened and of a dull, dark green color, the skin thick and granular. The flesh is cream colored, nearly free from fiber and of fairly rich flavor. Seed obliquely spherical, medium sized, completely filling the cavity. The tree is remarkable for the deep wine color of the new foliage. Productiveness, fair; season, May to September.

28. BLAKEMAN. (Syn. *Habersham*, provisionally known as *Dickey No. 2*). Hollywood, 1912. Form broadly oblique, 4 inches in length and about 1 pound in weight, sometimes up to 20 ounces. Surface is nearly smooth, rarely roughened, dark green in color, the skin thick and tough, separating readily from the deep cream-yellow flesh, of fine, smooth texture and rich, agreeable flavor. An analysis has shown the fat content to be 16 per cent. Seed broadly conical, small to medium sized, completely filling the cavity. The tree is fairly hardy, a strong grower and promises to be prolific. Season, May to July.

29. BRODIA. Orange, 1914. Pyriform, somewhat oblique, about $4\frac{1}{2}$ inches long, slightly over 1 pound in weight. The surface is somewhat roughened, deep green in color, the skin very thick. The flesh is very slightly fibrous, of fairly good flavor. Fat content, by one analysis, nearly 11 per cent. Seed medium sized, conical to spherical, tight in the cavity. A prolific bearer, but the tree is tender.

30. CHALLENGE. Hollywood, 1912. Form obliquely spherical, measuring about 4 inches in length and weighing 14 to 18 ounces. The surface is rough, dark purple in color, the skin thick and granular. The flesh is cream-colored, smooth, the flavor not so rich as in the very best varieties. One analysis has shown it to contain 9 per cent of fat. The seed is very large, spherical, completely filling the large cavity. The tree is a moderately strong grower with slender wood, difficult to bud. It is prolific and ripens its fruits from February to May.

31. CHAMPION. Orange, 1911. Form oblong-oval, somewhat oblique, length about $4\frac{1}{2}$ inches; weight 14 to 20 ounces or more. Surface smooth, green, the skin thick. Flesh cream-colored, nearly free from fiber, of fairly rich flavor. Seed medium sized, completely filling the cavity. Tree a good grower, considered rather tender. It is productive and ripens its fruits from June to the end of September.

32. COLORADO. (Syn. *Murrieta Purple*). Los Angeles, 1912. Form obovate, length 5 inches, weight 14 to 18 ounces. The surface is slightly roughened or reticulate, dark purple in color with numerous brown dots, the skin medium thick, hard and granular. Flesh rich yellow, free from fiber, smooth, buttery, of very rich, nutty flavor. The seed is oblong-conical, medium sized, tight in the cavity. The tree is rather weak in growth and difficult to propagate. It is moderately productive and ripens its fruits during April and May.

33. DICKEY. Hollywood, 1912. A slender pyriform fruit, broad and rounded at the base, somewhat oblique at the apex. Length nearly 6 inches, weight 14 to 20 ounces. The surface is slightly roughened, bright to deep green in color, the skin moderately thick, tough. The flesh is of rich cream-yellow color, smooth and free from fiber, and of very rich and pleasant flavor. The seed is roundish-conical, small, completely filling the seed cavity. The tree is a strong grower, but difficult to propagate. It bears good crops of fruits which ripen in May, June and July.

34. DICKINSON. Los Angeles, 1912. Form oval to obovate, $3\frac{1}{2}$ inches long, weighing 7 to 12 ounces. The surface is very rough and verrucose, dark purple with large maroon-colored dots. Skin unusually thick and woody. Flesh pale greenish yellow, free from fiber, of pleasant, fairly rich flavor. Seed roundish oblate, medium sized, tight in the cavity. The tree is a good grower, very precocious and a prolific bearer, but is considered more tender than some of the other varieties of this type. The fruit ripens in April and May.

36. FERRY. Hollywood, 1912. An obovate to nearly pyriform fruit, $3\frac{3}{4}$ inches long, weighing 5 to 8 ounces. The surface is rough, light green in color, the skin thick, hard and granular.

Flesh greenish yellow, slightly fibrous, the flavor not very rich. Seed oblong-conical, small, completely filling the cavity. The tree is very productive and ripens its fruits in April and May.

36. LAMBERT. Hollywood, 1915. Form obliquely obovate, almost round, $4\frac{1}{4}$ inches long, 14 to 20 ounces in weight. The surface is rough, green in color with a brownish tinge, the skin medium thick. Flesh very slightly fibrous, the seed rather large, completely filling the cavity. Productiveness not yet determined. Season May and June.

37. LYON. Hollywood, 1911. Form broadly pyriform, indistinctly necked, oblique at apex. Length $5\frac{1}{2}$ inches, weight 14 to 18 ounces. Surface somewhat rough, rich green in color, the skin moderately thick and tough. Flesh deep cream-colored, smooth, free from fiber, and of rich, pleasant flavor. The fat content, according to one analysis, is 16 per cent. Seed broadly conical, medium small to medium in size, completely filling the cavity. The tree is rather difficult to propagate, and not a strong grower. It is very precocious, coming into bearing at 2 years from the bud, and is a heavy bearer. The season is April to June.

38. MESERVE. Long Beach, 1912. - In form this fruit is broadly oval to spherical, measuring about 4 inches in length and weighing 14 to 16 ounces. The surface is undulating to roughened, dark green in color, the skin thick and tough. The flesh is creamy yellow in color, with slight fiber discoloration, of very rich and nutty flavor. The seed is oblate, medium sized, completely filling the cavity. The tree is a good grower, with rather slender wood. Its productiveness is somewhat in doubt, but is probably good. The season is April to June.

39. MILLER. Hollywood, 1910. Oval to obovate in form, about $4\frac{1}{2}$ inches in length and 8 to 14 ounces in weight. Surface rough, deep, dull purple in color, the skin thick and woody. Flesh deep yellow in color, free from fiber, and of rich and pleasant flavor. An analysis has shown it to contain 23 per cent of fat, the highest percentage yet found in a variety of the Guatemalan type. Seed medium large, broadly conical, completely filling the cavity. Tree a vigorous grower, productiveness not determined; the parent tree sets good crops of fruit, but drops them before they develop to any

size; it is old, and has been moved in recent years, which may account for this. The fruits ripen in May and June, but hang on until late summer.

40. MONROE. Santa Ana, 1914. Form obconical to broad pyriform, length about 6 inches, weight 22 to 24 ounces. Surface nearly smooth, green in color, skin thick and tough. Flesh cream-colored, free from fiber, of rich, agreeable flavor. Seed medium sized, tight in the cavity. Tree a good grower, blooming in February and March and ripening its fruit from May to July. Productiveness not yet determined, as the parent tree is just coming into bearing.

41. MURRIETA. (Syn. *Murrieta Green*). Los Angeles, 1912. Form broadly obovate to spherical, slightly oblique, measuring $3\frac{3}{4}$ inches in length and weighing 16 to 20 ounces. The surface is undulating to slightly roughened or pitted, dark green in color, the skin medium thick and tough. The flesh is creamy yellow in color, of smooth, fine texture, free from fiber, and of rich, nutty flavor. The seed is large, spherical, completely filling the cavity. The tree is not a very strong grower and is difficult to propagate. It is moderately prolific, and the latest to ripen of the Guatemalan varieties yet fruited in California, maturing in September and October.

42. PRESIDENTE (Formerly called *El Presidente*). Los Angeles, 1912. An oblong-pyriform fruit, about 5 inches long and 14 to 18 ounces in weight. The surface is undulating, dull green with numerous large yellow dots, the skin moderately thick, rather tender. The flesh is yellow, smooth and of fine texture, the flavor very rich and pleasant, fiber almost none. The seed is medium sized, completely filling the cavity. The tree is moderately vigorous, productive, ripening its fruit in June.

43. RHOAD. Orange, 1912. Slender to broad pyriform, $4\frac{1}{4}$ inches long, about 12 ounces in weight. The surface is roughly undulating, light or yellowish green in color, the skin thick, firm. Flesh cream colored, firm, very slightly fibrous, the flavor not very rich. One analysis has shown it to contain about 10 per cent of fat. The seed is large, roundish conical, tight in the cavity. The

tree is a strong grower, fairly hardy and productive, ripening its crop from April to June.

44. ROYAL. Hollywood, 1913. Broadly pyriform, length $5\frac{1}{2}$ inches, weight 14 to 20 ounces. The surface is rough, dark purple in color, with large maroon dots, the skin thick and woody. The flesh is cream colored, free from fiber, of fairly rich flavor, containing by one analysis 14 per cent of fat. The seed is small, completely filling the cavity. The tree is difficult to propagate and rather lacking in vigor. It is moderately productive, the parent tree producing 600 fruits in one crop. Its season is February to May.

45. RITA. Orange, 1912. Broadly pyriform, about $4\frac{1}{2}$ inches in length and 8 to 14 ounces in weight. The skin is rough, thick and tough, yellow-green in color. Flesh light yellow, smooth, of pleasant and fairly rich flavor. An analysis has shown it to contain 14 per cent of fat. The seed is medium sized, tight in the cavity. Tree a vigorous grower and good bearer. Season, May to July.

46. SENOR. Orange, 1912. A broadly pyriform fruit, about 5 inches in length and 14 to 24 ounces in weight. The surface is smooth, green, the skin thick and tough. Flesh light yellow, free from fiber, flavor fairly rich. One analysis has shown it to contain 17 per cent of fat. The seed is rather large, tight in the cavity. The tree is vigorous, but rather straggling in habit, moderately productive, ripening its fruit from May to July. Crop for 1916 very heavy.

47. SHARPLESS. Santa Ana, 1913. An elongated pyriform fruit, broad at the basal end, measuring about $6\frac{1}{2}$ inches in length and weighing 1 to $1\frac{1}{2}$ pounds. The surface is slightly pitted or roughened, greenish-purple to deep purple in color, the skin thick and hard. Flesh cream-colored, smooth, free from fiber, of unusually pleasant, rich flavor. It has been shown by one analysis to contain nearly 16 per cent of fat. The seed is small, completely filling the cavity. Tree a strong grower, having a tendency to become tall and slender. Productiveness very good, season May to August.

48. SOLANO. Hollywood, 1912. Form broadly obovate to oval, measuring $5\frac{3}{4}$ inches in length and weighing 1 to $1\frac{1}{2}$ pounds. The surface is nearly smooth, somewhat glossy, bright green in color; the skin moderately thick, firm. Flesh yellowish-cream colored, firm, fine grained, the flavor pleasant but not rich. One analysis has shown it to contain about 4 per cent of fat, but it seems probable that the percentage would be considerably higher if the fruit was grown under proper conditions. Seed small, oval, tight in the cavity. The tree is a fairly vigorous grower. It fruits prolifically, the season being March to May.

49. SPINKS. Monrovia, 1915. Form nearly spherical, length about 5 inches, weight averaging 27 ounces, sometimes attaining to 30 or 35 ounces. Surface roughened, purplish-black in color, the skin thick and hard. Flesh cream colored, smooth, of rich flavor. The seed is 3 ounces in weight, completely filling the cavity. Tree precocious and a prolific fruiter. Season February to August.

50. SURPRISE. Hollywood, 1915. Oblong pyriform, about $5\frac{1}{2}$ inches in length and 1 to $1\frac{1}{4}$ pounds in weight. The surface is very slightly roughened, bright green in color. Skin thick and tough. Flesh deep cream colored, free from fiber and of rich, delicious flavor. Seed small, tight in the cavity. Productiveness not yet determined. Season probably April and May.

51. TAFT. Orange, 1912. A pyriform fruit, broad and slightly necked, measuring about 5 inches in length and weighing from 14 to 25 ounces. The surface is slightly roughened, particularly around the base, deep green in color, the skin thick and firm. The flesh is light yellow, smooth, with no trace of fiber, of unusually pleasant rich flavor. One analysis shows $18\frac{1}{2}$ per cent of fat. The seed is medium sized, completely filling the cavity. The tree is exceptionally handsome and vigorous, readily propagated, probably the hardiest variety of this type originated in California. It is of good productiveness and ripens its fruit from May to October. The parent tree has set a heavy crop this year.

52. ULTIMATE. Orange, 1912. A pyriform fruit, about 4 inches long and 12 ounces in weight. The surface is nearly smooth, bright green in color, the skin medium thick. The flesh is cream colored, slightly fibrous, of rich flavor. Seed spherical, medium

sized, completely filling the cavity. The tree is moderately productive, vigorous, ripening its fruits from May to September.

53. WALKER (Syn. *Walker's Prolific*). Hollywood, 1910. Form obovate to broadly pyriform, very shortly necked, measuring about 4 inches in length and weighing 5 to 8 ounces. The surface is rough, especially toward the base, deep green in color, the skin thick, woody. Flesh light cream colored, nearly free from fiber, the flavor rich, but a trifle strong. One analysis has shown it to contain nearly 19 per cent of fat. The seed is very large, tight in the cavity. The tree is a vigorous grower, reasonably easy to propagate, somewhat diffuse in habit, precocious in fruiting and a very prolific bearer. It ripens from May to August, the fruit sometimes hanging on until October.

54. WAGNER (Syn. *Hollywood Wagner*). Hollywood, 1914. Form broadly, obovate, about $3\frac{1}{2}$ inches in length and 8 to 12 ounces in weight. The surface is rough, deep green in color, the skin thick and tough. Flesh cream colored, smooth, of fairly rich flavor. The seed is large, completely filling the cavity. Tree fairly vigorous, precocious and very productive, ripening its fruit from May to August.

b. Varieties of Foreign Origin.

55. ALTO (West India Gardens No. 28). Atlixco, Puebla, Mexico, 1911. Roundish obovate to pyriform, measuring 6 inches in length and weighing $1\frac{1}{4}$ pounds. The surface is slightly undulating to rough, deep green in color, the skin thick and hard. Flesh deep cream yellow in color, smooth and buttery, free from fiber, of rich nutty flavor. Seed conical, small, tight in the cavity. Tree said to be productive. Ripens in November and December at Atlixco.

56. AMECA (Syn. *Furnival No. 1*). Ameca Valley, Jalisco, Mexico, 1912. Described as a large fruit, about 2 pounds in weight, and purplish-black in color. The skin is thick, the flesh abundant and of very rich flavor. Seed medium large, tight in the cavity. It may not be a true Guatemalan variety.

57. ATLIXCO. (West India Gardens No. 29). Atlixco, Puebla, Mexico, 1911. Form oblong to obliquely pyriform, measur-

ing 5 inches in length and weighing 1 pound. Surface slightly rough, greenish purple in color, the skin thick and tough, not brittle. Flesh light cream colored, smooth, fine in texture, free from fiber, of rich flavor. Seed medium to large, oblong-conical, completely filling the cavity. Tree erect, with drooping branches. Season said to be December at Atlixco.

58. CANTO (West India Gardens No. 25). Atlixco, Puebla, Mexico, 1911. Broadly pyriform, not distinctly necked, measuring 5 inches in length and weighing 1 pound. Surface slightly roughened, yellowish green, skin thick and hard. Flesh cream colored, smooth and buttery, free from fiber, of mild, very pleasant flavor. Seed very small, conical, tight in the cavity. The tree is said to be productive and ripens its fruit in January at Atlixco.

59. COLIMA (Syn. *Johnston No. 5*). Near Colima, Mexico, 1912. Described as a large, hard-skinned fruit of excellent quality. It is a vigorous grower, with unusually large foliage. It may not belong in the Guatemalan type.

60. COLON (West India Gardens No. 24). Atlixco, Puebla, Mexico, 1911. A slender pyriform fruit, 5 inches in length and about 12 ounces in weight. The surface is undulating, scarcely roughened, dark green in color, the skin medium thick, hard and tough. Flesh deep cream color, smooth, free from fiber, of rich, pleasant flavor. Seed small, completely filling the seed cavity. The tree is said to be productive, and ripens its fruit in January at Atlixco.

61. FUERTE (Syn. *El Fuerte*, West India Gardens No. 15). Atlixco, Puebla, Mexico, 1911. Form broadly oval, length 4 inches, weight about 14 ounces. Surface roughened, green in color, the skin thick. Flesh yellow, smooth and buttery, of rich flavor. The seed is small, tight in the cavity. The tree propagates readily and has proved to be an unusually strong, erect grower. Its season at Atlixco is said to be October and November.

62. GORDO (West India Gardens No. 14). Atlixco, Puebla, Mexico, 1911. Form nearly round, length about 4 inches. Surface rough, deep purple in color, skin thick and tough. Flesh cream colored, of rich flavor. Tree said to be productive.

63. GRANDE (Syn. *El Grande*, West India Gardens No. 39). Atlixco, Puebla, Mexico, 1911. Obovate to pyriform, not distinctly necked, measuring 6 inches in length and weighing about 2 pounds. The surface is rough, dark green in color, the skin thick and tough. Flesh deep cream colored, very smooth, free from fiber, of rich, delicious flavor. Seed round-conic, medium sized, completely filling the cavity. The tree is moderately vigorous, but somewhat difficult to propagate. It comes into bloom very young. Its season at Atlixco is said to be December.

64. JOHNSTON. (Syn. *Johnston No. 6*). Near Colima, Mexico, 1912. A large, thick-skinned fruit, described as of very good quality. It is characterized by unusual vigor of growth and exceedingly large foliage. May not belong to the Guatemalan type, but is placed here provisionally.

65. KNIGHT'S NO. 1 (provisional name under which the variety is being grown by E. E. Knight, the introducer). Depto. of Jalapa, Guatemala, 1914. Form round, length $3\frac{1}{2}$ inches, weight 1 pound. Surface rough, green in color, the skin thick, woody. Flesh very firm, free from fiber, yellow in color, of very rich, nutty flavor. Seed medium sized, tight in the cavity. Tree of strong, vigorous growth, said to be hardy and a prolific bearer. Season October to March in Guatemala.

66. KNIGHT'S NO. 27 (provisional name under which the variety is being grown by E. E. Knight, the introducer). Depto. of Antigua, Guatemala, 1914. Form round, length 4 inches, weight $1\frac{1}{2}$ pounds. The surface is rough, green, the skin thick and woody. Flesh firm, yellow in color, free from fiber and of very rich, nutty flavor. Seed medium sized, completely filling the cavity. The tree is a strong grower, hardy and prolific in fruiting. Its season in Guatemala is October to March.

67. LINDA (Knight's No. 29). Depto. of Antigua, Guatemala, 1914. Form round, length $4\frac{5}{8}$ inches, weight 2 pounds. Surface rough, deep purple in color, the skin thick and woody. Flesh firm, yellowish in color, free from fiber, of rich, nutty flavor. Seed medium sized, completely filling the cavity. Tree vigorous and hardy, productiveness good. Season October to March in Guatemala.

69. MILES (West India Gardens No. 35). Atlixco, Puebla, Mexico, 1911. Fruit slender pyriform, about 1 pound in weight, deep purplish black in color. Season December at Atlixco.

70. MODESTO. Atlixco, Puebla, Mexico, 1912. Fruit large, deep purple in color, of good flavor, with a small seed. Tree is reported to be unusually productive, ripening its fruits in December at Atlixco.

71. MONTEZUMA (West India Gardens No. 33). Atlixco, Puebla, Mexico, 1911. Form obovate, sometimes broad pyriform, measuring $4\frac{1}{2}$ inches in length, and weighing 14 to 16 ounces. The surface is nearly smooth, deep green in color, the skin thick and hard. Flesh deep cream color, smooth, free from fiber, of mild, pleasant flavor. Seed small to medium sized, oblate-conical, tight in the cavity. The tree is moderately vigorous in growth, but difficult to propagate. It is reported to be unusually prolific, the parent tree bearing 3000 fruits in a single crop. The season at Atlixco is December.

72. NUTMEG. Honolulu, Hawaii, 1912. Form broadly oval to nearly round, about 4 inches in length and 16 ounces in weight. Surface rough, deep purple in color, the skin thick and woody. The flesh is said to be smooth, free from fiber and of rich, pleasant flavor. Seed rather large, roundish, tight in the cavity. Tree precocious and a prolific bearer.

73. OBISPO (West India Gardens No. 41). Atlixco, Puebla, Mexico, 1911. Roundish oval to broadly pyriform, $4\frac{1}{2}$ inches long, weighing 14 to 16 ounces. Surface slightly undulating, deep green in color, the skin thick, hard. Flesh deep cream colored to yellow, smooth, free from fiber, mild and pleasant in flavor. Seed oblate-conic, medium sized, tight in the cavity. Tree said to be moderately productive, ripening its fruits in December at Atlixco.

74. ORO (Syn. *El Oro*, West India Gardens No. 32). Atlixco, Puebla, Mexico, 1911. An oblong pyriform, rather slender fruit, $6\frac{1}{2}$ inches long, weighing 18 ounces. Surface undulating to slightly roughened, glossy green, the skin very thick, hard. Flesh deep cream colored, smooth, of rich, pleasant flavor. Seed very small, conical, tight in the cavity. Tree erect, of vigorous growth, fairly easy to propagate. It ripens its fruits in December at Atlixco.

75. PERFECTO (Syn. *El Perfecto*, West India Gardens Nos. 19 and 22). Atlixco, Puebla, Mexico, 1911. Form broadly oblong-pyriform, 7 inches long, weighing 24 to 30 ounces. The surface is undulating to slightly rough, dark green in color, the skin thick, tough and hard. Flesh cream colored, of very smooth, buttery texture, entirely free from fiber, the flavor rich and delicious. Seed small, conical, tight in the cavity. The tree is only moderately vigorous in growth, and not as prolific as some of the smaller varieties, the parent tree bearing about 200 fruits in a crop. The season at Atlixco is said to be January.

76. POPOCATEPETL. Atlixco, Puebla, Mexico, 1912. Form oval to broad pyriform, weight about 20 ounces. Skin thick, deep purple in color. Flavor very rich. Tree said to be abundantly productive with off years.

77. PUEBLA (West India Gardens No. 13). Atlixco, Puebla, Mexico, 1911. Broad pyriform, not distinctly necked, 4 inches in length, about 10 to 12 ounces in weight. The surface is nearly smooth, the skin thick and tough. Flesh yellow, smooth, of rich flavor. Seed small, tight in the cavity. The tree is a very rapid grower, erect, with drooping branches. It promises to be precocious and a prolific fruiter. Propagates very readily. Season September and October at Atlixco.

78. QUEEN (Knight's No. 28). Depto. of Antigua, Guatemala, 1914. Form oblong-pyriform, 5 inches in length, weight $1\frac{1}{2}$ pounds. Skin rough, deep purple in color, thick and woody. The flesh is firm, yellowish in color, free from fiber and of very rich, nutty flavor. Seed very small, completely filling the cavity. Tree vigorous, spreading in habit, very productive. The season in Guatemala is October to March.

79. REDONDO (West India Gardens No. 16). Atlixco, Puebla, Mexico, 1911. Form spherical, length $3\frac{1}{4}$ inches, weight 12 ounces. Surface somewhat roughened, dark green in color, the skin very thick and hard. Flesh cream colored, smooth and buttery, free from fiber, of rich nutty flavor. Seed small, roundish conical, completely filling the cavity. A strong, upright growing tree, easily propagated. Said to be very productive. The season is December at Atlixco.

80. SINALOA (West India Gardens No. 37). Atlixco, Puebla, Mexico, 1911. Oval to pyriform, 7 inches long, weighing $1\frac{1}{2}$ to 2 pounds. The surface is rough, green in color, the skin thick and tough. Flesh deep cream colored, smooth, free from fiber, rich and pleasing in flavor. Seed roundish conical, tight in the cavity. The tree is moderately vigorous, and propagates fairly well. It is productive and ripens its fruits in December at Atlixco.

81. SCHMIDT (West India Gardens No. 40). Atlixco, Puebla, Mexico, 1911. A pyriform fruit, $5\frac{1}{2}$ inches long, weighing 16 to 24 ounces. The surface is rough, deep green in color, the skin thick. Flesh cream colored, smooth and buttery in texture, of rich and pleasant flavor. Seed medium sized, round-conic, completely filling the cavity. Its season at Atlixco is December.

82. VERDE (Syn. *California Trapp*, West India Gardens, No. 17). Atlixco, Puebla, Mexico, 1911. Form roundish, slightly oblique, $5\frac{1}{4}$ inches long, weighing 22 ounces. The surface is nearly smooth, green in color, the skin very tough and hard. Flesh cream colored, smooth, practically free from fiber, of rich, nutty flavor. Seed medium sized, oblate, tight in the cavity. The tree is a moderately strong grower, erect in habit, rather difficult to propagate. The season of ripening at Atlixco is December and January.

83. VOLCAN (Syn. *Ixtaccituatl*, and erroneously *Itzia*). Atlixco, Puebla, Mexico, 1912. Oval to pyriform, large purplish black in color with a thick hard skin. The quality is said to be excellent, the seed small and tight in the cavity. Season December and January at Atlixco.

WEST INDIAN TYPE.

a. Varieties of Florida Origin.

84. FAMILY. Miami, Florida, 1904. Form obovate to slender pyriform with a pronounced neck, about $5\frac{1}{2}$ inches in length and weighing 10 to 14 ounces. The surface is undulating or nearly smooth, maroon colored, the skin moderately thick, leathery. Flesh greenish cream-colored, sometimes slightly fibrous, of mild, pleasant flavor, but a trifle watery and lacking in richness. Seed large, roundish conical, tight in the cavity. The tree is a vigorous grower,

tender, very productive. The fruit commences to ripen early in the season (July at Miami) and continues until rather late, about the end of September, making the season longer than with most other varieties.

85. POLLOCK. Miami, Florida, 1901. Form broadly pyriform, not distinctly necked, measuring 6 to 8 inches in length and weighing $1\frac{1}{2}$ to 3 pounds. Surface smooth, light green in color, the skin moderately thick, leathery. Flesh rich yellow in color, smooth, buttery, free from every trace of fiber, of unusually rich and pleasant flavor. Seed broadly conical, not large in comparison with the size of the fruit, almost filling the cavity, sometimes loose, with loose seed coats. The tree is a vigorous grower, tender, not as prolific as some of the smaller fruited varieties and showing a tendency to fruit in alternate years. Its season at Miami is August and September.

86. TRAPP. Miami, Florida, 1901. Form roundish oblate, measuring about 5 inches in length and weighing 14 to 20 ounces. The surface is smooth, yellowish green in color, the skin moderately thick, leathery. Flesh greenish yellow to yellow, smooth, free from fiber, and of fairly rich, pleasant flavor. Seed oblate, large with loose seed coats and often loose in the large seed cavity. The tree is tender, rather lacking in vigor, but is precocious and a prolific bearer. The season in South Florida is October to December, with a few fruits hanging on until the end of February.

Several other varieties of Florida origin have been planted experimentally in California, but as they are ones which are of no commercial importance in Florida and very few trees have survived the winters of California, it is not thought necessary to describe them here. Cardinal, Cyrus, Quality, Sterling and Wester may be mentioned as among this number.

Following his paper, Mr. Popenoe said: "This meeting is the inception, really, of the avocado industry in California, a very important event in every way, and this matter of varieties is one which is also very important. Let us be careful. Let those of us who are propagating and growing trees conform to the facts and not state opinions influenced by a desire to dispose of trees we may have for sale. Let us hew to the line and let the planter, especially

the coming commercial planter, probe the question to the core. He can do that safely and the time is coming for him to do it."

STATION WORK FOR THE AVOCADO

By H. J. Webber, Director Citrus Experiment Station

The avocado has interested me so much and I see such great possibilities in its future development in California that it is scarcely safe for me to express myself freely in a public way. I am interested in the avocado as a commercial fruit, but am far more interested in it as a food fruit for home use. The food value of the avocado is probably as high or higher than any other fruit cultivated. One fruit is said to be a fair meal for an ordinary individual. We may expect to see the time when this fruit will form an important part of our everyday diet, and we certainly need to grow more of our own staple foods.

My only excuse for appearing on this program is to assure you of my interest and the interest of the Citrus Experiment Station in the development of the avocado industry. It is our desire to aid so far as we can in the upbuilding of the industry. I have personally known considerable of the development of avocado growing that has taken place in Florida, and since coming to California I have been following more or less closely the trial plantings that have been made here. I think we have reached a point in these first experimental trials where we may say that the first stage in the development of the industry has passed. We are, I believe, able now to conclude safely that avocado growing in Southern California is destined to become an important industry. This is a great step in advance and is the first milestone passed.

Meanwhile, rapid progress has been made in the direction of solving several other of the primary problems. As I conceive it, the next stage in the development of the industry will be the determination roughly of the safe regions for its first general development. In the solution of this problem the University and Station will naturally be of minor service, as the final determination of the most favorable regions will be by the success of experimental plantings of growers in the various sections. Fortunately many plantings of sufficient size to give fair judgment have already been made in many widely different sections, and the

climatic endurance of the avocado as a whole in these different regions will probably be determined in the next five years. We are, however, confronted with the difficulty that we do not know the effect of our different soils on the avocado, and that some of the first plantings, even if the climatic conditions are favorable, may fail because of soil conditions. Like the orange, the avocado apparently thrives well under a very wide range of soil conditions, and it is probable that the climatic conditions will be the principal limiting factor in the spread of the industry. By careful observations of the experimental plantings made by growers, the University may be able to assist in more quickly arriving at an understanding of this problem.

With the avocado, as with all other fruits, the question of suitable varieties and root-stocks will probably long remain a puzzling question. An excellent beginning has been made with the variety problem, as we now have about eighty different varieties under trial in the state. In finding the best varieties of any fruit for cultivation in a certain section, the first means is through the importation and trial of the known varieties of other regions. This has been done to some extent, but without doubt many varieties that would be of value in California have not yet been imported. In talking with Mexican, Central American and South American travelers, I have learned of a number of avocados growing at high altitudes and said to be very cold-resistant, that we should surely have for trial in California. It is my feeling that every effort should be made to import and test out every promising variety that can be found, and we should urge the Bureau of Plant Industry, through its division of Seed and Plant Introduction, to send explorers to promising regions to get such varieties for us. The Citrus Experiment Station expects to be in position to assist in the trial and study of varieties and expects next year to plant a trial orchard of as many varieties as it is possible to obtain. The studies of Professor Coit and Mr. Condit on varieties and of Professor Jaffa on the chemistry of the different varieties are highly interesting and important in this stage of the industry.

As an industry develops, imported varieties usually give way to native varieties; select seedlings, hybrids, and the like; of superior quality and better adapted to local conditions. This will probably be the history of the avocado industry, and it is grati-

fyng to notice the large number of native seedlings that already are playing an important part in the development of the California industry. In the work of improving the varieties, the Experiment Station should also be able to assist. Here also growers can do a valuable work, and it seems to me that every means should be taken to encourage the growing of seedlings and the selection and trial of the superior types that may be discovered. I would suggest to the Association the desirability of holding an exhibition of seedlings each year at the annual meeting, and the awarding each year of a medal to the seedling adjudged the best by a competent committee. In this way in the early days of America, the Massachusetts Horticultural Society greatly stimulated the breeding of new varieties of apples, pears, strawberries, and other fruits. In this way the gooseberry in England was developed from a fruit three-eighths of an inch in diameter to one nearly as large as an average hen's egg.

The problems of propagation, cultivation, fertilization, irrigation, pruning, and the like are all before us for solution. Fortunately, the studies of soil management that are now being made with citrus fruits will doubtless be of great value as a guide to similar operations with the avocado. As an illustration, the experiments in fertilization that have been under way at the Citrus Experiment Station for the last eight years indicate the paramount importance of nitrogen in fertilization and the addition of organic matter to the soil. Potash fertilization has given no indication of value as yet, and phosphoric acid has shown but little effect. Doubtless in a general way these results will apply to the avocado almost as fully as to citrus trees, as they point out the general soil requirements. Again our citrus experiments have indicated very forcibly the importance in orchard practice of using winter cover-crops of some legume, such as bitter clover (*Melilotus indica*) or purple vetch (*Vicia atropurpurea*) to supply organic matter and nitrogen and keep the soil in good physical condition. Doubtless, this same practice will prove just as important in groves of avocados.

Lastly, I wish to speak of the diseases. We are, I believe, and I am sure you also believe, laying the foundation of what is destined to become an important California industry. It behooves us in this early stage to take full account of all diseases and strive in every

way to eradicate such maladies and pests as we now have and to prevent the importation of those that exist in other places. Consider what saving would have been accomplished in the citrus industry, if the various pests, such as the red, black, and purple scales had not been introduced, or had been eradicated when first introduced. I wish to urge that every grower of the avocado keep close watch of his plants, and if any diseases or insect pests are noticed, immediately send specimens of the diseased parts to the Citrus Experiment Station for study and identification. Our pathologists and entomologists will be glad to co-operate with you to the fullest extent possible in the study and control of any difficulties. Similar aid will be freely given as well by the specialists at the University at Berkeley and of the State Department of Horticulture at Sacramento. Very few pests are now known to occur on the avocado, but doubtless there are many in various parts of the world, and some of these may have been introduced and occur here now in small numbers. If discovered now they might easily be eradicated; in a few years their eradication may be impossible. In Hawaii the avocados are badly infested with the fruit fly, and the commercial growing of avocados, which otherwise would have become important, has been ruined. Every traveler coming from Hawaii is tempted to bring along some of the rare tropical fruits. Our laws are stringent on this point and sufficient, but people are ignorant, and we are constantly threatened with the possibility of the importation of such pests. We should all be alert and watchful to aid so far as we can in preventing any such pests that threaten our industry from becoming established.

Mr. Webber, in answer to questions, stated that the Riverside Experimental Station has been provided with a tract of land, nearly five hundred acres, and that it is engaged at the present time in constructing buildings, planning and building laboratories, hot houses, barns, and putting in wells and ditches for irrigation. So far it has not been in a position to propagate trees, but beginning next year expects to start experimental planting.

THINGS TO BE EXPECTED

Mr. C. P. Taft, Semi-Tropical Fruit Grower, Orange, Cal.

The role of a prophet is usually rather a risky one. If his predictions come wrong, he is accused of deceiving the people and if right, "Why it's nothing but guess work and anyone with common sense and equal experience could do as well," which is doubtless quite so.

It may be that I was given this subject (for I did not select it myself) because of a semi-prediction which I made some ten years or so ago at a farmers' institute held in Tustin. At that time very few knew or cared about ahuacate, and those who did thought it unlikely that we could ever grow in California the fine fruit which we have since found adaptable to our climate. I then read what I think was my first paper making particular and enthusiastic mention of the alligator pear as probably a very-greatly-to-be-grown fruit of the future and I ended the article with the interrogatory prediction "Will the next (horticultural) craze be over the alligator pear?" using the word craze, of course, in the sense of greatly aroused interest, with a possible overdoing the matter on the part of some. That prediction, if it may be called one, has been fairly answered in the affirmative; though with possibly one or two exceptions, no one has become unduly excited and the great interest aroused is fully justified by present facts and future prospects. Much of what was then the future is now the past and we find many acres, aggregating thousands of trees planted to the ahuacate, and that these trees will soon be bearing large quantities of marketable fruit is beyond controversy.

Will the market take all that we are likely to raise? I think it will and it is the purpose of this Association to see that the public has no excuse for pleading ignorance of the great privilege which we are placing before it. It has been my duty this season to supply for the Orange County Horticultural Contribution to the Panama-Pacific Industrial Exposition, along with other fruits, what was at this stage of the industry a very creditable display of ahuacates. Every ten days from July 8th to September 30th I sent a dozen or so ahuacates of the Taft variety, and of my other varieties so long as they lasted. The manager of the

Orange County Exhibit states that they attracted more attention than anything in his collection; in fact, more than any display of fruits sent in. The people who have acquired a knowledge of the fruit in the tropics, and dealers, who are often also importers, had difficulty in believing that the fruit was really raised in this state, and when convinced were very enthusiastic in their favorable predictions. One San Francisco fruit broker is reported to have said that he could sell twenty dozen like the Taft daily at \$10.00 per dozen; a statement which I, of course, would very much like to believe true. Another, an importer of long and large experience and high standing, thought that he could handle a carload of such fruit weekly at from \$5.00 to \$6.00 per dozen, but that the consumers were not yet educated to distinguish among varieties and most any of those exhibited would sell equally well at first, size being the main requisite. The steward of the Hotel Oakland who had a Taft presented to him pronounced it the best he had ever tasted and remarked that he would rather have an orchard of such fruit than a gold mine.

All of this is mentioned to help justify the prediction, that we will have a ready market for all thick-skinned fruit of good quality that we are likely to raise. I am not sure as to the thin-skinned kinds and do not grow them much myself, except incidentally for seed to raise stock for budding. Probably they will prove remunerative, but not to the same extent.

To obtain the best returns it is eminently necessary that the fruit should be smooth and not roughened. Visitors to my ranch have noticed, of course, that where the crop was large I have erected screens, not only to prevent the fruit from being twisted from the trees by the desert winds which occasionally blow with considerable violence during the winter months, but also to keep the fruit from being rubbed excessively on the limbs and twigs and against each other. Breezes, too gentle to blow off the fruit, may persist for several days. Continuously rubbing lightly on any woody surface produces abrasion and roughens the fruit so that while its contents may be unimpaired its looks prevent it from being marketable fruit of the first class. The difference in appearance, between protected and unprotected fruit is often great, particularly in the case of the thick-skinned kinds to which these observations principally apply. The thin-skinned varieties

by maturing sooner are gone before the winter has hardly begun, and so are not exposed so much to the winds; on the other hand, the skins being thin, they roughen the more readily. It is obvious, as I have often remarked, that with fruit at \$5.00 or more per dozen, one does not have to save very many to pay for the protection. Once purchased, the material of which the screens are composed will last for years, to be used repeatedly. Another benefit to be derived from the use of screens is, that a tree so protected can endure several degrees more frost unharmed.

In the ahuate we have a fruit which justifies more expense in its cultivation than any other and the conclusion I have arrived at is that nothing we raise in California is destined to be the object of greater care and more intensive cultivation and as a result a source of greater profits, and we will do this not because it is essential in order to obtain fruit, we can get that without trouble, but because it pays and pays well to raise the best.

MARKETING

E. B. Rivers, of Rivers Bros. Co., Los Angeles, Wholesale Fruit and Produce Dealers

In a few words am going to tell you what I know about marketing this delicious fruit.

We have been in the fruit business in this city for the last twenty years, and first handled the avocados sixteen years ago, getting them from Honolulu, or Haiti, through San Francisco, and at that time we never expected this fruit to be grown in Southern California. Three or four dozen in those days would have overstocked this city; some of the exclusive clubs and cafes were about the only ones that used them.

About twelve years ago we used to receive them from porters running on the dining cars out of Mexico, who used to buy them from the natives there very cheap. These were sold by the natives in baskets of different patterns, which were highly prized and much sought after.

This fruit at that time sold at from six to seven dollars a dozen. The trade has steadily increased since then, and at no time have we been overstocked on fancy fruit that was in good shipping condition.

Three years ago there was a man by the name of G. Fuentes, living at Atlixco, Mexico, who shipped us a basket of the finest fruit we ever handled, being the large black alligator skin and hard-shell variety.

These were packed in excelsior in a basket that held about fifty pears, with nothing but a cloth cover to protect them, and they carried pretty well. We immediately wrote him to ship us all he could get. He began by shipping about two baskets a week, and we wired him again to ship more, and the next week it seemed like every train out of Mexico had some ten to twenty-five baskets of fruit for us. We were paying out about \$100 a day express charges, and before we could stop them had about five or six hundred dozen on hand. We thought we were stuck for fair, as we could not get rid of that many in California.

I got out Bradstreet's and spent about twenty-five or thirty dollars in telegrams to all the large produce houses in the East, and got orders out of Boston, Philadelphia, New York, Chicago and other large cities, following up with repeat orders, and we cleaned up this fruit at a good profit. Fortunately this fruit came onto the market in the holiday season, along about Christmas time. This fruit brought \$6 a dozen wholesale. This stands to show that there was a good market in this country, among certain cities, three years ago, and the trade has steadily increased since that time.

I will say here that a man from Lower California shipped us by boat 274 boxes of the large green variety fruit. This fruit was not packed at all and came in the worst possible shape imaginable. Every pear was bruised and lots of them mashed, and we had a hard time getting freight out of them. We sold the seeds at from five to eight cents apiece, and the man who shipped them probably thought we robbed him, as we never heard from him again after making returns for them.

It seems to me there ought to be some way to classify this fruit without having so many different names, as it is going to conflict a good deal in filling orders and quoting them out on price sheets. We have orders coming to us from Arizona every week, and it will only be a matter of a couple of years when this fruit gets down to a reasonable price, that there will certainly be a big demand for it.

Last winter we handled a good many of Mr. Walker's fruit from Hollywood, getting as high as \$12 per dozen for them. We

received some fruit from Florida the other day, packed in a box with partitions in it of cardboard, the same as egg cases, with excelsior in the bottom of the box. This fruit weighed on an average of from one to one and a half pounds and seemed to carry very well that distance. A handsome package made out of a basket that would hold about a dozen fruit, and not too expensive, in my estimation would make a fine package to ship.

Again, preparing this fruit to be served is another thing that ought to be well advertised. It was my pleasure the other day to take a merchant from Silver City, and a customer of ours, up to one of our prominent clubs for lunch. As he had never had any avocado salad, I asked to have a couple of orders brought in. He said he had heard a good deal about them, but had never tasted any, and after tasting it said he didn't see how anybody could possibly like them.

I asked the waiter to bring me the makings of a dressing prepared in this manner: Taking a common tumbler and putting about one-fifth full of olive oil, one-sixteenth of an inch of vinegar on top of this, a large teaspoon of Worcester sauce, plenty of salt and a good sprinkling of paprika, I took half of a good-sized pear and poured this in on it, permeating it and mashing it up with a fork. He tasted this, and said it was the finest thing he ever tasted in the way of a salad.

The fruit is often condemned without a fair trial as to its merits. It certainly contains all of the parts to make it one of the best fruits produced, and when it gets down to a reasonable price I have no doubt there will be a big demand for it, and I look for it to be one of the coming industries of Southern California.

Questioned, Mr. Rivers indicated that \$2.50 to \$3.00 per dozen was a fair price for choice fruit; that higher prices were difficult to obtain.

MARKETING

**John C. Bosche, Los Angeles, Formerly Importer of
Mexican Avocados**

Mr. President, Ladies and Gentlemen: In presuming to address you on the subject of marketing from Mexico, I will premise by stating that this has been quite impossible during the past eight-

een months, and for several years previous to that time was conducted only under great difficulties, owing to political disturbances in that country, whereby lines of transportation were constantly subject to temporary interruption or entire destruction.

Some seven years ago I began the shipping of ahuacates from Mexico to United States points, confining my markets for the first several years to cities of the South, Middle West and California. Later, when the overland routes were not available, it was necessary to utilize the water lines into New York, from where I found it quite practicable to reship to cities from Boston to San Francisco.

Since February 27th, 1914, the small, thin-skinned fruit of the ahuate, from Mexico and the countries of Central America, are prohibited entry into the United States, while the large varieties, known generally throughout Mexico as pagua, may only be imported under certain restrictions, and confined to regions where there will be no danger of infection resulting from entry of the fruit. In other words, the Mexican ahuate is contraband in California and Florida, and under existing restrictions and conditions its importation into any part of the United States is practically prohibited.

As the ahuate is comparatively unknown, the market at present is quite limited. I found the demand for this fruit greater in San Francisco and Los Angeles, in proportion to population, than in any other cities of the United States, with the possible exception of New Orleans and San Antonio. This is no doubt due to the fact that this fruit is better known here, having been imported from Hawaii and the South Seas for some years, besides having been grown here in limited quantities. This suggests the necessity and importance of publicity; of introduction, of demonstration. Comparatively few people acquire a fondness for the fruit at first, even when properly introduced to it; but when served to them in an indifferent or improper manner it requires years to fully appreciate its true value.

In marketing the ahuate from Mexico, several points have been brought out which may be of interest. First of all, the American market demands a large or "fancy" fruit; almost to the exclusion of the smaller varieties; and often size is the ruling factor, even at the expense of flavor. This applies especially to Eastern cities, where I found it difficult to market the smaller sizes at a

profit, while the large fruit found a ready market. That is to say, fruit weighing from six to twelve ounces each were at a discount, while those weighing from sixteen to twenty-two ounces were accepted with favor, and all over twenty-two ounces were in strong demand at a premium.

Contrary to general opinion, I found the thin-skinned varieties to be remarkably good shippers. Indeed, when cut at the proper time and carefully packed, they will hold up quite as well, if not better, than some varieties of even the hard-shelled fruit. I have no hesitancy in saying that California growers will find no difficulty in shipping the thin-skinned varieties to any part of the United States.

Another point is that, while ahuacates can be transported long distances under refrigeration and arrive at destination in apparent good condition, it is generally found they will ripen-in badly, especially when a temperature lower than 45 degrees Fahrenheit is maintained. An air temperature of from 50 to 60 degrees is quite ideal for the transportation and preservation of this fruit.

Paper wrapping of any kind is injurious. A small amount of coarse excelsior should be used, and packing in single-layer crates is desirable, though not essential, the first requisite being a free circulation at air temperatures, and a dry atmosphere under refrigeration.

In marketing from Mexico, many difficulties were encountered in picking, packing, transporting to railways and other lines of transportation, etc., but with the facilities available in this country the California growers will soon determine the best methods for marketing, the most essential requirements being to expand the markets by educating the public to the value of this fruit, and by propagating the best varieties.

In addition to the restrictions upon the Mexican ahuate, there are existing embargoes against the mango, zapote, guava and sweet lime; so that further experiments with the tropical fruits, at least from Mexico for the American market, cannot be made.

Experience With Shipments

Questioned in regard to the fruit shipped to Chicago and returned, Dr. Coit said:

I think most of the people have seen it. I would like

to say that I have planned a little shipping experiment that has been worked out very well. We took a number of varieties about two weeks ago, and sent them to the Department of Agriculture at Washington with the request they send them back here immediately, collect. We haven't heard from them. The day after, President Hart sent another one. That box was sent to Chicago with instructions to return. Half of the box was packed intentionally loose to see how they would take the shipment, and the other was packed firmly, and those thin-skinned varieties passed very fairly under that test, although most of them were considerably muddled about. There are hardly more than two or three in the box fit to go on the market at the present time. However, I want to call attention to the fact they were expressed from here to Chicago and back, and they were pretty ripe when packed, so it is a pretty fair test, and you can see the results in the exhibits.

Continuing the discussion of transportation, Mr. Bosche said these remarks referred to both thick and thin skin varieties. It is a matter of protecting them, keeping them in the proper atmosphere and properly packed. Reverting to the shipment to Chicago, Mr. Bosche said they had entirely too much packing; that with a little excelsior the fruit could be put through in very proper condition. The fruit should not be wrapped in paper.

I was very much interested in the matters referred to by Mr. Rivers. My man is now in Mexico in connection with the avocado business, and I would say that I have packed them, of necessity, in those baskets, because boxes were not available there. I found that by packing them in five or six layers in a little excelsior that they would come through in very fine shape, but that was a necessity. I think a single or a two-layer crate would probably be better, but I have shipped to New York from Mexico, kept them there eight or ten days, and then shipped them to California, Los Angeles, San Francisco, and other cities with less than two per cent loss.

The chairman announced that Mr. F. J. Walker has been appointed by the U. S. Government, as a member of the committee to go into Southern Mexico and Central and South America to investigate trade conditions and advance our trade relations. Mr.

Walker intends to make a special investigation of the avocado, and has kindly offered to get any information desired in connection with this association for its members. His address is F. J. Walker, San Fernando, California.

SOME INTERESTING ARTICLES

R. Brinsmead, Staff Correspondent, California Citrograph, Riverside

Mr. Chairman, Ladies and Gentlemen,—We much appreciate the fact we have been allowed to call to your attention that California now has a publication devoted to subtropical and tropical agriculture, and it is our intention to publish a monthly department devoted to the avocado, and in doing so we hope to have the co-operation of the association in the matters presented there. In the coming November issue there will be a considerable amount of space devoted to that matter, and in addition to covering the October meeting, the president of your association, Mr. Edwin G. Hart, has kindly consented to prepare a paper. Professor Jaffa has prepared a paper, and Mr. E. E. Knight is preparing something for us. We are seeking to support the avocado growers and feel sure in this publication you will find the answer to many questions which perplex you and in which you are interested, and in the course of our work we are co-operating with your association in collecting data from such growers as are found around the different citrus districts who are planting large or small numbers of trees.

GENERAL DISCUSSION

The chairman announced that the time had come for general discussion, and continuing, said:

I am going to ask Dr. Coit to take the chair for guiding this discussion. One thing I desire to remark upon now, and that is, it is up to us to all decide on a name and stick to it, if we want something which will take the place of "alligator pear." My favorite has been ahuacate. I am predisposed to that because I learned the name in Mexico, but I am willing to bury my own preference with the idea that the association should at this meeting decide by a vote of some sort, which name to adopt, and with the understanding that it stands back of the name chosen, because if

we don't everybody is going to call the fruit alligator pear. I am not sure but what they will anyway. The only chance of avoiding that is to get behind one name. When we named this the California Ahuacate Association, I thought we had adopted that name, but it is only by standing behind it that we can get results.

We have not been agreed on that name on the board of directors. It has been the one question that we have not been unanimous on. I want to see some decision arrived at.

Assuming the chair, Dr. Coit said:

Friends, the program has been completed. A good many avocado growers have a lot in their minds, and we want to get together and have a real heart to heart discussion and pass around some of this information from one to another. So if anybody hasn't time to stay—I suppose we can stay as long as we like—until dinner time, now is the time for them to make their getaway. This is an especially interesting subject.

If you pardon me for saying just a word or two before throwing this open to general discussion, I want to emphasize what the president said in regard to this association and its importance and urge every one who can, even if you don't grow avocados, to join the association and give us your support. I have just returned from a two weeks' trip through the desert country and I am very much interested there about the date industry. They have organized a Growers' Association, and they are directing that young, growing industry of date culture in the right way, and it has developed very successfully. In fact, I am interested in watching these two young industries, the date growing industry and the avocado growing industry, and it is a question in my mind which one California is going to be the proudest of in ten or fifteen years from now.

A good many speakers today have mentioned this question of varieties, and I would like to make a suggestion, and that is, that with the large number of seedlings coming into fruiting, we are going to have a confusion of names, unless some definite action is taken. There are going to be so many seedlings that look so much alike and so many people who raise a pet seedling in their backyard, who think it like an only child, cannot be convinced but what it is the best thing produced under the sun, that we need some committee—I don't see why the president of the association should not

appoint the committee—on new varieties and nomenclature, whose business it would be to judge the fruit as it is brought in. If we are going to have two meetings a year we can get every one who has seedlings, and encourage them to bring them in here and exhibit them. Those people who are of the thick-skinned crowd can come in in the spring, and the thin-skinned in the fall, and then the committee can correctly judge the value of those and give some tangible evidence of their quality, for instance, an award of merit. Nurserymen propagating a variety say that it is a good variety, and some one says, "Who says so?" Answer: "The Committee of the Avocado Association gave this award of merit." And that would mean something, and those that are given the award of merit in that way could be scientifically described and given a name.

Now, my friends, we would like to direct this discussion clearly and concisely. This question of name, I presume, comes up first.

THE NAME

D. W. Coolidge, secretary of the association took the chair.

A motion was made and seconded to adopt the name "Avocado" instead of "Ahuacate."

Mr. Adams of Upland opened the discussion as follows:

Mr. Chairman, Ladies and Gentlemen: It is a thing of vital moment to us to decide upon a name if we are going to get rid of the words "alligator pear," and I am sure most of us don't desire to have our fruit masquerade under anything that has relation to either alligators or pears, and if you could realize what that one effort could accomplish you would not hesitate. I think you can readily see if you refer back to the efforts we made in the early days of the citrus fruit industry to change the word "grape fruit." The United States Department of Agriculture, the American Horticultural Society, and the Society of Growers and Nurserymen, and very large people interested in producing this fruit, used every effort to bring about the adoption of the name Pomelo, but the people in general, consumers, retailers and jobbers, had got used to the name grape fruit and they would have no other. The effort failed, and now, today, we have a similar opportunity, a great deal better opportunity, because it is much earlier in the history of the industry, to adopt a name for popular usage.

You have heard the gentleman say that most of the consumers of the fruit call it the alligator pear, and this will become, I am sure, an unsuccessful result to change that unless all the forces are united in favor of one name. Now, if we undertake to adopt the name ahuate, which is undoubtedly the most correct name, we are going to fail, because a large majority of the growers are used to avocado. If you have watched the program, hardly anybody used any other name. The word ahuate is impossible to pronounce by English-speaking people according to the way it is spelled. You have to know something about Spanish when you try to pronounce it. That is not true of the word avocado. It can be pronounced the way it is spelled, by English-speaking people, and is easy to acquire. It is a word that has been identified with the fruit. I don't see any reason why it is not a suitable name to use, and surely if we succeed in having any other name than alligator pear, we cannot succeed in having a name different from the name now used. Therefore, I make this motion, in order to avoid having the name alligator pear. I am sure if we divide our forces we will not succeed in getting the change, but if we all unite in getting practically one name we have much better chances of succeeding.

Mr. Hart: Mr. Adams, while mostly correct, makes some statements I cannot agree with, and one of them is that the word "Avocado" is used in Mexico.

Mr. Adams: I have that statement from Mr. R. O. Price, who was a long time in charge of a large estate on the Isthmus of Tehuantepec.

Mr. Hart: I lived in Tehuantepec for some years, and I never ran across any Mexican who used any other word than ahuate. In some places it is spelled aguacate, and the Indians in places, would spell it a-h-u-a-c-a-t-l.

I think you have missed the strongest argument in favor of the word avocado. And that is, that it has the backing of the Department of Agriculture. The Department of Agriculture made a mistake in calling the fruit the avocado through the ignorance of some subordinate. They have put that name through the pomological institute, and are not willing to correct their mistake now. The question is whether it would be better policy to correct the mistake and use the word ahuate, or to continue and use the word avocado. Now, the Department of

Agriculture has a good deal of power, and I am willing to say that we don't want to attack it unless we are sure we will stand by each other. Unless we are going to fight for the name we advocate, we had better take our medicine and call it the avocado, not because it is right, but because we have to. The Department has a great deal of power and when it comes to a show down they can stop our shipping avocados under the name ahuacates. They are not disposed to acknowledge mistakes. As a matter of fact, if you look up the name of avocado, you will find it is a Spanish term for serving an appeal, from one court to another. The whole thing is obsolete. There is no connection with any fruit or with any living thing. It was the error of some one in the Department trying to translate something he didn't know anything about. The Department accepted it, and they are strong, and they don't have to acknowledge their mistakes. I think if we are unanimous for the name ahuacate, we would make them come through. I am not for fighting and bumping my head against a stonewall unless I am sure of my associates, and I am not sure, because some are against me. I think the proper thing is to adopt the name avocado, but let us not adopt it without understanding the reason for it.

Professor Condit, in response to these remarks, said:

I have carried on quite an investigation in literature, and I find that the first use of the name avocado was in 1696, by a man by the name of Sloan. I have just received a photograph of the original book written by Mr. Sloan, showing the word avocado, and I find during practically two hundred years since this word has been largely used in the English literature. I believe we should encourage the use of this name because it is an English name, and has been endorsed by these other associations.

If this is a proper time for a motion, I have been thinking of the matter of our varieties, and there has been impressed on me that the Department of Agriculture has been doing very excellent work in the importation of different varieties, and it has also come to my attention and notice that there are a very large number of fruits existing probably in Guatemala and Central America which have not been introduced and should be brought into California at the very earliest possible date. It seems to me while the department may possibly send a man to these foreign

countries, it is likely they might do it a little earlier, if we were to urge upon them the necessity and desirability of having some one go down there as soon as possible, and get hold of fruits, and I have had that so strongly impressed on me, that I have prepared a resolution which the Association might want to send to the Secretary of Agriculture. I am not a member of the association, and have no right to offer such a resolution. If you desire, however, I will read that resolution, and possibly some of you may offer it.

Motion to adopt the name "Avocado" carried.

Importation Urged

Whereas, the possibility of developing in California a successful avocado-growing industry has in our judgment been amply demonstrated; and,

Whereas, we have reason to believe that many valuable varieties, particularly cold-resistant sorts, exist in Central America, Mexico, and South America that have not been introduced into the United States, and which would probably be of great value in the further development of the industry in California and help to insure its permanent success.

Therefore, be it resolved:

(1) That we urge upon the Secretary of Agriculture and his associates in the Seed and Plant Introduction work of the Department of Agriculture the great importance of sending a special agricultural explorer to these countries at the earliest possible date to secure and import into the United States all varieties of the avocado that can be obtained;

(2) That in recognition of the value of the importations of avocado varieties already made by the Department of Agriculture, we also express to the Secretary of Agriculture our keen appreciation of the value to the industry of the service his department has already rendered;

(3) That copies of these resolutions be forwarded to the Honorable Secretary of Agriculture and to the Chief of the Bureau of Plant Industry.

Dr. Webber was elected an honorary member of the association, and then moved the passage of the above resolution, which was duly seconded and carried.

PRUNING

Mr. C. P. Taft, who was questioned relative to one of the famous trees of Southern California, grown on his place at Orange, which is known as the original of the Taft variety, said that it had been heavily pruned, but in order to obtain bud wood rather than for shaping the tree. He was in doubt as to whether this had delayed the fruiting or lessened the amount of production. Along this line he said a medium sized tree that had borne fruit was badly damaged by a wind storm—one side blown off—and that for the next three and a half years it devoted all its energies to rebuilding wood. Last year it regained its normal size and now has one thousand fruits on it. Mr. Taft will prune only when he thinks it necessary, perhaps only in shaping the tree. Disastrous experiences from pruning in August have convinced him that the trees should not be cut back in the very hot weather. He prefers the early spring or November. This applies to nursery stock as well as older trees. He considers spring or fall as the most desirable for pruning.

After a bud has taken hold and is ready to grow, Mr. Taft does not cut the top of the seedling back until cool weather, leaving it to protect the young tree from the sun.

In the course of a dialogue on the subject, J. T. Whedon advised such protection for the trunks by encouraging downward growth of foliage as with oranges. He believes in waxing the cuts regardless of how smooth they are. D. W. Coolidge agreed as to this method, and advised systematic, regular pruning for the first few years, but differed with Mr. Taft as to the season for such work, advising cutting back in the vigorous growing season, when the high flow of sap will heal the cut more thoroughly.

E. S. Thacher's experience tends to favor pruning. His trees are seven years old and all bushy, some of them threw out high limbs in the center and these were cut back, giving his trees a uniform appearance. His theory is that it does not hurt to cut them any more than any other tree, and later he believes the production will be increased by pruning. He advises waxing the cuts.

Referring to the Harman variety and its inclination to grow in large umbrella form, Mr. Coolidge stated that it could be shaped up to form a perfect pyramid, which resists heavy winds and pro-

fects its body from the hot sun. In his estimation a great deal of fruiting space is gained by such treatment. He said he could show limbs two inches in diameter that had been pruned without any die-back. All Mr. Coolidge's pruning is done in the vigorous growing season. He says that he has known them to die back in many instances, when cut in the early spring or the fall. Questioned, he said he had never trimmed back a Taft or any of the other thick-skinned type. Mr. Whedon, who asked the above question, gave it as his experience that such treatment of first-class trees would cause them to die.

WORMS AS PRUNERS

To show a kind of instinctive tendency to control the wood and leaf growth, E. E. Knight of Yorba Linda described a system the Indians of Guatamala have of driving "Hear Me" worms (so called because they raise their heads when any one speaks) among the trees and shooing them up the trunks. He says they do all the pruning practiced there. Regarding his own experiences Mr. Knight stated that he had trimmed one of the hard-shell types with a view to demonstrating whether it would be killed by cutting back, and that it gave him no difficulty, but the rather heavy pruning produced a very beautifully shaped tree. He agreed with Mr. Coolidge that a tree could be pruned to give a large bearing space and still be kept in compact form. Comparing an unpruned tree with the pruned tree he found the former had enormous, long branches with two or three fruits in a space that should have a dozen or more. Small pruned trees furnish evidence to him that it is better to have compact trees with large bearing surface rather than the huge branches with little fruit space. The tendency to terminal growths to the exclusion of laterals should be controlled by cutting the terminal points. One eleven-year-old tree, thirty feet in height, with branches reaching the ground, yet having comparatively little bearing space, and a two or three-year-old tree pruned to throw out many lateral branches assisted him in reaching the above conclusion. The Meserve variety is referred to.

In regard to shaping trees, Mr. Whedon said he has two trees, ten or twelve years old, that he clips for the purpose of shaping, and although he hasn't bound or waxed any of the cuts he has had no die-back.

As a result of his experience Mr. Hart stated that it was not well to generalize too much on the amount of pruning. "No two varieties," he said, "grow the same. I have something like fifteen varieties on my place." Some of the varieties he pruned very little and they developed in good shape. Others throw out such long branches that they leave the trunk exposed to be sunburned. Such trees must be pruned. He said his experience of the effect of pruning was very much in accord with that of Mr. Coolidge—prune a tree while growing and there is little chance of die back. His observation has led him to do his pruning in the early spring after the sap has come up and the tree has started to grow, but in advance of the summer heat. This method enables the tree to protect itself from the sun. Mr. Hart advocates pruning, preferably in the spring, or about the time of fall when the weather is cooler and the tree is still growing from the warmth in the ground. He considers it extremely necessary to prune some varieties in order to protect them and shape them up.

IRRIGATION

That the avocado needs thorough irrigation, even more perhaps than citrus trees, is an opinion expressed by Mr. Coolidge. He mentioned a four-year-old tree planted near a large hydrant from which water is taken for a considerable amount of nursery stock. Every two weeks that tree is flooded, and it produced 150 fruits this year. He stated that other trees of the same variety and practically the same age, planted near, but with less irrigation, were about two-thirds the size and much less vigorous, and that they produced not more than two-thirds as much fruit as the flooded tree. He believes that trees growing in light, sandy soil cannot get too much water in the growing season.

Mr. Knight planted a number of trees on a corner of one acre and gave them a double portion of water. These trees, he said, were planted in the summer, during the hot months, and were irrigated twice a week. His irrigation is done by means of tanks and the best tree is the one with the biggest tank. Mr. Knight stated the trees on the corner, receiving double portions of water, showed best results. His soil is a clay loam.

Mr. Whedon agreed with Mr. Coolidge and Mr. Knight as to copious irrigation in some soils, but referring to his own soil said

if it were watered once a week it could not be walked on. He said his soil had been analyzed as clay loam the first foot, and the next five feet sandy clay, and that once a month would be ample irrigation for it.

A tree planted in his lawn and watered every morning with an automatic sprinkler was said to be the best tree its owner has.

FROST RESISTANCE

The question was asked whether it was safe to plant thick-skinned trees where lemons do "pretty well," where frost can be expected at about four-year intervals.

Dr. Coit, acting as chairman, thought it would require a very fine degree of judgment to answer the question satisfactorily, if such an answer could be given at all. The question was referred to Mr. Taft, who answered that either type—the thick or the thin-skinned, might be planted, but that there is a great variation in the frost resistance of the different varieties. It is his judgment that the Taft will stand as much as any thick-skinned fruit, but not as much as some of the thin skins. Planting in such a locality, Mr. Taft said he would protect his trees for four or five years and then let them look out for themselves, just as he would with lemons, and he believes they would stand it as well as the lemons.

Mr. Whedon told of two seedling trees that he purchased in 1912, both Mexican varieties, one black and one green, the latter said to be very fine fruit. This was protected until it was four or five feet high, and when he last saw it, it was growing nicely. The black variety he did not protect, and the first heavy frost of 1913 killed it.

Regarding the frost resistance of the hard shells, Mr. Knight stated that he had seen them growing two thousand feet above the elevations where the hardiest thin-skinned avocado grows.

Mr. Hart resumed the chair and called attention to the fact that the Alexandria Hotel had furnished the rooms with all the beautiful fittings for the present meeting, that they had brought up the displays and had assisted in every way, giving exceptional assistance in the preparation of the samples of avocado, and all entirely without cost to the association. He said he would entertain a motion showing appreciation to the management of the hotel.

A motion was made to express the heartiest thanks of the California Avocado Association to the management of the Alexandria Hotel for the use of the rooms and the assistance rendered.

Motion seconded and unanimously carried.

Meeting adjourned.

The California Avocado Association is Issuing in Folder Form the Following Suggestions for Preparing the Avocado for the Table:

A person of ingenuity can, in addition to what is here printed, find many delicious ways of serving the avocado.

There are many varieties of avocados, and they vary very considerable in flavor and texture. Be careful to buy good-quality fruit, free from fiber and not too ripe. Learn to identify good varieties. The fruit can be purchased hard and ripened at home, the same as the Bartlett pear.

The avocado is highly nutritious and very easily digested. It is ready for eating when it yields to the slight pressure of the thumb. The flesh is about the consistency of well-made butter, if the fruit is ripe. An unripe avocado is of small charm to the palate, but a ripe one lives long in the memory of delicious flavors.

In preparing the fruit, especially in combining it with other ingredients, it is well to remember that the flavor of the avocado is so fine and delicate that it may be easily hidden. (A good rule to keep in mind: One-half avocado meat, one-half other ingredients.) Following are a few recipes:

HOR D'OEUVRE

Avocado Served in Skin. Cut the fruit in half. Carefully remove the seed. Serve a half to each person with any of the following dressings, as personal taste directs: 1. Lemon or lime juice. 2. Salt. 3. Sugar. 4. Tomato catsup. 5. Mayonnaise. 6. French dressing.

Avocado on Toast. Remove the flesh with a spoon and mash with a fork. Spread thickly on a small square of hot toast. Add a little salt and pepper. This is one of the nicest ways of serving avocado.

Avocado with Caviar. Prepare as the above recipes direct. Spread a small quantity of caviar on top of each piece. This is a very delicious appetizer.

Avocado Cocktail. Cut the fruit into dice. Place in small cocktail glasses, cover with a good cocktail sauce. Tomato catsup with lemon juice and salt and pepper is excellent. Serve very cold, or packed in ice.

SALADS

Celery and Nuts. Fill seed cavity of a half fruit with chopped celery and nuts mixed with a small quantity of mayonnaise.

Apple and Celery. Take equal parts of chopped celery and apple. Heap in a lettuce loaf, cover thickly with avocado meat well beaten with a little mayonnaise. Lemon juice may be used if preferred.

Combination Salad. Make a good combination salad of green vegetables—peas, beans, tomatoes, cucumbers, celery, hard boiled egg, lettuce. Mix with one-half as much avocado meat. Season with French dressing.

Avocado on the Half-Shell. This is only practicable with the thick-skinned variety. Divide fruit in half, carefully remove meat, add yolk of a hard-boiled egg and one tablespoon of French dressing for each fruit. Press through a sieve and pile back in the shell of the avocado. Garnish with boiled whites, finely chopped with parsley.

Cuban Salad. In the cavity of a small fruit place three stuffed olives, add lime or lemon juice. A teaspoon of sugar dissolved in the lime or lemon juice is very nice.

If you care for Onions. Cut the flesh of the avocado in cubes, mix with chopped onions, lime or lemon juice and salt. A finely chopped boiled egg sprinkled on top makes it very pretty.

Aspic Jelly made with Avocado. One-half box gelatine, one-half cup cold water, one cup boiling water, two cups mashed avocado, juice of half a lemon, salt, cayenne. Soak gelatine in cold water one-half hour. Dissolve in boiling water. Strain and add avocado meat which has been flavored with salt, cayenne and lemon juice. Place on ice to harden. Serve with mayonnaise.

With Bananas and Apple. Take one chopped apple, one sliced banana and three medium-sized avocados. Mix in a bowl with either French dressing or mayonnaise. Serve on lettuce leaf.

Sandwiches. A good hostess appreciates the value of an original and delicious sandwich. **With rye bread**—Mash the flesh of three large or six small avocados, season with lemon juice, salt and pepper. Spread between very thin slices of rye bread. A lettuce leaf may be used in the sandwich if desired. This makes about twenty sandwiches.

With Chili Pepper. Chop the fruit with chili pepper. Season carefully and spread between buttered bread, with or without lettuce leaf. The above recipe can be used with nuts or olives in place of the pepper or onions.

An Original and Delicious Dessert is: Avocado and chopped dates beaten in whipped cream slightly sweetened.

Avocado Ice Cream. Yolks of five eggs, one quart milk, green Maraschino cherries, two cups sugar, four medium-sized avocados, almond or vanilla extracts. Make a boiled custard with the milk, egg and one cup sugar, flavor with almond extract. When the custard is cool add the fruit and freeze. Serve with green Maraschino cherries on top or each dish.

Avocado with Sea Foods. A most appetizing form of serving the avocado is to mix equal parts of cold salmon or lobster with the diced fruit, and serve with mayonnaise.

In Soups. The avocado is used extensively in the tropics in all kinds of meat soups. Cut in small cubes and add to the soup just before serving.

For Invalids. The avocado is recommended by physicians as a most desirable form of food for invalids. It is highly nutritious, containing as high as 25 per cent of fat in the best varieties, according to Government statistics, and yet is very easily digested, so that the most delicate person can eat it freely.

The California Ahuacate Association is willing to give any information in its possession to assist producers and users of the fruit. Address 917 Union Oil Bldg., Los Angeles.

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Annual Report

1916

California
AVOCADO
Association



Riverside, California

Annual Report

OF THE

California Avocado Association

FOR THE YEAR

1916

Including Reports of the 2nd Semi-Annual Meeting held in Los Angeles,
April 29, 1916, and the 3rd Semi-Annual Meeting held in
San Diego, October 30 and 31, 1916.

Issued March 15, 1917

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1917

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CALIFORNIA AVOCADO ASSOCIATION

1916 ANNUAL REPORT

General Office at Citrus Experiment Station
RIVERSIDE, CALIFORNIA

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Notice: The Association does not hold itself responsible for the opinions and statements expressed by the authors of the various papers published in its reports.

The illustrations used in the report must not be taken as illustrating the most desirable varieties. They are used merely as a means of illustrating the range of variation.

JUL 9 1916

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Figure 29—**Lyon** (Natural size). This is one of the thick, hard-shelled varieties that is attracting considerable comment. Season of ripening. April to June. A prolific and precocious variety beginning to ripen fruit two years from the bud. Tree a tall upright grower. (Photo by Citrus Experiment Station.) H. J. Webber.

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Figure 35—Newly set avocado trees, protected from wind and sun injury by cloth covers. Judge Silent place, Glendora, California. (Photo by H. J. Webber.)

FOREWORD

Organization of Association.—The growing of the avocado in California is just beginning. It is fortunate that an association has been organized thus early in the development of the industry to guide and direct its development. The semi-annual meetings of the Association, of which three have been held, have all been notable for the numbers in attendance and the interest and enthusiasm manifested. One of the great benefits derived from the Association is the stimulation it gives to the development of the industry. The holding of the Association meetings serves to advertise the industry, and this is also one of the very necessary factors at the present time.

Exhibits and Demonstrations.—At the second semi-annual meeting held in Los Angeles, April 29, 1916, a much larger number of varieties of the so-called Guatemalan, or thick-skinned types were exhibited than at the preceding meeting. There was also a good exhibit of nursery stock, including budded trees of a large number of varieties. For a discussion of this exhibit the reader is referred to the report of the committee on the classification and registration of varieties. (See page 37.)

The exhibit in connection with the third semi-annual meeting, held at San Diego, October 30 and 31, 1916, was staged in a special room and was notable from the fact that though held late in the fall it contained exhibits of a considerable number of thick-skinned, or hard-shelled fruits. Of these the fruits of the Taft, the Dickinson, and the Sharpless were in prime market condition.

A demonstration of the methods of serving the avocado was made during the noon hour, and over six hundred people were given an opportunity to test the avocado served in different ways, as sandwiches, salads, and the like. The very enthusiastic comments heard on every side, and the very evident interest manifested, clearly illustrated the great educational value of such demonstrations in the present stage of development of the industry.

Publications.—The available information regarding the growing of the avocado and the methods of conducting the industry is very meager. Regarding the methods of practical culture in California, almost nothing has been published excepting the papers that have been read before this Association. The experience of growers in various parts of the state must form the basis of knowledge on which a rational and successful system of conducting the industry can be founded. The recording of the experiences of growers and the stimulation of growers to make observations becomes thus an important factor in the work of the Association. In making up the program for the third semi-annual meeting, special attention was given to the presentation of papers outlining personal experiences. This series of papers included in the present report will be of great value to the industry.

The report of the first semi-annual meeting, held in Los Angeles, October 23, 1915, was published by the Association and copies distributed to

all members of the Association and to a limited number of public libraries and scientific institutions. A considerable number of copies have also been sold to parties not members of the Association. These were at first sold for 35 cents per copy, but later following the instructions of the board of directors the price was raised to \$1.00 per copy. A number of copies still remain on hand for sale and can be had by writing to the general office of the Association.

The reports of the second and third semi-annual meetings are published herewith as the annual report for the year 1916. This report will be mailed to all members of the Association, and copies will be mailed on application and the payment of \$1.00 per copy.

Membership.—The membership of the Association at present is 141. This is by no means as many members as the Association should have. The advancement of the industry must come through co-operation, and all growers of California interested in the avocado should become members of the Association. The interest in the industry in California is certain to center around the Association, and the Association will undoubtedly have greater influence than any other agency in advancing the industry. It thus becomes the duty of every grower to join the Association and assist in the great work before us. The support of the Association is entirely derived from the membership dues, and without a large membership, funds will be available for only a limited extension of the legitimate work of the Association.

At the present time the collection, publication, and dissemination of data regarding the growing of the fruit, is the main work of the Association. The avocado plantings, recently increased very greatly, are nearing productive age, and soon the industry will be confronted with the problem of marketing many hundred times the quantity of fruit now marketed. To dispose successfully of the increasing quantities of fruit means that a campaign of advertising must be carried on, and the Association is the only organized agency having this as one of its main functions. This purpose, however, cannot be carried out effectively without the aid of all interested growers. If growers neglect to join this Association, waiting until necessity forces co-operation, the industry will suffer severely for a period. Every grower expecting to have avocado fruit to market cannot afford not to join the Association. All must co-operate in pushing forward the objects of the Association. The present membership gives only sufficient funds to provide for the meetings and publication of the annual reports. A campaign should be organized to increase the membership next year to 500 at the least estimate, in order to provide funds to begin a systematic campaign of education in the great market centers. If all cities in the United States, of equivalent size to Los Angeles, were equally well educated in the use of the avocado, the present prices for the fruit probably would be maintained for a number of years.

H. J. WEBBER,
President California Avocado Association.

BY-LAWS OF THE CALIFORNIA AVOCADO ASSOCIATION

I

Name

The name of this Association shall be the California Avocado Association.

II

Purpose

The purpose of this Association is the improvement of the culture, production and marketing of the avocado.

III

Directors

The governing body of this Association shall consist of a board of nine directors.

IV

Officers

The officers of this Association shall be a president, a first vice-president, a second vice-president, a secretary, and a treasurer. Any two of these offices may be filled by one person, in the discretion of the board of directors.

V

Executive Committee

The board of directors shall have the power to appoint an executive committee of three members of the board of directors, said committee to exercise such powers as may be delegated to it by the board of directors.

VI

Powers of the Board of Directors

The board of directors shall have the general powers of management of the Association and may make such rules as they deem necessary to carry out the purposes of the Association.

VII

Powers and Duties of Officers

The powers and duties of the officers herein provided for shall be those usually pertaining to said offices, subject to the rules that may be made by the board of directors.

VIII

Elections

The directors shall be elected at the annual meeting of the members of the Association. Immediately upon their election the board of directors shall convene and elect the officers herein provided for. The board

of directors shall have the power to fill any vacancy in their number or any vacancy in any office in the Association.

IX

Membership

The qualifications for membership in this Association shall be the payment of the dues required and a membership fee of five dollars.

X

Dues

Regular annual dues, payable in advance, for membership in this Association, shall be five dollars per year, beginning January 1, 1916.

XI

Meetings

The annual meeting of the Association shall be held at a place designated by the president on the second Tuesday of May in each year. Special meetings shall be called by the president as occasion may require.

MEMBERS

California

Adams, Chas. D.	Upland	
Albertson, Emery	Whittier	145 North Painter Ave.
Armstrong Nurseries,	Ontario	
Ballard, R. L.	Orange	R. F. D. 1
Barber, T. U.	Los Angeles	518 Van Nuys Bldg.
Barnes, Mrs. Arthur J.	Pasadena	1875 Summit Ave.
Barron, A. Ellis	San Diego	P. O. Box 992
Bartlett, Rev. Dana W.	Los Angeles	1437 Malvern Ave.
Bartley, E. D.	Santa Ana	R. F. D. No. 1
Bates, Mrs. K.	El Cajon	R. D. San Diego Co.
Beattie, A. C.	Upland	
Beattie, G. W.	Highland	
Beck, G. W.	La Habra	
Bell, David C.	Saratoga	Santa Clara Co.
Bentley, W. H.	Los Angeles	R. D. 13 (La Canada)
Billingsley, Ray	Orange	R. D. 1, Box 115
Blackwood, Gordon F.	Glendora	
Blakeslee, H. I.	Fullerton	
Blanchard, Nathan W.	Santa Paula	
Bliss, F. A.	Monrovia	844 Wild Rose Ave.
Booth, Chas. F.	Long Beach	837 E. Ocean Ave.
Browning, V. A.	Anaheim	R. R. No. 2, Box 34
Bryant, P. T.	Fillmore	
Buxton, G. E.	Carlsbad	Sales Agt., S. Coast Land Co.
Camp, E. W.	Sierra Madre	
Cavanaugh, W. A.	Fellows	Kern Co.
Chapman, A. S.	Los Angeles	306 E. 25th St.
Chase, E. A.	Riverside	
Chidester, Arthur M.	Whittier	446 S. Painter Ave.
Collins, Isaac	Whittier	608 N. Painter Ave.
Cook, Max H.	Chula Vista	
Coolidge, D. W.	Pasadena	Colorado & Hill Sts.
Coulston, J. B.	Pasadena	Pres. Nat. Bank of Pasadena
Cubbon, John	Santa Ana	
Danziger, J. M.	Los Angeles	1006 Security Bldg.
Dickey, Edward W.	Los Angeles	513 Story Bldg.
Dixon, F. A.	San Francisco	112 Market St. (care Hunt Bros. Co.)
Downing, Mrs. J. O.	Los Angeles	727 S. Rampart St.
Elliott, J. M.	Los Angeles	First National Bank
Fargher, Robert J.	Harper	
Fesler, Martin	Covina	
Field, C. M.	Chula Vista	
Fly, E. M.	National City	
Flynn, W. Earl	Monrovia	
Fulton, S. M.	Pomona	Val Vista & Cleveland Sts.
Gage, Earl D.	Fullerton	R. F. D. No. 2, Box 12
Gane, Henry S.	Santa Barbara	
Garthwaite, J. W.	Corona	P. O. Box F.
Gray, E. R.	Puente	
Haldeman, H. M.	Los Angeles	214 N. Los Angeles St.
Hall, M. O.	San Diego	3320 30th St.
Hardin, C. H. E.	Ocean Park	
Hardin & Keller	Yorba Linda	155 Dwight Ave.
Farman, Ed N.	Sherman	
Hart, Edwin G.	Los Angeles	518 Van Nuys Bldg.
Hertrich, Wm.	San Gabriel	
Hills, R. W. Jr.	San Francisco	175 Fremont St.

Hoff, J. E.	Hollywood	1850 Vista St.
Hoffman, Geo. D.	Pasadena	P. O. Box 438
Hosford, G. W.	San Dimas	
Jamieson, S. W.	Glendale	220 S. Louise St.
Johnson, C. W.	Pomona	R. D. No. 1
Johnson, Geo. H.	Los Angeles	407 Consolidated Realty Bldg.
Kirkman, Wm. T., Jr.	Fresno	Kirkman Nurseries
Kirwin & Bradford	Santa Ana	
Knight, E. E.	Yorba Linda	
Kramer, Henry J.	Los Angeles	932 S. Grand Ave.
Lemona Heights Co.	Riverside	
Littleton, C. H. S.	Pasadena	370 Arroyo Terrace
McKay, Ellen G.	Hollywood	1430 Fielding St.
McNaghton, Malcomb	Los Angeles	819 Investment Bldg.
Magee Bros. Nurseries	Pasadena	R. F. D. No. 2.
Mann, O. A.	Yorba Linda	
Manning, Dr. Will R.	Fillmore	
Manz, A. F.	Whittier	Philadelphia & Pierce
Marvin, B. K.	Riverside	P. O. Box 525
Mather, R. J.	Altadena	R. D. No. 2.
Matthews, Roy P.	Wah-To-Ke	Fresno Co.
Maurer, Oscar	Del Mar	
Moore, Stephen P.	Azusa	Cerritos St.
Mooris, R. R.	Whittier	R. F. D. No. 1
Murry, Wm. D.	Hollywood	501 Laurel Ave.
Needham, C. E.	Glendora	
Newkaemper, Wm.	Pasadena	788 Curtis St.
Nichols, C. O.	Bostonia	
Olshausen, B. A.	Los Angeles	143½ S. Broadway
Pitcairn, Robert	Pasadena	289 State St.
Popenoe, F. O.	Altadena	West India Gardens
Price, R. O.	Upland	
Ransford, J. E.	Los Angeles	(500 Crescent Heights Blvd., R. F. D. No. 10, Box 281. James Nurseries, 483 E. Villa R. F. D. No. 106
Rechstemer, V. M.	Pasadena	
Rhoades, Mrs. S. B.	Covina	
Rideout, W. L.	Whittier	
Roeding & Wood Nurs.Co.	Los Angeles	Compton & Washington Sts.
Ross, Geo. F.	Los Angeles	2158 W. 21st St.
Roth, Paul M.	Pasadena	82 S. Marengo Ave.
Sallmon, Wm. H.	San Diego	401 So. Title Bldg.
Sandusky, Earl	Los Angeles	406 W. Pico
Sexton, Joseph	Goleta	
Shaffer, Geo. B.	Los Angeles	First National Bank
Sharpless, B. H.	Santa Ana	17th St. & Newport Rd.
Shedden, Thos. H.	Monrovia	231 E. Lemon Ave.
Sherlock, W. P.	Pasadena	Box 213, R. F. D. No. 2
Simcoe, B. F.	Bakersfield	1828 Orange St.
Silent, Charles	Glendora	
Skinner, R. W.	Yuba City	
Spaulding, E. A.	Harper	
Spinks, Wm. A.	Duarte	
Stearns, A. G.	Los Angeles	601 Story Bldg.
Stearns, Henry A.	Pasadena	810 N. Los Robles Ave.
Stephens, Wm. D.	Montebello	
Stevenson, Arthur L.	Pasadena	969 Topeka St.
Stewart, Mrs. J. T.	Los Angeles	2319 W. 11th St.
Stuart, James C.	Los Angeles	Antlers' Hotel
Swift, A. L.	Alta Loma	
Taft, C. P.	Orange	
Thacher, E. S.	Nordhoff	

Townsend, Dr. E. L.	San Gabriel	R. F. D. No. 1, Box 175
Underhill, E. F.	Glendora	
Utt, C. E.	Tustin	
Walker, T. J.	San Fernando	
Waterbury, G. W.	Corona	
Waters, Genetta H.	Lemon Grove	
Wetzel, Hugo	Anaheim	R. F. D. 3
Whedon, J. T.	Yorba Linda	
White, Camelia B.	Palm Springs	Riverside Co.
Whiteley, Mrs. F. J.	Arcadia	Box 55
Wilder, G. W.	Redlands	
Williams, A. B.	Pasadena	987 N. Raymond Ave.
Woods, Robert S.	Los Angeles	919 Bonnie Brae St.
Webber, Dr. H. J.	Riverside	Citrus Experiment Station
Zapf, A. E.	Orange	West Walnut Ave., and
		Santa Fe Tracks
Zuill, W. L.	Pasadena	427 S. Madison Ave.

Non-residents of State

Bryant & Greenwood	Chicago, Ill.	1301-06 Westminster Bldg.
Cellon, Geo. B.	Miami, Fla.	
The Elizabeth Nurs. Co.	Elizabeth, N. J.	Wilder St.
Harn, Sam P.	Gainesville, Fla.	
Linne, Hans. S.	New York City.	Palace Theater, 1564 Broadway
Metz, Emma K.	Chicago, Ill.	548 Menominee St.
Niles, L. D.	Lucerne Park, Fla.	
Ostrand, Edward	Chicago, Ill.	156 Van Buren St.
Wright, A. P.	Mission, Tex.	Mission Nurseries.

SECOND SEMI-ANNUAL MEETING OF THE CALIFORNIA AVOCADO
ASSOCIATION HELD AT BLANCHARD HALL,
LOS ANGELES, APRIL 29, 1916

E. G. Hart, President
Wm. A. Spinks, First Vice-president
Charles Silent, Second Vice-president
D. W. Coolidge, Secretary
C. P. Taft, Treasurer

MINUTES OF THE SECOND SEMI-ANNUAL MEETING

The convention was called to order at 10 a. m. by President Edwin G. Hart, who presided during the meeting.

The following papers were presented during the forenoon session:

"By-Products of the Avocado", by Professor Wm. Cruess, University of California.

"Market Value of Fruit", by C. P. Taft.

"Chemical Constituents of the Avocado", by Professor M. E. Jaffa, University of California.

"Marketing Obstacles and Problems," by Dana C. King, Sales Agent, California Fruit Growers' Exchange.

At the close of the forenoon session, Mr. D. W. Coolidge made an appeal for membership.

The afternoon session convened at 1:30 p. m., the first portion of the meeting being devoted to a business session. C. D. Adams, T. U. Barber, F. O. Popenoe, Judge Silent, and C. E. Utt were named as a committee to nominate the directors of the Association for the ensuing year. The treasurer's report, printed herewith, was read and approved. After a general discussion, reported elsewhere in the proceedings, the committee on nominations reported the following nominations for directors:

Dr. H. J. Webber	Riverside
T. U. Barber,	Los Angeles
Judge Chas. Silent,	Glendora
W. H. Sallmon,	San Diego
E. S. Thacher,	Nordhoff
F. O. Popenoe,	Pasadena
C. D. Adams,	Upland
W. A. Spinks,	Duarte
C. P. Taft,	Orange

They also recommended that Dr. Webber be made president and that Mr. T. U. Barber be made vice-president. Mr. Whedon moved that the report of the committee be accepted and that the directors nominated be elected for the next year. Motion seconded and carried.

On motion of Mr. Taft a vote of thanks was unanimously given Mr. Hart for his efficient services as president during the year.

Following the business session, the following papers were read:

"From Seed Time to Harvest", by T. U. Barber.

Report of Committee on Classification and Registration of Varieties and on the Results of Judgment of Exhibits",—Report presented by Dr. H. J. Webber.

"The Avocado and Its Future", by Judge Charles Silent.

"Work and Value of the Avocado Association",—A general discussion, led by Prof. J. Eliot Coit, of the College of Agriculture.

At the close of this program, the Association adjourned.

A feature of the meeting of the Association very much appreciated was the fine exhibit of fruits staged in the rear of the meeting hall.

TREASURER'S REPORT

Report of the receipts and expenditures of the California Avocado Association from organization to April 29, 1916.

RECEIPTS:

Dues	\$670.00
Advertising in 1915 Report	127.00
Sale of 1915 Reports	32.90
Contributions for premiums, meeting 1916.....	25.00

Total receipts	\$854.90
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EXPENDITURES:

General expense, (includes cost 1915 meeting).....	\$153.18
Office expense—postage, etc.	32.52
Printing and stationery	135.85
Expenses in connection with printing, editing, etc., of 1915 Report	252.00

Total expenditures	\$573.55
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Balance of cash on hand and in bank	281.35
Due from advertisers in 1915 Report	30.00
Due from members for 1916 dues	50.00

Cash resources	\$361.35
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Total membership	85.
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AVOCADO BY-PRODUCTS

W. V. Cruess and S. K. Mitra

University California Experiment Station. Zymology Laboratory

At the present time, there does not seem to be any very great need of a by-product industry to utilize waste avocados. Still there is a certain amount of soft fruit and blemished fruit which normally will find no market in the fresh condition. In order to develop practical methods of utilizing this fruit and any contemplated over production, experiments have been carried on in the Zymology Laboratory during the past two years.

Avocado Paste: Since the fruit is used as a salad fruit, the first thought will be to prepare a paste or minced product from the peeled fruit and preserve it by suitable methods. This idea was tested very thoroughly. Paste was treated with varying amounts of salt to pre-

serve it without sterilization. Portions of the same lots were sterilized at various temperatures. Various antiseptics were tried, such as vinegar, or benzoic acid. Fermentation of the paste before canning was also experimented upon.

In all cases, the results were poor because of the loss of the fresh avocado flavor and the development of an acrid taste.

It is possible that if the fruit was treated with lye before making into a paste, the acrid taste would be eliminated. Experiments made on the peeled halves would indicate this to be true.

Dried Avocados: Peeled and pitted fruit was dried at 100 degrees C. The flavor of the dried product was palatable, but very much inferior to the fresh article. Used in soup, it was found to impart a pleasant rich flavor. It seems to have possibilities as a flavoring for high-priced soups. The temperature of drying used should not be above 212 degrees F. The flesh darkens during drying.

Canning Avocados: A number of different lots of fruit were canned in various kinds of brines and syrups and at various temperatures. Salt brines were unsatisfactory in all cases. A disagreeable acrid taste develops in the fruit canned in plain water or brines of various degrees of salt.

Fruit canned in a 60 per cent cane sugar syrup at 180 degrees F. gave excellent results. The flavor was rich and seemed equal to that of the fresh fruit. The only objection seems to be that the flavor is a little too rich for the product to be eaten freely. Fruit sterilized in a syrup at 212 degrees F. was not equal to that sterilized at 180 degrees F. The addition of a small amount of lemon juice to the syrup improved the flavor of the canned product.

Syrups of lower concentration than 60 per cent were not so satisfactory as the heavy syrup.

Preservation in Vinegar and in Brandy: The fruit keeps well if stored in ordinary cider vinegar, but the excess vinegar must be leached out before using the fruit. This flattens the flavor considerably, but the product is fairly palatable. The texture becomes soft on long standing.

When stored in brandy of good quality the halved fruit retains its color, texture and flavor very well. The alcohol is easily removed by soaking the fruit in water twenty-four hours before use.

Oil: As Professor Jaffa has pointed out in a paper presented last year, the avocado is very rich in oil which constitutes a very large portion of the nutritive value of the fruit. It is probable that it will be many years before enough avocados are produced in the state to make possible the establishment of an avocado oil industry. As a point of interest, however, various methods of recovering the oil were tried out on a very small scale. It seemed to be necessary to dry the fruit first. The oil was then recovered by pressure at 500 pounds per square inch and the oil left in the press cake was extracted with ether. The oil obtained by pressure had a pleasing flavor. Its appearance was greatly improved by decolorizing with bone-black and filtration. A great deal of solid fat separates on cooling the oil. This can be removed by filtration. The oil at best was inferior to good cottonseed oil. Therefore, avocado oil as a

by-product does not seem very promising for table use. It may later be discovered to have other uses, such as in soap-making.

The following table gives a summary of the more important experiments performed:

Experiment Number	Date Treated	Date Examined	TREATMENT	RESULTS
1803-a	1915 Nov. 23	1915 Nov. 25	Dried at 212 deg. F.	Made good soup flavoring. Not satisfactory for eating alone.
-b	" 23	" 25	Dried and pressed. Pomace extracted with ether. Press oil decolorized and filtered.	Press oil edible. Solvent oil poor.
-c	" 23	Dec. 5	Halves treated with ½ % lye 24 hours. Lye washed out with water. Sterilized in 5% brine.	Fermented slightly during lye treatment. Flavor poor.
-d	" 23	" 5	Same as 1803-c, but 1% lye used.	Same results as 1803-c.
-e	" 23	" 5	Same as 1803-c, but 3% lye used.	Flavor excellent. Texture a little too soft.
-f	" 23	" 5	Same as 1803-c, but 5% sodium carbonate used.	Results fair. Not so good as "e".
-g	" 23	" 5	Canned halves in plain water at 85 deg. C.	Acrid taste. Not satisfactory.
-h	" 23	" 5	Canned halves in 3% brine at 85 deg. C.	Acrid taste. Not satisfactory.
-i	" 23	" 5	Canned halves in brine plus vinegar to increase acid to .3%.	Not satisfactory.
-j	" 23	1916 Feb. 1	Pickled in vinegar.	Flavor good if excess vinegar is washed out.
-k	" 23	" 1	Pickled in brandy.	Flavor good if excess alcohol is washed out.
1803-l	" 23	1915 Dec. 5	Paste from boiled fruit sterilized at 212 deg. F.	Flavor very poor.
-m(1)	" 23	" 5	Paste plus 1% salt, not sterilized.	Flavor very poor; color, dark.
-m(2)	" 23	" 5	Paste, plus 3% salt, not sterilized.	Flavor very poor; color dark.
-m(3)	" 23	" 5	Paste plus 6% salt, not sterilized.	Flavor very poor; color dark.
-m(4)	" 25	" 5	Paste plus 12% salt, not sterilized.	Flavor poor.
-m(5)	" 25	" 5	Paste plus 15% salt, not sterilized.	Flavor poor.
1803-n(1) to-n(4)	" 25	" 5	Salt, varying from 1 to 15%, followed by sterilization at 100 deg. C.	Flavor poor in all cases.

Experiment Number	Date Treated	Date Examined	TREATMENT	RESULTS
1835 (1)	1916 Jan. 26	1916 Mar. 15	Peeled halves in plain water. Sterilized at 212 deg. F.	Flavor acrid and disagreeable.
1835 (2)	" 26	" 15	Peeled avocados in 30% syrup; sterilized at 212 deg. F.	Fair. Not so good as (3).
1835 (3)	" 26	" 15	Peeled avocados in 60% syrup; sterilized at 212 deg. F.	Palatable. Flavor very rich. Not so good as (4).
1835 (4)	" 26	" 15	Peeled avocados in 60% syrup; sterilized at 180 deg. F.	Flavor excellent, but very rich.
1835 (5)	" 26	" 15	Peeled avocados in 60% syrup plus 3% lemon juice. Sterilized at 180 deg. F.	Best of series; flavor very rich.

Summary: Avocados canned in a 60 per cent syrup at 180 degrees F. retained more of the fresh rich avocado flavor than did products prepared in any other way. This seems to be one of the most promising avocado by-products. Canning in brine or plain water gave poor results. Avocados treated with 3 per cent lye for 24 hours in the same way that olives are pickled gave a very palatable product, after removal of lye and sterilization in a dilute brine. Avocado pastes were in all cases unsatisfactory. The flavor of the fruit was fairly successfully retained by pickling the halves in vinegar or in brandy. Dried avocados gave a very pleasing flavor to vegetable soup. The oil is not satisfactory as a food.

In general, the canning in heavy syrups seems to be the most satisfactory method of preserving avocados or avocado products.

Discussion

Mr. Taft: Your investigations as reported were confined almost entirely to the thin-skinned varieties. Have you investigated the thick-skinned varieties also?

Prof. Cruess: Our investigations have been confined to the thin-skinned varieties principally and seedlings of thin-skinned types sent up by Mr. Taft. The material worked with was not first class. It was soft fruit in most cases.

Mr. Taft: It is possible that when you investigate the larger varieties you may be able to succeed better.

Prof. Cruess: One of the troubles is that the fruit softens.

MARKET VALUE OF THE AVOCADO

Mr. C. P. Taft, Orange, Cal.

When one begins planting on an extensive scale, the first consideration should be, and usually is—"What is the market value of the product that he proposes to raise?" He may be very fond of the fruit of his

choice, very much interested in fruit-growing in general, a thorough botanist and an experienced horticulturist, but all this is subservient to the question—"What will the fruit which I hope to produce sell for? What is it bringing in the market at present and what is it likely to sell for in the future?"

The very first avocado trees in California were doubtless planted with little regard to pecuniary returns. When Mr. Harvey set out the trees on what is now known as the Buddington Place, Los Angeles, and the Walker Place at Hollywood, he doubtless felt that he was doing little more than trying a doubtful experiment. Other trees planted at approximately the same time in Pasadena did not prove a success because they were of hot country types. With better judgment, Mr. Harvey selected seeds from the uplands of Mexico, where the climate is similar to ours. Among the resulting trees were the original trees of the well-known varieties, Challenge, Royal and Walker's Prolific, and another tree on the Buddington place which came into bearing even earlier than the three above mentioned, but was not so prolific and has not been propagated as a variety so far as I am aware.

Somewhat later Mr. Murrieta planted similar Mexican seeds and from them came the Murrieta varieties, of which the Murrieta, a round green fruit, is of unexcelled flavor.

About the time these trees came into bearing, Los Angeles was assuming a metropolitan aspect and metropolitan habits, and beginning to show in its markets, evidence of the rapid increase of wealth and intelligence of its people. It may be stated that Mr. Walker's tree of the Prolific produced fruit which sold in Los Angeles for \$400 in one year. Mr. Walker did not try to advertise this, but rather the opposite, for he feared that much increase in production would glut the market, and not liking the fruit himself at that time he did not see how the taste for it could be cultivated very much. Since his Challenge and Royal, much better varieties have come into bearing, I fancy that he has changed his opinion.

But the news of such great prolificness and profit leaked out and inquiries disclosed, that in addition to the local product there was a more or less regular importation of avocados from Hawaii, Mexico and elsewhere, which were retailed, at what then seemed, the rather startling prices of \$4.00 to \$6.00 per dozen.

Looking back, it seems as obvious as can be that there was a big future for fruit which could bring such prices under any conditions and that the worst that could happen, were very many grown, would be to cheapen the product somewhat but not in proportion to the increased consumption. Indeed I doubt if the price for large thick-skinned avocados will ever be on a par with that received for other fruits. How many people do you suppose in Los Angeles know this fruit even by name? One in ten, in think, would be a liberal estimate, and the number here is far in excess of other large cities in the United States, whose markets we have yet to investigate, educate and supply.

We are justified in expecting continued high prices if we do this thoroughly. When imported avocados sell well, there is no reason why

home grown fruit, if equally good (and ours is), should not do the same, especially as it has the advantage of always arriving in good condition, while the foreign is liable to be more or less decayed. The chef or steward who uses considerable quantities at a time and regularly all the year around, when he can get it, would much prefer to have the fruit hard, so that he can do his own ripening and have an edible supply on hand when needed. We have doubtless much to learn as to the keeping qualities of the various varieties and the stage of maturity at which they should be picked, whether for shipping long distances or for immediate home consumption.

There are people who "knock" the avocado one way or another, of course, but they are few. One young man in particular has given those who received high prices for the best fruit, quite a scolding in an article read before the Farmers Institute held at Stanford University last August and afterwards published in the Monthly Bulletin of the state Commission of Horticulture, and in that excellent magazine, the Citrograph. In it he states quite vigorously that the high prices of avocados don't suit him at all and that by taking them the growers are guilty of "shortsighted greediness" which will "strangle" the industry and that the "greatest problem" of this Association is to put an end to such a lamentable state of things and bring the fruit within the reach of the "masses." Just how making money out of an industry is going to strangle it is not very obvious. As to the greediness,—well, the best you can say about that is that it is merely an impolite remark. The prices will adjust themselves as the supply increases and the one object of this Association is to see to it that the classes get this fruit at good prices as long as they want it and are willing to pay for it, and the "masses" will have to wait until there is enough for both.

This is not a philanthropical organization, though there is nothing to hinder its members individually from being as benevolent as they please. I know a doctor who bought avocados on the open market at \$1.25 each for a poor patient whose stomach could retain nothing else and to whom they were a great benefit. This was philanthropy on the part of the doctor and business on the part of the dealer and both were satisfied.

Really, it is no business of anyone's, what the prices are, except those concerned in the transaction. No fruit is wasted in order to maintain the prices. No necessity of life is being cornered. No one is compelled to buy. No one is any worse off, than if there were no avocados grown. No need of being scared over a situation which didn't exist and never will! The real "greatest problem" is so to direct matters that avocado growers will receive the full value of their products.

There is also something to be claimed for the pioneers in this, as in any industry. Usually they have tried many things unsuccessfully and taken unusual risks and expense, so that when an opportunity arises for abundant or even phenomenal returns they are certainly entitled to them. We growers are all to a greater or less extent pioneers and this Association is a pioneer association, and I do not think any attempt will ever be made by it to induce its members to take less for their products than the market warrants, but on the contrary one of its objects will be so to

distribute them that the prices may always be maintained, proportionate to the supply.

DISCUSSION

Mr. Taft (in answer to question): I am raising only thick-skinned varieties. Whereas last year I received as low as \$3.00 to \$6.00 a dozen, there have been very few this year that I have sold for less than \$9.00 a dozen.

Chairman: While on this business, would it not be well for the Association to give some information that the committee can work on in regard to selling prices? Last month an article appeared, showing that \$1.25 a crate was paid for avocados, while a crate of the same size in December brought \$36.00. All the leading varieties at the present time are spring and summer-bearing, and there is no question in my mind but that just as quick as we get a good winter-bearing, thick-skinned variety all the now leading varieties will drop back to fourth or fifth place. Of course, for home production they are all right, but for commercial business there should be a winter-bearing variety. The best variety is a winter variety. The summer-bearing will net very little revenue in my judgment.

I think that we, as an Association, ought to develop the market for the entire year, not for any particular month. If we develop a market for winter varieties, we are developing at the same time a market for summer varieties. The avocado can be produced here for ten months out of the year and probably soon will be produced during the entire year.

While there is an advantage in producing fruit at a time when most people are not producing them, it is a good deal a matter of judgment and I do not believe that Florida is really a criterion of our condition. In summer, they go into competition with a lot of Cuban varieties. There is not an organized market to accept the fruit when it is sent in. The dealers do not know when they are going to get shipments, and fruits frequently arrive in bad condition. If dealers were getting shipments so that they could provide their market in advance and know the price, they would be a great deal better off than they now are. At the present time the West and the adjoining states will provide a market for everything we can grow, and this will be the case for the next ten years. At the end of that time we may have to go into the Eastern markets. There is an opportunity of getting a dollar apiece for fruits there, where we may get fifty cents apiece for them here, or in Denver or Salt Lake. I think we can take Los Angeles as a fair sample of market conditions.

There were ten avocados eaten in Los Angeles last year to one eaten before. I think the price last year was higher than before. The fact that there was a lot of thin-skinned varieties on the market had no particular effect. Their production and sale will, I think, stimulate a taste for the better varieties, and one of the great things for this Association to take up is that of standardization. During this year we shall undoubtedly get on a firm basis. At the present time there is no worry about a market. A good avocado will bring such a price that if a man had an acre of them, it would make a small fortune for him every year. I think we can handle every city in the West as we are handling

Los Angeles today. If Los Angeles is a good example, we shall have a long future when we extend our shipments and take up San Francisco, Portland, Seattle, and the Middle West, like Salt Lake, Denver, and El Paso. They will keep up business for some time.

The trees are not going to come into market with one fell swoop. Three years from now,—and there will not be much production before that time—I think the market can easily be developed to keep up with the development of the orchards planted.

The surplus of the fruit here will be as in Florida, of the thin-skinned varieties; that is, the summer and the fall-bearing stock. We are not looking at the past, we are looking to the future, and I believe it is a self-evident proposition that the winter-grown fruits are going to bring high prices. Our efforts as an Association must be to develop the market for the year around.

Mr. Whedon: Every person advocates his stock. A man selling a piano, auto, or anything else, advocates the one he carries as the best. Some say the small thin-skinned varieties are the best in our market. Everybody going into the business is new to it, and I think it would be no more than right that the Association should place itself on record as to what is the best variety, so that we would not be compelled to rely on any individual's opinion. It is a pretty hard matter to say which is the best, but the Association would probably have the best opportunity of knowing what would be the best.

Chairman: That is the purpose of the committee we have recently appointed to classify and register all varieties. I think their statement as to varieties and qualities will be far more impartial than if the Association or its officers acted. This committee was appointed from people who have no commercial interest and are especially qualified to act on these very questions. This committee has been chosen because they are the best qualified people to pass upon the question and are not interested commercially. While statements may be correct from a writer's standpoint they are naturally prejudiced to some degree in his own interests. When the Association goes on record, it wants to go on record through its committee.

Question: I would like to ask Mr. Taft whether he has noticed a tendency of the thick-skinned varieties to bear on alternate years?

Mr. Taft: Yes, with some. Really the industry has not been established long enough to lay down any rules. Sometimes a tree bears on alternate years, especially if one year it bears an enormous crop. If it over-works itself one year, it is apt to rest the next. I have known trees to bear enormous crops for three years in succession and beyond that our experience does not go.

THE MINERAL ELEMENTS OF THE AVOCADO

Professor M. E. Jaffa, Division of Nutrition, University, Berkeley, Cal.

The analyses that have been heretofore published of the avocado have not given any insight into the nature of the mineral matter of this fruit, merely indicating the total amount. A few years ago when a dietary or even the nutritive value of a food was discussed, it was deemed only

necessary to consider the content of protein, fat and carbohydrate, and the caloric value, no special attention being paid to the mineral matter or to the value of the individual proteins and fats. This is emphasized by reference to the literature bearing on dietary studies and digestion experiments. As has been previously stated, the general subject of the mineral matter has only recently been accorded the prominence which it demands, as evidenced by the fact that the first complete and comprehensive bulletin by the Agricultural Experiment Stations of the United States on the importance of the mineral elements in nutrition, was issued by Dr. Forbes of the Ohio Station about seven years ago.

It was formerly considered that the amount of mineral matter in any diet or ration, particularly for the adult animal, was ample and that no further attention need be paid to this matter, owing to which, as above mentioned, in the compounding of rations and diets only the organic nutriments were considered. The older views have been gradually changed to meet the results of late nutrition investigations, particularly with reference to not only the amount but the nature of the minerals ingested by animals, and this is particularly true in connection with human dietaries.

The mere statement that a combination of foods contains so many grams of mineral matter or such and such a percentage of mineral matter is almost meaningless as far as its physiological value is concerned. Not only must there be an adequate supply of mineral matter but there must be an adequate supply of each of the chemical elements necessary and furthermore these must bear some quantitative relation to each other, otherwise the diet is unbalanced in this respect.

The most important elements which we have to consider are iron, calcium, magnesium, potassium, sodium, chlorine, sulphur, and phosphorus, and it may be said that these elements, which are most important as far as animal nutrition is concerned, are equally important to the soil as plant food.

The question may well be asked if these mineral elements are so important, why were not earlier investigations conducted with reference to them. As Dr. Forbes writes:

“There are a number of reasons why our knowledge of the functions of the mineral elements in nutrition has not kept pace with our advancing knowledge along other lines. First, animals need comparatively little of the mineral nutrients in their food; second, animals' bodies contain considerable reserve supplies of the mineral nutrients which can be drawn upon in case of need, so that a deficiency of the food in certain mineral nutrients is not at once made apparent by the behaviour of the animal; third, the excretion into the intestine of waste products containing mineral elements, and their consequent appearance in the feces along with undigested mineral nutrients prevents an accurate judgment as to the digestibility of the same; fourth, the redigestion and reassimilation of mineral matter from certain waste products which have been excreted into the intestine, thus resulting in a repeated utilization of the same nutrient substance, tends to obscure the facts regarding the nutrient in question; and fifth, most foods, though by

no means all, even of our commonest ones, furnish as much of the mineral nutrients as animals need."

"Can it be that such an important matter as the provision of the body with mineral nutrients has not been adequately provided for by natural selective processes? Have not animals' food-habits and digestive processes been adapted to the provision of the body with all those nutrients which it needs?"

In a general way we may answer these questions in the affirmative, but when we consider them with care we see many exceptions and qualifications becoming necessary.

"It is doubtless true that in his aboriginal state man's food habits provided his body with all those nutrients which his simple life required, but civilization has set up new standards, unnatural ones in the sense that natural selection has not been able to accomplish new adaptations as fast as they were required by changed habits and so we find ourselves living somewhat out of harmony with our physiological processes.

"Civilization requires specialized efficiency, and so the organism is put upon a strain by the severity of the tax upon some functions; certain it is that the twentieth-century American has need for more food of a sort capable of developing his nervous system than had aboriginal man. Indiscriminate eating may sustain life at low-pressure, but keen competition and highly specialized activity call for definite adaptation of the food, both as to kind and quality, to the necessities for nutriment."

Time will not permit entering into detail regarding the use made by the body of each of the different minerals above mentioned. The sulphur, however, that is found in the protein in foods is mainly metabolized into sulphuric acid, the phosphorus into phosphoric acid, etc. It is very necessary that there be some base to take up or unite with these acids in order to preserve the neutrality or faint alkalescence of the blood and tissues. Many illustrations could be cited indicating that the continued use of a so-called mineral-free diet will product acidosis resulting from the lack of the base-forming elements in the food. A mineral-free diet is one that consists of proteins, fats, and carbohydrates, but that has been freed from mineral matter and leaves no appreciable residue on burning in the air. Such a combination of foods is termed an acid-forming diet because in the body there will be furnished from the metabolism of proteins sulphuric and phosphoric acids. As stated by Sherman:

"A diet in which the acid-forming elements greatly predominate must result in a withdrawal of fixed alkalies from the blood and tissues or an increased circulation of ammonia salts in the body, neither of which can be regarded as advantageous. While such a diet is more or less habitual with carnivora and may not be dangerous to man, it must put upon the body accustomed to a mixed diet a tax, which, however, small, might better be avoided, especially as we have no reason to anticipate any disadvantage from a predominance of base-forming elements, which if not used to neutralize stronger acids, would take the form of bicarbonates and thus aid in the maintenance of the normal and necessary neutrality or faint alkalescence of the blood and tissues. It therefore seems desirable that in constructing a dietary the foods in which the acid-forming elements

predominate should be so balanced by foods having a predominance of bases that the diet as a whole may yield sufficient fixed bases to neutralize the mineral acids produced in its metabolism."

The foregoing thus indicates the value of the generous use of fruits and vegetables in the diet. Previous to the investigation of the importance of the mineral matter, the value of fruits and vegetables was considered more of a hygienic nature and the fruits themselves more as luxuries. Nuts belong to the foods which furnish the acid-forming elements in excess and therefore the wisdom of the combination of fruit and nuts.

An investigation just completed in the Nutrition Laboratory at the University of California, shows that the avocado belongs to that class of foods which yield an excess of the base-forming elements. This was perhaps to have been inferred, but until the investigation was completed, no definite conclusions could be drawn. Four different analyses were made, the varieties examined being the Taft and Sharpless furnished by C. P. Taft and B. H. Sharpless, respectively, and seedlings from Messrs. C. P. Taft and W. A. Spinks. There is evidenced a close agreement between the results of the specimens tested.

More than one-half of the ash of the avocado consists of soda, potash, magnesium and lime, the latter occurring, however, in comparatively speaking small amounts, the phosphoric acid averaging about 17.5 per cent, with 1.5 per cent of iron.

In the ash of the cereals, nuts, meats, eggs, etc., the phosphoric acid greatly predominates. This element is found in the avocado, on the other hand, as in other fruits, only in relatively small amounts. In view of the low content of lime, therefore, it could not be said that the avocado should be recommended as furnishing any notable supply of bone material. This, however, is not the function of the avocado. Its great value, as far as mineral matter is concerned, lies in the fact that the ash contains a predominance of bases such as sodium, potassium, magnesium, and calcium.

Another advantage which may be cited in favor of the avocado is that its content of ash is far higher than that noted for any other fruit. The pure ash of the edible portion of the avocado shows an average content of 1.05 per cent, while those of the other fruits are as follows:

Grapes .....	.500	
Prunes .....	.565	
Plums .....	.524	
Apricots .....	.484	
Nectarines .....	.490	
Figs .....	.440	- .897 (av. .600)
Lemon .....	.535	
Orange .....	.500	

The olive is not included in this list for the reason that the ash of the olive is high but due mainly to the salt with which it is pickled. In other words, the olive is a processed fruit which cannot be eaten in the fresh state and therefore one might say does not belong to the same class as the avocado.

It is true that if we were to compare the fruits above listed and the

avocado on the same water basis, or upon a water-free basis, the figures would not be so favorable to the avocado, in that the avocado contains less water on the average than do most of the fresh fruits. The above statements, however, are made on the fruit as consumed and therefore it can be said that per unit weight of fresh fruit eaten, more mineral matter is ingested with the avocado than with any of the other fruits mentioned.

Current investigations carried on by such men as McCollum, Osborne, Mendel, etc., have now fully established the fact that animals cannot grow when limited to rations of carefully purified proteins, carbohydrates, fats, and salts. McCollum and Davis have shown that certain fats, as butter fat, egg yolk fat, kidney fat, and some others, contain something which greatly stimulates growth when added to a diet of casein, dextrin, lactose, and a salt mixture of appropriate composition. This substance is present in certain products of plant origin as well. Later they discovered that if the lactose was replaced by dextrin in this ration the addition of butter fat did not induce growth. When this diet, containing butter fat, was supplemented with small additions of the water extract of boiled egg yolk, or water or alcoholic extracts of wheat germ, growth proceeded at the normal rate. They formulated the working hypothesis that in addition to the recognized essential constituents of a successful diet, viz., protein, carbohydrate, fats, and inorganic salts, the growing animal requires two substances, or groups of substances; one, which is soluble in fats, is contained in fats from certain sources; the other, which is soluble in water and alcohol, is found widely distributed both in the animal and the vegetable worlds.

This Laboratory intends, during the summer, to conduct investigations on growing animals with avocado oil to ascertain whether it will rank in the positive or negative group as regards its content of this unknown element necessary for growth.

It has been shown, as above, that in addition to this fat-soluble material, there is another water-soluble material that must be associated with the fat-soluble material in order to bring about the best conditions for growth. It has been suggested by McCollum that this unknown element soluble in fat be called fat-soluble A, while the other unknown substance soluble in water which is contained in different plant foods, be termed water-soluble B. If it could be proved that both the fat-soluble A and the water-soluble B were present in the avocado, as they are in the wheat embryo, it would be the highest recommendation for the avocado as a food for the very young.

FROM SEEDTIME TO HARVEST

T. U. Barber, Los Angeles, Cal.

Selection of Seed.—All fruit growers recognize the value of a strong, healthy root system. Without such a beginning a vigorous, heavy bearing top cannot be developed. With this important fact in mind, we must pay considerable attention to the selection of seeds which are to form the foundation stocks of our orchards. At the present time everything stands in favor of seed from the thin-skinned Mexican fruit—this type is the most resistant to both frost and heat and produces just as fine growth

of budded tree as any other stock so far used. Three years ago there was a good comparative demonstration of the frost-resistant qualities in a field where there were both Florida and Mexican root-stocks. Nearly every Florida root was entirely killed, while most of the Mexican type soon sent up new thrifty shoots and in some instances the budded tops were only partly damaged with a temperature under 20 degrees. Another example which I have watched with interest, is a large Hawaiian seedling 12 to 14 inches in diameter, which was killed close to the ground. The roots were so badly affected that it has never been able to produce a healthy growth, although it has received special attention.

Each year seeds of some of the tropical types of avocados are shipped to California from Florida and Tahiti, finding ready sale on account of the shortage of local production and the federal embargo on importations from Mexico. Let us confine ourselves to the use of hardy seed from local trees, although the production is limited, rather than import such stock which we know to be less desirable.

Seed Planting.—Seed will keep for several months if stored in a cool place and not allowed to dry out, although the best results are obtained by planting as soon as possible after the fruits become fully mature, and will shake from the tree. A sandy loam or a mixture of half sand and half leafmold are excellent for starting seed. The small pointed end is allowed to show slightly above the surface. Many are planting in seed boxes holding 6 to 8 inches of dirt; others are using 4 to 6 inch pots. Part shade is desirable until the seeds sprout; after that they protect themselves and will grow more stocky if exposed to the full light. Sufficient water should be applied to keep the soil thoroughly moist.

Transplanting Seedlings.—The seedlings should be transplanted to the nursery rows when 4 to 8 inches high. As most of our seed is produced in the fall, the stock is usually ready to set out in March or April. Some growers are transferring from the seed-bed to pots and holding about three weeks before planting in the open ground. It may be well to state that stock allowed to stand in pots much over a month, will form a circular root growth from which it has a hard struggle to recover. Such trees are often badly stunted and unable to support themselves after a year or two of growth.

Direct planting from the seed-bed to the field nursery is the most desirable but is not practical in too light a soil; it is far more difficult as the seedlings must have constant attention for the first few weeks until they are thoroughly established. It is necessary to furnish partial shade, such as a shingle on the south side, and to supply frequent irrigation, never allowing the ground to dry out around the roots. This method should be used only through the cool months of spring.

The nursery rows should be 4 feet apart and the trees set every 18 inches in the rows. First class, one-year-old, budded stock will require this amount of space.

Budding.—Stock planted in the field during April should be ready to bud the following August or September. The seedlings should be from one-half to one inch in diameter before budding.

Budding in pots or boxes, which was practiced in Florida and thought

to be necessary during the early development in California, is no longer followed, as it has been fully demonstrated that the field-grown tree produces a better stand in budding and a decidedly more vigorous tree when transplanted to the orchard.

There are many individual ideas regarding the budding of avocado trees, the selection of budwood, and the subsequent care after the bud is inserted. No doubt some of the things practiced today will not be in use ten years from now. The following are my methods which I believe agree closely with other propagators who have made a study of this branch of the work.

Budwood of the different varieties is not alike. In some kinds a bud which is slightly broken open can be used, while in others this advanced bud is sure to be unsuccessful; therefore it is necessary to become familiar with the wood to be used and learn which buds grow the best in each variety. In general, it is desirable to select a plump, mature bud which seems ready to start into growth. Early in the spring this wood is obtained from the last growth of the previous year, and later in the season from the new branches. This new growth must become fairly mature, which usually requires from six to ten weeks. Very little success is obtained in using budwood from the soft tips.

If possible, cut a shield bud not under an inch and a half in length, leaving a small piece of wood attached. It is best to leave a short piece of the leaf stem to push on while inserting the bud. This also protects the bud from the wrapping. The common T-shaped cut is made, being careful not to break the bark in placing the bud. The sap must be flowing freely so that the bark separates readily or the work will be a failure.

Waxed tape is generally used, although some propagators are using plain tape or cotton string with good results. The bud must be tied extremely tight, being careful to leave the eye exposed; it is also well to secure the wrap by slipping the end under the last loop, as many buds are lost by a slight spreading of the bark. At the end of three weeks, a second wrapping of plain cloth is required to allow the proper expansion and still hold the bark from spreading away. This in turn can be removed at the end of four weeks.

The seedling tops are cut back gradually to start the bud into growth, always allowing a few leaves to remain to aid in keeping up the flow of sap above the bud. The avocado will not stand the complete topping, so often practiced in citrus work. The bud should be at least 6 inches high and contain some mature wood before the entire stubbing can be made. This is most satisfactory if practiced through the cool months of spring.

After the bud is started, it should be tied with raffia every few weeks in order to make a straight trunk. The seedling top can be used to good advantage in this work until the bud is large enough to require staking.

The suckers and branches should be kept off until the tree reaches a height of 24 to 30 inches, when it will generally form a perfect head of four or more branches. In some cases it may be necessary to pinch out the terminal bud to force this branching at the proper place. Stock grown in this manner soon shades itself and makes a beautiful, well-shaped tree.

Transplanting to Orchard.—Avocados are best removed from the nursery during the spring months. In preparing the trees for balling it is essential to trim off about one-half of all well-branched stock, and in some cases to remove part of the remaining foliage, or cut the leaves in half. So far but little success has come from transplanting bare roots, while trees balled with plenty of earth have started into new growth in a short time. It is important to harden off the stock in a lath-house with the roots packed in damp shavings for ten days before planting.

General Orchard Notes.—Most of the trees in orchard plantings up to the present time are from 20 to 30 feet apart. The oldest demonstrations of budded stock in California are about five years of age, and at this early stage show a spread of from 10 to 15 feet. It is impossible to say just how much space a mature, budded tree will require. Certain varieties show a very marked difference in growth, and it is quite probable that some may require twice as much space as others.

In preparing the holes it is well to dig at least 2 feet deep and as much in width, breaking in the sides so that the young roots have plenty of loose soil in which to start. Plant a little deeper than the tree stood in the nursery, leaving the bud-union slightly above the surface as precaution against decay, and consequent disease at this point. Water must follow the planting closely and be supplied several times during the first month; the best results have been obtained from irrigating twice each month during the warm part of the first year. The mature tree is expected to require about the same amount of irrigation as our citrus groves receive.

It is best to stake the trees from the start; the new growth is generally too much for the young trunks to support in a strong wind.

Some protection from the sun is one of the most essential things to bear in mind. Until the bark has turned completely brown the sun will burn it so badly that the scar is hard to cover. All kinds of burlap shades are used for this purpose, also newspapers and manufactured tree protectors. Some of us are using with success, a whitewash made with salt, tallow and quicklime. It must be fairly heavy and is applied with a brush to the south side of the trunk and exposed branches. After the tree is two years old it will usually shade itself.

If frost protection is considered necessary, any of the methods used in our citrus groves will be found satisfactory. Young trees are often wrapped in burlap or corn-stalks during the first two winters. This should be removed as early in the season as possible, on account of a mildew which sometimes forms during the rainy season.

Cultivation.—The ground should be kept in a loose condition by cultivation after irrigation, although it is not good to work the ground very deep close to the tree, so as to disturb the young roots. A good mulch will both supply shade for the roots and help keep a more constant supply of moisture. This should be removed or worked into the ground before the winter rains start.

Fertilizer.—So far but very little fertilizer has been required, and that supplied has generally been barnyard manure. Bone or blood will produce excellent growth, but what effect they have on fruit production has not been demonstrated.

I hope the owners of the young groves which are now reaching the bearing age will keep careful records which can be published by this Association from time to time.

Pruning.—In every fruit industry there always are different ideas on pruning. This is often brought about by the individual habits of varieties. The avocado certainly shows considerable variation, and it is to be expected that some varieties will be discarded on account of undesirable growth. There are, however, certain general principles to be followed in forming the framework. The trees should be allowed to branch from 20 to 30 inches above the ground, and even higher in some varieties which have a drooping habit. These four or more branches will form the main body of the tree. Next the main limbs should be forced to branching not more than 2 feet from the trunk. This can easily be done by pinching out each terminal. The small lateral branches produced in this manner will carry numerous fruit spurs, and largely increase the bearing surface. Some valuable varieties which have a natural tendency of drooping, can easily be controlled by light pruning to force the lateral branches. This should be done every two or three months during the growing season. When such trees are properly cared for, they produce beautiful compact heads that are fully protected from sunburn.

The question of topping the slender pyramid type such as the "Lyon" is one which should be discussed. How high should they be allowed to grow? Can they be forced into spreading, as the other varieties do, or must they be allowed to grow extremely tall and plant more to the acre?

Certain trees send out one branch which grows twice as fast as the others, in some cases even dwarfing the main trunks. These should be heavily pruned or entirely removed.

All pruning should be done with very sharp tools, each cut being left entirely smooth and close to the bud which is left to make the next growth. If the cuts are large they need painting over with a heavy shellac or asphaltum tree paint. Many places are noticeable where the limbs have been badly affected with die-back from lack of care. The wounds will usually heal over in time; yet if not properly cared for, will always contain a small portion of dead wood, which is subject to disease.

In closing I wish to call attention to the value of tree records as presented to the last meeting by Mr. Shamel. It is very important that not only production records be kept, but special notes on the habit of growth, results from pruning and many other equally important subjects. Even as early as this the present season many budded trees are setting fruit. There is bound to be variation, the records of which will greatly help not only the individual grower, but the entire industry.

DISCUSSION

Mr. Whedon: Have you had any experience in irrigating when the tree begins to set its fruit? Is it better to irrigate then or later?

Mr. Barber: Has anyone had any experience along that line?

Mr. Whedon: I will give you a little of my experience. I had a tree that set half a dozen fruit as large as a small egg and I prided myself on having the first avocados in the neighborhood. To my surprise in a few weeks, they all dropped off. I then turned the water on and what

buds were there set fruit and I have now ten times as much fruit as before. I have a number of trees just commencing to set fruit and they seem to appreciate the water as shown by the setting fruit.

Mr. Barber: Mr. Whedon's statements in regard to what he has done certainly follow the results in Florida. Mr. Simmons, who is in charge of the Government station at Miami, states that in the years when they had lots of rain they had lots of avocados.

Mr. Fessler: I would like to give my experience in using blood on young trees in the spring when just blooming. It is not well to use the blood too early during the blooming period, but if we wait until the bloom gets fairly well out, then it can be put on with good results.

Question: What is the best time to bud?

Mr. Barber: The budding season starts usually about the first of April. It lasts for a period of about ten days, but is limited on account of the supply of budwood. As soon as the season's growth starts, you cannot obtain any more good budwood for six or eight weeks. Just exactly which budding season is the best I could not say.

Mr. Metcalf: About pruning trees, I would state that my experience has been that if you prune anything off at all, the trunk does not grow in proportion to the top where you prune, but if you let it grow right from the bottom you will have a trunk large and symmetrical.

Mr. Whedon: I want to qualify my statement made last October in regard to pruning trees. What was meant was not that they would die immediately, but that they would develop hollow trees. I planted 79 trees in 1913. The nursery man trimmed them back about as he would lemon trees and never painted them. About three months afterwards I went to examining them and found that the pith had died back. In every one the pith had died back several inches, so that the pruning does not necessarily kill the tree immediately, but when you have a hollow tree, it will not live long.

Question: How late in the spring can trees be put out?

Mr. Barber: I should say it would depend on the district. You could still set through June, but I don't think it advisable to set in June unless you are willing to give them special care. February, March, April and May are the best months.

Question: I would like to ask how much irrigation the trees should have?

Mr. Barber: The frequency of irrigation depends on the soil. If you have a light soil, irrigate every week; if a heavy soil, every two weeks. You can't do them any harm if you irrigate every week.

MARKETING OBSTACLES AND PROBLEMS

By Dana C. King, California Fruit Growers Exchange, Los Angeles, Cal.

When I was requested about a week ago to come before your California Avocado Association, I probably knew about as little of the avocado business as one could and be interested in anything in California that is grown on a tree. I had heard of avocados and had eaten them more or less, but I had thought of avocados in the same light as we did a few years ago of the Belgian hares, spineless cactus, and eucalyptus.

When I was requested to speak to you on some of the problems of the market and I began to come in contact with the people who were in the business and began to learn something of the avocado besides having had it in salad, I began seriously to ponder upon the subject, the obstacles and the problems, and I am frank to say to you that I come before you, after a week of that sort of mental thought, in a very different frame of mind than I had when the subject first came to me.

I have realized the desirability of the avocado as a food. Last fall I was in Florida and Louisiana and there I enjoyed the avocado very much and in fact first learned to eat it.

The first problem in California with the avocado, is to put it where the average man can eat it. I have looked at avocados on the bill of fare at 75 cents and a dollar, and I thought they would be fine if I had a million dollars, but they did not mean anything to me at that price in the selection of a meal.

I have compared the launching of your industry with that of the California citrus industry, when the California industry came face to face with a marketing problem, with over-production, without the present system of distribution then in existence, and with absolutely no organization. There was a period when fruit was scarce, prices high, and speculators numerous. At this time the fruit went to the consumers at satisfactory prices to the producer. Then there came a period when the entire condition was reversed, when the market was always over-supplied, the distribution was imperfect, and the prices were nothing. Then the speculative element that had bought the fruit the previous year was entirely absent, except to handle fruit on commission.

You have in your organization a lot of people I did not know were growing avocados, but I see them in this room—men who will go at anything with a determination to carry it through to a successful business-like conclusion, so I know your organization has started out all right.

I jotted down a few things that seemed to me particularly pertinent to the launching of the marketing campaign of a new perishable fruit industry, as you have to recognize that the avocado is perishable. It seems to me that you are situated geographically in the production of this product, in a most favorable location. We have here each year thousands of visitors,—the best people of the entire world—to whom if you take the proper steps locally, you can present your product in a favorable manner. It means a great deal to be able to present to a customer—because they are customers—your article under favorable conditions. I believe that more has been done in the introduction of California ripe olives through the fact that after the visitors from elsewhere eat the olive here and acquire the habit here, they use them on their tables and tell their friends about them. I believe more has been done in that way than by any one thing, and I think this is a very important thing in connection with the avocado campaign.

See that your local market is supplied with good fruit, fruit you are proud of as growers. See that your restaurant and hotel people, who use them, know how to prepare them. I am frank to say that the few times I have eaten an avocado in an eating-place in Los Angeles, I have been

disappointed in the way it was served. It seemed as though there was a lack of knowledge as to the proper way to prepare the fruit.

You have two cities in California,—Los Angeles and San Francisco—and as I see it, it would be an object for you to begin a comprehensive distribution of your products here under your own supervision. We have found many problems in our citrus marketing that we are now undertaking to solve by what we call “trade development work,” or dealers’ service work. This work has been done very largely in the East. We only know from our reports and the general effects on our business what the results are. This is a class of work, it seems to me, that would be of great advantage in your business. It works not only with the hotels and restaurants, but with the retailers, with the jobbers, who would handle your product, keeping them all advised of the proper method of keeping the avocado until it is sold and consumed; of preparing it in the various ways it can be used; of its advantage in the diet:—in fact an advertising idea carried out by demonstration such as you have all seen many, many times.

We have in our citrus problem something you may or may not have here. I think I can be frank because I don’t know anything about avocados. You should standardize your varieties, just insofar as you can. You must be careful you do not get into your commercial varieties types that may be of temporary benefit to the producer, but may be of lasting injury to the industry. We have in the citrus game certain types of fruit that have an appearance that leads to their selling, at certain times, at higher prices than the standard varieties, but these fruits it has been proven are a menace to the standing of our fruit with the consumer, and it is the consumer you have to satisfy.

You may have a co-operative organization of your producers and may co-operate in your marketing, but you must carry that co-operation down to the people who handle your product and the people who eat it. You take their money to pay you for your effort.

We have found in our business at various times that certain varieties or types of fruit, that were satisfactory from an exterior appearance, did not have the eating quality, the satisfactory amount of juice, and the flavor, to build up an appetite for oranges, and we have had reports from certain markets at different times that indicate that the sale of such fruit has seriously affected the demand for more fruit. It would seem desirable to me, if you standardize your product, that you should adopt something in the nature of a brand, which would stand for your Avocado Association, and which would mean a certain thing to the consumer.

I am not “talking shop” at all, or boosting our own organization, but the greatest thing the California Fruit Growers’ Exchange did was to adopt the word “Sunkist” on the best grades. I believe the benefit of the word “Sunkist” has been decidedly cumulative. It has been worth more to us every year than the preceding year. I believe if your Association is in such form that you can get together on something of this kind in the beginning, you will find the benefit cumulative as you go on.

I was talking to a jobber the other day about avocados. I asked him what he knew about them. “Well,” he said, “I don’t know much about them except in Chicago they used to ship them from Florida—great big

green things. The people used to cut them open with a hatchet and take the seeds out to take home to the children to play with." You will probably have advertising problems and I believe, from what I know, that you can carry this out successfully. It is probable that if I were going to do this, I would figure that as the production increased you should start advertising in Los Angeles and San Francisco and work out from these points near the center of production, as fast as the increasing production makes it necessary.

I think it is very important in your marketing arrangements that you bear in mind that you should make very careful selection of the people who represent you and are going to handle your products. It would be a very grave mistake to go into a city of one hundred thousand and attempt to place avocados with every one in that market who is handling perishable commodities. I know that in every city there are celery houses; there are other houses that are known as orange houses, which handle nothing practically but oranges and apples; and there are other houses that handle everything. You must show the party who handles your products that there is a future and a profit in them, and that you intend to put out a grade of goods that will enable him to build up a business.

I don't know what your present package for shipping avocados is. A great deal of care should be given to this. It must be a package that will meet the necessity of the fruit itself and it must be something of a size that will admit of its proper handling by the jobber. Now the old Spanish Valencia case was a great big box about the size of a coffin, that held three packages of oranges. That was a package one couldn't handle and distribute in the by-ways of the country, as we have the standard California box. There are things of this kind that are very pertinent in helping to build up your business.

We have a marketing problem that may not be greatly dissimilar to the avocado, and that is marketing the California grapefruit. There are a great many varieties, you all know, of California grapefruit. There are only a few varieties commercially profitable, and grapefruit people are now going through a period of changing their varieties to those commercially satisfactory and that can be commercially sold. We have found that Florida competition on our grapefruit has practically confined our grapefruit to this coast. We possibly don't raise as good a fruit as they do in Florida, but anyway, we have a problem of increasing the consumption that is possibly similar to the one you will encounter.

To be a successful industry, a product must be placed within the reach of the middle class, and your problem is to work out the way of doing this. It is not the problem of selling a limited product to a class of trade who are demanding more than you have, but it is a constructive problem which must be built up on what is fundamentally the right lines of distribution. With the proper people in charge of your business, I can see no reason why you should not have success and build up a business that will be a great one for California.

As I heard the food elements of the avocado discussed, it seemed to me that you have a wonderful field. With the increased cost of all

things such as meats, etc., it is very evident to us that fruits are becoming more and more a staple in all parts of the country and with all classes of people. This is not a fad, I think, but a thing that is coming to stay. This is true with our different fruits; and with your fruit—the avocado—which is almost a staple food. It will be true when the time comes that you can place your product before the consumer at a price he can afford to pay. Create an appetite for the avocado, as you may have to do—although such was not my experience—and you will find a wonderful outlet for the production of an article of which you can be proud and which will be of lasting good to the American people.

I don't know that I have anything further to add. I assure you it is a great pleasure to speak to you and to see that so many good people are interested in the production of the avocado.

DISCUSSION

Chairman: There has been considerable discussion on the matter of values of the avocado fruit, and some criticism as to the selling price. We feel that this should be taken up and some expression given by the Association.

Mr. J. T. Whedon: Has there been any action in regard to the kind of box to ship in and whether every individual should look after his own market or do this through the Association?

All of our other crops, such as walnuts, lemons, and oranges, are handled through associations. Marketing was tried individually and proved a failure. Co-operative marketing has brought success, and it seems to me that we have started in on the right line and should have some one looking after this part of our business.

Chairman: The Association has attempted to prepare itself to do that very work. Getting the proper package and proper trade-mark will be two of the first things to be taken up. Of course, the market has been such up to date that there has been no call for the aid of the Association. The small, thin-skinned varieties that are not classified in any shape, we cannot expect to market except in a general way.

Mrs. McKay: How is the Association going to handle it? By a committee? In what way would they bring the work to a head?

Chairman: That would be a matter for the consideration of the Board of Directors. I should judge that when we have sufficient shipments, we will have a committee of the actual shippers to decide on these points.

Mrs. McKay: I should like to know if it would be in order to appoint a committee to find out how to use the avocado and have several women assist the University in its research on the avocado.

Chairman: I think that is a good suggestion.

Mrs. McKay: It seems to me a woman could devise new suggestions for using them.

Chairman: Last year we did give this matter consideration to some extent. We had some experiments conducted and issued a card giving a number of recipes that seemed to be especially good. We have these cards or folders at the office of the Association where they may be had on application.

Mr. Robertson: While it may be a little early in the industry to bring up a discussion as to the best methods of packing, I have wondered if the Association has made any investigations as to packing avocados, whether they should be packed in paper or packed loosely.

Chairman: We made some experiments last year, and the results show that this fruit must not be wrapped.

Question: What is the trouble?

Answer: They sweat and rot when wrapped.

Question: They were packed in paper, were they not?

Answer: Yes.

Mr. Robertson: The reason I mention this at this time is because last fall at El Paso I happened to go into one of the grocery stores and bought some avocados that came from Florida. I happened to get the first fruit that came out of the package, which was a box about the size of our ordinary orange boxes. When I put my hand inside the box after the clerk had taken one fruit out for me, it was quite warm, in fact, hot. This led me to believe that possibly they should not be packed or wrapped in paper at all.

Chairman: Growers have made some study of shipping, and the best method to date seems to be to ship them in excelsior and not wrapped in paper. Anything that prevents free ventilation is bad.

Mr. Spinks: I have made some small investigation of this matter. When in San Francisco last fall I visited several shippers of avocados and they all seemed to agree that they wanted very little excelsior, just as little as possible, and as open a grade as possible, no excelsior at all if it could be avoided.

Mr. Robertson: The box I saw in El Paso was not a well ventilated box. It was an orange box, I judge.

Question: Have the growers in Florida learned anything along this line?

Answer: They pack about 40 fruits to the crate and in excelsior.

REPORT OF COMMITTEE ON THE CLASSIFICATION AND REGISTRATION OF VARIETIES

Your committee met at the Hotel Clark at 2 p. m. Friday afternoon, April 27th, and spent the entire afternoon and evening in considering the plans for the work of the Association in the naming and registration of varieties, and the encouragement of variety production through the recognition of meritorious new sorts by the awarding of medals and the holding of competitive exhibits. Many matters of interest were considered by the committee, not the least interesting of which was the dinner served the committee at the Athletic Club, through the courtesy of one of the members, Mr. H. M. Haldeman, at which home grown and imported avocados, probably from Tahiti, were tested comparatively. It is unnecessary to record that the native grown fruit was unanimously voted to be the superior of those tested. Another important action of the committee, unanimously voted for its own guidance, was that any member of the committee using the barbarism "alligator pear" in any of the deliberations of the committee should be forthwith fined 500

ducats to be paid in the coin of the realm. It might be well to recommend this action as equally important for application to the Association as a whole.

Exhibits at Present Meeting.—The classification and judging of the exhibits made at this meeting having been referred to the committee for action, the following rules were adopted:

(1) That the medals to be awarded for the fruit exhibited be based on varieties rather than on exhibits as a whole, and be given in order of merit to the best fruit of a single variety exhibited, whether a native seedling or an importation.

The important factor leading the committee to this decision was that it is of no interest to the industry as a whole what exhibitors have the largest number of fruits displayed, but that it is of value to know what varieties produced the superior fruits exhibited.

(2) That the three best exhibits as a whole be given honorable mention in the order of their merit.

(3) The following score card was adopted for use in judging the fruit exhibited this year:

Size	12
Form	8
Skin	30
Color	10
Finish and surface	5
Thickness	10
Freedom from blemishes.....	15
Flesh	40
Color	5
Thickness	10
Flavor and quality	10
Texture	5
Freedom from fiber	10
Seed	10
Size	8
Condition of cavity	2

100

This score card is not recommended by the committee for adoption as the official score card of the Association, but for use temporarily pending further investigation.

(4) It was not thought by the committee necessary to use a special score card in judging the exhibits of nursery stock.

Registration of Varieties.—The devising of plans for the registration of varieties by the Association was thoroughly considered by the committee, and the conclusion reached that further study and thought must be given to the matter before the committee can make satisfactory recommendations. One of the desirable ends to be achieved by such registration is the supplying of reliable and satisfactory information regarding the value of the different varieties.

As a means of starting this work and of obtaining the most reliable

information available up to the present time, the committee proposes to send to each member of this Association a communication containing a list of the varieties that have been fruited and tested in California, and request each individual, having the necessary information, to mark after each variety their judgment as to its comparative value, rank 1st, 2d, 3d, 4th, etc. This judgment is to be based on the fruiting of the variety in California.

If the different members of the Association, having knowledge of the value of varieties, will carefully fill these blanks, the compilation of the varieties receiving the largest number of high ranking votes will furnish the best judgment possible to obtain at this time, as to the safest varieties for general planting. This list, with the results of the vote, the committee proposes to insert in their report for publication in the proceedings of the Association. Before carrying out this plan, the committee desires the approval of the Association.

An Official Variety Orchard.—As a second step toward the registration and classification of varieties, the committee recommends the adoption of a plan involving a cooperation with the Citrus Experiment Station of the University of California. This plan involves the requirement by the Association that any new variety presented for admission to its accredited list shall be accompanied by a guarantee to furnish to the Association at the proper season at least five good trees of the variety concerned, budded on the stock approved by the Association. (This stock, until otherwise designated, to be a seedling of the thin-skinned Mexican type.) These trees would then be cultivated in the variety orchards of the Citrus Experiment Station where their performance records can be kept through a series of years, and from time to time reported by the officials of the Station to the Association, and where committees of the Association may from time to time study the trees and fruit and report their findings to the Association.

Your committee recommends the approval of this plan, the details of the arrangement to be fully worked out and approved by the Board of Directors of this Association.

Medals for Meritorious New Varieties.—Recognizing that the extent of the success of the avocado industry in California must necessarily depend upon the degree of perfection of the varieties available for cultivation, your committee recommends that the Association each year confer three medals, gold, silver, and bronze,—to the best and most noteworthy new avocado productions brought to the attention of the Association during the year,—these medals to be awarded only after a careful study of each competing new variety, facilities for such study, in the nature of fruit and information regarding the tree, to be furnished by the owner of the variety. The Association should reserve the privilege of withholding the conferring of any medals if there are not a sufficient number of competing varieties to give a fair competition or if in the absence of competition the new sort is thought, after study, to be clearly inferior to well known old varieties.

If the Association feels that the expense will not be too great, the

committee would recommend that one series of medals be given for the Guatemalan type and another series for the Mexican type.

The detailed plans of this competition are to be approved by the Board of Directors before being put into operation.

Plans for Competitive Exhibits.—For purposes of education and to encourage the production of good new sorts, the committee would recommend the continuation of the policy of holding exhibits at each of the regular and semi-annual meetings of the society. As prizes in such shows, the committee would recommend that only ribbons be awarded,—first prize, blue; second, red; third, yellow.

In the arrangement of such shows, the committee would recommend as follows:

(1) **Plate Exhibits**, Spring exhibit—each plate to contain three fruits. Fall exhibit—each plate to contain five fruits. Prizes, blue, red, and yellow ribbons.

(2) **Single fruit exhibits**. Prizes, blue, red, and yellow ribbons.

(3) **Nursery stock exhibits**. The committee recommends that nursery stock exhibits be included in the show, but as, in their judgment, such exhibits do not directly contribute to the improvement of the industry, they would recommend the discontinuance of giving prizes for such exhibits.

(4) **Exhibit of diseases and blemishes**. The committee recommends that an exhibit be made at each meeting of diseases, injurious insects and blemishes. Such exhibits to be educational and not competitive.

Respectfully submitted,
Committee,

H. J. Webber, Chairman,
C. D. Adams,
H. M. Haldeman,
I. J. Condit,
Wm. Hertrich.

Dated April 29, 1916.

Mr. Hart: I think this report should go to the Board of Directors and the recommendations will be referred to them.

REPORT OF THE COMMITTEE JUDGING EXHIBITS

The Committee on the Classification and Registration of Varieties, consisting of H. J. Webber, C. D. Adams, H. N. Haldeman, I. J. Condit, and Wm. Hertrich, was appointed to judge the exhibits.

Report presented by Dr. Herbert J. Webber, Director, Citrus Experiment Station, Riverside.

The committee desire me to say for them that their task was an exceedingly hard one and rather unsatisfactory. Last night before the fruits were displayed and thus before we had seen the exhibits, we came to the conclusion, as announced this morning, that the only intelligent and valuable way to judge them was on the basis of varieties and the superiority of one variety exhibited over others. When, however, we came to consider the exhibits and compare them one with another, we were forced to the decision that to judge the varieties as

such would be absolutely unfair and misleading at the present time, because they were all green, or the majority of them were, so that it was impossible for us to compare the quality and unfortunately also these fruits are so expensive that we did not desire to cut many of them for testing. Possibly I should explain that it was the owners of the fruit rather than the judges that did not desire to have many cut.

The judges came to the conclusion that the only safe and proper way to make the award was to base it on the exhibit itself, considering the number of varieties shown and the class of the exhibit as a whole. I think we are very fortunate in being able to announce that the committee were unanimous in every award made.

It gives me the greatest pleasure now, on behalf of the Association and your Board of Directors, to make the announcements regarding the award of the medals. We have three prizes given for the best fruit exhibits,—a gold medal as first prize, a silver medal as second prize, and a bronze medal as third prize. The committee unanimously voted to award the gold medal to Mr. C. P. Taft, of Orange, California, the silver medal to Mr. W. S. Spinks, of Duarte, California, and the bronze medal to Mr. J. H. Walker, of Hollywood, California. I would ask that these gentlemen kindly come forward and receive the rewards of merit.

(Presentation of medals).

We have still two other medals to award,—a gold and a silver medal,—for best exhibits of nursery stock. The committee desires to say in making these awards that they hope in any future exhibits of nursery stock, that a larger number of exhibits will be made, so that there will be more competition. There are only three exhibits entered of nursery stock, so that there is little competition. It is proper to state, however, that the two exhibits of nursery stock awarded medals are high class exhibits and well worthy of the recognition given them. The first prize,—or gold medal, is awarded to Messrs. E. G. Hart and T. U. Barber of the Hart & Barber Avocado Company, Los Angeles, California, and the second prize, or silver medal, is awarded to Mr. F. O. Popenoe, president and manager of the West India Gardens, Altadena, California.

(Presentation of medals).

Your committee were instructed by the Board of Directors merely to award these prizes. On the other hand, there are three fruits, represented by single specimens in the exhibit, that our committee were unanimous in thinking should be especially mentioned, because we desire to call attention to them.

We desire to make special mention of one fruit of the Challenge variety exhibited by Mr. J. H. Walker. This single fruit appeared to the committee to be the best appearing and the best shaped fruit in the hall. It should be remembered, however, that shape and appearance are not the primary or most fundamental characteristics of a satisfactory variety. We merely call your attention to it as one of the striking fruits on exhibition and worthy of special mention.

Two other varieties that are new, we think deserve special mention.

One of them is the Spinks variety and the second one, the Bartley variety, cultivated respectively by Mr. W. A. Spinks and Mr. E. D. Bartley. These new varieties, from their appearance, seem to be exceedingly promising for trial.

THE CLASSIFICATION AND REGISTRATION OF VARIETIES

H. J. Webber, Director, Citrus Experiment Station.

Mr. President and Gentlemen of the Association:

Now my pleasant task is over, and I come to the more prosaic task. Your directors appointed a committee of five members to consider and study the classification and registration of varieties and their nomenclature and other things of similar nature.

I think we all realize that in a new industry of this kind we are dependent upon getting good varieties. We may talk about irrigation, fertilization, and cultivation, and such fundamental things, but after all at the present time the most important thing in the avocado industry, in my judgment, and I think in the judgment of the committee, is the obtaining of superior varieties.

I was very much interested in a statement made by one of the expert market men in the citrus industry to the effect that in the citrus industry the marketing question was most important. In the avocado industry, it is not a question of marketing primarily but of getting the best varieties of fruit in order to establish a market. Possibly our industry is growing too rapidly and taking up varieties that have not been thoroughly tried out. The question most frequently asked of the University men is, "What are the best varieties to plant?"

The present most important problem is to choose the varieties that are going to succeed the best. We know well that the majority of the varieties that we are talking about are not thoroughly tested varieties in any sense of the word. There are some varieties that we are planting on the basis of what they are supposed to do rather than on known performance records under California conditions. It is of the highest necessity that thorough tests be made and that the fruits be studied, and reliable records published.

One of the main lines of work of this committee is expected to be the judging of the seedlings and importations brought to the attention of the Association. This is a work similar to that of the Massachusetts Horticultural Society and various other societies of similar nature in stimulating the production of improved new sorts through awards of medals and prizes. It seems to your committee that one of the primary things for this Association to do is to establish some safe method to get at the judgment of fruits.

We would like to have the Association discuss the exhibition and the methods to be pursued in the future. We have before us in this Association a most wonderful experience. I know of no case where an association has been organized in the very beginning of an industry and where the history of the importation and the history of every original seedling tree of every variety is so well known and where we can

follow up every detail. Such men as Mr. Taft, Mr. Popenoe, Mr. Spinks, Mr. Walker, Mr. Wagner, and a dozen other men, whose names I might call in connection with this industry, who have planted and grown new seedling varieties, or imported valuable new sorts, are historical characters. I wonder if we all realize the importance of this fact. We have not yet reached the point in the development of American history where we are ready to recognize properly agricultural achievement. It is just such work as these men are doing that is going to bring this recognition. It is fortunate that we have certain men in various parts of the country who are gaining recognition in this way. For instance, I always think of one or two men who stand out in connection with the corn industry, as for example, Mr. Reed of Illinois, who bred Reed's Yellow Dent corn, and Mr. Riley of Indiana, who bred the Boone County White corn. If some of us can add as much to the world's industries as these men added, we shall be fortunate indeed. The work of such men as Riley and Reed should be recorded in the pages of our history, and the time is coming shortly when the achievements of some of our members who are laying the foundation of a new industry, will receive their proper recognition in the history of the industrial development of California. They are adding something to improve the general welfare, and there is no higher aim.

I consider that we are an especially fortunate people, in having to deal with an industry just starting. Almost everything remains yet to be done, and it should be the business of every one of us to achieve something for the general good of the industry. There is inspiration in the thought of achievement, and so when I see the enthusiasm of this convention I think there is a good reason for it. Every grower of an avocado grove owes it to the industry and to himself to take an active part in the study of the industry. No man is so humble or so poorly educated but that he can have a place in this development. We desire knowledge of every detail of the industry, and to add to our knowledge at the present time all a grower is required to do is to keep a careful record of the different methods he pursues in caring for his grove, and observe and report on the results.

The study of varieties will for a number of years be our most important problem. It is not enough to produce fruit for market. We must produce fruit that will extend the market. Only by the production of the best fruit can the industry be extended to the proportions we all conceive as the future development. We are budding groves to various varieties today that we may be compelled to discard within two years. Building up a budded grove is an expensive undertaking, and it is thus of the highest importance that we reach an understanding at the earliest possible date of what varieties are satisfactory.

The grower must become a student of varieties, noting every characteristic, good or bad, of the various varieties he is growing. We should have no pet varieties but consider all varieties on the basis of their intrinsic qualities, as ready to recognize a bad quality as a good one.

Every budded tree of every variety in the state should be carefully followed as to yield in weight and number of fruits, and quality of fruit produced each year, in order that we may sooner be able to judge the important characteristics of the different varieties. These notes should include also the dates of picking, in order to determine definitely the season of maturing of the different varieties. The Association should collect such data ultimately and compile and digest the reports from various orchards to obtain the information desired, in concrete form. By such means we can probably most quickly arrive at a safe judgment of the comparative value of the different varieties. I may say that the Citrus Experiment Station will be very glad to assist in the carrying out of such a cooperative study of varieties.

What has been said regarding the study of varieties, applies equally well to the study of methods of planting, cultivating, irrigating, manuring, and other processes.

GENERAL DISCUSSION

Lead by Dr. J. Eliot Coit, College of Agriculture, Berkeley.

Dr. Coit: May I make a suggestion. It seems to me in view of the fact that many of us have been in the hall several hours and have not been able to examine the fruit, that it would be well to dispense with the discussion and examine the exhibits. I would like an expression of opinion as to whether you want to look at the fruit or to continue this discussion.

A member: We have with us people prepared to give short talks. This period for a general discussion was arranged to give every one an opportunity to ask questions.

It was moved and carried that the Association proceed with the discussion.

Mr. Popenoe was asked to speak on "The Work and Value of the Association."

Mr. Popenoe: I feel it to be fundamental, Mr. Chairman, that this Association, composed as it is of good representative men, should have the endorsement of a larger membership. Instead of eighty members, it seems to me that we should have five hundred. I wish that every one here, who is not a member of the Association and who is really thoroughly interested in the avocado, would recognize this responsibility and not wait, but join the Association now. Every one interested in advancing the avocado industry should desire membership and want to throw his influence with us. I do hope that all of our good friends will feel this responsibility and will come to us without solicitation. It is not a pleasant thing to be appointed on a membership committee and go around asking for memberships. It would be a very pleasant thing to have a spontaneous and voluntary offer of a large number of members.

Professor Condit: I desire to enlist your interest in connection with the investigations in the University. I have a volume of 225 pages of notes. I am not going to read them to you this afternoon. I mention this for the reason that the University for the last two or three years has been investigating: first, the different varieties, second, the chemical

constitution of the various varieties, and third, by-products. Professor Jaffa and Professor Cruess have told you something of the work they have been doing. We have issued one bulletin, No. 254, on this subject, and this is distributed free upon application. We are also conducting a correspondence course, which is free for the asking. If you care to enroll for this course, write to the Agricultural Experiment Station in Berkeley.

It is my habit to go to San Francisco once in a while and look through the commercial markets. About three months ago, I was in the market in San Francisco and was told they had received a shipment of avocados from Tahiti that were decayed. About two or three weeks later I noticed an advertisement for seeds at five cents apiece. I realized then what had become of the seed from that spoiled Tahiti fruit. Probably this seed was purchased by growers and used for propagation. I was in the San Joaquin Valley a few weeks ago, and a nurseryman had a number of such seeds in a lath-house. Experience has shown that the seedlings of the Tahiti fruit are very tender. They frost down like tomato vines, and we believe it is not a promising thing to bud our California varieties on that kind of stock. It is for this reason that we are recommending the growing of the Mexican type of seed for rootstocks.

With citrus fruits we know the best rootstocks. We don't know the best stock for the avocado, but so far as present information goes, we believe that seedlings of the Mexican type are the best. The Mexican avocado gives the most healthy and vigorous seedlings and will impart its vigor to the top. A variety budded on the Tahiti will not make as good a tree as the same variety budded on a rootstock of the Mexican type.

Dr. Webber has said that the most important thing is the selection of the variety which will be the best in the end. Now, I believe the second most important thing is to get a tree on the right stock, a tree that is sturdy and vigorous. If a bad beginning is made, the tree will be practically ruined for the future, so it is well to begin right. At the present time the best procedure is to get a tree budded on a good seedling, one that is vigorous and free from diseases and infections.

Mr. Fessler: What do you know about the seeds for planting to grow budding stock?

Prof. Condit: We know that the larger the seed is, the more vigorous the seedling. You get a larger seedling in a short time from a large seed than from a small one. Now as to the value of the stock from seeds of varieties like the Challenge, etc. I have had no experience. So far as I can see such seedlings would be good.

Question: What is necessary in the way of protection from winds?

Answer: I think it has been stated already that young trees should be protected from the wind.

Question: I mean when they begin to bear. Suppose you were planting out an orchard, would it be necessary to provide windbreaks?

Answer: Yes, I think it would be.

Question: What is the best cultivation? Shallow?

Answer: Shallow around the trees.

Mr. Barber (exhibiting two avocado roots, showing root coil): In my paper I referred to the practice of growing young trees in pots. The avocado is a very fast grower, and no matter how small the trees are, the roots will grow around in the pot. The question has come up here as to the cause of the dying back of a lot of trees planted near Del Mar. During the discussion, the point was brought out that it might be due to root coil. I don't think it is. The same sort of trees have been planted out in other sections of the country and are growing thriftily. These trees had started and after showing the first growth or two started to die back from the ends of the limbs, dying into the trunk and in many cases resulting in the death of the entire tree. What is the cause? Is it a local climatic condition? Is it the soil? Is it the water, or is it this root? I freely admit that the nurserymen at first thought it necessary to start everything in pots, and doubtless this tree was started in a pot. I hope the time will come when it will be found that we can plant from the seedbed directly to the open ground. If this can be accomplished, we shall absolutely do away with this root coil.

Dr. Coit: I think the root coil is the trouble. I looked over a lot of seedlings where a great many of them had failed to grow. On looking into the matter, we found those that failed to grow had the roots twisted around and around. Those that did not seem to be so badly curled managed to live, but not many of them were as healthy as they should have been. In this case it may be said that practically every tree had been grown for a short time in a pot, some of them entirely too long.

Mr. Barber: All of these trees during the first six months after they were planted started a good growth.

Dr. Coit: What variety are they?

Mr. Barber: Harman.

Dr. Coit: How long were they grown in the pots, Mr. Barber?

Mr. Barber: Possibly not more than two or three months.

Question: How soon is it safe to set from pots into the field?

Dr. Coit: I should say about three weeks. All you need to do is to get the dirt settled enough so that you can take the plant out with a ball of dirt. The trouble is to make the seedling stand up.

Question: You won't have coils under six or eight months?

Dr. Coit: You will have coils undoubtedly in three months. I don't think seedlings should be left in pots more than four weeks. The question today is whether we can get away from the use of pots. You may have to use them for three, four, or five weeks.

Question: Will you please explain what happens if you plant a seed in the open ground?

A member: We grow the seed in large seedbeds. When the young plants are from 8 to 12 inches high we move them out into the open field, and they have come along fine. We plant the seeds just at the surface of the ground and cover them with shavings until they start.

Mr. Fessler: I have planted the seed with about one-third above the soil and covered with leaves. Just as soon as the seedlings began to show through, I transplant them into the nursery row and have not

lost 1 per cent of them. In the early history of the industry I bought quite a few trees and they didn't grow. I had a neighbor who planted about seventy-five trees and lost every one of them. They grew quite nicely for a short time and then stopped growing and died. I saw the roots of some of them when he took them up, and they were matted together. These trees were absolutely worthless, and I think it is a mistake to plant in pots. When trees are from half an inch to 2 inches tall, transplant them to nursery rows. Protect them and keep them wet and they will grow right along.

A member: I have done the same thing successfully, having transplanted seedlings with bare roots from the seedbed into the nursery row. The water in such cases was put directly into the hole.

Mr. A. N. Cadwell, of Carpinteria: I have had very limited experience in the matter of raising avocado trees from seed. I cannot say very well how to plant them. When I started to plant avocados, I knew that those I had seen planted before were planted in pots with the ends sticking out a little above the ground. I was in a hurry and I could not see well how I could plant them in pots and take care of them, so I laid them down in a bed. I prepared a bed in a flat some 2 by 4 feet. I planted the seed (almost dropping them) in sandy soil that would not pack much with watering, and covered them with soil. Some were covered to a depth of half an inch or more. I kept them well watered and they began to spring up nicely, and they grew right along. My son put out 1500 or more in the same way, but he had them in smaller flats. The roots were so nice that I did not like to put them in pots and so we planted them in nursery rows and they grew nicely and we did not lose any of them. We can show you seedling avocados put out four years ago that have made as nice a growth as you can find anywhere.

Question: I would like to know whether any one has any knowledge of avocados planted near the sea that are doing well.

Mr. Fisher: I have some growing very well. Most of them are seedlings. They are less than a half mile from the coast, and it don't seem to affect them at all.

Question: Do they bear?

Mr. Fisher: No, they are only about five years old. The seedlings have not borne but have blossomed very freely.

A member: Speaking about trees growing close to the sea, I would state that in the Island of Hawaii they may frequently be seen within one block of the ocean and doing well.

Dr. Coit: I know of an old tree, perhaps twenty-five years old, not more than a mile or a mile and a quarter from the sea. It has never had any fruit or even a blossom, but it is a very healthy tree.

Mr. Spinks was called on for some ideas in regard to the Association.

I am sorry to say that I am not a speech maker, as I would be very glad to entertain you. There is one thing, however, that has been overlooked by the various speakers. No one who has discussed this matter has paid much attention to the importance of the tree. They all speak

of the fruit, the size of the fruit, thick-skinned or thin-skinned, but have not considered the most important, primary thing,—that is, the tree itself. Some varieties of avocado trees will grow fifty times as fast as others. Some varieties grow very fine large fruit. Every nurseryman who has had experience with the Murrieta and some of the other varieties will admit that it is almost impossible to grow them as nursery trees. I can show you an instance at my place of a Trapp that was budded the same day as a Harman, and the Harman is fully fifty times as big as the Trapp, and both are healthy trees. You must first get a tree to grow strong, straight, and vigorous. The important thing to consider first is the tree.

Dr. Coit: Every variety has a characteristic growth just as much as it has a definite color of fruit. You may buy a tree that is small, crooked, and gnarly, but it may be entirely typical of the variety. There are going to be many hundreds of seedlings grown in people's yards. Every one is going to have a favorite son. Don't forget that before any variety has a chance to become established as a commercial sort, it must be demonstrated that it can be propagated readily and that it produces a good growth.

Question: What insect enemies infest the avocado?

Mr. Chidester: I have found the black scale and the brown scale to a slight extent, and also the green scale, but I don't think any of them are likely to be serious, except the green scale, and this seems to be more abundant on the thin-skinned than on the thick-skinned types. There are also one or two other things, such as a bark liner, but this is not very bad. Nothing along this line that I have seen is very serious. I haven't noticed the red spider on the avocado.

Question: Is it your experience that the black scale will grow on the avocado, but not by choice?

Mr. Chidester: It will grow on the avocado, but does not thrive on it. The black scale thrives on the citrus tree, but on the avocado it is scattered and not abundant.

Some one in the audience said: In connection with the remarks as to the effect of the black scale on the avocado, I wish to state that three or four days ago I saw a large tree with one limb, which was covered with a mass of black scale. That particular limb was more completely covered with black scales than I have ever seen in the case of an orange tree. To me it shows that we have this scale to fight in the future.

Mr. Martin Fessler: Is there any one who knows about the avocado weevil that gets into the seed in Mexico? We would like to know about it so we can be prepared.

Dr. Coit: There is very little information available on the avocado weevil, except that it is a bad pest and we don't want to get it here. It has never been introduced into California. So far as I know, this pest is the only reason that the Mexican fruit has been kept out. I have never seen it and I don't know of any publication on it yet. We would have to get this information from the United States Department of Agriculture.

Mr. Knight: There is only one fruit in five thousand affected by

the avocado weevil. It does not injure the flesh of the fruit especially.

Mr. Hart: Referring again to the black scale, I was out at Mr. Walker's place in Hollywood, where there are a number of large trees that have been growing for a number of years. There is a lemon orchard adjoining the avocado plantings. This lemon orchard was black with black scale and in a very bad condition, but the avocado trees did not have any scale so far as I could see, showing that the black scale prefers the lemon to the avocado. My seedling oranges accumulate a lot of black scale every year. Avocados alongside have a few, but apparently the scale does not thrive and is scattered. I think it is safe to say that it much prefers the citrus to the avocado. I don't believe this scale will be serious on the avocado at the present time.

Mr. Spinks: I have had avocados among orange trees. The orange trees have more or less black scale and also some other scale pests. I find that if the avocados are crowded up against the citrus covered with scale, they are apt to get some scale but not many. I have seen a brown scale cover the trees pretty well, but I have succeeded in getting rid of it by spraying. Strange to say, it did not communicate itself to any other tree.

THIRD SEMI-ANNUAL MEETING OF THE CALIFORNIA AVOCADO
ASSOCIATION, HELD AT THE MARYLAND HOTEL, SAN DIEGO,
CALIFORNIA, OCTOBER 30 AND 31, 1916.

H. J. Webber, President

T. U. Barber, First Vice-President

Charles Silent, Second Vice-President

Charles D. Adams, Secretary

C. P. Taft, Treasurer

MINUTES OF THE THIRD SEMI-ANNUAL MEETING

Evening Session, October 30.—The first session of the Third Semi-annual Meeting was called to order by Dr. H. J. Webber, President of the Association, at 8 p.m. in the assembly hall of the Maryland Hotel, San Diego. The president introduced Mr. Wm. H. Sallmon, of San Diego, chairman of the local entertainment committee, who was requested to serve as chairman during the evening session.

The program arranged for the evening included two illustrated lantern-slide lectures on the avocado by Prof. Ira J. Condit, of the College of Agriculture, and Dr. H. J. Webber, Director of the Citrus Experiment Station. After these lectures, the Association adjourned to give opportunity to visit the exhibition of fruit.

Regular Session, October 31.—Dr. H. J. Webber, President of the Association, in the chair called the meeting to order at 9 o'clock and gave the presidential address on:

"The Avocado Industry and the Avocado Association."

Then were read the following papers in the order named:

"The Hotel and the Avocado," by Thomas H. Shedden, of Monrovia.

"The Avocado in Mexico," by R. O. Price, of Upland.

"The History and Performance of Avocado Varieties in California," by Prof. I. J. Condit, College of Agriculture, Berkeley.

"Has the Mexican Type of Avocado a Permanent Place in the Industry," by E. S. Thacher, of Nordhoff.

"Experiences With Avocado Varieties and Necessity of Co-operation," by Charles D. Adams, of Upland.

The president then addressed the meeting on the desirability of as many as possible of those present joining the Association, and stated that a recess of ten minutes would be taken in which they could do so.

At the close of the recess, the following papers were read:

"Further Investigations of the Composition and Food Value of the Avocado," and

"Metabolism Experiments with the Avocado," by Prof. M. E. Jaffa, University of California, Berkeley.

"Avocado Variation and Improvements by Bud Selection," by L. B. Scott, Pomologist, U. S. Department of Agriculture.

The meeting was then adjourned until 2 p.m., in order to give all present an opportunity to take part in the avocado luncheon, which was served in an adjoining room.

The afternoon meeting opened at the time named, and the following papers were read:

"Methods of Avocado Growing in the Tropics Applicable to California," by E. E. Knight, of Yorba Linda.

"Fruiting Habits of Budded Trees of the Different Avocado Varieties," by T. U. Barber, of Puente, who also read

"The Avocado in Southern California," by Joseph Sexton, of Goleta.

"What About the Avocado?" by C. E. Utt, of Tustin.

"Four Years' Experience with Budded Avocado Trees," by J. T. Whedon, of Yorba Linda.

The following resolutions, prepared by a committee appointed by the directors, were presented by E. S. Thacher and adopted unanimously:

"RESOLVED: By the California Avocado Association, assembled at its Third Semi-annual Meeting:

THAT, we warmly appreciate the liberality of Mr. Lilly, manager of the Maryland hotel, in donating the use of the meeting rooms, as well as in other acts of hospitality.

THAT, the thanks of this Association are extended to Mrs. Thomas K. Kneale and members of the San Diego Floral Association, who have so kindly come forward to assist in our demonstration of the uses of the avocado as it may be served;

THAT, we acknowledge our obligation to those who have promptly and generously supplied us with fruit for serving and exhibition purposes;

THAT, the San Diego newspapers, who have given ample space in their columns for the spreading of information about these meetings and their purposes, have contributed most valuable aid to their success;

THAT, we are greatly indebted to those gentlemen of science who have come from a distance to give us the benefit of their learning and experience, and to those who have sent papers which will be incorporated in our report;

THAT, the large attendance and cordial responsiveness of those who have joined us in these meetings have been a most important factor in the success of our gathering and a support to the enthusiasm and vigor with which its sessions have been conducted by our efficient president."

During the part of the meeting devoted to discussions, J. T. Whedon, of Yorba Linda, spoke about having received balled trees with leaves dropping off and otherwise in unsatisfactory condition, and thought the Association should specify the proper balling of trees, and in order to

minimize the danger in transit should order that not more than two trees of large balls should be placed in a box, and also should impress upon the people the desirability in planting, of providing a hole of good size, which should be, he thought, two feet deep and three feet wide.

Thomas H. Shedden, of Monrovia, spoke in favor of our taking energetic measures to strengthen the use of the name "avocado" and strive to free the fruit from the misnomer "alligator pear." He moved that a committee be appointed by the chair to send out circular letters to hotels and dining-cars, urging them to adopt the name "avocado," giving the reasons why they should do so. The motion was seconded by R. O. Price and carried. The president appointed Mr. Thomas H. Shedden as such committee. C. P. Taft, of Orange, protested against the practice of the Los Angeles Times, of not only always calling this fruit "alligator pear," but always classing it and placing it among the vegetables, and asked that the matter be referred to the same committee, which was so ordered.

A general discussion was had, mainly on sizes of budded trees, on pruning, on tap-root, and on distance of planting. This discussion was taken part in by C. P. Taft, of Orange; Hindebaugh, of San Diego; Marvin, of Riverside; W. L. Rideout, of Whittier; E. E. Knight, of Yorba Linda; J. T. Whedon, of Yorba Linda; C. E. Utt, of Tustin, and Reiss, of Sierra Madre. After a few announcements from the president, the meeting adjourned.

(Signed)

CHAS. D. ADAMS,
Secretary.

Note. Owing to lack of time, a considerable number of papers prepared for presentation at the meeting, by authors who could not be present, were not read. These papers, however, are all printed in this report.

THE EXHIBIT OF FRUITS AND NURSERY STOCK

The exhibition of fruits and nursery stock, held in connection with the Third Semi-annual Meeting of the Association, was very instructive and greatly added to the value of the meeting. No premiums were offered for competition, the Board of Directors having decided that in the present stage of the industry and of the Association, a non-competitive exhibition for educational purposes only would best serve the interests of the Association. The success of the exhibit was largely due to the enthusiasm and energy of Mr. T. U. Barber, who was appointed by the Directors to have charge of this part of the meeting, and to the hearty cooperation of the exhibitors. The following is a list of the exhibitors:

Allen, R. C., Bonita
Bartley Bros., Santa Ana
Carton, P. F., San Fernando
Chappelow, Wm., Monrovia
Fulton, Mrs. M., Orange
Garcia, Manuel, Duarte
Goddicksen, P., Orange
Hart & Barber Avocado Co.,

Shedden, Thos. H., Monrovia
Smith, Willard, Orange
Spinks, Wm. A., Duarte
Stewart, Mrs. J. T., Los Angeles
Symmonds, R., Los Angeles
Taft, C. P., Orange
Thacher, E. S., Nordhoff
Utt, C. E., Tustin

Los Angeles	Wagner, C. F., Los Angeles
Hindebaugh, Mr., San Diego	Walker, J. H., Hollywood
Knuth, C. A., Orange	West India Gardens, Altadena
Mather, Robt., Pasadena	Whedon, J. T., Yorba Linda
Metcalf, Volney, Azusa	Zapf, A. E., Orange
Sharpless, B. H., Santa Ana	

An important feature of the exhibit was the avocado luncheon held in special rooms kindly furnished for this purpose by Manager Lilly, of the Maryland Hotel. Here over six hundred people were given an opportunity to test the avocado served in sandwiches and salads. The following statement regarding the value of the exhibit and demonstration was prepared by Mr. Wm. H. Sallmon.

"In estimating the value of the recent meeting of the California Avocado Association held in San Diego, I would say that many expressions of enthusiastic appreciation of the value of the gathering have come to me. These expressions group themselves around three features—

"1—**The Exhibit.** The display of fruit was the largest and finest ever brought together, both the thin-skinned and thick-skinned varieties being in evidence. The season was not propitious for a large exhibit of nursery stock, but some splendid trees were shown, a few of which were in bearing. The spirit of the growers shown in the sacrifice of these trees for the good of the cause, and the earnestness with which the exhibitors explained the merits of their fruits, were impressive;

"2—**The Food Demonstration.** Under the guidance of Mr. T. U. Barber, who also managed the exhibit, a most generous and palatable avocado luncheon, consisting of salad and sandwiches, was served to several hundred people. With the assistance of ladies of the San Diego Floral Association this affair was carried out in a most orderly manner and served to advertise the merits of the fruit in the most practical and attractive way to many who had never tasted it before;

"3—**The Program.** The business-like manner in which the sessions were conducted, the papers on a large variety of subjects filled with most useful information not available elsewhere, and the invaluable discussion contributed to the success of a most successful convention."

THE AVOCADO INDUSTRY AND THE AVOCADO ASSOCIATION. PRESIDENTIAL ADDRESS.

By Dr. H. J. Webber, Director, Citrus Experiment Station, Riverside, Cal.

GENTLEMEN OF THE CALIFORNIA AVOCADO ASSOCIATION:

It gives me great pleasure to have the honor of calling to order this Third Semi-Annual Convention of the California Avocado Growers' Association. This is a great convention of a great industry. In accepting the presidency of your Association, I was mindful of my lack of special knowledge of the avocado industry and of my inability to fill the position as it should be filled. In view of the action of the Association at its last meeting, however, it seemed wise for me to accept the trust and at least for a term serve the Association as best I could.

The short history of the Association is a record of success. The first meeting of the Association was an organization meeting only. The first and second semi-annual meetings, both held in Los Angeles, were large and important conventions, notable for their great interest and enthusiasm. This meeting, I am sure, is destined to be an equally enthusiastic and important gathering.

The success of the Association from the first was in very large measure accomplished through the untiring work and the enthusiasm of your retiring president, Mr. E. G.

Hart, of Los Angeles. The Association owes to Mr. Hart a debt of gratitude that can only be repaid by a continued and maintained policy of developing and enlarging the Association to the point where it will fully meet the demands of the rapidly growing industry.

The Avocado Association was organized to foster the development of the avocado industry, particularly in California. This, as I understand it, is the broad aim of the Association. The Association will thus expect

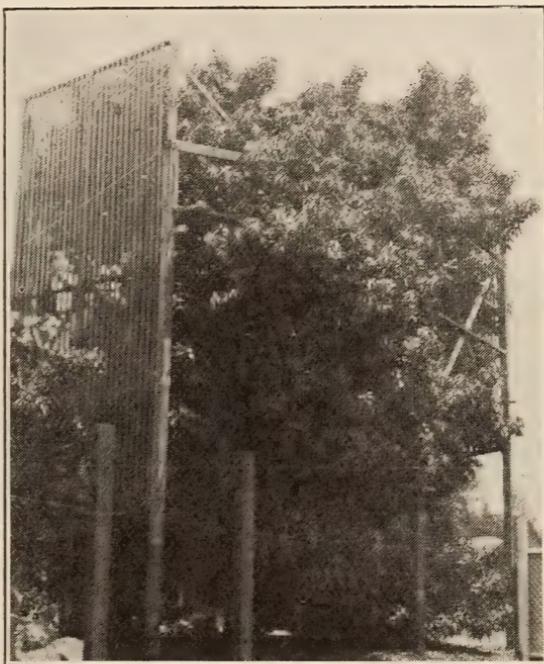


Figure 1.—Original tree of the Challenge avocado, Hollywood, Cal. Forty feet high and 38 feet spread. (Photo by H. J. Webber)

to be active so far as possible with all phases of the industry. In the present stage of the development of the industry, the greatest good is likely to be derived from the collection and dissemination of knowledge relative to the culture of the avocado, and for several years it is probable that the main interests of the Association will center on discussions of varieties, propagation, cultivation, irrigation, and like problems. Soon, however, we will be confronted with marketing problems and the development of markets. Indeed in this direction in my judgment, it behooves us to be at work continuously. To provide a market for our fruits, people must be taught to use them. We must recognize conditions as they exist. At the present time the avocado is known only to a few thousand people, and a large crop of fruits could not be sold to advantage. The greatest problem of all the problems before the Association is to educate a sufficient number of our people to the use of the avocado, to provide a market for the fruit as rapidly as our new plantings come into bearing.

Condition of the Industry in California

The avocado in California is such a new industry and interest in its culture has developed so rapidly that only a comparatively small number of growers and nurserymen in the center of the activities have any adequate idea of the greatness and magnitude of the development in California. I quote the following statement from a publication of one of the best known avocado growers of Florida: "This tree (the avocado) is the greatest money producer for Southern Florida, and the people of Southern California have gone wild over it, even though they have to send to Florida for seed, grafts and trees." It is clear that this gentleman is not aware that California has already developed 10 varieties to Florida's one and that it has already been pretty definitely proven that our native California seedling varieties are far better suited to our climatic conditions than any of the varieties imported from Florida. We do not necessarily need their stocks and varieties, but we do desire to try everything they have available to be sure of keeping our industry in the fore-front of the advance.

The old seedling avocado trees in Florida and in California are in general of about the same age, but the planting of commercial groves began in Florida at least 10 years earlier than in California. In Florida the interest in commercial avocado culture began about 1900; while in California the first interest in commercial plantings can hardly be said to have started prior to 1910 or 1912.

In California even today our planting is very small and altogether probably does not exceed more than a total of 300 to 400 acres. In large part this area is of young trees from two to four years of age. The California industry is founded on the results obtained with a few trees planted in isolated places in dooryards, such as, the Chappelow tree at Monrovia and the Ganter tree at Whittier. The sale of fruits from some of these old trees, together with the sale of bud wood, has netted such fabulous incomes as to stimulate a gold fever interest. We must remember, however, that in the development of the industry the financial returns quoted from such trees are even more exceptional than California weather, and

are a detriment rather than an aid to the industry. Even the present high prices of \$5 to \$10 per dozen, at which the best avocados sell, are liable to be misleading. The industry must be able to develop successfully

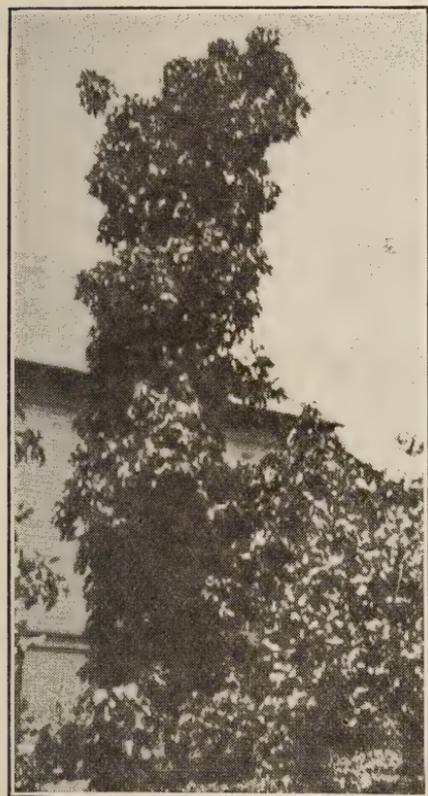


Figure 2.—Parent tree of the Lyon avocado. (Photo by H. J. Webber)

and dispose of its products probably at one half the present prices, if it is to become a truly important industry in the state. That this is possible I am certain all of us are convinced. We see in the avocado a fruit of the highest food value, attractive, palatable, and easily grown. Under our normal conditions it is exceedingly productive and gives a very high food value yield per acre. It appeals to the writer to be just the type of product California has needed, as it will enable us to produce a much larger percentage of our own food, and its largest value for a number of years will be for our own home consumption. Indeed one of its most valuable uses will be as a home fruit. Every home yard should contain two or three trees of as many varieties, ripening at different seasons, in order to have a continuous succession of fruits. Rapidly, however, the fruit will become national in character as people learn to use it, and thus the Association will be confronted with all of the problems of a great industry.

Problems of the Industry

Varieties.—Nowhere in the history of horticulture, so far as I am

aware, has there taken place such wonderful advance in the development of varieties in so short a space of time, as has occurred with the avocado in California. A decade ago the avocado in California was known only through a seedling here and there in yards, such seedlings having been grown from imported seeds mainly from Mexico, Guatemala, Hawaii and Florida, the Mexican and Guatemalan seedlings predominating. Fortunately, the natural desire of Californians to demonstrate the wide range of tropical and semi tropical products that could be grown here as novelties led to a considerable number of such seedlings being grown. Since the interest in the commercial culture of the avocado became acute, every nook and corner of the state has been searched for such seedling trees, and every promising seedling has been subjected to careful scrutiny and study.

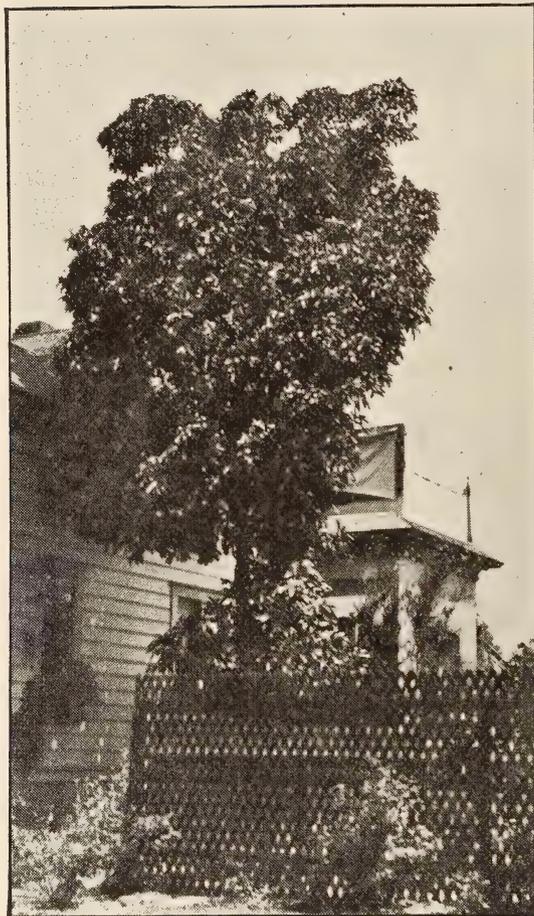


Figure 3.—Parent tree of Dickinson avocado at 679 West 35th Street, Los Angeles, Cal. (Photo by H. J. Webber)

The result has been wonderful, indeed, and far beyond any result that could have been predicted. The seedling trees have been found to be exceptionally variable in all important characters, such as, season of maturing, type and habit of growth, size, shape and quality of fruit, and the like. The range of variation exhibited is wonderful and is to be accounted for probably from the wide range of different sources from which the seeds were imported and the long years of accumulated variations that have been produced in the native home of the fruit through its extensive production as seedlings, without propagation by budding or grafting. It is fortunate for us at this stage that we are able to reap the benefit from these accumulated natural variations. Already over 50 of these promising native California seedlings have been given varietal names and are being more or less extensively propagated for planting.

The intensive interest in the development has also led several enterprising growers and nurserymen to secure buds from promising trees in Mexico and Guatemala to be grown and tested here.

While the result of this rapid development is highly creditable and of the greatest advantage to the industry ultimately, it nevertheless is accompanied with grave danger. Already we have over a hundred varieties to choose from in planting an orchard, and in almost no case have we adequate data and knowledge regarding any of them, to enable the planter to judge which are the superior ones. These new seedling varieties have been named and introduced mainly by various parties

owning the original trees, and naturally each introducer of a variety believes it to be the best variety yet named. I would have scant patience with an introducer of a variety, if he did not believe his variety a superior one. These men, as a whole, honestly believe in their varieties. There can be no question of this. Yet we all know that we already have too many varieties and that some of them must be superior to others. The most important work of the next few years will be to determine which of these numerous varieties are the superior ones, worthy of general propagation. In the meantime much of the planting that will be put out must be determined largely on imperfect evidence and faith. I do not wish to draw this picture too dismal. There are a few varieties that seem to have been sufficiently tested so that we know them to be good. No one can say, however, that these will not be superseded in a few years by much superior sorts.

It is highly interesting and gratifying to note the continuous advance that is being made through the introduction of new sorts in extending the season of ripening of the fruit. The great desideratum is to find satisfactory varieties maturing their fruits in the winter during the period from December to March, inclusive. The general concensus of opinion seems to favor the so-called Guatemalan or thick-skinned varieties. The spring and summer is covered by a number of fairly good varieties of this type, but there are only a few early and late sorts from which to select. The Fuerte and Puebla, both imported varieties, are apparently among the most promising winter sorts, yet introduced, ripening their fruits apparently from December to February. The fruiting habits of these varieties as judged by several budded trees in each case are apparently very satisfactory, the trees being of good shape and prolific. Little is yet known in either case, however, about the peculiarities of the fruit and its quality. Of the better known early sorts, we have such varieties as the Challenge, season February to May, Solano, season March to May, and the Spinks, season February to August, and Surprise, season February and March. Of these varieties the Challenge has a very large seed, the Solano is very low in oil content, and the Spinks and the Surprise have not yet been sufficiently tested to justify their general acceptance as standard sorts.

For early summer and mid-summer fruits, the two varieties that now seem to be in the lead are the Blakeman and the Lyon, with especial emphasis on the former. The Lyon while a good fruit seems inclined to overbear when young, which tends to weaken the trees, and again the tree is a tall, upright grower of a shape not now recognized to be particularly desirable. The Spinks variety mentioned above also extends into this season. The Dickey, the Miller, and the Monroe are other varieties of this period that are highly recommended by some growers. The Miller is one of the best flavored fruits we have and is rich in oil content, but its productiveness still remains doubtful. The Bartley, a new

sort that is attracting considerable attention, is a large fruit, possibly too

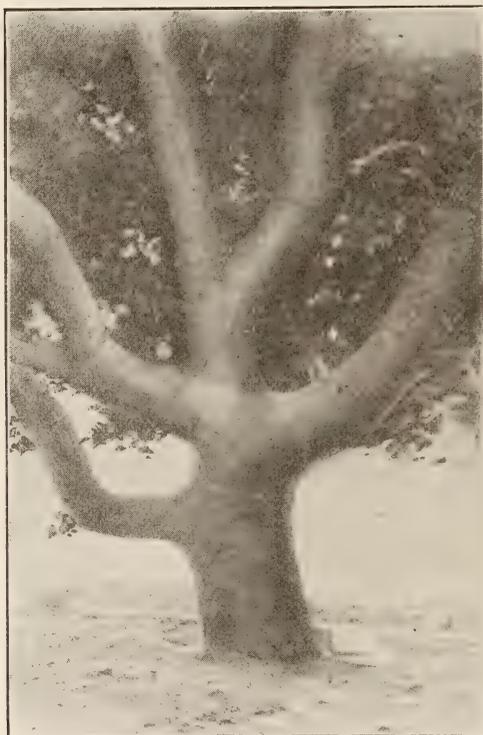


Figure 4.—Trunk of original tree of Northrop avocado, showing good arrangement of the branches. (Photo by Vaile and Webber)

large to serve best the market conditions, and has not yet been fully tested. As summer and fall varieties we have the Taft and the Dickinson, both of which are among the best known and tested varieties. The Taft, season, May to October, is probably the best proven of all of our avocado varieties and may be recognized as a standard sort. The Dickinson, which is a very fine quality fruit, with thick, brittle shell, has retained a large part of its fruits this year in good condition up to the first of October, and a number of fruits have been preserved in good condition up to the last of October and are now, October 31, on exhibit in our fruit show. The Walker, or Walker prolific, should probably also be mentioned in this class. It is very prolific but not of very high quality. It, however, could scarcely escape mention, owing to the fact that the original tree has been one of the best paying trees in the state up to the present time.

As a late fall variety, the Sharpless has this season assumed a prominent place. The original tree has this year produced a fine crop, and a large part of the fruit has held on the tree in good condition well into December and some of it into January. It is a large fruit, averaging about one pound in weight, and of very good quality, with a comparatively small seed. The flesh shows some fiber, but not sufficient to be objectionable, and the skin is thick and brittle. As this fruit ripens, it gradually becomes a dark purple in color.

In the case of the Mexican types much advance has also been made, but the season covered is as yet more restricted. We now have the Chappelow, season, July to October; the Northrop, the Carton, the Topa-Topa, and other midseason sorts ripening from September to November. The Ganter and Harman are catalogued as having the period of ripening extending into December. From the few observations I have been able

to make, the Sharpless is probably the best proven of all of our avocado varieties and may be recognized as a standard sort. The Dickinson, which is a very fine quality fruit, with thick, brittle shell, has retained a large part of its fruits this year in good condition up to the first of October, and a number of fruits have been preserved in good condition up to the last of October and are now, October 31, on exhibit in our fruit show. The Walker, or Walker prolific, should probably also be mentioned in this class. It is very prolific but not of very high quality. It, however, could scarcely escape mention, owing to the fact that the original tree has been one of the best paying trees in the state up to the present time.

to make thus far, they do not appear to be appreciably later than the Northrop and the Carton.

It will be apparent from the foregoing discussion that already we have varieties giving almost a continuous succession of fruits through the entire season. It must be remembered by the reader that these varieties are

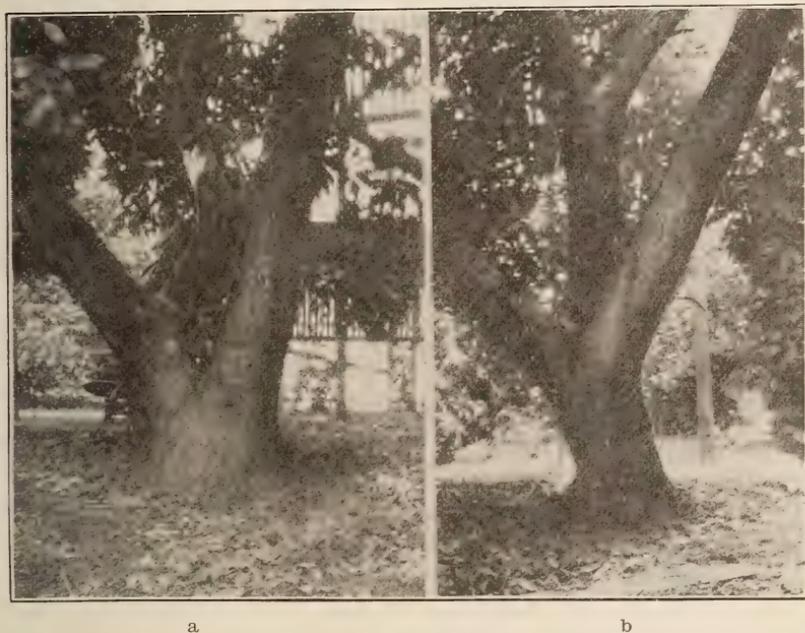


Figure 5.—Two views of trunk of original tree of Royal avocado, with left branch of (a) in front, in other photograph (b). Right-hand branch in (a) not divided low enough. (Photo by H. J. Webber)

mentioned primarily to show the range in variation in season of ripening, the names of the most prominent varieties being given in each class. The knowledge of varieties is yet too meager to justify a recommendation of any particular variety at the present time.

The experience with other types of avocados, such as the West Indian varieties and varieties from Hawaii, has in general been rather unsatisfactory, owing to their greater tenderness. It does not appear, however, that the trials up to the present time have been sufficiently extensive to justify us in the conclusion that all varieties of these types will prove unsatisfactory. We must continue our search for improved varieties in all directions.

With the large number of new and almost unknown sorts being planted, it is highly important that growers make a specialty of keeping records of the pick from the different trees, in order to secure a basis of judgment of the variety. The following is a record of the yields of the original Chappelow tree during fifteen years, with other interesting data.

TABLE 1.

Record of Production, Original Chappelow Tree.

(Data furnished by Mr. Wm. Chappelow, of Monrovia)

Date	Total No. of fruits	Price per fruit	Price received net for fruit	Main Crop ripened
1902	300	10	\$ 22.00	September
1903	380	10	32.00	September
1904	605	10	54.00	August
1905	575	25	130.00	August and Sept.
1906	235	30	65.00	September
1907	465	25	85.00	August
1908	1200	15	140.00	July and September
1909	260	25	60.00	August
1910	285	25	66.00	October
1911	1023	25	250.00	July and October
1912	350	25	76.00	September
1913	20 (freeze)			
1914	3215	18-25	404.00	September and Oct.
1915	1723	25	199.70	
1916	2861		218.00	Sept. to middle of Dec.

The above table not only shows the total yield for each season but also the months when the main crop ripened. It is exceedingly interesting to note that apparently the main crop season shifted in various years, showing a range from July to December during the 15 years.

Table 2 on following page is a similar record of the Wagner avocado for the years 1915 and 1916.

This data shows very clearly a range of ripening season from March to June for the Wagner variety as illustrated by the original tree, but the budded trees might be found to vary slightly. Records similar to this should be obtained for all original trees and a few budded trees of each of our varieties.

It is also important to urge at this time the growing of further seedlings from seed taken from the best varieties as it is in this way that new and improved sorts are almost wholly produced. Much of our advance in the direction of better varieties will doubtless come through importations. In all of this development the keynote should be "safety first." No variety hereafter should be generally sold or offered for sale until it has been fruited for several years in California and is known to be promising in comparison with our known best sorts.

Planting Problems.—The most fundamental problems regarding planting are yet in large measure a matter of guess-work. The commercial avocado orchards that have thus far been planted usually have the trees

placed from 25 to 30 feet apart. The Chappelow, which is 22 years old, has a spread of about 60 feet; the Challenge tree, 19 years old, 38 feet, (Fig. 1); and the Taft, 16 years old, about 35 feet. One would judge from the nature of the avocado tree that a low spreading form of tree is to be preferred. Evidently thus, the distance of the trees in a twenty-five year old grove should not be closer than 40 to 60 feet. Whether a method of pruning can be found to keep them successfully within this size remains to be seen.

TABLE 2.

Yields of Original Tree, Wagner Avocado
(Data furnished by C. F. Wagner, Hollywood)

1915 Crop		1916 Crop	
Date	No. of fruits	Date	No. of fruits
March 20	8	February 1	1
April 1	8	22	1
2	2	23	1
8	6	March 1	3
13	130 (limb broke)	15	2
23	36	16	1
24	15	21	3
30	6	24	2
May 1	3	25	15
2	1	27	2
6	25	29	7
13	25	30	3
18	25	May 1	4
25	37	2	3
June 3	30	3	2
7	15	4	40
16	25	7	37
18	20	8	3
23	25	9	4
..	..	10	25
..	..	12	1
..	..	25	26
Total crop.....	442		186

Certain varieties, such as the Lyon (Fig. 2) and the Perfecto, and the Carton that show a marked tendency even in budded trees to grow tall and columnar, not spreading to any great extent, will doubtless allow of closer planting. The original Dickinson seedling is also an erect, columnar tree with little spread, (Fig. 3), but young, budded trees seem to be as broadly spreading in habit as many other varieties.

It appeals to the writer that in planting avocados at the present time in commercial orchards, it would be a wise plan to follow one of two methods: first, to plant the trees in squares, 50 to 60 feet apart, with a filler tree in the middle of each square that can be taken out when the trees become so large as to interfere; or second, to plant the trees 50 to 60 feet apart and interplant with a supplementary, shorter lived tree crop, such as apricots, peaches, permissons, fejoas, or figs. (See article on "Planting Plans" in latter part of this report.

If trees are grown too close together so that they interfere, the trees will grow tall, and all of the crop will be deveoped in the uppermost branches rather than on the lower branches where they are desired.

Shaping the Trees.—The best avocado trees we now possess have been allowed in large measure to develop without any guidance. Like Topsy, they have "just growed," and thus we can derive considerable instruction from a study of these trees as to the different branching types and their desirability from a commercial orchard standpoint. The character of branching of the original seedling tree of a variety must not be taken as any sure indication particularly of the character of branching of the bud progeny, although it is much harder to make certain trees spread out than others. There is a certain variation between varieties in the natural branching habits. It is probable, however, that the main differences, good or bad, in the branching of the original seedling trees, is in considerable measure accidental and capable of great modification under the guiding hand of man. That young avocado buds may be trimmed and shaped to considerable extent has been fully demonstrated, I judge, as will be brought out in the papers presented at this meeting.

The natural branching of the Mexican and Guatemalan types of avocados, with which we are most concerned, is apparently of nearly the same general habit, but marked differences are shown by different varieties. In the Guatemalan group, the Taft is a particularly good spreading tree. This is shown by the original seedling and by the budded trees. The Lyon in the original tree is a tall, columnar tree, somewhat resembling a Lombardy poplar in habit and while this habit is doubtless over emphasized by the original seedling, still the budded trees of the Lyon show strong tendency to grow upright in this form. The Perfecto is a tall, upright grower in budded trees, and judging from the original seedlings, the Carton and the Dickinson varieties might be assumed to be of similar shape. These latter varieties, however, in budded trees examined in various places give evidence of producing spreading trees



Figure 6.—Trunk of original tree of Lambert avocado with 4 main branches springing from one point about 7 feet from ground. (Photo by H. J. Webber)

similar in shape to the Taft. In some cases, as in door-yards, the tall, upright habit of growth may be a decided advantage, and trees of this shape can doubtless be grown closer together in grove plantings than spreading trees. Other peculiar characters may be exhibited by certain varieties. As an illustration, the Atlixco shows marked tendency to develop spreading candelabra-like branches. It is too early to say which of such characteristics are desirable or undesirable. It is important that growers carefully study such characteristics exhibited by the different varieties.

The shaping of the young tree is apparently a very important matter and is certainly largely within the control of the grower. A study of the branching of a considerable number of trees including that exhibited by various original seedlings representing varieties has led the writer to the conclusion that the most desirable shaped tree is very wide, spreading, and low in height. The most satisfactory branches, it has seemed to me, are those that originate low down on the trunk and spread out at a wide angle. Such branches are easily supported by permanent props from the ground, and the fruit is borne near the ground, where it can easily be picked. Fine branches of this kind are observable on a number of old trees in the state, and particularly on the original Taft tree.

An almost ideal heading or primary branching, as shown in an old tree, is illustrated by the trunk of the original Northrop tree (See Fig. 4). This begins to branch about 2 feet above the ground, and the main divisions of the trunk are all within $5\frac{1}{2}$ feet of the ground. The original tree of the Royal (Fig. 5) splits into two main trunks almost at the surface of the ground, and one of the main trunks branches again low down, while the other reaches a height of about 10 feet before branching again. The original Lambert, while a well shaped tree, shows heading rather too high, the four main branches springing from one point about 7 feet above the ground (Fig. 6). A very strong low-branch-trunk is shown in Fig. 7, which is a tree in which the branches have sprung from inserted buds. The original tree of the Sharpless has two

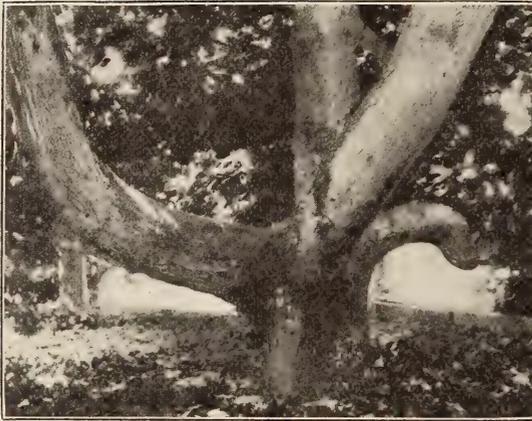


Figure 7.—Large, budded tree of Challenge avocado, branching very low, but satisfactory. (Photo by H. J. Webber)

main branches that do not rebranch until they reach a considerable height, forming a poor shaped tree from which it is difficult to pick the fruit and which lacks sturdiness. This character is apparently entirely due to the fact that the tree was not shaped when young.

Judging from his study of branching, it seems to the writer that the tree should be led to throw out some branches rather low down, probably not

more than 2 feet from the ground, and that the trunk should be headed at a height of not over 6 feet.

It would appear also to be important, as in citrus trees, to develop the branches so far as possible from points on the trunk at different heights, no two branches being opposite each other, in order to give greater strength.

Cultivation and Irrigation.—Little can be said regarding cultivation and irrigation, as we are here again confronted with inexperience. I have introduced this subject primarily to bring out one factor of the problem. The spread of the trees is such that in a mature orchard a large part of the surface will be covered and shaded. The land under such wide spreading trees must in a dry country receive attention. It would seem certain that it must be irrigated if good results are to be obtained. It cannot well be cultivated, as the limbs would interfere, and furthermore experience seems to show that it is far better not to mutilate and disturb the roots. It thus seems to the writer that orchards should be planted with the expectation of irrigating under the trees by the basin method, keeping the soil mulched instead of cultivated. The falling leaves from the tree provide naturally a considerable amount of mulch, which probably may profitably be supplemented by the addition of some other material, such as, alfalfa hay. The practice of mulching in citrus groves is rapidly gaining in favor, as a method of soil treatment, and judging from preliminary studies it apparently serves to keep the soil in excellent physical condition. It is a practice especially adapted to the avocado and can probably be recommended for trial as safely as can any other practice with avocados.

If the method of mulching under the tree, with basin irrigation, is to be used, it may be desirable to know this when the grove is being planted, in order that the arrangement of the basins may be considered

and the trees planted accordingly. If the land is sloping, as will frequently be the case, large, spreading trees of this sort may require four or more basins at different levels. In such cases the basins might possibly be better put in when the trees are planted or at least while the trees are still young, so that no large roots may be injured by leveling the soil in the basins.

The majority of groves that have thus far been planted are irrigated by the furrow method, as in the case of most citrus orchards. Much difficulty will certainly be experienced with this system, as the trees attain maturity, because the soil cannot be satisfactorily wetted under wide spreading trees by this method. If furrow irrigation is to be used, it would seem that permanent furrows that would not be disturbed by cultivation would require to be run under the trees.

Considerable has been said of the drip system of irrigation, where the water is supplied by a faucet placed near each tree, from which a small stream of water is allowed to run continuously and sink into the soil. This method cannot give a uniform moisture condition over the large area covered by the roots of the tree and will probably be found to give a very ununiform root development. In a deep, loose soil, the water from a single faucet dripping in this way would probably produce noticeable effect only on a comparatively small portion of the soil.

Every subject concerning the avocado that we introduce for discussion is a new one on which little information is available, and the problems discussed by the writer are introduced primarily to show again how little we know about them and to emphasize the importance of all growers recognizing that they are conducting an experiment that is of interest to their fellow growers. Every grower should keep careful notes of every operation performed in his groves and observe and record the results. Every grower should consider it his duty to co-operate with the other members of the Association by furnishing periodically carefully prepared statements regarding his experience and findings. By such co-operation we shall soon reach a condition of understanding where now we are in doubt.

"THE HOTEL AND THE AVOCADO"

Thos. H. Shedden, Monrovia, Cal.

Mr. President and

The Lady and Gentlemen friends of the Avocado:

I frankly say that I take earnest pleasure in addressing you upon a subject appropriate to the occasion, and yet, around which hangs a reminiscent aroma of the dining room; being, so far as known, the only hotel "has been" yet budded on to—or "butted into"—the avocado, the new and fascinating industry now developing in the two Eden lands of our country, Florida and California.

The topic is practical, for I believe that the popularity of the avocado as a splendid food, proven by the savants of the University of California to be of the highest value, will come directly via the hotel table and the Cafe too, of course.

The avocado has been an exclusive and elusive foreigner from the tropics; traveling at intervals to our shores in the cold storage seclusion of some big ocean liner; stopping at high priced hotels; dining only a la carte at swell cafes and clubs; attending ten dollar banquets, and appearing, upon occasions, in the homes of the upper ten; the lower millions, for which reason, are either uninformed, or cynical of the gustatory joy in store for them, just as soon as the avocado has been handed its final papers as a naturalized Yankee.

Though an alien in our land, the avocado is a nearby native North American. It was a precious food of the inhabitants when Columbus came. During a couple of centuries thereafter, many explorers wrote in high praise of it. The earliest known of such writings is the report of Oviedo to Charles V. of Spain. In a lengthy account of the tree, its fruit and uses, he quaintly says: "The Indians guard them well, but apply no work whatever to them, for the chief gardener is God." Guarded by the Indian and gardened by God! This beautiful thought of the avocado but adds to its charm. This was in 1526, since which time this aboriginal "staff of life" migrated eastward and westward, to the islands of the Atlantic and of the Pacific, to Spain, France and even to India; and yet, in the fifth century after Columbus, in our own land of good living, so close to its place of nativity, the noble avocado is only beginning to be known! While here in California, where nearly all the treasures of the tropics are being reproduced, an 18-ounce home-grown avocado retailed in the Los Angeles markets, in A. D. 1915, for \$1.50!—the price almost suggestive of them being yet in the curio class; and in Monrovia, where grows a sixty-five foot avocado tree, an old residenter recently told me. "he didn't know anything about either the alligator, or the avocado pears, but he'd bet they couldn't beat the Bartlett."

How came it about that ubiquitous and omniverous Uncle Sam deprived himself, for so long, of this delectable diet! Oh, why did Sir Walter Raleigh, when taking over to Queen Elizabeth those plebian potatoes, entirely overlook the patrician avocado!

There are some questions that growers have often asked me relative to "The Hotel and the Avocado." I have always carefully responded, within my scope, knowing how important a place the hotels and cafes now occupy, and will hold, in the expanding realm of the avocado, hence the more formal publicity here given these pointed questions of the practical growers.

FIRST: What is the proper size of avocado to grow for the hotel trade? In hotels and cafes of the highest class—as yet, alas! the sole places where the fruit is found—their service limits itself to, practically, two sizes: the 14 to 16 oz. and the 24 oz.; fruit of the first-mentioned weights, constituting, on some tables, one portion and on others, two. The 24 oz. is always cut, making two portions.

This has been crystallized into custom, not as might be supposed, by high cost, but through common sense; it being considered sufficient vegetable fat addition to the modern meal.

Now, let not the grower of smaller, or larger sizes be at all disap-

pointed, for all the good fruit that can be raised will be used, in many ways, but probably not for individual service in the hotels that set the pace in these matters.

But it would seem, that though the extra large avocado, so mouth-watering to behold, will be apt to carry off the prizes at beauty shows, yet it may not win in the race for popularity and standardization. It will be wanted for occasions, and by the avocado eater of great fondness and capacity—God bless him! One of the latter remarked to me, as he sat before a 32 oz. dear darling: "The big alligator often reminds me of what the old Virginia preacher remarked about the turkey: 'It's a rather inconvenient bird; too large for one, and not enough for two.'"

SECOND: What form of fruit is most desirable for that trade? Most people in thinking of the avocado, picture in their minds a pear, not knowing that it takes on other forms. I was interested in tabulating the great variety of shapes specified by Mr. Popenoe, in his much used booklet on "Varieties of the Avocado," descriptive of the various shapes now in California. I found that he used forty-three different terms—all in the English language, too.

The grower desires to raise the round fruit because it packs and ships well. But the hotel-man perversely prefers the pear shaped. The term, to him, permits of some variation, but does not include the gourd shaped, or even the round.

He wants it probably because he has become accustomed to it. But he will, eventually, accept the spherical fruit, and learn to handle it, because so many of the coming avocados will be round. It will be acceptable by reason of its safe carriage and short time from tree to table.

And yet, there is usually some philosophy in his likes. Here are several of his reasons:

1st: In a clean bodied, pear shaped fruit, free from fibre, the flesh is deeper and richer where it thickens toward the neck.

2nd: In eating the avocado on the half shell, any fruit having even a semblance of an end on it can be held easier on the plate, while spooning.

3rd: The gourd like fruit is apt to be bruised in its soft neck in shipping.

4th: The thin skinned fruit, delicious to the taste, does make a mess of itself in public, and finger bowls are out of fashion.

THIRD: What colored fruit do they prefer?

The hotelman will usually select a fruit that is, or will be colored, other than green, when ready to serve, knowing that, to the uninitiated, green is suggestive of unripeness—like that little young wifie who went to the market to get her poor hubby some lobsters. She rejected the green ones, insisting on getting some that were fully ripe.

This is by no means a prejudice but merely a preference that will soon disappear when the splendid green fruits become more abundant and the guests more educated.

FOURTH: Do hotels, generally, call the fruit alligator pear, or avocado?

Recently I was asked by the Hotel World, of Chicago, to contribute some information on the avocado. It needs publicity, and this opportunity was accepted. I thought it well to embody questions one and four in the article, suggesting that they might evoke discussion, and so help along the coming of the avocado. It is too soon to expect results, but I shall be glad to report them.

Few hotels have adopted the name avocado. I don't blame them if they do seem slow in the matter. The word suggests lawyer. I couldn't swallow it myself, until I came down south to Monrovia, and smoothed my throat with a 30 per cent oil avocado that is grown there. They are still called alligator pears, in the front of the house, and are nick-named 'gators, in the back of the house, and in the supply houses and markets. Interest in changing has not yet been awakened. There is encouragement, however, in the personal opinion of one of the masters in the humane art of preparing food, Victor Hirtzler, chef of the Hotel St. Francis, San Francisco, who enthusiastically tells me: "I love the California avocado, and I think Avocado is the proper name."

In further consideration of this question, I might quote from the aforementioned article:

"Avocado is the name; not alligator pear!

Both are misnomers and are misleading, but the former is euphonious, and is backed by authority and recommendation of the United States Department of Agriculture, the University of California, all recent writers, and the growers of Florida and California; having been selected from a list of forty-three different names under which it has been a foreigner to us. Henceforth, Brother Boniface, when thinking of a thing so altogether lovely as the avocado, banish the ugly alligator! Hotelmen, you caterers to creature comfort, who well know that the short cut to the guest's purse is down through Ailment Avenue, take an interest in spreading the kindly gospel of the avocado, that the present generation may yet enjoy much of this food delight before they go hence. You've taught 'em to eat the ripe olive; few persons will have to eat the magic three before comes the craving, and then the avocado habit takes a hold, like unto that of John Barleycorn!—Witness the poor victims standing up before the unblushing fruiterer and forking over a dollar for a lone one pound shell of palate tickle! Don't be discouraged should some beginner get balky and buck and kick at your table when you attempt to "put one over on him." It was always a source of amusement, the facial and verbal expressions of the tenderfoot when he would first meet one of these alligators. He sometimes acted as though it was a crocodile. He'd "deny the allegation and defy the alligator", but, eventually, he seldom failed to get the habit, and often would take some back east for the home folks."

The avocado is happily constituted for universal consumption. It is food for both the mighty eater and the modest vegetarian. How many of "us poor humans" are under doctors' orders: "Don't eat sugar." Don't eat salt." "Cut out meat." Just here the bland avocado comes forward, a real neutral in the war. It contains but a shadow of sugar and salt, and it takes the place of animal flesh.

All avocados are good, but how much better some are than others! I have, like that popular pickle man, fifty-seven varieties. The hotelman seeks the fruit that is free from fibre, and whose flavor appeals to him as tasting **rich and nutty**. These words described the perfect avocado. Some cynics think they are applicable to the present day avocado eater—rich and nutty.

As yet, with hotels, it remains, practically a salad fruit. It has been doctored by many prescriptions, but there remains only one best way to eat it: with a little salt, and, perhaps, lemon juice; the fewer frills the better—like that Irishman's celebrated recipe for whiskey punch: "You pour in the whiskey, and then the less water you pour in the better."

And now, fellow growers, benefactors of humanity, who are preparing this superb food for the health and pleasure of others—and profit to ourselves—don't be down-hearted when someone dolefully pictures prices "shooting the chutes." There will, doubtless, be an adjustment of prices, but take it rather as evidence that the production and consumption are keeping pace.

Be happy, conscious that you are bringing the avocado to stay, and it will soon find its welcome way to a hundred million mouths in the everywhere of "My Own United States!"

THE AVOCADO IN MEXICO

R. O. Price, Upland, Cal.

In complying with a request from Dr. Webber for a paper on the avocado in Mexico, I will state at the outset that I am limited to a general knowledge only of the subject coming to me as a coffee planter of some fifteen years experience in the Tierra Caliente, or hot country of southern Mexico.

Of course on the plantation we had all of the native fruits such as the mango, avocado, banana, pine-apple, orange, lime, guava, naranjilla, cocoanut, sapote, papaya and many other less known fruits.

Our plantation was located in the foot-hill section of the Sierra Madres, some seventy miles back from the gulf coast, in latitude seventeen and a half, at an elevation around eight hundred feet.

We were pioneering in a virgin forest as old or older perhaps than the ruins of the prehistoric city of Palenque in the same forest which stretched off to the east of us toward the Guatamalan line.

In making our clearings for the "fincas" or plantings, we left the largest trees of the forest to protect the coffee plants from the direct rays of the sun. The ground selected was always a hillside or mountain slope necessary to get proper drainage, as our rain fall often reached one hundred and forty inches. Invariably we found in this tropical under growth the wild avocado, called by the Indians "CHININI".

Apropos of the discussion of the proper name for this fruit, I might say, in passing, we have here in the Aztec tongue perhaps our oldest precedent.

We generally left these chininis standing as we did the wild cacao the producer of the chocolate bean and also the different saptotas, including the "Chicle" whose sap is now so profitably hunted to supply the great American craving for chewing gum. The vanilla vine frequently was found clinging to the trees.

The wild orange too is found here along the streams and bottom lands in the deep alluvial soils.

The chinini as found in the forest, does not grow to be a large tree. It is usually not over eight or ten inches in diameter and perhaps thirty feet high. The fruit is about the size of a large egg and in shape oval. The quality is only fair. We ate them only when our planted varieties were out of season. This fruit is green in color, and as I recall it now, the skin was of the hard shell type.

The planted varieties are all seedlings, and so far as I know very little effort has been made to introduce budded varieties of any fruits into Mexico. We had a number of varieties of avocados, each district having something different. In going about the country, whenever I found a particularly fine specimen, I took the seed home for planting. To show how fast avocados grow in the tropics, in four years time from the seed, we had trees six to eight inches in diameter, thirty feet high, and full of fruit. The fruits of this section of Mexico do not grow as large as our largest varieties here.

Crossing the Sierra Madres to the Pacific slope one enters the dry country, somewhat drier than we have here when irrigation prevails, and still in the lower altitudes we find the avocado fruiting and producing as good a quality if not better than that found in the wet or gulf side. Here also there is a hot wind from the South, "El Sur", that prevails for a season, very dry and very like our "Northers" here in California. I mention this fact as some of our people have feared that our interior valleys might be too dry and windy to allow the fruits to set.

I have spoken so far of the avocado as I have known it in the Tierra Caliente or real tropics, where the temperature varies from a minimum of 50 degrees to a maximum of 103, or an average of 76 degrees.

I feel very sure that these tropical varieties are not adapted to this country, for the same reason the banana and pine-apple do not mature fruit here. Below the Tropic of Cancer latitude apparently loses its value. Climate is made by elevation and amount of moisture, and climbing the mountains you reach the frost line between 4000 and 5000 feet, the dead line of tropical growth, where the fruits mentioned at the beginning of this paper all end, with the exception of the avocado. Here begins the semi-tropics and it includes the great table land of Mexico, the Tierras Templadas, the land of the scrub oak, pine and maguey. This is the region from which all of the California introductions of the avocado have come, a climate very similar to our own and in fact with a rainfall even less. Here I witnessed the first snow which had fallen in fifty years. Mr. Popenoe and others have introduced their varieties from such altitudes as Atlixco 7000 feet, Queretero 6000, Guanajuato 6800 feet, Guadalajara 5400 feet. This section of course is the natural one to explore for suitable plants for California.

In Mexico, I know of no large plantings of the avocado. In fact, orchards or commercial planting of any of the fruits is very little developed. In recent years Americans have, here and there, done some planting, chiefly oranges and pineapples in the state of Vera Cruz and bananas in Tabasco. Each family, in the country or in the small pueblas, will have a few trees around their homes, and the surplus finds its way to the plaza or market of the nearest town.

As to the popularity of the avocado, there is no fruit among the Mexicans or foreigners in Mexico that is more esteemed unless it be the mango. This fact alone is proof positive to me that the fruit has a great future in this country, and I feel justified in predicting that someday our shipments from California will rank along with its tropical neighbor the lemon, and perhaps the orange.

HAS THE MEXICAN TYPE OF AVOCADO A PERMANENT PLACE IN THE INDUSTRY?

By E. S. Thacher, Nordhoff, Cal.

When I consented to open this discussion, I felt as though I were going to be the bone for hungry dogs to fight over. For, at the meeting of last fall, although this, if any, should be the season for the "thin-skins" to assert themselves, whenever that humble type was mentioned, deep growls of fierce derision could be heard through the hall and there was no one bold enough to stand up and declare his trembling faith.

For myself, I was somewhat bewildered at discovering that the gentle orchardist should find the question of tree varieties a personal matter, involving his hottest feelings; and, being also a little under the weather at the time, I tamely kept silence. After the meeting, I asked a gentleman who had told us of his considerable experience, in Mexico and in this country, in the marketing of avocados, if it was not the case that, in Mexico, where the fruit has long been an every-day article of diet and is sold on its merits, thin-skinned fruit is generally preferred as being richer and more delicate than the big type. He answered at once, emphatically, that this is so, but added that he had not ventured to make this statement at the meeting, because he foresaw the uproar that it would occasion.

Possibly that wave of hostile feeling may have passed by, but if I am exposing myself to its return, I count on the shelter due me from our president, who detailed me for this undertaking.

It has been interesting to find in our experience with this new industry, that some of the large fruits are, nevertheless, very good. Plenty of varieties there are, handsome and generous in appearance, that are not worth anyone's trouble to eat, unless it may be an occasional consumer of the mildest tastes, who chiefly desires not to be much disturbed by what he feeds on. We shall eliminate these fruits as we go on, for it will not pay us to market fruits that do not invite the purchaser to come again. By the careful pursuit of this selective study we may be able to offer really good fruit throughout the year, but when large size ceases to be an object, as it pretty surely will when this product is an every-day matter, the discern-

ing householder will recognize that among the thin-skinned varieties, available chiefly in the fall months, the highest-flavored avocado will always be found.

Let us look for a moment at this matter of size. At present this fruit is a curiosity. The few people who have heard of it have been astonished at the prices paid for single specimens. Astonishment is what they are looking for in this connection, and the growers, who are pretty nearly as green as the public, have to some extent fallen into the error of believing that to astonish is the game we have to play.

But the permanent market is not made by surprising people. It rests rather on the persistent supplying of things that are good and convenient, and when you have 100,000 people habitually buying avocados in Los Angeles, instead of a few dozen curious or lavish individuals, they will not generally be found looking for fruits that approximate the pumpkin in size, if not in flavor.

What is a convenient size for the avocado? I should say that a fruit that furnishes as much as one man will ordinarily eat at a sitting is quite large enough. A 5-ounce fruit will do that with a reasonable ratio of flesh to seed, and it seems to me that the permanently favorite sizes are likely to run from 5 to 10 ounces, and that we shall soon be looking with commendation on those trees of the large type that can be induced to moderate the size of their fruits in favor of greater numbers. Numbers are a pretty good feature and I have sometimes found that the 3-ounce size, though taken less readily in the market than those from 6 to 8 or 9 ounces, brought more money by the box.

Many of us, I presume, are or have been orange growers, and those who were here when that industry was beginning in California remember that the very large navels were often at a high premium. It was a new thing that California should be producing oranges, and actually making a commercial matter of it; and the bigger the orange, the more surprising and interesting it was. It was not long, however, that this surprise was marketable, and those who in this recent Valencia season have been fortunate enough to have great numbers of small oranges have had a lesson which may well be applied to the avocado.

It has been the habit of our nurserymen to recommend the Mexican seedling for home consumption only, granting its excellent quality, but disclaiming fitness for commercial use. One reason for this is the size question, and it is true that if one grows seedlings there will be many trees whose fruit is too small for marketing satisfactorily. But trees budded from the varieties that have proved their quality are free from this objection.

The other point is carrying quality, it having been generally believed that a thick skin is almost necessary for long shipments. My slight experience disputes this and a year ago we had Mr. Boschet's testimony that there seemed to be no difference between the two types in this respect. The skin of the Mexican type is always much tougher and thicker than that of the Bartlett pear, which California ships in such great quantity to distant markets, and on the other hand there seems to be plenty of room inside the shell of the palta for unhealthy conditions to produce disaster

It is, of course, of great importance to find as fast as possible what thin-skin varieties produce fruit of good size, of the best quality and in dependable quantity; what sorts are hardiest as to frost (there is a great range in this respect); what sorts are handsome, inviting in appearance; what sorts are tenacious (some good varieties drop off very easily); and what are free from the habit of developing soft spots or other blemishes.

To this end we should not be too urgent in our advice to plant only the established varieties. We are at the experimental stage and there should be a great deal of seedling observation. Perhaps the most interesting feature of the avocado is its immense individual variation, coupled with the fact that until this country took it up there had nowhere been any systematic breeding or fixing of varieties. When I was first inquiring about it, a friend obtained for me a letter from the Mexican minister of Fomento, in which he said, "There are no budded ahuacates in Mexico; in fact there are very few trees planted anywhere. They come up in corners."

Nevertheless, Mexico, which is our chief source for both types, the so-called Guatemalan as well as the Mexican, has, in a wholly accidental way, produced all sorts of fruits, and our named varieties are simply selections from the product of their seeds. We mustn't begin just yet to be too wise on the subject, for we have hardly done more than look over the fence upon a field that has not been measured.

We have thin-skins to cover the markets from August to November. We have thick-skins from March to July. There remain only December, January and February, and our nurserymen are reaching out to supply these months also, and have perhaps done so already, though it is not covering January and February to pick and market in those months fruit that is not really fit to eat until March.

Our unbelieving friends have a patronizing way of conceding the fall market, saying that the thin skins, after all, have their use, as fillers of the gap. The difference between us is that, whereas they conceive that the industry is marking time, or soft-pedaling, through those months when the big fruit is in retirement, I maintain that it is only in that period that the true and supreme ahuacate is to be had and that the rest of the year is just doing what it can to keep the business alive.

I have not undertaken to cover all the points in this case. I was simply to put the subject before you, and I have considered the probable scarcity of time as a reason for doing this with extreme brevity. We are all learners together, with a very new subject, and no inquiry can as yet be considered closed. I will only repeat my opinion that, so far as I can see at present, the true Mexican ahuacate, the leading type in the country which certainly has the lead in the use and knowledge of this fruit is well worthy of our serious development and promises a commercial reward to intelligent perseverance. However, the question of comparative merit may finally be settled between the two types, they are so different that neither should be discarded in favor of the other, any more than we should abandon the pear because we approve of the apple.

EXPERIENCES WITH AVOCADO VARIETIES

By Charles D. Adams, Upland, Cal.

It is desired by our president to have presented at this meeting reports of the results so far obtained with avocado varieties by growers in different localities, and with different soil conditions. My report is that of an orange grower, located in the midst of the citrus belt which surrounds the San Bernardino valley, 38 miles east of Los Angeles, five miles northwest of the railroad station at Upland, and at 2,000 feet elevation above sea level.

The soil is decomposed granite, with good humes content and was also well supplied with boulders, which still remain below the plowing level.

It was 14 years ago when I planted my first avocado tree—a small seedling, obtained from Dr. Franceschi of Santa Barbara. It was planted in an orchard row, between two orange trees, where it stands today, twice the size of the surrounding trees, and bearing abundantly purplish-black, thin skin fruit, good to eat, but too small to be of value. Its hardness is its interesting feature, as it has never been unfavorably affected by adverse weather conditions and stood the remarkable cold of 1912-13 without a particle of harm, which could not be said of adjoining orange and lemon trees.

I have been planting experimentally, from time to time, during the past three years, trees of some 30 different varieties, to test value for a commercial product, very few of them being of the thin skin class. This was not because of the belief that this class will have no future commercial value. I believe it will, but not, I think, with the California varieties so far obtained. Those of them, such as the Northrop, hardy, vigorous, with abundant fruit of fine quality, have their place for household use, solely some think, but the fruit of our thin skin varieties is certainly in most cases of too small an average size and will not pay to market, when the sizes the public like better are to be had in abundance. I believe the right commercial, thin skin kinds are still to arrive, or, rather, are already here for us to discover among California seedlings or imported buds. This claim is sustained by the prices of fruit in the past and of that now on sale. Last week, in the street windows of one of the largest groceries in Los Angeles, the Ganter fruit was for sale under its variety name, tagged at 20 to 25 cents, though some very few, extra large ones were tagged at 40 cents. On this same day, small purple fruit was on sale at 5 cents, and good sized Florida fruit at 50 cents.

The trees of this variety and of the Harman are exceptionally hardy, vigorous and satisfactory, and the Ganter is one of the most prolific varieties, but the fruit of both, in my opinion, has a fatal defect in being so generally subject to cracks, scabs and soft decay spots, that it seems hardly possible it can have any future market value when it comes, in the near future, into competition with other varieties free from these blemishes. I am budding over both varieties.

Among the thick skin varieties which mature their fruit in the spring, summer and fall, we have a number of sufficient merit to seem very sure of being profitable for orchard planting. As yet, we are not so well off in varieties that mature their fruit in the winter, which is the period of highest prices. Most of us are looking forward with the keenest interest toward the discovery of first-class varieties to mature their fruit at this time and watch hopefully the tests of anything which looks promising for this period of the year. One of them is the Puebla. Some trees of this variety matured some fruit in California last winter, which was reported in a letter I received, to have been three-fourths of a pound and over in weight and of fine quality. Such a record we want sustained by similar ones from other trees before planting many Pueblas, but my tree of the variety pleases me greatly. Though planted only two years ago last spring, this Puebla tree now stands nine feet high and ten feet broad, and is carrying 15 fruits, very handsome by reason of their smooth, glossy skin. The tree of the Puebla has a very distinctive individuality. Its short leaf of deep, green color, its stocky, compact growth, and the form it naturally assumes without pruning has reminded many of an apple tree when seeing it at a distance, for the first time. It appears to have ideal characteristics to enable it to carry and protect a crop of fruit.

Another Mexican bud of promise that is beginning to bear in California and produce a large fruit, too large perhaps, is the Grande. My three-year-old tree of this variety, which has made a fairly good growth, blossomed profusely in the spring and set a quantity of fruit, of which one remains and the rest dropped, as usual with young growing trees. The variety promises to be fruitful. My trees of the Dickinson, Fuerte, Challenge and other desirable kinds, are very satisfactory, but not yet in bearing in most cases.

Is it not a decided mistake to continue planting poor growing, delicate kinds, when we can secure vigorous growers with fruit equally good or better? By such a test, we should discard, among others, the Colorado, the Dickey, the Royal and the Presidente. Another one is the Murrieta Green. My two Murrieta trees stood absolutely still for a year and a half, not growing an inch, though since growing quite well, which may or may not continue. I failed to raise the Dickey that I planted and two Colorados, one planted to take the place of the other. My Royal stands the same size as when planted two years ago, and my Presidente is a dwarf tree compared with the others.

For quite an opposite fault the Atlixco (if my tree is true to name), will hardly find a place in our orchards. It is altogether too aspiring and is determined, in spite of the pruner, to send up into the clouds a straight and branchless stem. The Lyon, some think, goes unjustly into the feeble class. It is so precocious and fruitful that it may commit tree-suicide if not restrained. Two of my one-year-old Lyon trees each set three or more dozen fruit this spring. Could they have been anything but feeble if not helped? All but two or three fruits were removed from each tree and the growth has been excellent right along.

Neither do the trees need to take the eucalyptus shape of the parent, at any rate to the same extent, for they submit readily to pruning. For one who will handle it with good sense and wants quick crops of large desirable fruit, the Lyon is not to be overlooked, unless, contrary to my own experience, it proves generally sickly, which some growers state they have found it to be.

A year ago last spring, I began some commercial planting, feeling it fairly safe to use a selection from some of our numerous fine varieties fruiting in the spring, summer and fall. Planting most largely of the first one I shall mention, my choice from those available were the Blakeman, Taft and Sharpless, which begin to mature their fruit consecutively in the order named. All are vigorous trees and good bearers of fruit, first-class in quality and a pound or more in weight.

Those who were present at the Association meeting of a year ago and saw the fruit cut before the audience, will remember the beauty of the Sharpless fruit with its small seed and exceptionally large proportions of cream colored flesh. The growth of the young trees is very slender, but good. The high quality of the Taft fruit is well known. The tree is one of the most beautiful of the avocado family, with its bright red young foliage and good, compact form. It is longer in coming into bearing than many others, but fruitful when it does begin and the tree itself gains by the delay.

The Blakeman, not as yet so well known, comes from a fruit from Atlixco, Mexico, sent by his brother to John Murrieta of Los Angeles, from which the seed was planted at Hollywood. The fruit is pronounced by some of our avocado experts as, at the very least, not excelled in quality by anything we have in the thick skin type and the young trees are certainly vigorous beyond my expectations. Though I am in the habit of heading in and pruning my avocado trees to produce compactness, my Blakeman trees, planted a year ago last April, now stand between 7 and 8 feet in height and broad in proportion. They are larger than any adjacent citrus trees of three or four times their age and are the admiration of my neighbors. They blossomed profusely last spring and set fruit abundantly, which naturally dropped off, as is to be expected of one-year-old trees. The parent tree was planted in 1904; it bore a few fruit in 1913; 25 to 50 in 1914; 250 in 1915, and in 1916 has a good big crop now on the tree.

NECESSITY OF CO-OPERATION

Charles D. Adams, Upland, Cal.

The avocado steps into its place among the industries of California at a time when the path it must follow to reach permanent success financially and otherwise is plainly marked out, by the history of the other fruits of importance in the state, to be through co-operation and to be possible by co-operation only. It is not to be had through the individual efforts alone of the isolated grower. Now, more than ever before, in all lines of production and manufacture, do we find co-operation in practice and its necessity and strength recognized.

The advantages in the united action of common interests are so great that our young industry is fortunate in having in its infancy, established a co-operative growers' organization, which is today demonstrating its value and will do so still more effectively in the future, according to the support it shall receive.

It is able to prevent unnecessary mistakes and failures by its recording, for general information and for preservation and use in the systematic study of the industry, the experiences of a number of growers, in problems solved, experiments made and successes or failures met. It gathers statistics in regard to trees, acreage-planting, production, orchard and nursery methods, varieties, fruit qualities, soils, diseases or anything else tending toward improvement and assistance in the culture and propagation of the avocado.

By its semi-annual meetings, its work and its literature, the attention of the public is attracted in an effective and dignified way to the great food value of the fruit and to methods for its preparation and use.

And, finally, when problems of crop distribution and marketing are to be met, and they may come sooner than we expect, we have in our organization a means whereby, when it is necessary we can put in operation a non-profit co-operative marketing system, such as the California Fruit Growers' Exchange which has preserved the citrus industry from destruction. Remember, that the Exchange started at a period of despair for the industry, when, under previous systems, a crop of 4,000 cars was more than could be sold at a profit and red-ink returns were the rule, whereas 44,000 cars were satisfactorily sold this season.

I want to call your attention to an action of the utmost importance taken by the California Fruit Growers' Exchange to illustrate what growers in co-operation can do, and what none but they would do and to meet a need that is plain when we consider, that in the next four years, the average number of acres of new citrus trees coming into bearing is 20,000 of lemons, 21,000 of Valencias and 43,500 of navels, a total of 84,500 acres. Resulting as to the first item that, in three years' time, the lemon production will be three times as large as at present and, in one year's time, twice as large.

In the last six years, the increase in the production of citrus fruits has been 45 per cent, while the increase in the population of the United States has been 12 per cent.

The planting is a condition out of our control. It was and is evident that consumption must be greatly increased to avert disaster and that by advertising. Seven years ago, the Exchange began by experimenting with \$2,500 outlay in the state of Iowa, resulting in an increase that year of 50 per cent in sales in that state. The following year in more general advertising the amount expended was \$75,000, gradually advancing to \$375,000 last season, though at a nominal expense to the individual orange grower of only 2½ cents per box, and performing a service to the whole industry of so great value that it would be hard to measure.

Our avocado organization is of an importance that has not been questioned and, if it be so, why not join it? While our membership is increasing, it must do it faster and we want to see it do so today from

those present who are not already members, and not alone those interested in avocado growing, but also everyone interested in fostering in the state so important and attractive an industry.

AVOCADO PERFORMANCE RECORDS

By **L. B. Scott, Pomologist, U. S. Department of Agriculture.**

Mr. Chairman, and members of the California Avocado Association. I am intensely interested in the avocado industry, and I believe there is a future for this fruit, provided its culture and development is restricted to safe and sane channels. In this connection I know of no other one factor which is bound to play as important a part in the development of this industry as the securing of individual tree performance records.

The success of the California citrus industry has been due to the fact that early in its development a few varieties were found suited to conditions here. The standard citrus varieties in this state can be counted on the fingers of one hand, the Washington Navel and Valencia oranges, the Eureka and Lisbon lemons, and the Marsh grapefruit. These varieties have distinct characteristics and are easily recognized by the trade.

However, even within the standard citrus varieties a wide variation has been found. Mr. A. D. Shamel, of the Office of Horticultural and Pomological Investigations of the United States Department of Agriculture, in 1909 began an investigation of the improvement of citrus fruits through bud selection which has shown that even the standard citrus varieties are made up of a number of strains, some worthy of propagation, others not. It is not necessary for me at this time to review the progress of this work, because you are all familiar with the details and many of you in your citrus orchards, are securing commercial records of the output from your individual trees. I have referred to citrus conditions simply to show what has been accomplished with these fruits and that the work already done in stabilizing and standardizing our citrus fruit products may be of assistance to us in working out similar methods for our rapidly developing avocado industry.

In Florida one standard fall avocado of the thin-skinned leathery class, the Trapp, has been secured. It is true, it is claimed by many, that the Trapp is lacking in quality but the fact remains that this variety is known to the northern markets. Because it is already established, this variety is going to represent the large bulk of the Florida plantings for many years to come. During the summer months an entirely different condition prevails. No variety as yet has been developed or planted in sufficient numbers to be known as a standard Florida summer variety. The result is that the northern and eastern markets receive shipments from Florida and the West Indies of seedling avocados and mixed crates of seedlings and budded fruits of exceedingly variable quality. Unfortunately the consumer has no means of determining which of the two avocados lying side by side in a basket is a good quality fruit and which a poor. This accounts in part for the fact

that avocados in our northern and eastern markets during the summer months, even at this stage in the development of the industry, sell at the low figure of ten cents a fruit.

Even within the Trapp variety we find a similar variation to that existing in our citrus varieties. I have found at least five distinct strains in this variety, which are characterized by differences in production, differences in foliage, and differences in the flower arrangements. Correlated with these differences are distinct variations in the shape of the fruit, some being pyriform, others oval, and others distinctly oblate.

The accompanying chart (table 1) shows the wide range of variation in production which exists in a young planting of Trapps in which we are securing detailed individual tree records.

**TABLE 1.—MEDORA SOUTH, 1913 TRAPP AVOCADOS.
1915 CROP NOTES (Number of fruit matured).**

Counting rows from east side and trees from north ends of rowe.

Rows	1	2	3	4	5	6	7	8	9	10	11	12	13
Tree 1	13	11	13	23	10	19	13	4	2	0	13	8	0
Tree 2	6	5	0	8	11	3	10	5	5	12	8	11	1
Tree 3	1	6	15	vacant	0	0	0	12	0	3	6	2	1
Tree 4	1	2	10	1	1	10	11	6	2	4	6	3	1
Tree 5	8	1	1	1	6	2	11	5	0	5	10	7	4
Tree 6	4	8	4	11	2	4	6	10	5	5	5	4	1
Tree 7	1	7	4	9	3	6	9	0	1	6	0	9	3
Tree 8	0	3	12	8	9	0	8	0	1	6	2	15	13
Tree 9	0	5	1	12	8	4	13	0	7	1	11	1	9
Tree 10	18	7	11	7	7	9	1	4	16	3	1	10	3
Tree 11	5	4	4	0	3	5	0	12	3	10	0	14	8

Fruit was picked from this planting as follows:

Oct. 1—8 crates No. 1.

Oct. 2—2 crates No. 2.

Oct. 29—6 crates No. 1.

Oct. 29—3 crates No. 2.

A considerable number of fruit, aggregating probably 3 or 4 crates, dropped after maturing. These are included in the list for each tree, but are not included in the quantity picked.

In this same orchard this year we have found that the high producing trees in 1915 are also the high producing ones this year, while many of the zero trees are also repeating.

Turning for a few minutes from avocados to citrus, you are all familiar with the action which has been taken by the California Grapefruit Club, an auxiliary of the California Fruit Growers Exchange. Repeated trials of different grapefruit varieties in this state have shown that only one variety, the Marsh, is suited to conditions here. Even in the Marsh variety a number of inferior strains are found. The California Grapefruit Club has officially agreed that its members will rebud all varieties other than the Marsh and all inferior strains of the Marsh to the smooth thin-skinned ideal strain of this variety. You can

readily see what this action means to the California grapefruit industry. Every grapefruit sold can be guaranteed as a typical standard Marsh.

I believe in this day and age no horticulturist or pomologist will admit that a stable fruit industry can be developed on an eighty-six variety basis. As I have just pointed out the success of the citrus industry in this state has been governed, in large measure, by the small number of varieties. Any unprejudiced person will admit that you have too many avocado varieties. I realize when fruits are selling from 50 cents to \$1.00 apiece, it is hard to sound a note of warning. Still we have to look ahead to the time when avocados are not marketed by the crate but by the carload. I have had enough experience with avocados to know that a good price will be paid for a standard high grade product, while it will not be paid for an inferior one. The statement has been made that in Guatemala, the high plateaus of Mexico, and the Central American countries, there exist avocado varieties far superior to any we now have in California. This may be true. I believe new varieties ought to be introduced, provided they are superior to existing standard ones, under state and federal supervision. At the present time Mr. Wilson Popenoe, of the Office of Foreign Seed and Plant Introduction, of the United States Department of Agriculture, is in Guatemala searching for superior avocado varieties. However, even if no new varieties are found superior to those which you now have, I believe you already have in this state a sufficient number from which a few good ones can be chosen and developed as typical California products.

It never will be possible for you to develop a strong market for avocados if you continue propagating eighty-six varieties. You have got to look ahead to the time when the eastern housewife will call up her grocer or fruit-dealer and order not simply an avocado but a Taft or some other typical variety. I believe your big problem is not a search for new varieties but an elimination of many of those which you are now growing and the choosing and developing of a few which can be known as strictly California products.

Of your summer varieties, or thin-skinned sorts, an early, a medium, and possibly a late variety are needed and of the thick-skinned winter and spring varieties an early, a medium, a late, and possibly a very late kind. The work which the Citrus Experiment Station has agreed to do in growing trees of the different varieties, at both the Riverside and Whittier stations, will be of great value to the growers but that work ought to be supplemented by definite record work by this Association.

Your trees are just coming into bearing. Now is the time to find out the comparative merits of the different varieties. The only way this can be accurately accomplished will be by securing performance records of every individual avocado tree owned by a member of this Association. By performance records we mean the actual record of the amount and quality of fruit produced by an individual tree for a series of years. Only by securing such records on the individual trees of your different varieties for a series of years can you decide on the six or

seven varieties which ought to be developed as standard California avocado varieties and which will be the foundation in building up a strong industry. I would like to see this Association devote a large part of its energies to tree registry work. If every member of this Association would agree to keep records of the amount and quality of fruit produced by each tree which he owns, and if copies of the records of his best trees were forwarded to your central office, in a few years' time definite and accurate information would be secured concerning the behavior of individual trees of the different varieties. This information then could be used by this Association as a basis for deciding on the varieties which should be developed as typical standard California products. Your Association would then be able to take action similar to that of the California Grapefruit Club and officially recommend a short list of standard varieties for the entire season.

A few important factors will have to be considered in securing individual tree records. These are: first, tree numbering; second, individual tree picking; and third, the recording of the data in some record form which would be chosen by this Association. In numbering trees I know of no method which gives better satisfaction than that now used in citrus performance record work and that is giving the tree an individual number consisting of the block number, row number, and number of the tree in the row. By using such a system of numbering there never will be a single duplication, no matter how large the acreage. Thus tree 8-4-16 written vertically on the tree trunk, thus 8 would instantly

4

16

locate that tree as being in block 8, row 4, and the 16th tree from the end of the row always numbering from some fixed place. The point might be raised that avocado plantings at the present time are so small that it would not be necessary to include the block number. However, looking to the future, when there probably will be larger solid blocks of avocados planted, and in order to avoid all confusion, I believe it would be better to include the block in the series number. If for any reason it should not be practical to paint the numbers on the tree trunks, they could be stamped on aluminum labels and the labels attached by copper wires to one of the main branches.

In securing individual avocado tree records it will be absolutely essential to pick each tree separately. While occasionally persons are found who believe they can estimate accurately the amount of fruit produced by an individual tree, the only sure way is by actually picking the tree separately and using some fixed unit in measuring the tree's production. When the trees are young the actual number or weight of the fruit produced by the individual trees could be recorded, as they grow older the unit could be the picking box.

The following charts, tables 2 and 3, show respectively the front and back of the forms we are using in securing our detailed avocado individual tree records. These forms are printed in convenient size, 4 by 6 inch notebooks. Each page is devoted to one tree's record. It is possible that this form may be of value to growers in securing

Table 2.

DETAILED AVOCADO PERFORMANCE RECORD BLANK.

Orchard..... Plot..... Row..... Tree.....
 Year..... Variety..... Strain.....

Date	Size	Grade 1.		Grade 2.		Grade 3.		Total	
		No.	Wt.	No.	Wt.	No.	Wt.	.No.	.Wt.
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Limb Variations

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Notes

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records in commercial plantings, especially where it seems desirable to study in detail the behavior of individual trees.

I believe the form shown in table 4, in which space may be provided on a single page for recording the data for 40 or more trees, will prove practical for commercial orchards. As it is necessary to make a number of picks from individual trees during a season, space is provided for recording these different picks. These data could be recorded in number of fruits, weight of fruit, or number of boxes borne by the individual trees.

Table 4.

COMMERCIAL AVOCADO PERFORMANCE RECORD.

Block No.....		Row No.....		Variety.....									
Date													
Tree No.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Total
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													

By securing such records you will be able to find out which varieties ought to be developed as strictly California products. Copies of the records of the best trees ought to be forwarded to the central office of this Association and filed. All members of this Association ought to know the location of these superior trees and ought not to plant trees unless they are propagated from bearing trees whose performance record could be furnished at any time by the secretary of the California Avocado Association.

Find out what your individual trees are doing, reduce the number of your avocado varieties from eighty-six to six or seven, make tree registry work an important activity of this Association, and start your new avocado industry on a performance record basis.

FURTHER INVESTIGATIONS OF THE COMPOSITION AND FOOD VALUE OF THE AVOCADO

By Prof M. E. Jaffa, University of California

The data here reported represents the partial results of chemical studies of the avocado which have been carried on at our station. The complete analysis, physical and chemical of each sample is on record and will be published later by the University. For the present brief discussion, however, the oil content seems to be the most important. Credit is due to Miss Stover, former assistant in the laboratory, and Mr. Albro, at present associated with the Nutrition Division, for the analytical work.

The results of 95 analyses are summarized in the accompanying tables. Tables Nos. I and II refer to those varieties which are generally supposed to mature in the late summer and fall and Table No. III to those varieties whose season is the first half of the year. In Table No. I the figures relate to but one sample, quite often to but one fruit, while in Table No. II they indicate analyses of two or more samples of the same fruit. The tabulated data might best be discussed under several different heads:

- A. Total amount of oil.
- B. Content of oil in seedlings vs. that in the known varieties.
- C. Oil content of large fruit as compared with that of small fruit.
- D. The development of the oil in the fruit during the ripening

process.

- A. The total amount of oil:

The highest percentage noted, 31.60, is to be credited to the Purdy variety from Whittier. This is a small fruit analyzed on the 9th of this month. It must be remembered, however, that only one fruit was analyzed. It is our intention to make further analyses of the Purdy in order to ascertain whether or not this high percentage will obtain. The nearest approach to the oil content of the Purdy in the spring varieties is noted for the Miller with an oil percentage of 27.45 and the Knowles from Santa Barbara 27.11. If we omit from the discussion the Knowles and the Miller, it will be observed that the spring varieties do not range as high in oil as do the fall varieties. Before such a statement can be considered as a fact, however, it will require more thorough investigation which the station will be only too glad to undertake. Furthermore it will be noticed that more analyses have been made of the fall varieties than of the spring and there are a greater percentage of immature and unripe representatives of the latter class.

The Chappelow ranks next to the Purdy as far as the oil content is concerned—the Northrop with 27.60 per cent the next highest. The lowest content of oil noted for fruit stated to be fully ripe is in the case of the Beauty from Orange, showing 15.25 per cent. In view of the fact, however, that the determination on the Beauty included but one fruit it will be necessary to make more examinations in order to have enough

data to warrant the drawing of dependable conclusion. From the present figures it would appear that there is a range of from 15 per cent to 31 percent in the different varieties, said figures based on ripe fruits in all cases.

It is of interest to note that Table No. I includes the test of one variety, the Pomona, grown at Sacramento, analyzed the 1st of this month, showing 25.36 per cent of oil, also the analysis of a seedling from Oroville analyzed in September yielding 24.8 per cent of oil, both good records.

Averages have not been indicated in any of the tables because there is such a variation in the oil content and again there are many determinations made of immature fruit. It was therefore, deemed best to present only individual analyses.

B. Content of oil in seedlings vs. that in the known varieties:

The highest percentage noted for the seedlings is 27.89, reported for Seedling No. 1, from Carpinteria, two years ago. This percentage has not been equaled by any seedling submitted for examination since that time, the nearest approach being a seedling submitted by Mr. Popenoe under date of September 22nd of this year, yielding 26.7 per cent of oil. There are six samples of seedlings as indicated by the tables which yield between 24 and 26 per cent of oil—a most excellent showing—five seedlings testing between 20 and 23 per cent, making a total of thirteen seedlings reported in the table with a credit of above 20 per cent of oil. Comparing the seedlings with the known varieties, it will certainly be seen that, as far as the oil content is concerned, many of them are, *caeteris paribus*, well worth propagating.

C. Oil content of large fruit as compared with that of small fruit.

As previously stated, the Purdy showing the highest percentage of oil, 31.60, is a small fruit, weighing approximately one-third of a pound, and by an examination of the data presented in the tables, it will be noticed that all the high percentages are in connection with comparatively speaking small fruits. The Chappelow with 29.1 per cent weighing 181 grams; the Northrop with 27.60 per cent weighing 218 grams; the Blake with 25.50 per cent weighing 150 grams; the Mattern with 25.7 per cent weighing 96 grams; the Pomona with 25.36 per cent weighing 80 grams; seedling from Carpinteria with 27.89 per cent weighing 150 grams; and the Knowles with 27.11 per cent weighing 100 grams. We do not find any large fruits containing a high percentage of oil. This is emphasized by a reference to Table No. III where will be found listed the Blakeman with 17.27 per cent weighing 472 grams and the Taft with 18.5 per cent weighing 626 grams.

D. The development of the oil in the fruit during the ripening process:

Definite conclusions can not be drawn on this phase of the work until more analyses have been made. From the data at hand, however, it would appear that the oil certainly increases with the ripening in that we have not analyzed any sample which is immature or partly ripe which shows as high a percentage as does the fully ripe fruit. In the case of the Chappelow we have an immature fruit showing as low as 13.86

per cent of oil while the fully ripe fruit the same season shows 27.66 per cent. In the same year we have a sample analyzed Oct. 15, 1914, showing 17.68 per cent and not fully ripe.

Again it is of interest to note, as was to be expected, that in different years or different seasons, the same variety will vary in its maximum oil content. This is emphasized by reference to the figures noted for the Chappelow, Harman and others. Further investigations may also indicate that the same variety grown in different places will yield different percentages of oil. Not enough analyses have been made to warrant the drawing of any definite conclusion on this point.

Avocados might be compared to milk. As is well know, there are certain breeds of cows yielding milk of different degrees of richness in fat and that said content of fat is more or less constant, for the respective breeds. While it is true that a herd of Holsteins may be bred to give a milk richer than a poorly bred herd, yet no matter how much breeding is carried on or how well a herd is cared for, it cannot be expected that a Holstein cow will ever yield a milk as rich as will a Jersey cow. Nor is it right to expect that if a Jersey cow is treated as it should be, such cow will yield a milk with a low fat content. Similarly with reference to the avocado. Those varieties which yield a high percentage of oil will do this consistently under proper conditions, while those which yield a lower percentage of oil will not, it seems to me, increase the percentage of oil materially by any treatment which may be given to the culture of the respective variety.

It must not be considered, however, that because a variety is lower in oil than another variety. such a variety will not meet with public favor. While it is true the higher the oil content the greater the food value per unit weight, as is the case with milk, yet those with a lower percentage of oil, of fine flavor, and which are fully ripe will doubtless find a ready market if prices warrant. In fact, it might be said that in some instances a fruit with a medium oil content might be more desirable than one with a higher content as is oftentimes the case with milk, the Holstein being preferable to the Jersey on account of the fact that the latter is too rich in fat. Of course it must not be considered from the foregoing, that the caloric value of a unit weight of milk is equal to that of the avocado. What has been stated is merely to indicate that those varieties of the avocado which are lower in oil content but otherwise acceptable, may be highly desirable.

At the request of some members of the Avocado Association the accompanying set of recipes* were critically tried and the comments and criticisms concerning them are given herewith. A number of persons participated in the testing and among them might be mentioned Miss Josephine E. Davis, Assistant Professor of Household Science at the University, who rendered valuable help in this connection. The discussion of recipes involve the consideration of:

*The recipes referred to here were published in the Report of the First Semi-Annual Meeting of the California Avocado Association pp. 91-93.

1. Palatability.
2. Nutritive Value.
3. Hygienic Value.
4. Esthetic Value.

If a combination is not palatable it matters but little whether the nutritive value is high or low. Again the food value or the nutritive value may be high while the combination may be objectionable hygienically, or esthetically. The latter point deserves the careful attention of all those engaged in the preparation of food for the table.

Avocado Served in the Skin: There does not seem to be any particular reason why the avocado should be served in the skin. By so doing there is obviously a greater percentage of waste than if the fruit were peeled before serving, in which case the entire portion could be eaten while when served in the skin this is impossible.

The consensus of opinion was that the fruit should be served with either lime juice or salt, salt being favored. No one cared for the avocado with sugar or with tomato catsup, and the use of mayonnaise and a French dressing rich in oil was decidedly objected to. The combination of the fruit and mayonnaise is hygienically a bad one in that we have two oily foods—the mayonnaise showing about 95 per cent oil while the avocados average about 20 per cent. Furthermore the strong flavor of the mayonnaise hides the delicate flavor of the avocado while salt brings out the flavor very markedly and it should be said in this connection that the finer the grain of the salt the better. The objection to French dressing rich in oil is practically the same as that made against the mayonnaise. The tomato catsup also was objected to because the strong flavor of the catsup hid that of the fruit.

The riper the fruit the better, and it should not be served too cold.

Avocado on Toast: This, while being relished by some, was preferred by others when modified by Miss Davis as follows:

Remove the pulp from the fruit and mash.

Spread lightly on a triangular piece of thin, hot toast. Sprinkle well with grated Parmesan cheese, add a little salt, a few drops of lemon juice. Paprika is added for flavor and color.

Avocado with Caviar: Objection—caviar too strong.

Avocado Cocktail: Objected to on the same ground as stated with reference to the use of tomato catsup.

Salads

Celery and Nuts: The objection to this combination was the use of mayonnaise and furthermore that celery itself has so strong a flavor as to detract, to a large extent, from that of the avocado.

Apple and Celery: The statements for Celery and Nuts apply here as well.

Combination Salad: It would appear to me that it would be hard work to find the avocado in such a combination and furthermore in view of the high price of the avocado it would seem decidedly undesirable to offer such a salad.

Avocado on the Half Shell: This was not tried but it does not

seem to recommend itself for general use. The egg and the French dressing would tend to disguise the delicate flavor of the fruit.

Cuban Salad: This was not objected to except that the use of sugar was not advised although there may be some who would prefer it.

Onions: The combination of avocado and onions was not advocated under any circumstances.

Aspic Jelly: It has been suggested with reference to this recipe that the following be substituted:

- ½ box gelatine
- ½ c. cold water
- ½ c. boiling water
- ½ c. thick tomato juice
- 1-½ c. diced avocado
- 2 t. of lemon juice

salt, paprika, etc.

Soak gelatin in cold water. Dissolve in boiling water. Strain and add avocado meat and tomato juice. Add seasonings and place on ice to harden. Serve on lettuce leaf.

It will be noticed that this recipe contains tomato juice but this is not tomato catsup.

With Bananas and Apple: There was a divided opinion with reference to the use of apples and bananas. Some liked it but others objected. The banana seeming to overpower the avocado. No French dressing or mayonnaise was used.

Sandwiches

The recipe for sandwiches is good but the use of pepper may be omitted according to some with advantage. A sandwich made of graham crackers, equal weights of fruit and crackers, makes a most inviting and appetizing sandwich. (8 grams of fruit to a sandwich.)

With Chili Pepper: This is objected to on account of the strong flavor of the pepper and the use of onion.

An Original and Delicious Desert: This is objected to because there is too much fat in the whipped cream.

Avocado Ice Cream: It would appear that in view of the high price of the avocado that it would not be profitable in any sense of the word to advocate the use of avocado ice cream. It is doubtful if anyone would be able to detect the flavor of the avocado among the eggs, milk, almond or vanilla extract, etc.

Avocado with Sea Foods: The serving of avocado with salmon or lobster was not relished but the avocado and tuna salad was preferred.

Soups: When the market price of the avocado is lower than at present the use of avocado soup may be advisable but under present conditions it would seem far better from every point of view to use the avocado as such with salt than to detract from its highly delicate flavor by making it into a soup.

It may be stated in summarizing the comments that the avocado served with salt met with more approval and favor than did the avocado served in any other way and personally the writer agrees.

For Invalids: There should be no objection whatever to the use of the avocado for invalids provided fat in the diet is not contra-indicated.

We will be glad to confer with the officials of the Association with the view of revising the suggestions for preparing the avocado for the table.

TABLE I.—SHOWING PERCENTAGE OF OIL IN THE AVOCADO

Varieties Maturing July-December.

Single Sample of Fruit Submitted.

A. KNOWN VARIETIES

Variety	Locality	Condition of fruit	Date	Wght. of fruit grams	Percent of oil
Azusa	Azusa	Badly shrunken	11-19-16	198	21.06
Bartley	Santa Ana	mature	7-31-16	928	13.35
Beauty	Orange	fully ripe	8-21-15	439	15.26
Cardinal	Florida	flesh soft	11- 9-14	587	10.70
Champion	Orange	ripe	8-12-15	524	16.54
Fowler	Pasadena	ripe	11- 2-14	132	21.20
Mattern		ripe	10-22-14	96	25.70
Pomona	Sacramento	fully ripe	10-19-16	80	25.36
Purdy	Whittier	fully ripe	10- 9-16	168	31.60
Purple Prolific	Orange	ripe	8-21-15	219	19.93
Topa Topa	Nordhoff	flesh soft	10-21-14	125	15.48
Trapp	Florida	flesh hard	.....	638	9.80
Ultimate	Orange	flesh soft	8-20-15	290	14.51
White	Santa Barbara	flesh hard	10-26-14	166	14.64

B. SEEDLINGS

Seedling 1	Carpinteria	fully ripe	10-22-14	150	27.89
Seedling 2	Carpinteria	flesh hard	10-22-14	101	15.30
Seedling 3	Carpinteria	flesh soft	10-22-14	125	23.40
Seedling 4	Carpinteria	medium soft	10-22-14	105	20.75
Seedling 5	Carpinteria	medium soft	10-22-14	117	13.00
Seedling 6	Carpinteria	very soft	10-22-14	96	17.20
Seedling	Nordhoff	ripe	10-21-14	223	23.10
Seedling	Whittier	ripe	9-27-15	...	20.07
Seedling	Whittier	ripe	9-27-15	171	20.15
Seedling	Taft	flesh hard	10-15-15	127	17.42
Seedling	Altadena	ripe	9-22-16	123	26.73
Seedling 1	Hollywood	ripe	9-28-16	90	22.13
Seedling 2	Hollywood	ripe	9-28-16	158	21.89
Seedling 3	Hollywood	ripe	9-28-16	88	25.84
Seedling	Whittier	flesh soft	9-29-16	80	18.47
Seedling	Whittier	not very ripe	9-29-16	90	14.74
Seedling	Oroville	ripe	9-30-16	127	24.88
Oval Shape	Riverside	flesh hard	10- 2-16	70	15.46
Pear Shape	Riverside	flesh hard	10- 2-16	68	15.58
Green Lined	Altadena	ripe	10- 6-16	135	23.00
Green Lined	Altadena	fully ripe	10- 6-16	125	25.61
Black Variety	Altadena	flesh hard	10- 6-16	107	14.78

TABLE II.—SHOWING PERCENTAGE OF OIL IN THE AVOCADO

Varieties Maturing July-December.

Two or More Samples of Fruit Submitted

Variety	Locality	Condition of fruit	Date	Wght. of fruit grams	Percent of oil
Blake	Pasadena	ripe	10- 3-14	150	25.50
Blake	Whittier	ripe	10- 4-15	120	21.65
Carton	San Fernando	not ripe	10-15-14	189	15.20
Carton	San Fernando	fully ripe	10-15-14	169	19.50
Carton	Riverside	flesh hard	10-16-16	108	12.76
Chappelow	Monrovia	fully ripe	9-21-14	181	29.10
Chappelow	Monrovia	fully ripe	10-15-14	191	17.68
Chappelow	Altadena	immature	9-24-15	80	14.66
Chappelow	Monrovia	immature	9-24-15	148	13.86
Chappelow	Monrovia	immature	9-24-15	126	16.55
Chappelow	Monrovia	not ripe	9-24-15	145	16.26
Chappelow	Monrovia	ripe	11- 1-15	181	24.43
Chappelow	Monrovia	flesh hard	11- 1-15	103	22.81
Chappelow	Monrovia	fully ripe	11- 1-15	108	27.66
Chappelow	Riverside	flesh hard	10- 2-16	114	20.31
Chappelow	Monrovia	flesh hard	10- 6-16	206	18.29
Chappelow	Monrovia	flesh hard	10-11-16	159	20.28
Condon	Pasadena	ripe	10- 7-15	143	21.00
Condon	Pasadena	ripe	9-28-16	150	23.55
Ganter	Whittier	ripe	1- 3-13	205	25.60
Ganter	Whittier	immature	9-27-16	196	16.48
Harman	Sherman	ripe	10-10-13	235	19.33
Harman	Sherman	ripe	10-26-14	263	18.30
Harman	Sherman	flesh soft	9-28-15	127	15.25
Harman	Sherman	flesh soft	9-28-15	136	15.34
Harman	Sherman	ripe	9-28-15	170	16.26
Harman	Sherman	ripe	11- 8-15	134	21.51
Harman	Sherman	ripe	11- 9-16	215	18.68
Harman	Sherman	ripe	11- 9-16	143	19.18
Northrop	Altadena	ripe	10-23-14	218	27.60
Northrop	Santa Ana	ripe	11- 6-14	163	23.00
Sharpless	Santa Ana	flesh soft	9-13-15	555	15.87
Sharpless	Santa Ana	not ripe	8-17-14	471	15.73
Taft	Orange	flesh soft	8-11-15	626	18.54
Taft	Orange	not ripe	9-13-15	639	16.39
Taft	Orange	ripe	10-20-16	417	14.67

TABLE III.—SHOWING PERCENTAGE OF OIL IN THE AVOCADO
Varieties Maturing January-June.

Variety	Locality	Condition of fruit	Date	Wght. of fruit grams	Percent of oil
Blakeman	Altadena	Fully ripe	5-14-15	472	17.27
Blakeman	Altadena	Fully ripe	6-11-15	454	15.43
Brodia	Orange	ripe	5- 4-15	405	10.86
Challenge	Hollywood	not ripe	2-25-15	512	9.48
Challenge	Hollywood	immature	1-11-16	602	2.66
Challenge	Hollywood	immature	2- 2-16	...	6.71
Challenge	Hollywood	immature	4-13-16	470	7.75
Challenge	Hollywood	immature	4-13-16	426	5.78
Challenge	Hollywood	not fully ripe	7-19-16	669	16.37
Dickey	Hollywood	immature	3- 1-15	363	16.46
Knowles	Santa Barbara	fully ripe	3- 2-15	100	27.11
Lyon	Hollywood	flesh hard	5-24-15	453	16.31
Lambert	Hollywood	flesh hard	3-14-16	285	14.31
Miller	Hollywood	ripe	7- 6-14	184	23.70
Miller	Pasadena	ripe	11- 2-15	275	27.45
Rhod	Orange	immature	5- 3-15	395	9.78
Rita	Orange	immature	5- 3-15	321	14.13
Royal	Hollywood	flesh hard	3-27-15	600	15.61
Senor	Orange	flesh hard	5- 3-15	528	17.00
Solano	Hollywood	immature	3- 2-15	506	3.61
Solano	Hollywood	immature	3-27-15	545	4.09
Surprise	Hollywood	flesh soft	3-14-16	537	9.96
Wagner*	Hollywood	flesh hard	10- 7-15	259	16.03
Walker*	Sherman	flesh hard	8-10-14	174	18.71

*Mature, May-August.

THE DIGESTIBILITY OF THE FAT OF THE AVOCADO

By H. A. Mattill, University of California.

With the increasing importance and more general use of the avocado, it seemed desirable to know something as to its actual food value and the digestibility of its most important constituent. As is the usual procedure in such work, an individual who is well and normal is given a diet of known composition and the solid excreta (feces) are properly collected and analyzed.

In this experiment the basal diet consisted of graham crackers, cottage cheese and milk, to which was added on some days 25 grams of butter per meal, on others 100 grams of avocado per meal. In the preparation of the avocado the fruits were peeled and ground to a uniform pulp which was spread upon crackers like butter.

The periods of avocado and butter diet varied in length from 2 to 4 days and the feces resulting from each diet were separated from those of the preceding and following diets by charcoal pills taken at the beginning of each period. Fat was determined by the Saxon method on the fresh samples without previous drying.

Following is a summary of the data on fat ingestion and excretion:

1	2	3	4	5*	6
Days	Diet	Fat ingested (grams)	Fat excreted (grams)	Fat absorbed (grams)	Digestibility (5/3x100) (per cent)

SUBJECT I.

1-2	Butter	298.7	20.0	278.7	93.30
3-4	Butter	325.4	21.8	303.6	93.30
5-6	Avocado	292.6	16.8	275.8	94.25
7-9	Avocado	521.9	32.7	489.2	93.77
10-11	Butter	325.4	16.7	308.7	94.89
12-15	Avocado	610.7	42.2	568.5	93.09
16-17	Butter	314.5	19.9	294.6	93.65
	Average digestibility of fat on butter diet				93.80
	Average digestibility of fat on avocado diet				93.70

SUBJECT II.

1-2	Butter	313.4	22.8	290.6	92.73
3-4	Avocado	280.6	30.5	250.1	89.13

*equals 3-4.

The coefficients of digestibility have been calculated in the usual way on the assumption that the fat of the feces represents unabsorbed food fat. This assumption can not be held as valid for several reasons:

- (1) The feces of a fasting animal contain fat.
- (2) On a diet free from cellulose the amounts of fat in the food may vary considerably without a proportionate variation in the feces fat.
- (3) In the present experiment the feces fat during the avocado periods was not of the consistency of avocado oil but differed not at all in general appearance from the feces fat of the butter periods. (This point is still under investigation).

But, even though the fat of the feces is not unabsorbed food fat, it may nevertheless be said that its amount is influenced by the quality and quantity of the diet, and that the difference between feces fat and food fat represents the net intake of fat by the organism on the given diet.

From the table the percentage utilization, or digestibility of the fat on the butter and avocado diets may be seen: in Subject I an average of 93.80 per cent for butter fat as against 93.70 per cent for the avocado; in Subject II 92.73 per cent and 89.13 per cent respectively. In a paper published recently (Bull. 310, U. S. Dept. of Agriculture, Nov. 1915) Langworthy and Holmes show that the digestibility of butter fat in their subjects varied from 90.9 per cent to 96.3 per cent with an average of 93.9 per cent, and since the value obtained on the present subject is 93.8 per cent it may rightfully be concluded that the fat digestion of this individual at the time was very near the average and that the digestibility of avocado fat is on a par with that of butter fat.

The single 4-day experiment on Subject II is of less value than the several and continued tests made on Subject I, but from the data of Subject II it would be concluded that the digestibility of avocado fat was not below that of beef fat, a value of 89 per cent being found by Langworthy and Holmes for this fat.

The above mentioned investigators find that of the fats tested (butter, lard, beef fat and mutton fat) those of low melting points are

capable of more complete assimilation than those which have a high melting point. It is highly probable that the melting point is not the only criterion of digestibility but the low melting point of avocado oil undoubtedly favors its utilization. Other factors which must also favor its utilization are its finely emulsified condition in the fruit (suggesting milk) and the relative absence in the fruit of hard and resistant fibre (as in nuts) because of which fat is rendered less accessible to the digestive secretions.

METHODS OF AVOCADO GROWING IN THE TROPICS APPLICABLE TO CALIFORNIA

E. E. Knight, Yorba Linda, California.

Methods employed in one country are not always applicable in another, still they offer many suggestions worthy of trial.

Having passed practically all my life in the tropics I am more familiar with those countries than with California. In my own planting of the avocado I am trying to reproduce as nearly as possible, the



Figure 8.—Avocado tree in Guatemala from which buds of the "Linda" were taken.

same conditions under which the best fruit is grown there, in the former place.

I know that some of my methods of growing avocados are not yet accepted by most growers; but we must each work along the lines that we believe best, and ultimately out of all of our experience develop that which gives the best results.

Avocados grow over a far greater range of climate than most avocado growers imagine; but like many other kinds of fruit, those with the best flavor are always found in a cool climate. In the extremely cold climates where the avocado grows, Nature has covered the fruit with a thick and unyielding shell to protect it from the cold. This makes it impossible to tell when such a fruit is ripe; therefore it is useless as a commercial proposition. But as the elevation drops and the climate becomes warmer, the shell becomes less rigid and there are found the best of the hard-shelled varieties which give promise of being of great importance to the avocado industry in California. I have never known a first class avocado to be produced in a hot, damp climate. Whatever success Florida will have in growing the hard shell variety remains to be seen. I have shipped a number of my hard-shelled varieties there and am waiting the results. In Guatemala, the avocado flourishes where the orange will not grow on account of frost. I believe avocado culture will ultimately extend over a much larger area in California than is now believed possible.

Seedlings.—All avocados in the tropics are seedlings; therefore each tree produces a variety all its own. The avocado has more varieties along all lines than almost any other fruit that I know. There are only two qualities which are always reproduced in a seedling and these are hardness and type of skin. For instance, a seedling of a thick-skin variety will always produce thick-skin fruit; a seedling of a thin-skin variety will always bear thin-skin fruit; or a seedling of a hard-shell will always bear hard-shell fruit. Other qualities, such as color, flavor, size, etc. are never constant in the reproduction through seeds. It is a rare exception, that a seedling is found to have all the qualities in fruit and tree which tend to make it a desirable commercial proposition. This is true even where the avocado trees are very numerous. The varieties now found here in California average fully as well, if not better, than the average trees do in the tropics. This, to me, is a proof that we can grow as good avocados here as anywhere else in the world, when we have eliminated the undesirable varieties and concentrated upon the best ones.

Varieties.—There is a misunderstanding in California concerning the classification of varieties that ought to be rectified as soon as possible. There are four general heads under which all avocados known in California may be classified. These are: 1, thin-skin; 2, West Indian; 3, thick-skin; 4, hard-shell. The first two classes seem to be fairly well known, but the last two, the thick-skin and the hard-shell are constantly confused or classed as one group. This error should be corrected at once, for if it is allowed to grow, it will be almost impossible to rectify it later on. It is as easy to distinguish a thick-skin from a hard-shell as it is

to tell the difference between a thin-skin and a thick-skin. A thin skin will not peel because there is no clearance between the skin and the meat. A thick-skin always peels. A hard-shell never peels. The



Picture Taken Oct. 1, 1915

Picture Taken Aug. 6, 1916

Figure 9.—Growth of tree of the Rey Avocado; budded July 6, 1914; transplanted March 10, 1915.

meat and skin of a hard-shell are always differentiated but the shell will not bend, it breaks. The hard-shell also has a distinct way of putting out its flowers.

Soil.—The best fruit I have found in the tropics grows in the coffee fields where the land is only hoed about three times per year, never plowed nor cultivated deeply. The avocado does best on a rich heavy soil with plenty of humus and leaf mold. Some of the best fruit I ever saw were grown on red clay and adobe. The ground should be shaded as much as possible. I believe that there is more danger in over-fertilization than there is in under-fertilization.

Water and Cultivation.—Most avocado growers use too little water. Some use too much at one time, and still others do not irrigate often enough. Ninety per cent of these fruits in the tropics flower and grow during the wet season and ripen during the dry season. The land should be kept damp, but not wet, where there is no danger of souring the soil.

Cultivation is bad for several reasons:

First: The taproot of an avocado tree practically stops growing after the first year, or as soon as the side roots begin to grow, and if the ground is soggy with water, the trees easily lean with the wind.

Second: Root pruning is harmful to the tree.

Third: I have never seen an avocado tree attacked by pests when the ground was hard around it.



Picture Taken Oct. 1, 1915
 Figure 10.—Growth of tree of the Queen avocado; budded July 2, 1914; transplanted March 10, 1915.

Picture Taken Aug. 6, 1916

To me the most important methods to follow are:

First: To keep the soil damp not wet with frequent irrigations.

Second: Not to cultivate in such a manner as to disturb the roots, or, better still use a permanent low cover crop or mulch.

Third: To pinch back frequently the lower branches so as to promote growth of the upper ones. Eventually to remove the lower limbs, so that when the tree is ten or fifteen years old the lowest branch will be at least three feet from the ground.

FRUITING HABITS OF BUDDED TREES OF THE DIFFERENT AVOCADO VARIETIES

By T. U. Barber, Puente, California.

Fruiting records and the different growth characteristics of budded avocado trees planted throughout California are of considerable importance to the growers. Through careful study of such records and the consequent selection of varieties, the value of future plantings can be greatly increased.

Varieties such as Dickey, Royal, Murrieta, and Colorado will be eliminated as the records will show that over seventy-five per cent of the budded trees have died within two years and that only a very few of the remaining trees are in a healthy condition.

As time passes, it is quite probable that certain varieties will be shown to be far better suited to one district than to another, and also that the season of fruiting may change one or more months. Such facts as these are all necessary to the best development of the industry.

Up to the present time, only a comparatively small number of

trees have come into bearing, but the next few years will show a tremendous increase.

To obtain the greatest benefit from such work, it is absolutely essential that the growers cooperate with the Association by sending in each season, the complete records from their trees. Do not wait for a request from the main office, but send what information you have at once and keep it up. The Association is called upon constantly for information regarding varieties, and it is impossible to give an intelligent up-to-date answer unless complete records are before them.

From the notes which I have made during the past two months, the following list shows the varieties of budded trees which are fruiting and the age that they started to bear:

Local Thick Skin Varieties.

Blakeman	3 years
Challenge	3 years
Dickinson	3 years
Lyon	2 years
Miller	5 years
Sharpless	2 years

(top worked tree on 12-year root).

Imported Varieties

Fuerte	2 years
Grande	2-3 years
Merito	4 years
Perfecto	3 years
Sinaloa	3 years

(top worked on 10-year root).

Thin Skin Varieties.

Azusa	2 years
Carton	3 years
Chappelow	3 years
Ganter	3 years
Northrop	2-3 years
Harman	3 years

Different Characteristics of Growth

I am sure most of us did not realize when we planted our first budded trees, that there would be such a marked difference in their growth. In nearly all cases, the originals were seven or eight years old before our attention was attracted to them by their first fruits, and at this age were so large and well covered with foliage, that few opinions were formed.

We have several distinct types—the tall, slender, sentinel trees like the Lyon which could be planted as close as fifteen feet and have plenty of room for many years of growth; the trees of long branched open growth as the Blakeman and Meserve, and those of wide spreading, heavy growth so well represented by the Taft. There are many

other individual characteristics, the examples given being merely representative.

In pruning to form a proper frame work, these traits must all be taken into consideration. One variety will need heavy pruning to hold back the tall growth, while another may have to be constantly checked to keep it from producing long willow-like branches that will droop to the ground. We hear of varieties being impossible on account of their growth. This may be so in extreme cases, but beautifully shaped and well balanced trees can be found in nearly every variety. The avocado requires attention just as any other orchard tree, if we desire to produce a frame which is resistant to wind, well formed to hold a large crop and to give the greatest possible bearing surface. For example the Blake-man, if allowed to follow its natural habit, will be irregular, long branched and exposed to sunburn. When the branches are about two feet in length, they should be cut back to three good buds, leaving about 18 inches of limb. This pruning will usually send out two well spaced branches and these in turn can be headed, resulting in a strong framework well protected by its foliage and having a bearing surface three times as large as an unpruned tree.

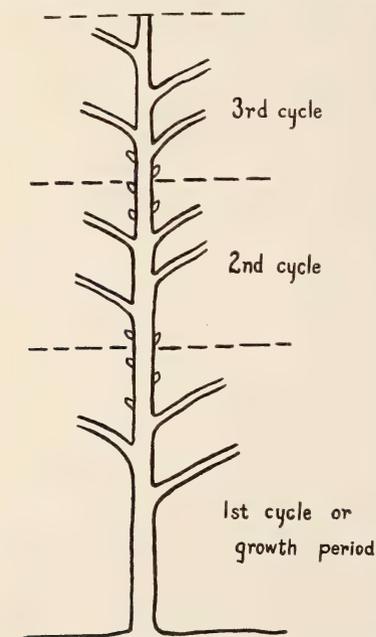


Figure 11. — Diagrammatic sketch, showing general type of desirable growth and growth periods in young avocado tree. Discussed by Mr. Barber under methods of pruning and heading.

In some varieties, it is absolutely necessary to top the young bud and force branching at the proper height. When this is done, care should be used to select an undeveloped bud and not one which has started to form a limb. If a limb bud is chosen, the terminal growth is entirely stopped, and the center of the tree exposed to sunburn. Much of the preliminary pruning should be done in the nursery or at the time the trees are balled for transplanting to the orchard. Trees properly pruned with well spaced branches forming a head from 20 to 30 inches above the bud, will need no further attention until a full season's growth has been made.

I desire to mention a question of importance pertaining to the bearing surface of our orchard trees—to what height should we allow the tree to grow before completely checking the terminal growth? The tree produces a series of limbs or what is called a cycle of growth or growth period, then we find six to a dozen dormant buds followed by another series of limbs and so on. (Fig. 11). Our frame work

can be built from one or more of these series of branches. My investi-

gations lead me to believe we must choose between two and three, yet I am not willing to pass final judgment until the trees become older and carry a full crop of fruit.

Irrigation and Fertilization of Fruiting Trees.

Records have so far shown that the avocado requires irrigation every two weeks until it is three years of age under average conditions, when the root system has become large enough to carry the tree in good growing condition on the usual monthly irrigation basis. The older fruiting trees appear to be producing satisfactorily under citrus irrigation methods.

Fertilization, as related to budded trees, is a question of the future, but I feel sure the avocado will respond well to a liberal supply.

Variation in Bloom.

As in nearly all fruit trees, we have a marked variation in bloom in the avocado; some produce a large amount the very first season, others will grow for several years without showing a single blossom, and still others will gradually increase from a small showing to a sufficient amount to produce a normal crop of fruit. The last condition is by far the most desirable, as the strength of the tree is not affected nor do we have the trouble of thinning our fruit. Some varieties have bloomed so abundantly that the entire foliage has been caused to drop—namely, the Walker and the Lyon. Certainly this draws heavily upon the reserve energy. Perhaps this can be controlled to some extent by pruning, although I have not heard of any experiments along this line. It appears to me, especially in the thick-skinned varieties, that trees which bloom moderately are showing the largest and most vigorous growth.

Fruit Setting.

It is not unnatural that we should be anxious to see our trees come into bearing, or wonder why they do not set fruit after blooming and why the fruit drops after having started to develop. In most cases this is the way Nature protects the young trees. We must allow the stock to become mature before it bears any great quantity of fruit. In fact, I believe varieties which scarcely bloom at all until three years of age, will in the end become our largest and most consistent producers.

The beautiful experimental orchard of Mr. Joseph Sexton at Goleta will prove of great interest to any avocado grower who finds time to visit it. The trees are from one to five years of age, and this season eighteen varieties have set fruit, which is a wonderful example of the avocado's adaptability to the Santa Barbara district.

At Monrovia, we have another fine grove which shows the constant and careful attention of one of our members, Mr. Thomas H. Shedden. This grove is but two and a half years of age, yet Mr. Shedden has an exhibit at this meeting of twelve varieties of fruit and several more are bearing, which have not reached sufficient maturity to display.

Mr. J. T. Whedon has a five acre planting at Yorba Linda, which contains a remarkable showing of the Fuerte, an imported variety, and

many others. In this orchard is the most healthy tree of the Dickey variety that I have ever seen. It is excellent in form, vigorous of growth, and at present carries a crop of 80 fruits. This variety, as many of us know, is almost impossible to grow because of an undetermined trouble which usually kills the budded tree during the first two years of its growth. It may be well to state that the Murrieta, Royal and Dickey have produced very unhealthy growth in Florida, and in most cases have finally died. Other plantings showing interesting growth are those of Mr. H. M. Haldeman, Beverly Hills, Mrs. J. T. Stewart, San Fernando, and Judge Charles Silent of Glendora, who has the best demonstration of the Dickinson variety. Mr. Wm. A. Spinks of Duarte, has more interesting new varieties fruiting than any other grower in California besides most of the varieties of local origin. Mr. Spinks also has fruiting, the only budded Florida or Hawaiian trees that have so far come into fruit in California. Among these is one specimen of the Trapp. The West India Gardens; Mr. C. P. Taft of Orange and Mr. C. E. Utt of Tustin all have important demonstrations.

In a recent letter, Mr. Geo. B. Cellon of Florida states that they have fruiting this season on top worked trees the Sinaloa, Schmidt, Grande and Fuerte. It is his expectation that these will mature several months earlier than in California. This question of season is an important one. It seems as though some of the California fruits have been picked before they were entirely mature. For instance, the Dickinson variety has always been picked during April and May until this season, when the crop of 450 fruits from the original tree was marketed through the months of July, August and September, and those picked during the latter part of September were delightfully rich in flavor and in perfect condition. Those on exhibition today are the very last of the crop and have been in cold storage since October first. Another change of season is that of the Sharpless. Mr. Sharpless picked nearly all his fruits last year before October first—today, October 31, 1916, he still has about half the crop of 700 fruits on the tree and hopes to hold some for the Christmas trade.

Seldom in the history of fruit growing, if at all, do we find any branch of that important industry fortunate enough to possess a cooperative association of growers to guide its development through the early and experimental years, as is found in the California Avocado Association. We are indeed favored to have the assistance and guidance of so many scientific and practical people as those who are to be found among our members.

In closing I must call your attention again to the valuable opportunity which we have through our Association to collect, compare and finally disseminate through our publications and semi-annual meetings authoritative information covering every stage of this interesting branch of fruit growing.

Let every grower do his small part by keeping correct records covering the behavior of his trees, such as fruiting and growth habits, pruning, frost and wind resistance and the results of general cultivation methods and help to increase the essential knowledge by sending this

data regularly to the California Avocado Association, care of The Citrus Experiment Station, Riverside.

THE AVOCADO IN SOUTHERN CALIFORNIA.

Joseph, Sexton, Goleta, California.

I have not had as much experience as some with the avocado. My oldest trees are five summers' growth. I have a small experimental orchard of over ninety varieties.

I have nearly all of the good and some of the poor varieties that have originated in Southern California. I have secured a great many of the Mexican varieties that have been imported by different parties from Mexico, also the best varieties imported from Guatemala, and fifteen varieties of those they consider best in the Hawaiian Islands. Some say that it is foolish to try things from the Islands. My oldest tree is three summers' growth, and so far it grows as well and stands the winter as well, as any in the orchard. It has not bloomed yet, but there is plenty of time for that.

My trees are from all climes and we must not expect them all to grow and thrive in Southern California. That is why I am experimenting. Some are dwarf and others rapid growers in their native places, and we should expect the same here.

Difference in Growth of Varieties.—Now let me give a few illustrations to show you how the varieties from different sections differ in growth. I have a Mexican variety, the Atlixco, planted in the spring of 1913, that measures 18 feet 4 inches high, and has a 13 foot spread of branches.

Twenty feet from the Atlixco, planted the same day, is a Florida Trapp, measuring 5 feet 6 inches high, and with a spread of 6 feet.

Twenty feet from the Trapp in the same row is a Taft, one year younger than the Trapp, measuring in height 9 feet and with a spread of 10 feet.

Eighty feet from the Atlixco, in the same row, and planted the same day is the Mexican variety, Redondo, measuring 3 feet high with a 2 foot 6 inch spread of branches. This tree looks as though it wanted to grow, but makes poor progress. Later I think I will give it a change of climate. I have heard the Redondo spoken of as a good grower in some sections.

Needed Experiments.—If we experiment with many varieties, and throw out those that do not grow satisfactorily, then later throw those out that do not produce a good quality of fruit, we shall soon have fewer varieties and fruit of a better quality.

Another experiment we want to work on is the season of ripening. After getting a good quality of fruit, then select those that ripen the fruit early, medium and late. I believe if this is followed up we can have fruit on the table every day in the year. I have seventeen different varieties of budded avocados fruiting this year, and some of these for the first time. There are several others of the younger trees that bloomed but dropped their fruit when small, and some that never set. Some of my oldest trees have bloomed every year since they

have been old enough but have never set a fruit. I hope they will change this habit when they get older.

Varieties that are hard to handle.—We have about one hundred and twenty-five or more varieties in the state, and one-fourth of that number would be plenty. We can carry a larger number of varieties of the Mexican type as they will be for home use and local trade, but when it comes to the commercial varieties I believe we should have but few varieties. Some markets prefer the black, others the green colored fruit. I think that the size and shape are the most important fruit characters. Fruit weighing from three-fourths of a pound to one and a half pounds, would be a good size; round, or if not round, the nearer the better; and firm in seed. At Honolulu some think the loose seed the better fruit. In examining the fruit, they first take it up and shake it, and the looser the seed the better they consider the fruit.

As soon as our varieties imported from Mexico commence to fruit, it will be interesting to see how they will do in this climate, and when we have imported all of the varieties from other countries, we shall, I hope be able to show fruit far superior to any now cultivated in California.

Pruning.—At the last meeting I attended, the majority of the members favored light or no pruning for the avocado. I was hoping that I could attend this meeting to get some instructions on pruning. I have formed my tops low, and a great many of the limbs are resting on the ground. The time to prune is another question I shall experiment on in the spring. I prefer that time to the fall. If done in the fall, pruning might force the sap out and start fresh growth for the frost. In the spring I will cut the bottom limbs off so the air can circulate under the tree; then thin the top so the air and light can pass through.

The Taft is about as difficult a tree to handle as any variety I have experimented with. I experimented on some last spring, taking off considerable brush, but they do not show it now. Another difficulty with the Taft is, it is a tree that wants watching to keep a head or leader. You tie up a branch that looks the best, for a leader, and in a few weeks there is another that has grown faster and looks as though it would be a better limb for the purpose. I will keep on trying and if my bamboo holds out, I believe I shall succeed. If this is not attended to and such a leader formed, you will have a fork in your tree that will split down and spoil the tree.

New varieties.—I have shipped from Hawaii several hundred seed of the best avocado fruit they produce there and have distributed these from San Diego to Santa Barbara in tropical places in the hope of getting some good new varieties. This year I have budded a few of the best of these varieties, and shall distribute them to those that will give them good care, and I hope we shall find some varieties that will be superior to our best.

HISTORY OF THE AVOCADO AND ITS VARIETIES IN CALIFORNIA WITH A CHECK LIST OF ALL NAMED VARIETIES

Ira J. Condit, College of Agriculture, Berkeley, California.

The first reference to the introduction of avocado trees into California which we have been able to find is in the Report of the Visiting Committee of the California State Agricultural Society for 1856. The committee visited the place of Dr. Thomas J. White near San Gabriel on September 4, and reported as follows: "Dr. White has imported from Nicaragua a variety of choice tropical fruits including the sapota, the Aguacate or Butter Fruit, and the Mango." With what success these plants were cultivated has not been learned.

The early history of the avocado in California is so well described by Dr. F. Franceschi that I wish to quote the following paragraphs from his pen:

"Just like the aboved named Mexican fruit trees, also the Ahuacate was first planted at Santa Barbara, but many years later, that is in 1871, when three plants were brought from Mexico by the late Judge R. B. Ord, who brought also the first Cherimoyas. One of these trees died in infancy; the other two were very large and thrifty when I came to Santa Barbara twenty years ago. Both have unfortunately disappeared, the tallest and finest bearing fruits of good quality, dying probably on account of the ground being too shallow and dry at the place called "Las Palmas," in the upper part of Montecito; the other, which was branched low and much spreading, with very small and poor fruits, located on De La Vina Street, in Santa Barbara, was cut down some fourteen years ago to make room for a new building.

"In 1892, when I lived in Los Angeles, there was only one good sized Ahuacate in all that neighborhood, and precisely at the Jacob Miller place, where stands now beautiful Hollywood. This had been brought from Guatemala, towards 1880 I believe, together with many other rare and interesting trees, and is still extant and thriving. Seedlings from this tree are among the most promising of those which attract the attention of Ahuacate growers in California.

"At Los Angeles the first person to give an efficient impulse to the growing of Ahuacates, as well as other kinds of tropical or semi-tropical fruits in the early nineties, was Mr. J. C. Harvey, a Canadian by birth, and during some years agent of the Standard Oil Company in Southern California. It was Mr. Harvey who raised the very remarkable Ahuacate trees now to be seen at Mrs. Buddington's place on College Street, and in Elysian Park, together with a numberless host of choice and beautiful plants scattered all over the country.

"The first orchard of Ahuacates ever planted in California was started by the late Kinton Stevens, along Palm Avenue in Montecito. Mr. Stevens was an Englishman full of energy and enterprise, who had also been the first in California to issue a catalogue of tropical and semi-tropical plants. His orchard was set out in 1895 and comprised about 120 trees, all Mexican seedlings, which in a few years grew to consider-

able size. Most unfortunately Mr. Stevens died in 1897, and then a series of dry years came on when water was very scarce in Montecito, and a great acreage of lemons were grubbed out, as absolutely unprofitable and alas! the pioneer Ahuacate orchard of California had to share their unlucky fate.

"The "White" Ahuacate, to be seen on West Arrellaga Street, Santa Barbara, which has proved to be such a prolific bearer, was raised by me from Mexican seed in 1895. A few grafted plants and a large number of seedlings from this tree were distributed under the name of "Santa Barbara Early."

"It was also about 1895 that I obtained from Chile a few seeds of "Paltita", as a very hardy form or variety is called there, with small fruits, but of good quality. Most of the plants I raised went abroad, and in this country I know only of one large specimen, on the Nordhoff place at Redlands, which has proved to be much hardier than any other."

Judging from this account by Dr. Franceschi it appears that the older trees planted in Santa Barbara have passed out of existence and that the White tree which he raised in 1895 is the oldest in that city. The tree on the Jacob Miller place, Hollywood, to which reference is made, is probably the Miller, but the year 1886 is now commonly accepted as the date when the tree was planted. This seems to make the Miller tree the oldest by several years of any avocado tree in California. The Chapelow tree was planted in 1893, and the White in 1895.

In 1897 Dr. Franceschi wrote that the last two years had seen a considerable increase in the plantings, several hundred trees having been set out chiefly at Santa Barbara, Los Angeles, and San Diego. Fruits were not exactly marketed but many more people, residents and tourists had opportunity of tasting the delicious fruit.

Mr. C. P. Taft of Orange planted the first avocado seed on his place about 1899 from a specimen obtained on the market. The resulting tree proved a poor bearer of almost worthless fruit. The next year another seed obtained in the same way was planted and later the seedling bore excellent fruits. In 1902-3 more seeds were planted; these were partly from Los Angeles trees but most were from Mexican fruit sent to private parties in Los Angeles. From the seeds planted during the four years, he had in 1912 thirty trees over eight years old in addition to over three hundred younger trees. Twenty-four of the thirty trees had borne fruit and only one or two seemed likely to prove unprofitable. Eight were of the thin-skinned type while the others were of the thick-skinned.

In the spring of 1908, Mr. E. S. Thacher planted his first avocado trees at Nordhoff. Most of them were bought from the Exotic Nurseries of Santa Barbara but some were obtained from Mr. Taft and Mr. Camfield of Orange. The same spring he bought some seed from the American Fruit and Produce Company of Mexico City and it was from this lot of seed that trees were sold to W. G. Davison of La Habra in 1910. All of the first seeds planted by Mr. Thacher were of the Mexican thin-skinned type.

The trees planted by Mr. Davison grew thriftily in the location selected at "Orchard Dale" near Whittier and La Habra, a region that had always been practically frostless until the winter of 1912-13 when they were severely frosted. Mrs. Davison did not care to replace the trees that were most damaged and sold the entire lot to D. E. Clower who moved them to his nursery in Monrovia. Mr. Clower budded ten thousand seedling avocado trees as early as 1909. In 1910 Mr. Clower published what was probably the first descriptive nursery pamphlet of budded trees in California.

Mr. F. O. Popenoe of the West India Gardens, Altadena, began propagating the avocado a number of years ago and, realizing the need of good varieties, imported budwood from Mexico in 1911 and 1912.

The first lot of buds was sent by J. M. Goulding now living at Paso Robles. Afterwards Mr. C. B. Schmidt was sent down to collect budwood, and more trees were propagated from the buds he secured than from the others. Later, budwood was secured from parties in Mexico, namely Roberto Johnson of Jalisco and F. S. Furnival of Guadalajara. Twenty-seven varieties in all were successfully established here from these introductions.

Mr. W. A. Spinks of Duarte began planting avocado trees about 1907 and produced budded trees in 1908. He has tested out a large number of seedlings as well as budded trees of California and imported varieties. The fruiting habits of such varieties as the Buddington, Murrieta, Colorado, Ferry, Harman, Ganter, Chappelow, and others were ascertained by Mr. Spinks by budding them into larger seedlings.

Mr. Sexton of Goleta planted out a few avocado trees several years ago and has since gathered together a large number of varieties for testing under similar conditions. In 1916 he had about ninety-two distinct varieties representing types from Mexico, Guatemala, Florida, and Hawaii as well as from California. Seventeen have already fruited.

I have been unable to ascertain where and when the first budded avocado trees were produced in this state, but Dr. Franceschi probably deserves this credit.

The number of varieties of distinctively California origin which I have listed is fifty-four; those of foreign origin number eighty-six, a total of named varieties of one hundred and forty.

California seedlings are fruiting and varieties are being obtained elsewhere in such numbers every season that the list is likely to be considerably lengthened. Many local seedlings are undoubtedly as good and some are much better than several of the varieties already named. It is unwise to give names to seedlings which appear here and there until they prove themselves superior to established varieties of the same type. This superiority may manifest itself in productiveness, hardiness, or resistance of the tree to soil conditions or disease, or quality and flavor of the fruit.

While some may think it best to omit from the list and forget the names of certain varieties previously described, it is true that many trees under these names have been planted along the coast and throughout the interior valleys of the state where they may prove to have

qualities which show them worthy of further propagation, especially as home fruits. It will be at least several years before they can be eliminated from the variety list in untested localities.

The names of varieties follow in alphabetical order, the abbreviations after each being Guat. for Guatemalan type; Mex. for Mexican; and W. I. for West Indian.

Alto. (Guat.)

Introduced as budwood in 1911 by the West India Gardens under No. 28 from Atlixco, Puebla, Mexico. Described by K. A. Ryerson in Pomona College Journal of Economic Botany for Feb. 1913.

Ameca. (Guat.)

Introduced as budwood in 1912 by the West India Gardens under the name Furnival No. 1, from Ameca Valley, Jalisco, Mexico. Described under the latter name by Ryerson in the Pomona College Journal for Feb. 1913.

Atlixco. (Guat.)

Introduced as budwood in 1911 by the West India Gardens under number 29 from Atlixco, Puebla, Mexico. First described by K. A. Ryerson in the Pomona College Journal of Economic Botany for February, 1913.

Azusa. (Mex.)

Original tree at Azusa in the dooryard of Mrs. Henry Roberts. Budded trees bearing in 1916. Described by F. O. Popenoe in these Proceedings for Oct. 23, 1915.

Baldwin. (W. I.)

A Florida variety described by P. H. Rolfs in 1905 under S. P. I. No. 12933* and included in the descriptions by F. W. Popenoe in the Pomona Journal for February, 1911. Named for Mr. Baldwin of Miami, Florida, who owns the original tree.

Bartley. (Guat.)

Original tree growing on place now owned by Bartley Bros., Santa Ana, R. D., the same place on which the original Northrop tree stands and adjoining the place on which the Sharpless and Monroe varieties originated. The tree was planted about 1907 by J. H. Northrop now of Indio, who formerly owned the place.

The tree bore thirty-six fruits in 1916 and specimens were exhibited at the Association meeting in Los Angeles in April. Since the description of the fruit has not appeared previously in these Proceedings, it is here given: fruit very large, 6 inches long, 4½ inches in diameter and 32 ounces in weight. Color, deep green; surface, dull, rather rough; skin, thick, granular. Flesh, creamy, thick, buttery, of excellent flavor and very slight fiber. Seed, tight in cavity, roundish, tapering toward the apex, 2¼ inches each way, with two seed coats adhering to the seed. Season at Santa Ana, May 15 to July 1.

Bartlett. (W. I.)

A Cuban variety described under S. P. I. No. 40978.

Beauty. (Guat.)

*S. P. I. refers to the Seed and Plant Introduction, U. S. Department of Agriculture, Washington. D. C.

Original tree on place of C. P. Taft of Orange; seed planted by him in 1902; the latest of all Mr. Taft's varieties to mature, coming from June to October. First described by F. O. Popenoe in these Proceedings for October 23, 1915.

Blackman. (W. I.)

A Florida variety described by P. J. Wester and included by F. W. Popenoe in the descriptions in Pomona Journal for February, 1911.

Blake. (Mex.)

Original tree growing at 389 South Fair Oaks Ave., Pasadena; planted about 1903; first described by F. W. Popenoe in Pomona Journal for February, 1911. Budded trees now bearing in many localities, some in the San Joaquin Valley; reported to have matured three distinct crops at Goleta in 1914-15. No longer being propagated in any quantity. Fruit very susceptible to decay organisms while still on tree.

Blakeman. (Guat.)

Variety originated from the seeds of avocado brought by John Murrieta or received by him from his brother near Atlixco, Mexico. He gave some seeds to Mr. Habersham, then residing at the head of La Brea Street in Hollywood, who planted them in 1904. The place is now owned by E. W. Dickey. In 1913 the production was a few fruits; in 1914, from 25 to 50 fruits; in 1915, about 250; and in 1916, good crop. The variety was first described by Ryerson in the Journal of Agriculture for November, 1913, under the name of Dickey No. 2. It has also been known as Habersham.

Brodia. (Guat.)

Original tree on place of C. P. Taft of Orange; seed planted by him about 1902. When first tasted the flavor of the fruit had a fancied resemblance to that of an onion, hence the name Brodia, a native wild flower, sometimes but incorrectly known as wild onion. Tree severely frosted in 1912-13. Fruits produced at Orange in 1916 on large top-worked seedling. First described by F. O. Popenoe in these Proceedings for October 23, 1915.

Buddington. (Guat.)

Original tree on place of Mrs. Buddington, 776 New Depot Street, Los Angeles. No description of fruit published.

Butler. (W. I.)

A summer ripening variety being extensively propagated by U. S. D. A. at Miami, Florida, under S. P. I. No. 26690. A tree is fruiting this season at Mr. Spink's place, Duarte, under this S. P. I. number.

Canto. (Guat.)

Introduced as budwood in 1911 from Atlixco, Puebla, Mexico by West India Gardens under No. 25. Described by Ryerson in the Pomona Journal for February, 1913.

Canyada.

Introduced as budwood in 1911 from Canyada, Queretaro, Mexico, under No. 9, First described by Ryerson in the Pomona Journal for February, 1913. One fruit set on a budded tree at Altadena in 1916.

Cardinal. (W. I.)

A Florida variety described by P. J. Wester; foliage exceptionally

handsome, being crimson when young, hence the variety name. Introduced into California and being tested out in some localities.

Carton. (Mex.)

Original tree owned by P. E. Carton, San Fernando; seed planted in May, 1907, from an extra large, green fruit sent from Guadalajara, Mexico. The tree is said to have borne the third year from seed 67 fruits; fourth year, 780; fifth year, 227; sixth year, 460; and seventh year, 1000 fruits or more. Several budded trees bearing at San Fernando, 1916. Variety first described by Ryerson in the Journal of Agriculture for November, 1913.

Challenge. (Guat.)

Original tree owned by J. H. Walker, 1547 Las Palmas Ave., Hollywood; said to have been planted about 1897. Tree began bearing at seven or eight years of age and following crops averaged from 800 to 1500 fruits. It failed almost completely one season several years before the freeze of 1912-13 and also the one immediately after. In 1914-15 there were approximately 2500 fruits on the tree but in 1916 only six fruits were produced, seeming to indicate the habit of bearing in alternate years which is common with many other kinds of fruit trees, due no doubt to over production. Mr. Walker actually sold 1540 fruits from the tree in 1915 for \$756.36. There were also a good many fruits used in the family of which no account was made and 200 were picked to lighten the branches.

During the cold spell of January, 1913, the tree was subjected to two nights of frost, the first with a temperature of 24 and the second of 18°; the tips of the branches were frozen and in exposed places some of the older wood was killed, but the fruit escaped. The worst feature was the failure of the tree to set fruit that spring for the following season. The variety was first described by F. O. Popenoe in these Proceedings for October 23, 1915. Budded trees fruiting in 1916.

Champion. (Guat.)

Original tree on the place of C. P. Taft of Orange; seed planted by him in 1902. Budwood was sent to Florida in 1916 for trial. First described by F. O. Popenoe in these Proceedings for October 23, 1915.

Chappelow. (Mex.)

Original tree owned by Wm. Chappelow, Monrovia. The seed from which the Chappelow avocado was grown was sent by the U. S. D. A. in the summer of 1893. They had been received from Mr. F. Foex then of Eddy, N. Mexico, who had obtained them from fruits found on trees near Monterey, Mexico, where they had been subjected to a temperature of about 22° F. during several consecutive nights when in blossom during the preceding winter.

The seedling was grown in a pot and not planted out until the following spring. The winter of that year (1894) was very cold and the small tree was frosted down to the ground and came up again the next spring. The tree began bearing the fourth and fifth years from planting and has been bearing every year since except the year of the heavy freeze of January, 1913. Buds of the tree were sent to Professor Rolfs of Miami, Florida, in 1902. He top-worked it in seedlings and

two years later obtained fruit. Professor Rolfs named the variety after Mr. Chappelow, by which name it has been known since. The tree is now 23 years old and is the largest in California, possibly in the United States. The tree itself has never been injured by frost since it was one year old, but several years the crop of fruit has been lessened by an extra cold snap in blooming time. The tree has always borne a crop with the exception of 1913 when the thermometer went down to 10° and all the fruit and bloom were killed. It bloomed again later on, but only a small number of fruits set. The record of the number of fruits since 1902 is as follows: 1902, 310; 1903, 380; 1904, 605; 1905, 575; 1906, 235; 1907, 465; 1908, 1209; 1909, 260; 1910, 285; 1911, 1025; 1912, 350; 1913, 20; 1914, 3215; 1915, 1723. Seedlings of the Chappelow have borne fruit remarkably like that of the parent tree, due either to its isolation which prevents cross-pollination with other varieties or to the pure strain of seed from which it came. Budded trees have been bearing for several years in various parts of Southern California. Some trees are known to produce small, elongated, seedless fruits in addition to normal specimens.

The variety was named and described by P. H. Rolfs under S. P. I. No. 12934 in 1905. A description, history and colored reproduction of the fruit is given in the U. S. D. A. Yearbook for 1906, pp. 363, 364. An outline drawing was published in 1904 in Bulletin 61, Bureau of Plant Industry, by P. H. Rolfs.

Chili. (Guat.)

Imported as budwood from an altitude of 6000 feet in Chili in June, 1911, by D. E. Clower of Monrovia through Dr. W. E. Aughenbaugh. Described by K. A. Ryerson in Pomona Journal of February, 1913.

Christmas Red. (W. I.)

Described in John B. Beach's Florida Catalogue as a seedling from the Trapp which produces a fruit more oval in form than the parent and mahogany red.

Colima. (Guat.)

Introduced as budwood in 1912 by the West India Gardens from near Colima, Mexico, as Johnston No. 5. Fruit not yet accurately described.

Colon. (Guat.)

Introduced as budwood in 1911 by West India Gardens, from Atlixco, Mexico, under No. 24. First described by F. O. Popenoe in these Proceedings for Oct. 23, 1915.

Colorado. (Guat.)

Original tree planted on College Street, Los Angeles, about 1901 by J. Murrieta, the seed coming from Atlixco, Mexico. In May 1914 the tree was transplanted by E. L. Doheny to his home grounds, Beverly Hills near Los Angeles, and is fruiting in 1916. Buds of the Colorado placed in large seedlings have produced fruit at Duarte. Variety first described by Ryerson in the Journal of Agriculture for November 1913. Quite commonly known as Purple Murrieta.

Cyrus.

A Florida variety described by P. J. Wester in 1910 probably under S. P. I. No. 26699.

Dickey. (Guat.)

Original tree on place of E. W. Dickey, head of La Brea Ave., Hollywood. Seed from Atlixco, Mexico, planted about 1904. First crop about 300 fruits. Budded trees very difficult to grow and very few thriving; several fruiting, however, at Yorba Linda in 1916, also at San Fernando. Buds sent to Florida fruited during the winter of 1915-16. Variety described by Ryerson in Journal of Agriculture for November 1913.

Dickey A. (Guat.)

Original tree on place of E. W. Dickey, Hollywood; planted about 1904. Described by Ryerson in the Journal of Agriculture, November 1913, under the provisional name of Dickey A.

Davis Nos. 4, 6, 7,

Analyses of these three varieties are given in the Hawaii Station Report for 1914, p. 66.

Dickinson. (Guat.)

Original tree growing at 679 West 35th Street, Los Angeles. Mrs. M. J. Dickinson, 630 West 35th Street, planted the seed and owned the tree up to 1912. According to Mrs. Dickinson, a grocer of the neighborhood went to Honduras and when he came back brought two avocado seeds with him. She planted these about 1899. One seedling was killed by the frost, while the other was planted near the house and grew thriftily, being more sheltered. It bore a few fruits in 1909, 1910, and 1911, 50 or so each year, while in 1912 the fruit on the tree sold for \$150.00, at \$.25 each. In 1912-13 it was more or less frosted and did not bear much fruit until 1916, when 450 fruits matured. Another report says that the seed came from the city of Guatemala. The variety was first described by Ryerson in the Journal of Agriculture, November 1913.

Don Carlos.

A Cuban variety described in 1916 under S. P. I. No. 40979.

Eskbank.

A Hawaiian variety especially recommended for planting in the Islands.

Estelle. (W. I.)

A Florida variety described in nursery catalogs.

Family. (W. I.)

A Florida variety described and figured by a colored plate in the Yearbook for 1910, p. 431. First described in 1905 by P. H. Rolfs under S. P. I. No. 12935.

Farnsworth.

A Hawaiian variety especially recommended for planting in the Islands.

Ferry. (Guat.)

Original tree growing on place of Dr. F. C. Ferry, Hollywood Blvd. and Serrano Ave., Hollywood. Tree was planted in 1898 as a seedling from the Sturtevant Nursery. The first fruits were produced about 1910; there were none on the tree in 1914, but in 1915 the tree bore 12 to 15 dozen and in 1916 a total of 23 dozen which sold at \$4.50 a dozen. No fruits have set in 1916. The tree was damaged by fire in 1907, one

side of the trunk still showing the effects. Buds placed in a large seedling have produced fruit at Mr. Spink's place. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Fowler. (Mex.)

Original tree growing on place of Mrs. E. M. Fowler, 363 Grove Street, Pasadena. Seed was planted in 1902 and is said to have been obtained from the garden of Charles M. Cook of Honolulu. One account states that it is a seedling of the Blake. Budded trees fruiting in several localities this season, some in the San Joaquin Valley. The variety was described by F. W. Popenoe in the Pomona Journal for February, 1911. Nearly 1000 fruits were produced on the original tree in 1915.

Fuerte. (Guat.)

Introduced as budwood in 1911 from Atlixco, Puebla, Mexico, under No. 15. Budded trees are bearing this year for the first time at Yorba Linda and Altadena. Described by Ryerson in Pomona Journal for February 1913 as No. 15.

Fulford.

A Florida variety, budded trees of which are growing in the propagating house of Plant Introduction Gardens, Chico, under S. P. I. No. 36709.

Ganter. (Mex.)

Original tree growing on the place of H. A. Woodworth, Rideout Heights, Whittier. The seedling tree was purchased with several other trees from a nurseryman of Whittier, I. H. Cammack, by A. R. Rideout who planted it in the spring or summer of 1905. The seedling was about 3 feet in height and at least one-half of the bark sun-burned so that it took a long time for this to heal over. At the same time about a dozen other trees were planted but the Ganter proved to be the only one worthy of mention. Just as the tree came into bearing the place was sold to A. M. Ganter, after whom the variety was named. A little later Mr. Woodworth bought the property and some trees have been disseminated under the name Woodworth. Budded trees are bearing in many localities. Small seedless fruits are sometimes produced in addition to normal specimens. Described by F. W. Popenoe in the Pomona Journal for February, 1911.

Gordo. (Guat.)

Imported as budwood in 1911 by West India Gardens from Atlixco, Puebla, Mexico, under No. 14. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Gottfried.

A Florida variety described in 1906 under S. P. I. No. 19094.

Grande. (Guat.)

Introduced as budwood in 1911 by West India Gardens from Atlixco, Puebla, Mexico, under No. 39. Described by Ryerson as No. 39 in Pomona Journal for February 1913. Fruiting at Upland and Riverside in 1916.

Grant. (W. I.)

A variety collected from Bahama Islands, British West Indies by P. J. Wester in 1906 and described under S. P. I. No. 18731.

Guadalupe. (W. I.)

A Cuban variety described in 1916 under S. P. I. No. 40980.

Guatemala.

A variety introduced by U. S. D. A. and which fruited in Florida for the first time in April, 1914.

Harman. (Mex.)

Original tree on place of E. N. Harman, Sherman, Foothill Boulevard. It is said to be one of six trees brought to California from South America and planted by Mrs. Charles Horn on her ranch at Sherman in 1899. Mr. Harman acquired the place in 1905 just as the tree was beginning to bear. Since that time the crop has averaged about 1500 fruits. Budded trees are bearing in many localities and trees have been widely disseminated in California. First described by F. W. Popenoe in the Pomona Journal for February 1911.

Hathaway. (Mex.)

Original tree on place of B. Hathaway, 1659 Miller Ave., Hollywood. The tree was grown from a seedling obtained from Mrs. Miller in 1904. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Hollenbeck. (Mex.)

Original tree growing at the Hollenbeck home in Los Angeles. Budded trees listed in nursery catalogs in 1915. Described in these Proceedings for October 23, 1915.

Horn. (Mex.)

Original tree growing on place of Ed Harman at Sherman until about two years ago, when it was removed. Budded trees advertised in nursery catalogs in 1914; propagated in small way only.

Hulumanu.

Recommended for planting in Hawaii in 1915.

Ideal (Guat.)

Imported as budwood from Mexico by D. E. Clower of Monrovia. Described by Ryerson in Pomona Journal for February 1913.

Ingersol. (Mex.)

Described in the California Cultivator for October 28, 1916 as follows: The tree stands eight feet high and has a spread of about 12 feet. "It bore this year 180 fruits of an average size of three and a half inches long and two and a quarter inches in diameter and an average weight of five and a half ounces. It is a thin-skinned variety of deep purple color. The flesh is of excellent quality. The tree blooms in March and the fruit ripens in August, September and October."

Inezholt.

A Hawaiian variety imported in the spring of 1914 by Joseph Sexton of Goleta, under No. 1907, or Holt's No. 1. Especially recommended in 1915 for planting in the Islands.

Jersey Cream.

A Hawaiian variety imported in 1914 by Mr. Sexton of Goleta as No. 1911.

Johnston. (Guat.)?

Introduced as budwood in 1912 by the West India Gardens from near Colima, Mexico, under Johnston No. 6. Fruit not yet described.

Johnstone. (W. I.)

A variety described by P. J. Wester in 1906 under S. P. I. No. 18729. Budwood originally from Bahamas.

Kailua.

Recommended in 1915 for planting in Hawaii.

Knight. (Guat.)

Introduced under No. 27 as budwood in 1914 by E. E. Knight, Yorba Linda from Antigua, Guatemala. Fruit round, 4 inches diameter, 1½ pounds weight; surface, slightly rough; skin, a hard shell, woody; green in color. Flesh, firm, yellow, free from fiber, rich nutty flavor; seed medium size, tight in cavity. Bloom first of June; season, following November until last of March in Guatemala. Description by Mr. Knight.

Knowles. (Mex.)

Original tree on place of W. A. Knowles, Santa Barbara; planted in 1898 and at eight years of age produced about 1000 fruits. Annual crop from 150 to 1200 fruits. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Lambert. (Guat.)

Original tree on place of C. F. Wagner, corner Fairfax and Fountain streets, Hollywood. The seed was obtained from a fruit sold on the Los Angeles market and planted in 1907. In 1915 it bore three fruits and in 1916 four fruits. The variety was given Mrs. Wagner's maiden name. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Landon.

A Florida variety included in descriptions made by F. W. Popenoe in the Pomona Journal for February, 1911.

Largo.

A variety described in 1906 by P. J. Wester under S. P. I. No. 18730; originally from Bahama Islands.

Linda. (Guat.)

Introduced as budwood from Guatemala in 1914 by E. E. Knight of Yorba Linda as Knight's No. 39. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Los Angeles (Mex.)

A variety originated on the place of W. A. Spinks, Duarte, in 1914-1915. The tree is a strong grower; the fruit is purplish-black, bottle-necked, glossy; skin thin; seed fairly large; flesh of good texture and little fiber; quality very good. Season late.

Luisa.

A Cuban variety described in 1916 under S. P. I. No. 40912 and being tested out in Florida.

Lycett.

Especially recommended in 1915 for planting in Hawaii.

Lyman.

Recommended in 1915 for planting in Hawaii.

Lyon. (Guat.)

Original tree on place of Miss A. M. Lyon, 7276 Sunset Boulevard,

Hollywood. The seed was from a fruit purchased on the Los Angeles market and planted in 1908. The original tree is not very large having been cut heavily for budwood and also somewhat injured by the freeze of 1912-13. Budded trees have proved to be very precocious, literally blossoming and bearing themselves almost to death, unless prevented by thinning the fruit.

Lyon. (Guat.)

Two varieties have been described under the name of Lyon. This one was described by P. J. Wester in the Philippine Agricultural Review for February 1914. The original tree grew from seed imported in 1903 by L. Lyon, the horticulturist of the Philippine Station at that time.

Macdonald.

Especially recommended in 1915 for planting in Hawaii.

Magoon.

Introduced as budwood in 1914 from Hawaii by Joseph Sexton of Goleta, under No. 3203. Especially recommended in 1915 for planting in Hawaii.

Makaha I and II.

Analyses of these two varieties are given in the Hawaiian Station Report for 1914, p. 66.

Matamoras.

A hardy variety secured from across the river in Mexico near Brownsville, Texas. A budded tree is growing in the propagating house of the Plant Introduction Gardens, Chico.

Mattern (Mex.)

Original tree growing in Los Angeles, fruiting in 1912. Short description by F. O. Popenoe in these Proceedings for October 23, 1915.

Merced.

A Cuban variety described in 1916 under S. P. I. No. 40981 and introduced into Florida for trial.

Merito. (Guat.)

Introduced as budwood in 1911 by West India Gardens from Atlixco, Puebla, Mexico, under No. 18. Budded trees set fruit in Altadena in 1916. Described by K. A. Ryerson in Pomona Journal for February 1913.

Meserve. (Guat.)

Original tree growing on place of Ralf Goddard, corner Cherry and Hill Streets, Signal Hill, Long Beach. Said to have been grown from a seed obtained from Honolulu about 1901 by Mrs. Meserve, who formerly owned the place. Described by Ryerson in the Journal of Agriculture for November 1913.

Miles. (Guat.)

Introduced as budwood in 1911 by West India Gardens from Atlixco, Puebla, Mexico, under No. 35. Briefly described by F. O. Popenoe in these Proceedings for October 23, 1915.

Miller. (Guat.)

Original tree on place of Jacob Miller, head of Miller Avenue, Hollywood. Seedling tree said to have been brought from Guatemala by John Greleck, an uncle of Mrs. Miller, and planted in 1886 on a neighboring place, from which it was transplanted about 1910. The tree blooms pro-

fusely and sets an immense crop of fruits which, however, keep dropping until very few mature. Described by F. W. Popenoe in the Pomona Journal for February 1911.

Mitchell

Originated in Porto Rico and introduced into Florida in 1906 for trial. Described under S. P. I. No. 18120.

Moanalua.

A chance seedling about 25 years of age growing on the estate of S. M. Damon, Moanalua, Hawaii. A bud on Mr. Spinks' place at Duarte has developed into a tree but has proved very tender, the young foliage and twigs being spotted and blackened by cool nights; some fruit is maturing this season. Described by J. E. Higgins in the Hawaii Station Report for 1910.

Modesto. (Guat.)

Introduced as budwood in 1912 from Atlixco, Puebla, Mexico, by the West India Gardens. Briefly described in these Proceedings for October 23, 1915.

Monrovia. (Mex.)

Original tree on part of the Bradbury Estate, Duarte, formerly called the Winston ranch, but now owned by Miss Louisa Bradbury, who has named it the "Valadenia." Parent tree quite large, from 20 to 25 years old, bearing a very large oval leaf; very few propagated. Budded tree fruiting at Thos. H. Shedden's place, Monrovia, 1916. Described by F. W. Popenoe in these Proceedings for October 23, 1915.

Monroe. (Guat.)

Original tree on place of B. H. Sharpless, Santa Ana, R. D. Tree was planted in 1905 and bore two fruits in 1914, five in 1915, and sixty in 1916. It was named for Mrs. Sharpless, whose maiden name was Monroe. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Montezuma. (Guat.)

Introduced as budwood in 1911 by the West India Gardens from Atlixco, Puebla, Mexico, under No. 33. Described and figured by Ryerson in the Pomona Journal for February 1913.

Murrieta. (Guat.)

Original tree growing at 765 College Street, Los Angeles. Planted about 1910 by John Murrieta; seed secured from Atlixco, Mexico. Buds placed in large seedling trees have fruited at Mr. Spinks' place near Duarte. Budded trees fruiting at Mr. Shedden's place, Monrovia, 1916. Very few trees have been grown on account of difficulty of propagation. Sometimes known as Murrieta Green. Original tree said to have died recently. Described by Ryerson in Journal of Agriculture, for November 1913.

Murrieta Two Pound or Two Pound Murrieta. (Guat.)

Original tree said to be on the old Murrieta Place, 765 College Street, Los Angeles. Propagated and distributed by the Pioneer Nursery in 1915 and 1916. Fruit not yet described.

Northrop. (Mex.)

Original tree on place of W. R. Bartley, Santa Ana, R. D. It was planted by J. H. Northrop, now of Indio, the seedling having been secured

from C. P. Taft about 1900. The place was owned for many years by Mr. Eells and some budded trees have been disseminated under the name "Eells." In 1914 the tree produced 1,800 fruits, and in 1915 about 1,000 fruits, bringing \$2.50 a dozen on the Los Angeles and San Francisco markets. The tree produces a heavy crop in the fall and lighter crop in the spring. Described by Ryerson in the *Journal of Agriculture* for November 1913.

Nutmeg. (Guat.)

Original tree in orchard at Hawaii Experiment Station, Honolulu; seedling planted in March 1908, and tree came into bearing in December 1911. Described by C. J. Hunn in *Hawaii Station Report* for 1912, p. 38. Budded trees are growing in California at Goleta and Pasadena.

Obispo. (Guat.)

Introduced as budwood in 1911 by West India Gardens from Atlixco, Puebla, Mexico, under No. 41. Described by Ryerson as No. 41 in the *Pomona Journal* for February 1913.

Oro. (Guat.)

Introduced as budwood in 1911 by West India Gardens from Atlixco, Mexico, under No. 32. Described as No. 32, by Ryerson in the *Pomona Journal* for February 1913.

Pico. (Mex.)

Original tree on place of Jacob Miller, Hollywood; moved recently to Doheny place. Very few trees propagated. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Perfecto. (Guat.)

Introduced as budwood in 1911 from Atlixco by the West India Gardens under Nos. 19 and 22. One fruit matured on a three-year-old bud at Altadena in 1916. Described and figured by Ryerson as No. 19 in the *Pomona Journal* for February 1913.

Plata. (Mex.)

Introduced as budwood in 1911 by the West India Gardens from Santa Maria del Rio, San Luis Potosi, Mexico, under No. 2. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Pollock. (W. I.)

Original tree on grounds of S. H. Pollock, Miami, Florida, and planted about 1896 or 1897. Budded trees were disseminated under the variety name as early as 1901 by a Florida nursery; described in 1905 under S. P. I. No. 12936. It is fully described and a colored plate of the fruit given in the *Yearbook* for 1912, p. 272. Budded trees fruiting at W. A. Spink's place, 1916.

Pomona. (Mex.)

Original tree on grounds of Mrs. Anna Skinner, 533 West Ninth Street, Pomona. A hardy variety distributed a few years ago but no longer being propagated. Fruit small, purplish-black. A three-year-old budded tree is thriving near Sacramento and this year produced twelve fruits.

Popocatepetl. (Guat.)

Introduced as budwood in 1912 by West India Gardens from Atlixco, Mexico. Described by Ryerson in the *Pomona Journal* for February 1913.

Presidente. (Guat.)

Original tree growing at 765 College Street, Los Angeles. Seed planted by John Murrieta about 1901. Described by Ryerson as El Presidente in the Journal of Agriculture for November 1913.

Preston.

A variety described in Hawaii Bulletin No. 25 as No. 157 and which G. P. Wilder calls Preston.

Puebla. (Guat.)

Introduced as budwood in 1911 by West India Gardens from Atlixco, Puebla, Mexico, under No. 13. Budded trees are maturing fruit at several localities this season. Described by Ryerson in the Pomona Journal for February 1913.

Quality.

A Florida variety described by P. J. Wester and included in the descriptions given by F. W. Popenoe in the Pomona Journal for February 1911. Several budded trees growing in California.

Queen. (Guat.)

Introduced under Knight's No. 28, as budwood in 1914 by E. E. Knight of Yorba Linda from an elevation of 5,200 feet in Guatemala. Described by F. W. Popenoe in these Proceedings for October 23, 1915.

Queretaro. (Mex.)

Introduced as budwood in 1911 by the West India Gardens from Canyada, Queretaro, Mexico, under No. 11. Described by Ryerson in Pomona Journal for February 1913. Budded trees fruiting this season at Yorba Linda, Monrovia, Nordhoff and Tustin.

Rader.

Listed in the 1915 catalog of Griffing Bros., Jacksonville, Florida.

Rainey. (Mex.)

Original tree on place of Mr. Rainey, Santa Barbara Street, Santa Barbara; said to be a seedling of the White. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Redondo. (Guat.)

Introduced as budwood in 1911 from Atlixco by the West India Gardens under No. 16. Budded trees fruiting at Yorba Linda this season. Described and figured by Ryerson in the Pomona Journal for February 1913.

Rey. (Guat.)

Introduced as budwood in 1914 by E. E. Knight of Yorba Linda from an elevation of 5,200 feet in Guatemala. Original tree low and round in outline; 25 feet high with a trunk about 14 inches in diameter; yield in Guatemala 500 fruits; season October to April; probable age of tree, 20 years. Fruit, average weight one pound; color, green; surface, rough; rind, thick; fiber, none; quality, very nutty; size of seed, medium; tight in the cavity. Description furnished by Mr. Knight. The name Rey was suggested by the owner of the original tree who said it was king of all varieties he knew.

Rhod. (Guat.)

Original tree on place of C. P. Taft, Orange. Seed planted in 1902; tree bearing its first fruit at five years of age and it is said to have

brought in more actual money returns than the original Taft tree. In 1915 it produced 500 fruits, and in 1916 1,200 fruits. Budded trees fruiting at Orange and Goleta, 1916. First described by Ryerson in the Journal of Agriculture, November 1913.

Rico.

A Florida variety. Described in 1905 under S. P. I. No. 13731.

Rita. (Guat.)

Original tree on place of C. P. Taft, Orange. Seed planted in 1902; described by Ryerson in the Journal of Agriculture for November 1913.

Rodolph. (Mex.)

Original tree on place of Mr. R. D. Fish, 231 Jasmine Avenue, Monrovia. Said to be a seedling of the Chappelow; planted about 1906 or 1907. It began to fruit when only four or five years old, bearing a large crop for such a small tree. In recent years it has been an irregular bearer. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Royal. (Guat.)

Original tree on place of J. H. Walker, 1547 Las Palmas Avenue, Hollywood. Tree planted about 1897 and began bearing in the seventh or eighth year. It had in round numbers 300, 400 and 500 fruits in 1910, 1911, and 1912, respectively. In 1914 the tree produced nearly 1,000 fruits. Described by Ryerson in the Journal of Agriculture, November 1913.

San Sebastian. (Mex.)

Introduced as budwood in 1911 from San Sebastian, Queretaro, Mexico, by West India Gardens under No. 7. Proved to be hardy in 1912 and 1913, being untouched in exposed position by temperature of 16 degrees. Described by Ryerson in the Pomona Journal for February 1913.

Senor. (Guat.)

Original tree on place of C. P. Taft, Orange. Seed planted in 1901. Described by Ryerson in Journal of Agriculture for November 1913.

Schmidt. (Guat.)

Introduced as budwood in 1911 by West India Gardens from Atlixco, Mexico, under No. 40. The Schmidt ripened fruit in Florida during the winter of 1915 and 1916. Described by Ryerson as No. 40 in the Pomona Journal for February 1913.

Sharpless (Guat.)

Original tree on place of B. H. Sharpless, Santa Ana, R. D. No. 1, adjoining the place on which the Northrop tree is growing. Mr. T. Gackley is said to have bought the tree as a seedling in 1901 from C. P. Taft. It fruited first at nine years of age. In 1912 the crop was two fruits; in 1913, 20; in 1914, 75; in 1915, 250; in 1916, several hundred. Two-year-old buds in large seedling trees are setting heavily this season. Described by Ryerson in the Journal of Agriculture, November 1913.

Sinaloa. (Guat.)

Introduced as budwood in 1911 by the West India Gardens from Atlixco, Mexico. The Sinaloa ripened fruit in Florida during the winter of 1915-16. Budded trees at Yuba City, California, have proved hardy. Fruiting on three-year buds on old seedling at E. W. Dickey's place, Hollywood. The variety described by F. W. Popenoe in the Pomona Jour-

nal for February, 1911, is no longer in existence, the name being transferred to this variety. Described by Ryerson in the Pomona Journal for February 1913.

Skinner. (Mex.)

Advertised in nursery catalogs of 1914. Listed but not described in these Proceedings for October 23, 1915. Very few trees propagated.

Smith. (Mex.)

Original tree on the place of C. R. Smith. 1308 North Main Street, Santa Ana. Said to be a budded tree of a Mexican Seedling, planted in 1906. It bore its first crop at seven years of age, producing 783 fruits at that time. The fruit is small, weighing from three to five ounces, but very rich in flavor and practically free from fiber. During 1914 it produced over 1,000 fruits.

Solano. (Guat.)

Original tree on the Solano Estate, Hollywood. The origin of the seed not definitely known but said to have been planted by Mr. Murrieta. According to J. E. Higgins, the Solano is a Hawaiian seedling. First crop produced in 1912. In 1913 about 150 fruits and in 1915 about 325 fruits were produced, while in 1916 only two matured. The Solano ripened fruit in Florida during the winter of 1915-16. Buds of the Solano on large seedling trees matured fruit in 1916 on Mr. Spinks' place at Duarte; fruit also maturing elsewhere for 1917. Described by Ryerson in the Journal of Agriculture for November 1913.

Spinks. (Guat.)

This variety originated as a promising seedling in a nursery row on W. A. Spinks' place at Duarte. A bud was taken from the seedling, placed in an older tree and produced 19 fruits in 1915. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Sterling.

A Florida variety described by Wester under one of the S. P. I. Numbers 26689 to 26730. Description included in those given by F. W. Popenoe in the Pomona Journal for February 1911.

St. Petersburg.

A Florida variety described in 1907 under S. P. I. No. 26699. A budded tree is growing in the propagation house of the Plant Introduction Gardens at Chico.

Surprise. (Guat.)

Original tree on place of C. F. Wagner, Hollywood, California. Seed planted from a fruit shipped from Mexico in the fall of 1908. The tree produced one fruit in 1915 and in 1916, 81 fruits were gathered. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Taft. (Guat.)

Original tree on place of C. P. Taft, Orange. Seed planted in 1900. The tree bore 6 fruits at nine years of age. It then skipped a year and produced a good crop during the next three years. In 1912 it produced 120 fruits; in 1913, 120; in 1914, 120; in 1915, 300; in 1916, 700. Budded trees are bearing this season in different places in Southern California as well as in the San Joaquin Valley. although buds placed in large

seedlings have borne fruit at Mr. Taft's place the last two years. Described by Ryerson in the Journal of Agriculture for November 1913.

Taft Hardy. (Mex.)

A variety propagated by some nurseryman and quite widely distributed a few years ago, but is no longer being propagated. Budded trees are bearing in different localities.

Taylor. (Guat.)

A Florida variety described in 1916 under S. P. I. No. 26710. The original tree is a seedling either of the Challenge or Royal, seeds of which were sent to Washington and planted at Miami in 1908.

Topa Topa. (Mex.)

Original tree on place of E. S. Thacher, Nordhoff. The tree is one of 122 seedlings which were planted in orchard form in March, 1909, the seed having probably been planted in 1907. In 1911 the tree bore several fruits and has produced crops every year since. In January, 1913 the tree stood a temperature of about 20 degrees, carrying all its leaves uninjured and part of its bloom, maturing some fruit the following season. In 1914 the tree had about 200 fruits, but on account of the greater number they averaged considerably smaller in size. In 1916 the tree set an excessive crop, many dropped when smaller than eggs and of the rest a considerable share ripened at the stem end first, many dropping off. Several hundred marketable fruits, however, matured. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Trapp. (W. I.)

Originated as one of a lot of seedlings planted about 1894 by S. C. Trapp in his garden at Coconut Grove, Florida. Described in 1915 under S. P. I. No. 12937 and in the same year more fully described and figured in colored plate in the Yearbook. Considered by Florida growers and shippers to be the best variety for commercial planting in that state. Budded trees have been growing in California for several years but have made poor growth. A tree at Mr. Spinks' place, Duarte, is carrying fruit in 1916.

Two Pound Green. (Guat.)

Introduced as budwood from an elevation of 6000 feet in Atlixco, Mexico by D. E. Clower of Monrovia through G. Fuentes. Described by Ryerson in the Pomona Journal for February 1913.

Ultimate. (Guat.)

Original tree on place of C. P. Taft, Orange. Seed planted in 1902 and according to Mr. Taft dropped its fruit badly during the early years of fruiting. Placed by Mr. Taft next to the Taft variety both in quality and hardness. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Val de Flor. (Mex.)

Introduced as budwood in 1912 by E. G. Hart of Los Angeles from the State of Oaxaca, Mexico. Budded trees fruiting this season show two types of fruit, one oblong and one bottle-necked. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Veranero.

A variety obtained by U. S. D. A. from Caracas, Venezuela under

S. P. I. No. 35121, March 1913. It is called Veranero on account of the crop coming at the end of the dry season while the high time for the other varieties growing about Caracas is August. Said by Pittier to grow at some elevation and should do well in Southern California where the rain is somewhat scarce.

Verde. (Guat.)

Introduced as budwood in 1911 by the West India Gardens from Atlixco, Mexico, under No. 17. Described by Ryerson in the Pomona Journal for February 1913, as the California Trapp.

Volcan. (Guat.)

Introduced as budwood in 1912 by the West India Gardens from Atlixco, Mexico. Described by Ryerson in the Pomona Journal for February 1913, under the name "Itzia".

Wagner. (Guat.)

Original tree on place of C. F. Wagner, Fairfax and Fountain Aves., Hollywood. The Wagner is said to be a seedling from the Royal and was planted in the spring of 1907, bearing its first fruit the fifth year, all dropping but three. The crop in 1914 was 36 fruits; in 1915, 442 and in 1916, 186 fruits. Budded trees have been bearing during the last two years; some four year old trees are carrying fruit in the San Joaquin Valley in 1916. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Walker (Guat.)

Original tree on place of J. H. Walker, 1547 Las Palmas Ave., Hollywood. It was planted in 1897 or 1898 and began bearing at six years of age, since which time it has produced every year except in 1914. The crop for the past few years has been from 1800 to 3000 fruits. In 1915 it produced about 3,500 fruits but fewer than in 1916. has probably brought in more actual cash to the owner than any fruit tree in California. Budded trees have been bearing for several years in various parts of Southern California. Described by F. W. Popenoe in the Pomona Journal for February, 1911. Sometimes known as "Walker Prolific".

Wester. (W. I.)

A Florida variety described under S. P. I. No. 19297.

White (Mex.)

Original tree on the place of Mrs. G. A. White, 24 W. Arellaga Street, Santa Barbara. The tree was a seedling purchased from Dr. Franceschi in the fall of 1897, although Dr. Franceschi himself said that he raised the tree from a Mexican seed in 1895. The tree matured several fruits at 3 years of age and has borne every year since. During the last few years the approximate number of fruits would be around 400. Budded trees have been bearing for several years and in some cases have matured three and even four crops in one season. Described by F. W. Popenoe in the Pomona Journal for February 1911.

Wilson (W. I.)

A Cuban variety introduced for trial in Southern Florida and described in 1916 under S. P. I. No. 40982.

ILLUSTRATIONS OF INTERESTING AVOCADO FRUITS

The following illustrations of avocado fruits are from photographs supplied by Prof. I. J. Condit, of the Department of Citriculture, College of Agriculture, Berkeley, California, and by Prof. H. J. Webber, Director of the Citrus Experiment Station, Riverside, California.

The varieties reproduced are taken without reference to their comparative value and are used for the purpose of furnishing growers a means of familiarizing themselves with the characters of the various varieties. In comparing the illustrations carefully note in each case whether the photograph is natural size or reduced. Some fruits owing to their large size have been somewhat reduced.—(Editor's note).

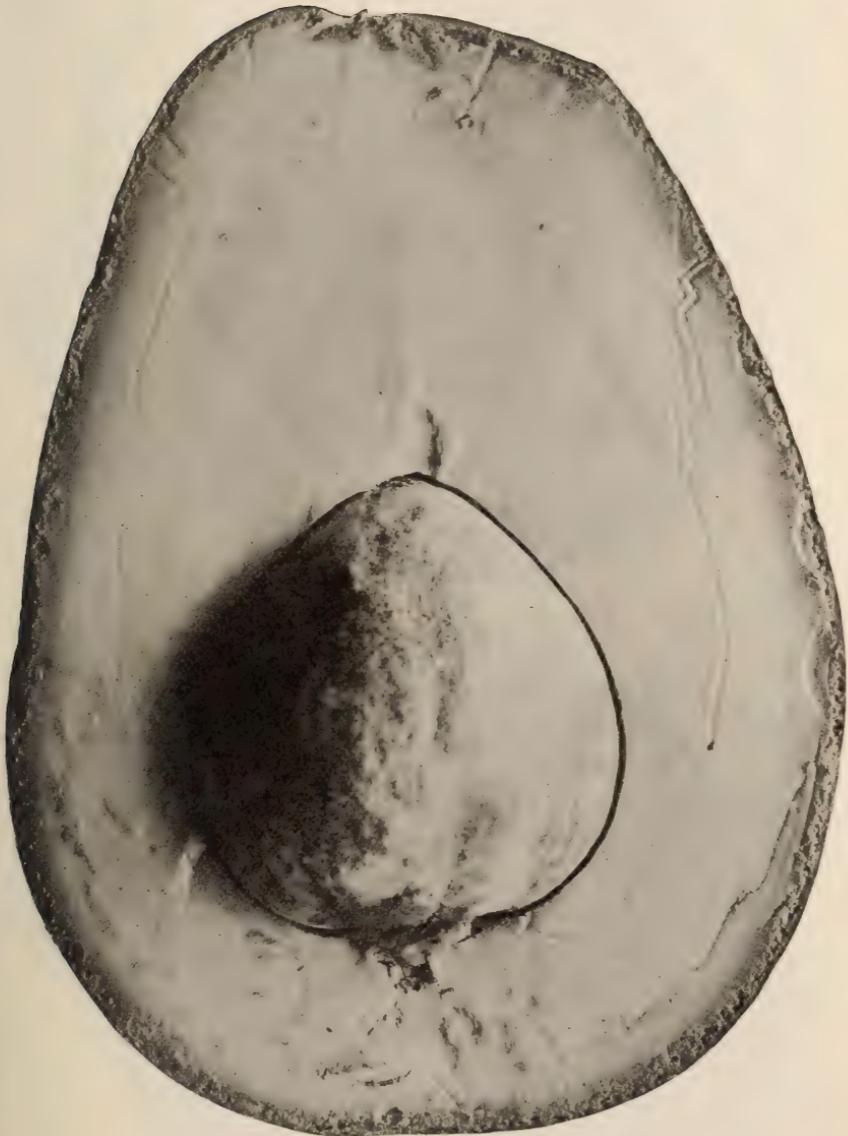


Figure 12.—Bartley (natural size). This is one of the largest avocados so far produced in California, the fruits averaging about 32 oz. in weight. (Photo by the Division of Citriculture, Berkeley) I. J. Condit.

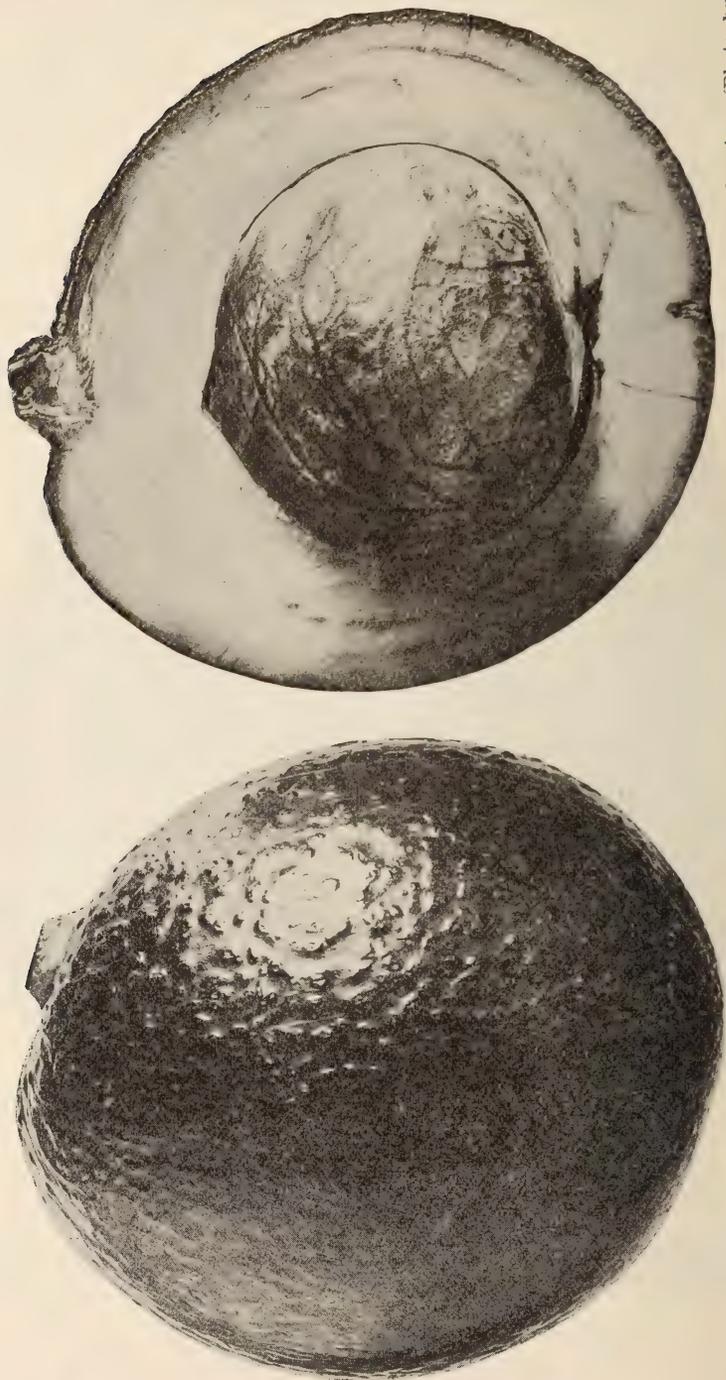


Figure 13.—Challenge (natural size). The fruit is of good size, shape and color; budded trees are now coming into bearing. (Photo by Division of Citriculture) I. J. Condit.

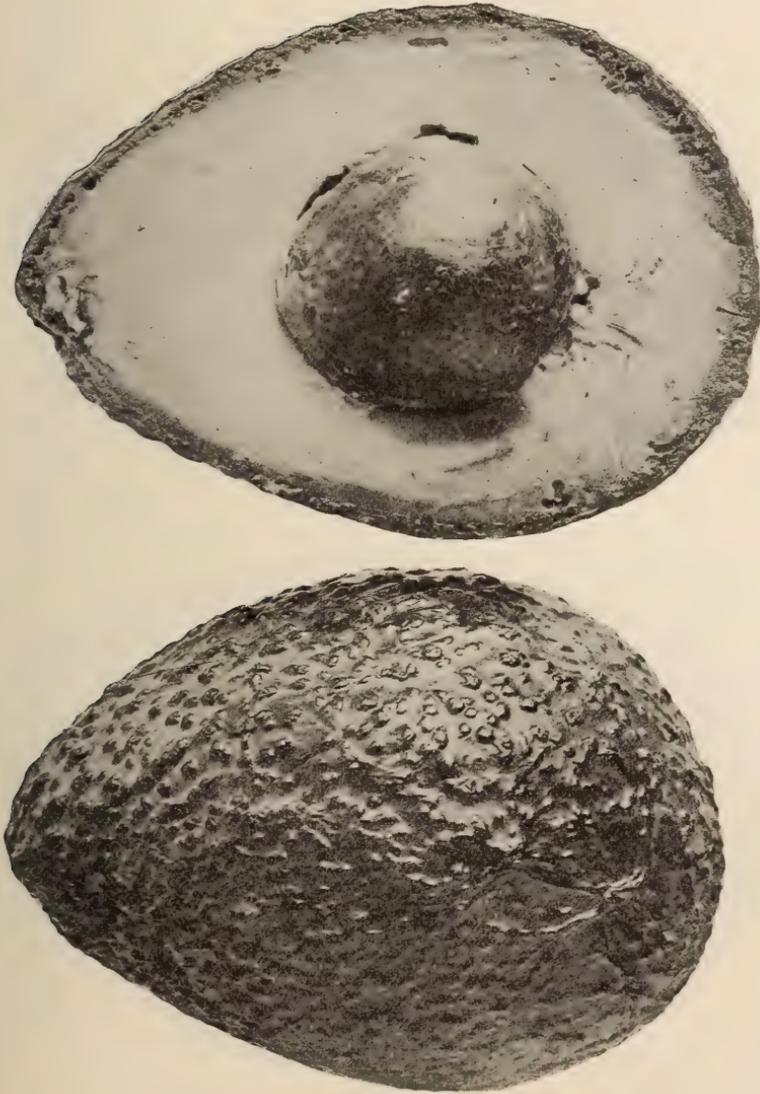


Figure 14.—Dickinson (natural size). These fruits were picked from the original tree Sept. 27 and placed in cold storage two days later at 37 degrees F. One month later they were taken from storage and exhibited at San Diego Oct. 30 and 31. Two weeks later they were sent to Berkeley, arriving in good condition. (Photo by Division of Citriculture, Berkeley) I. J. Condit.

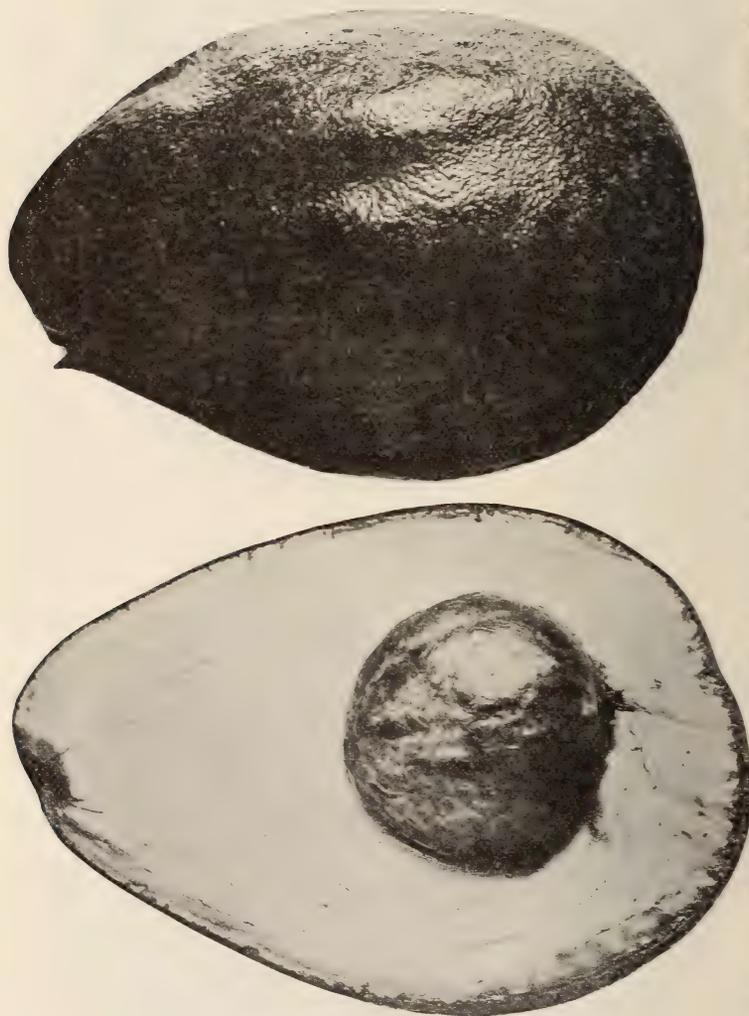


Figure 15.—Diekey (two-thirds natural size). In fruit character Diekey is an excellent variety, but like some other sorts, budded trees seldom thrive and only a few are growing out of many hundred propagated. (Photo by Division of Citriculture, Berkeley) L. J. Condit.

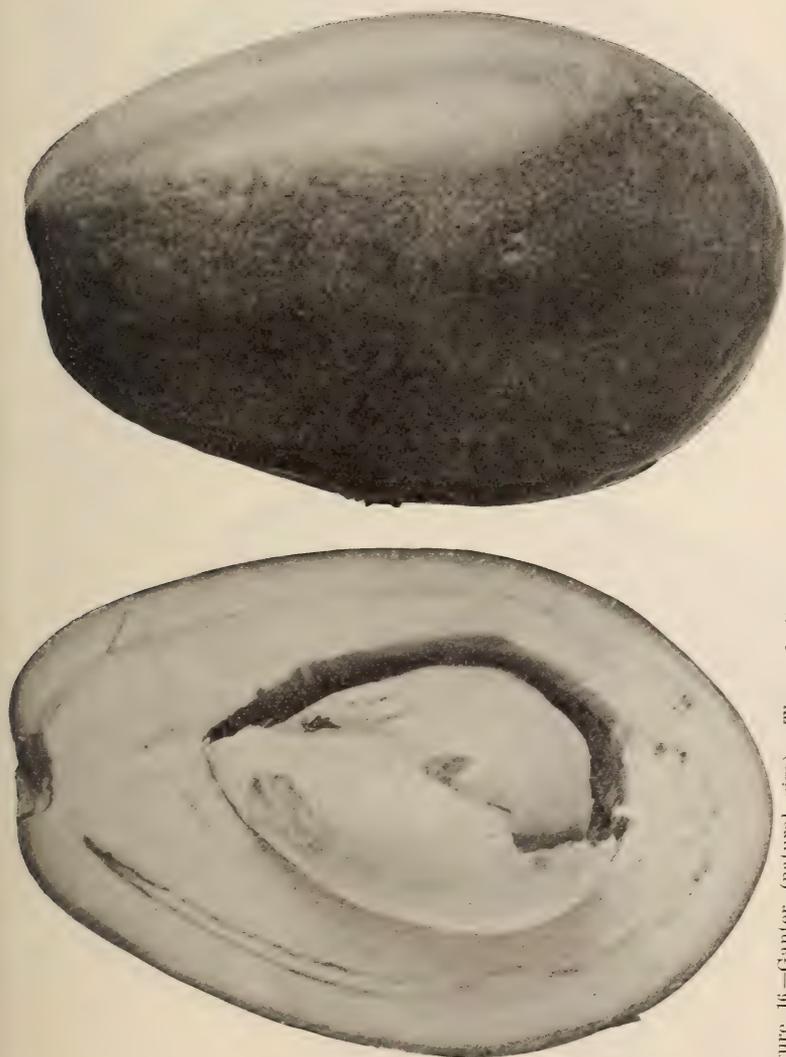


Figure 16.—Ginter (natural size). These fruits were produced on budded trees and are somewhat larger than those from the original tree. The Ginter is a thin-skinned variety, green in color and is rather prone to rot at the end and to show cracks and scars. (Photo by Division of Citriculture) I. J. Condit.



Figure 17.—Northrop (natural size). The original tree of the Northrop variety bears a large fall crop and a smaller spring crop. The fruits are of excellent flavor and quality and have very little fiber. (Photo by Division of Citriculture, Berkeley.) I. J. Condit.

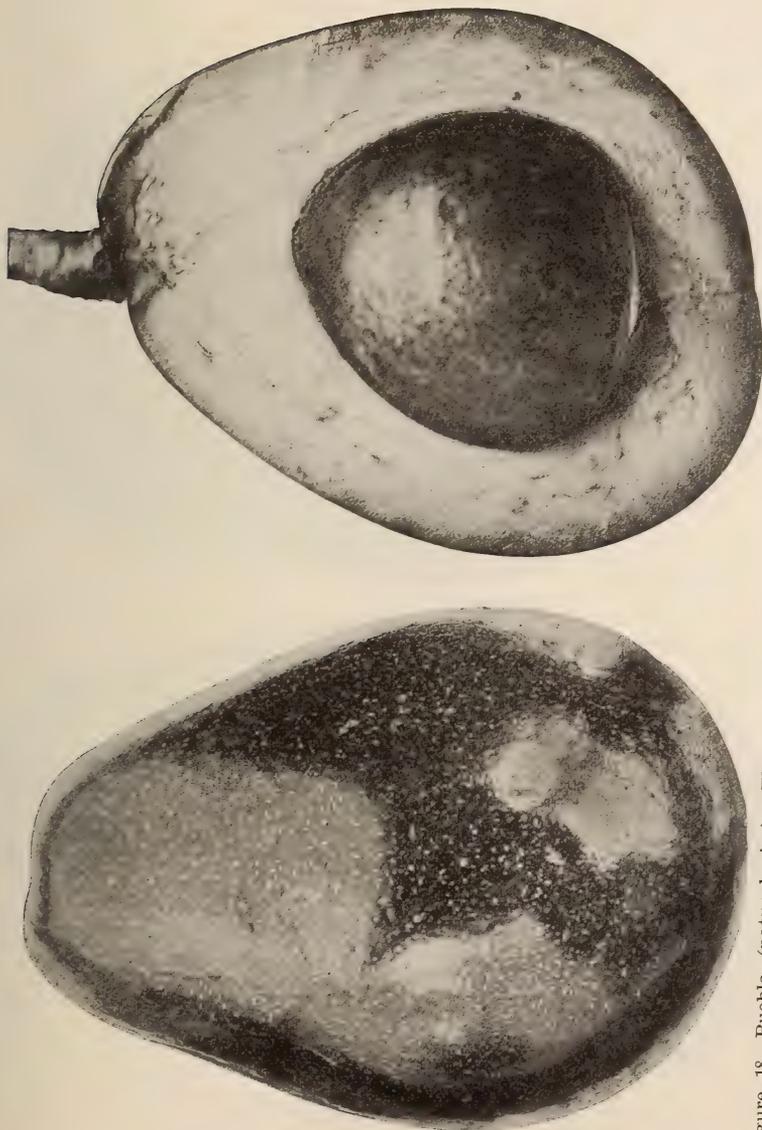


Figure 18.—Puebla (natural size). The Puebla budwood was brought in from Mexico in 1911 and trees fruited in California first in 1916. The skin is more leathery than granular. The surface is glossy and purplish-red at maturity. Average weight 8 to 10 oz. Season middle of December to March. (Photo by Division of Citriculture). I. J. Condit.

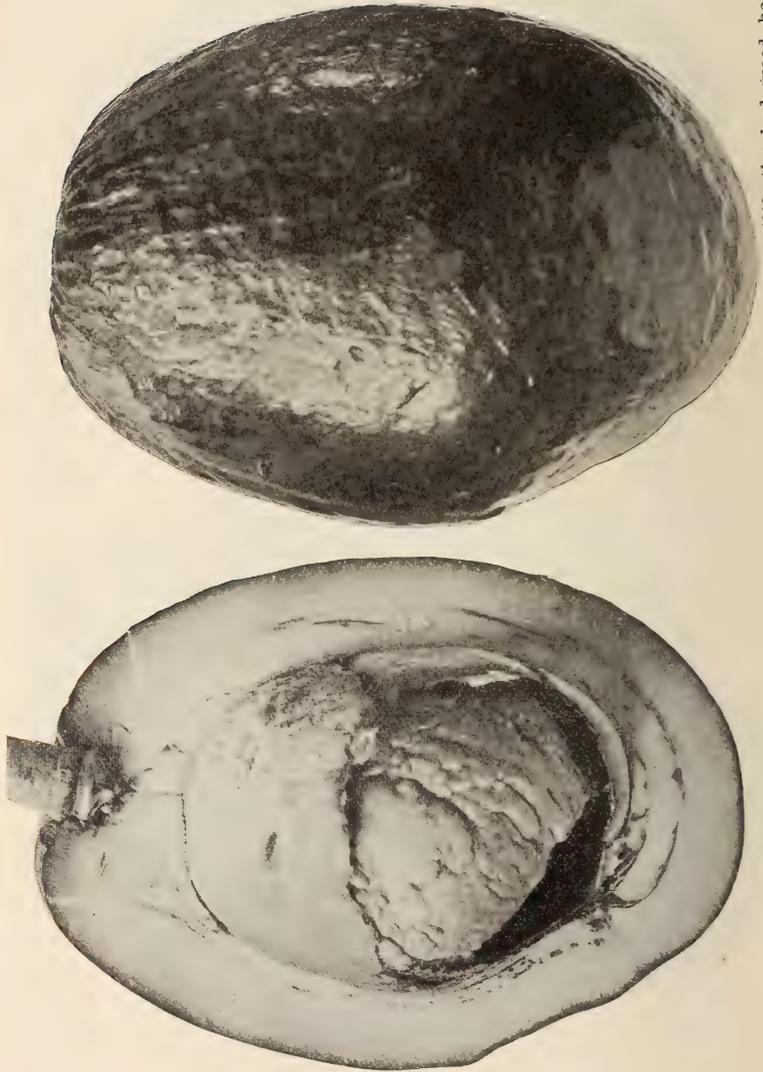


Figure 19.—Quererato (natural size). This variety first fruited in California in 1916, the bad wood having been brought from Mexico in 1911. The fruit is disappointing as the seed is large and inclined to be loose in the cavity. The seed coats are thick and separating and the flesh has considerable fiber. (Photo by Division of Citriculture) I. J. Condit.

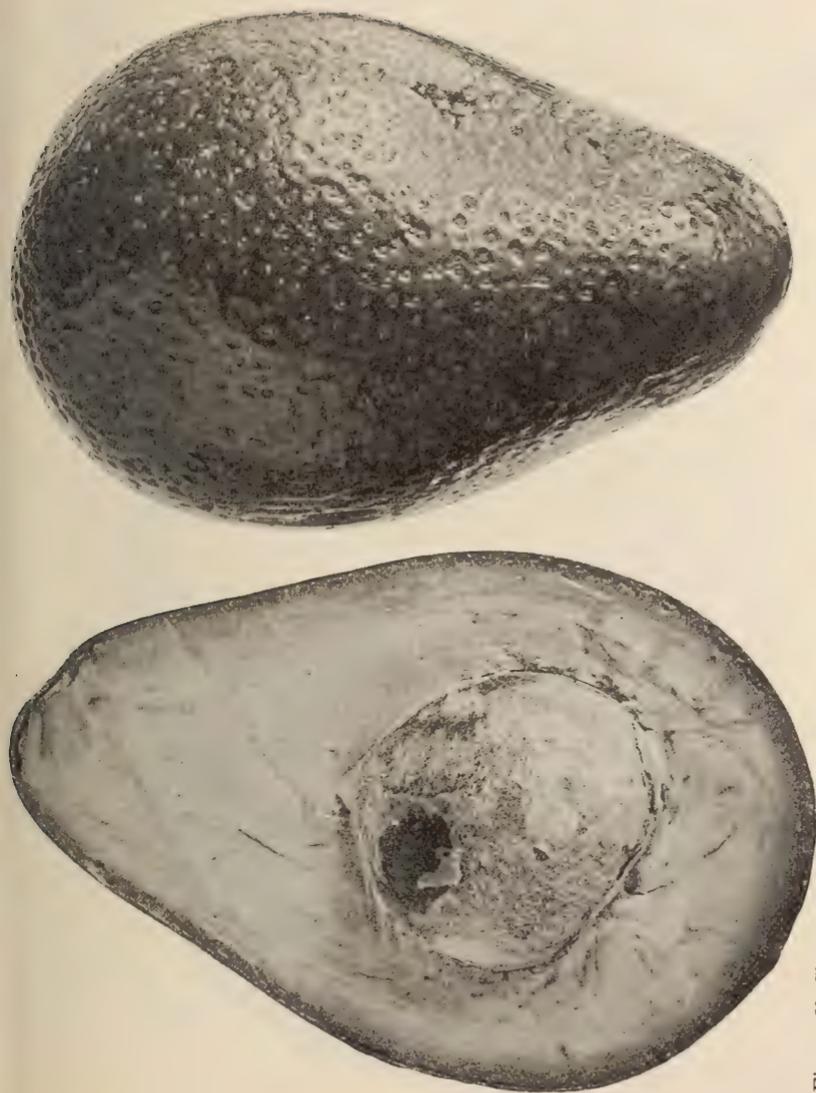


Figure 20—Sharpless (three-quarters natural size). Among the varieties that ripen late in the fall the Sharpless ranks high. The season in 1916 was considerably later than in previous years, some fruits hanging on the tree through January. (Photo by Division of Citriculture, Berkeley) I. J. Condit.

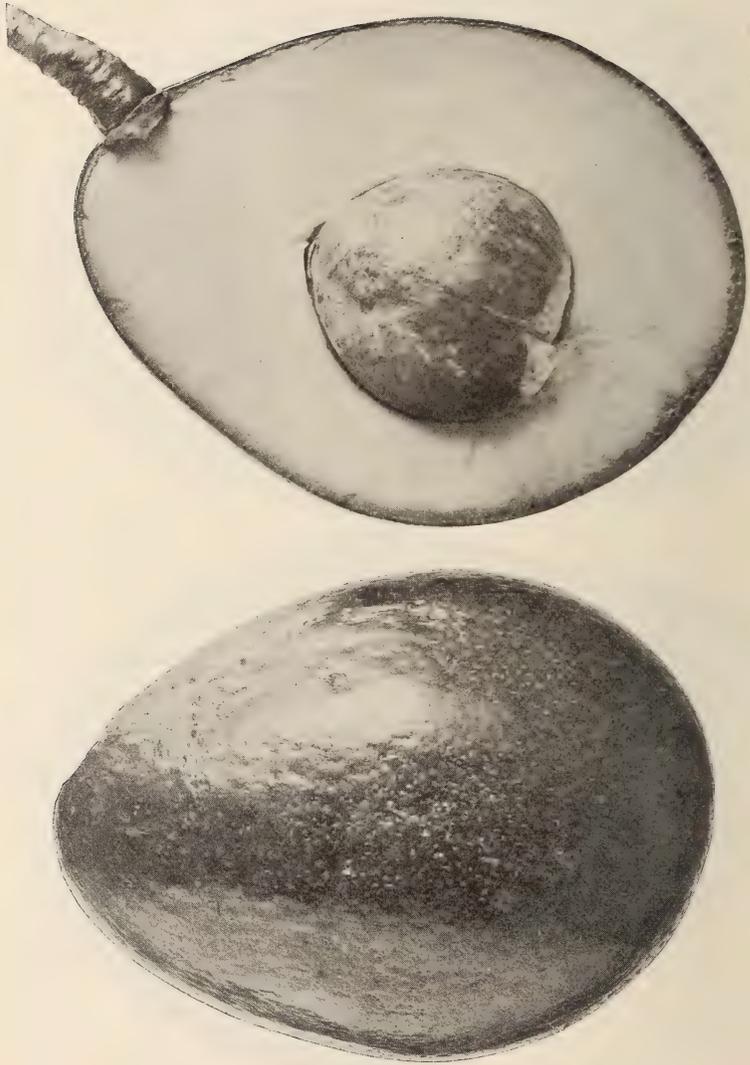


Figure 21.—Solano (about three-quarters natural size). The Solano has a very small seed and a large proportion of flesh. Analyses have shown a low percentage of fat. (Photo by Division of Citriculture) I. J. Condit.



Figure 22.—Taft (natural size). As a commercial variety the Taft has taken its place in the front rank. Its season is from May to October. (Photo by Division of Citriculture) I. J. Condit.

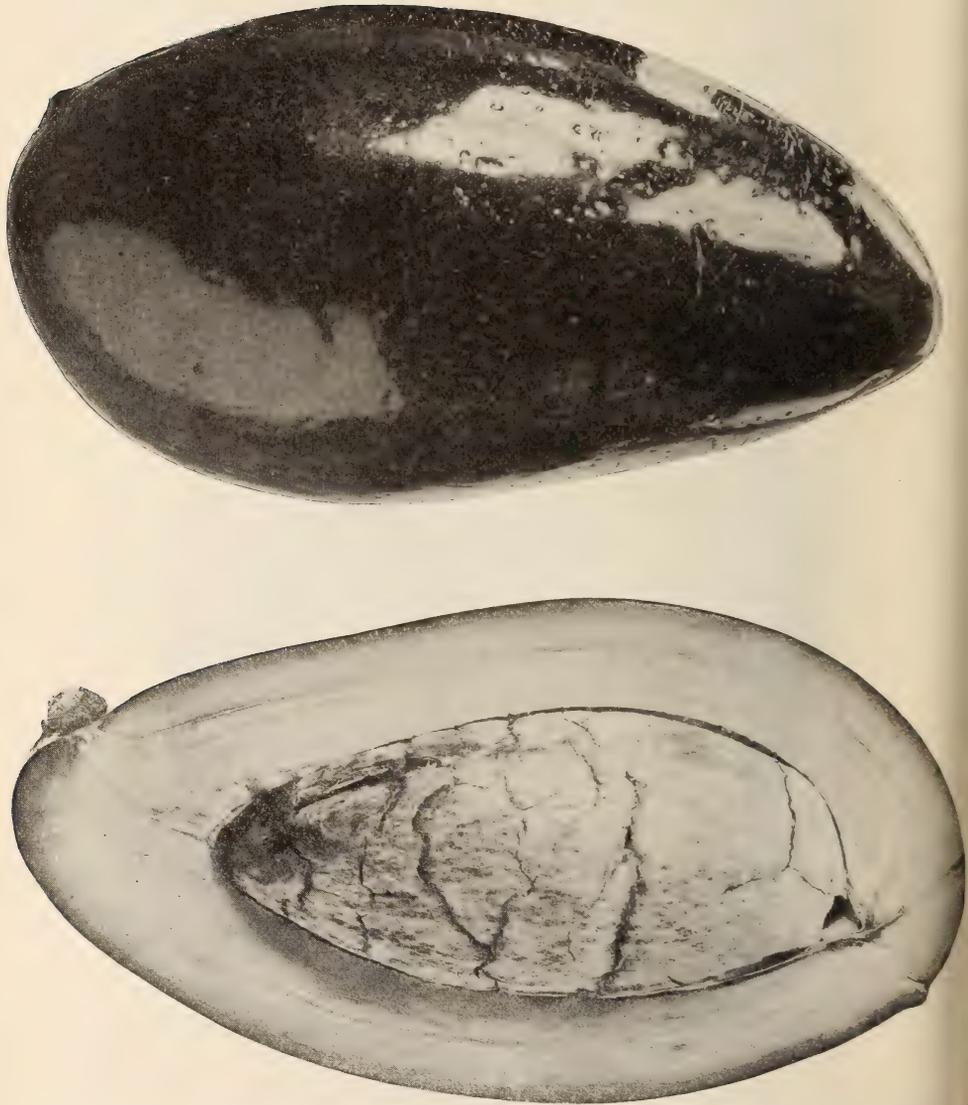


Figure 23.—Topa Topa (natural size). The Topa Topa is a beautiful fruit of the Mexican type with a glossy surface and deep purplish-black color. (Photo by Division of Citriculture I. J. Condit.)

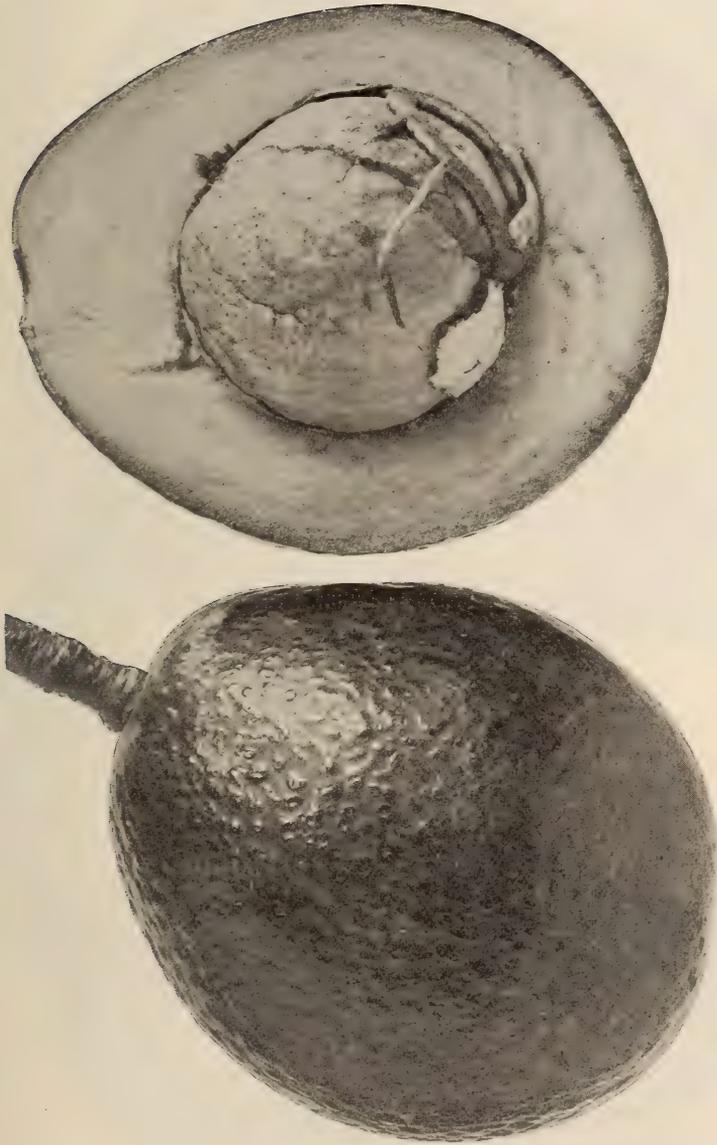


Figure 24.—Wagner (natural size). This is a very prolific and precocious variety. If fruits of some varieties are left on the trees too long, the seed may sprout in the cavity as shown in the cross section of this variety. (Photo by Division of Citriculture) I. J. Condit.

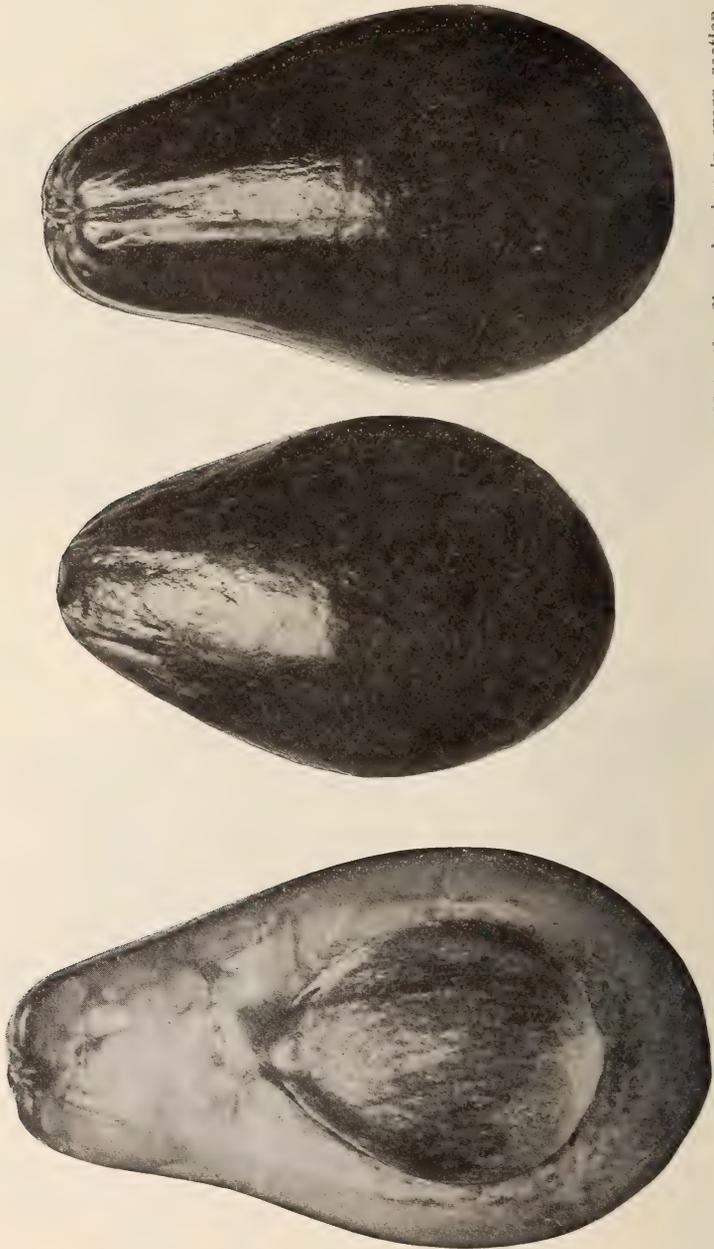


Figure 25.—Carton (natural size). A medium late, medium sized Mexican type. Note the fiber showing in cross section, particularly at base of seed. (Photo by Citrus Experiment Station) H. J. Webber.

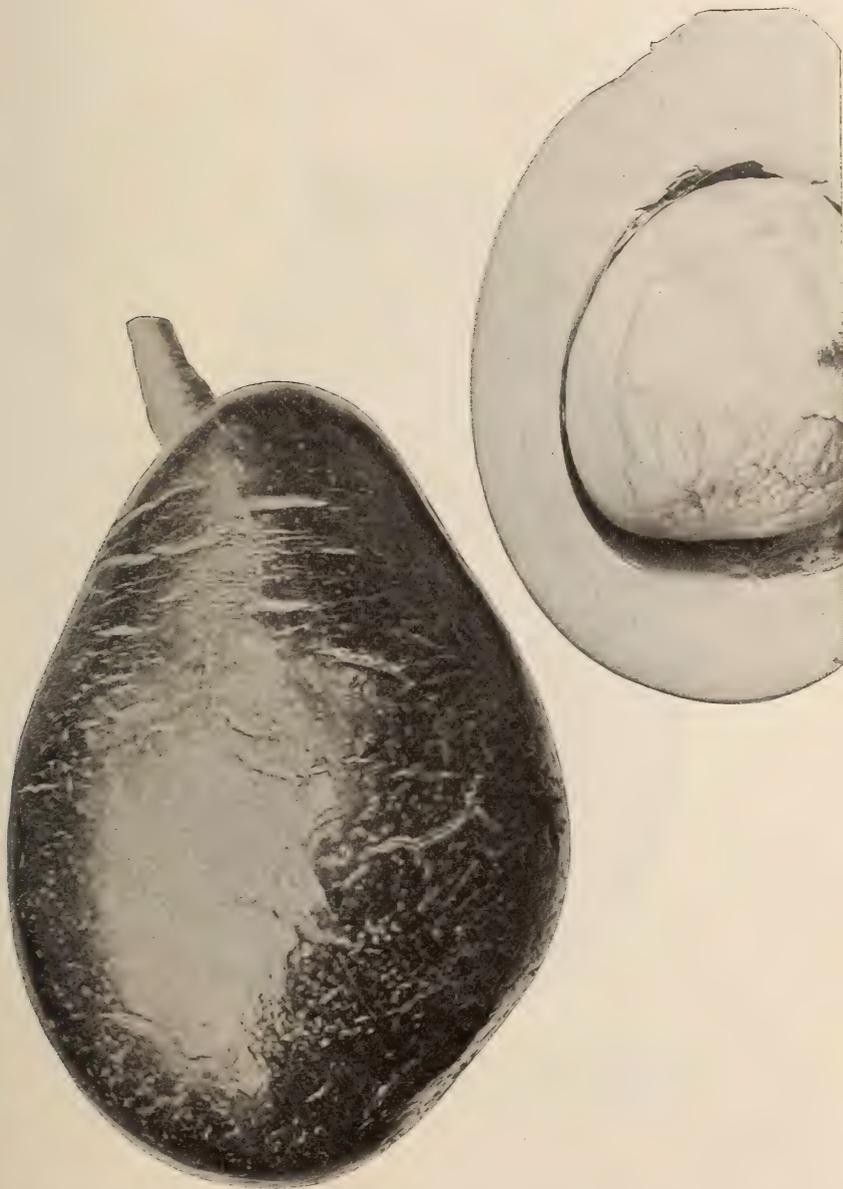


Figure 26.—Harman (natural size). This fruit is a Mexican type that has shown a marked tendency to become disfigured by the cracking of the skin, this seeming to be a varietal characteristic. It is also rather prone to rot at the end. Seed large and loose in cavity. H. J. Webber.

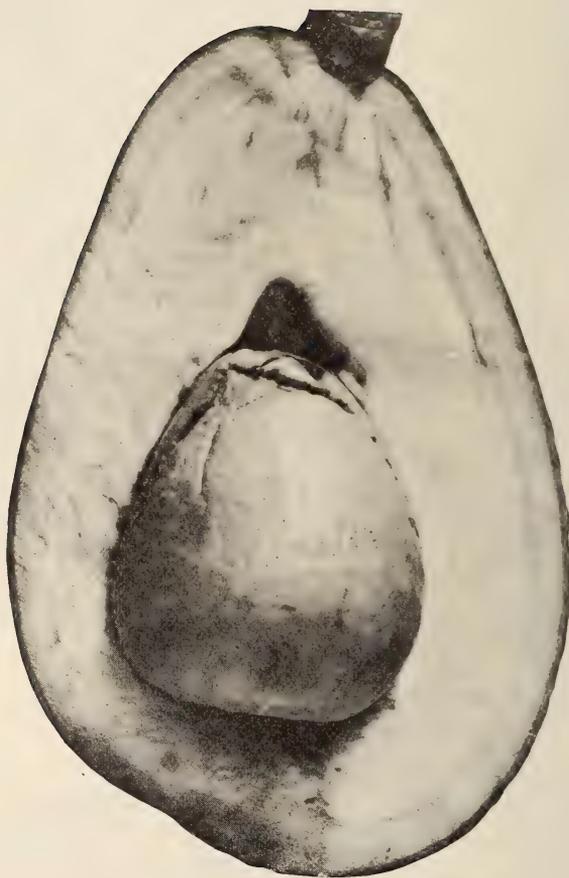


Figure 27 a.—Fuerte (natural size). A mid-winter variety maturing normally between January 15 and April 1. Average weight 10 to 14 ounces. (Photo by Citrus Experiment Station) H. J. Webber.

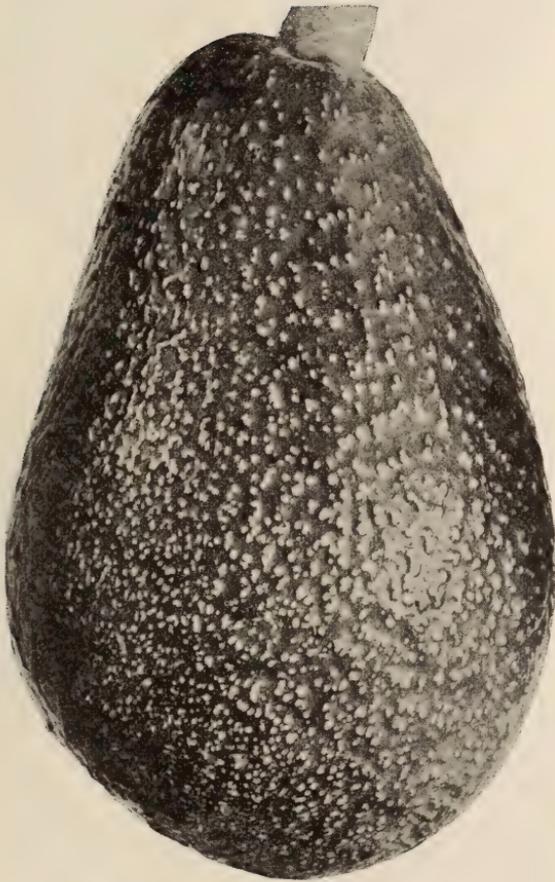


Figure 27 b.—Fuerte (natural size). A mid-winter variety maturing normally between January 15 and April 1. Average weight 10 to 14 ounces. (Photo by Citrus Experiment Station). H. J. Webber.



Figure 28.—Bud variation in Fuerte avocado (one-half natural size). On right normal Fuerte fruit, on left round fruit of Redondo type produced on the same budded tree of the Fuerte on the ranch of Mr. J. T. Whedon, at Yorba Linda, Cal. The tendency of this variety to produce two types of fruit is said to be the cause for the naming of two varieties, Fuerte and Redondo, when they were imported from Mexico. The Redondo is now known to be the round fruited bud variation of the Fuerte. (Photo by Citrus Experiment Station) H. J. Webber.

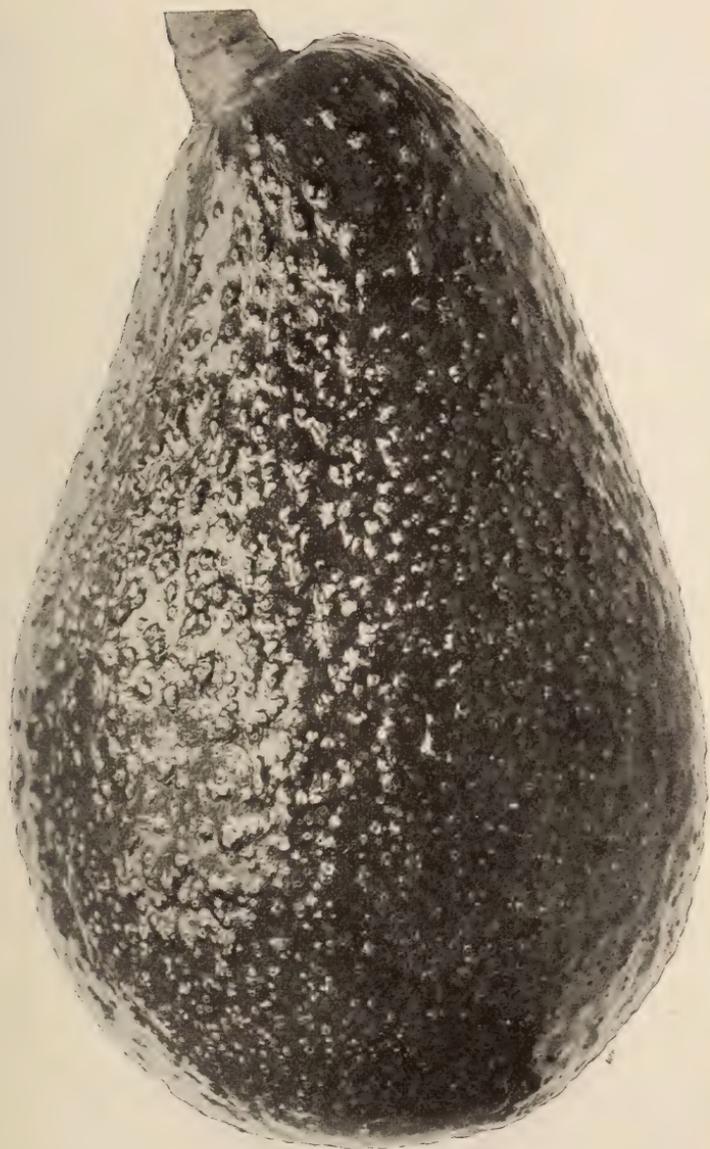


Figure 29.—Lyon (natural size). This is one of the thick hard-shelled varieties that is attracting considerable comment. Season of ripening April to June. A prolific and precocious variety beginning to ripen fruit two years from the bud. Tree a tall upright grower. ((Photo by Citrus Experiment Station) H. J. Webber.

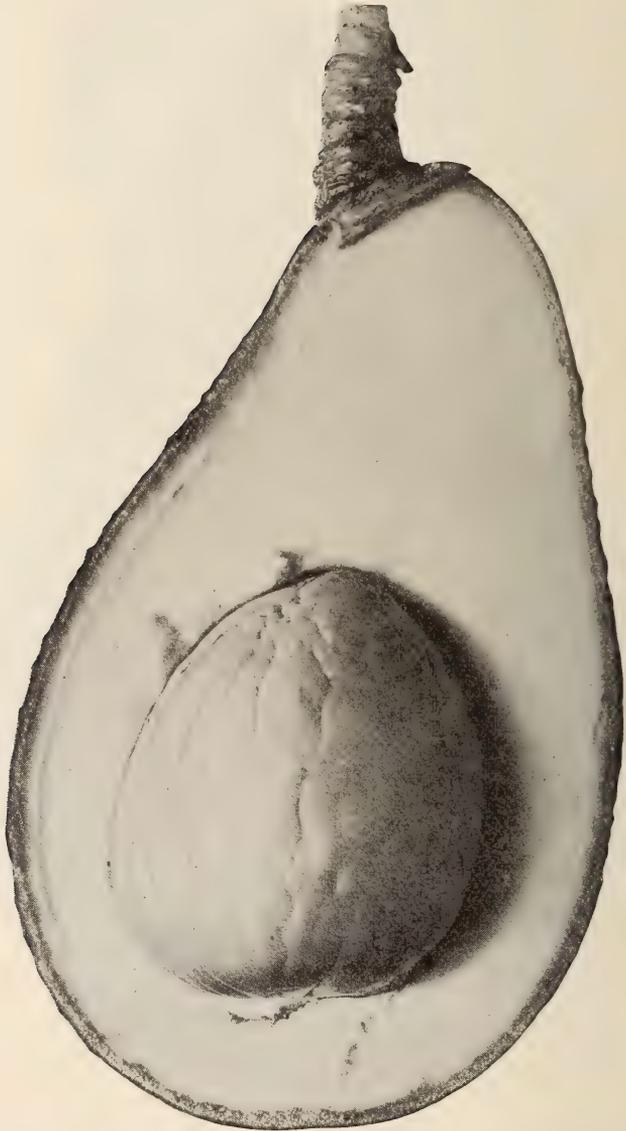


Figure 30.—Lyon (natural size). Cross section of fruit showing comparative size of seed and pulp. Note thickness of skin. (Photo by Citrus Experiment Station) H. J. Webber.

WHAT ABOUT THE AVOCADO?

By C. E. Utt, Orange, Cal.

The title of this paper would indicate inquiry. Can the avocado be grown successfully in California? Will its cultivation assume considerable proportions? Will the growing of avocados prove remunerative? Will it prove a disappointment and a loss? Will we over-supply the market? Can the market be extended?

These and many other questions come to mind when we discuss the avocado. In fact, this is much the same set of questions that has confronted practically all the other fruit industries that have been introduced in California; and often it has taken a long time and many expensive and disastrous experiments before we have been able thoroughly to establish some of these industries.

I believe it likely that the avocado will be quite extensively cultivated, and that where the business is intelligently conducted it will prove remunerative. I think it will prove a loss and a disappointment to many. Without doubt the market will at times be over-supplied, but that the consumption may be extended to great proportions is a reasonable supposition.

It took us about thirty years to find out that we should only attempt to grow two varieties of oranges. It is quite likely that we shall find use for more than two varieties of avocados, but it is a safe guess that we shall eliminate and forget the greater part of the 139 varieties that are being boosted by fond owners and enthusiastic nurserymen. I shall return to the question of varieties later.

We also have the question of proper location for our orchards,—soil, climate, water supply, winds, etc. Undoubtedly we shall find some localities better adapted to the economical and profitable cultivation of this fruit than others, just as there are best places to grow oranges and olives and raisins and prunes and apples and walnuts.

Some twenty odd years ago the olive boom swept over California. This boom was largely caused by the nurserymen, who by the skillful advertising and exploitation of the enormous profits to be had by any one who would plant olives anywhere, created a sale for their nursery stock. We were told that the olive would thrive in the moist lowlands and in the arid sterile hillsides. In fact, olives would do well anywhere, everywhere. Just plant them out and neglect them; they would thrive on neglect. All we had to do was to plant an olive orchard, and retire to the city and spend the great profits. In fact, most of our fruit industries have been cursed by ignorance, the bombast of promoters, and the "great expectations" of enthusiasts, and the avocado is proving no exception.

Location:—My experience and observation have led me to the conclusion that the locality best suited to the successful and profitable growing of avocados is the one with the least wind and the least frost, the best soil and the best water supply. The avocado will suffer much more from the wind than the orange or lemon. In fact, I do not think it

advisable to grow this fruit at all in windy localities without thorough protection by artificial windbreaks. Many avocados have been, and are being, planted on very poor soil. I do not think this advisable, as the tree from which we expect from 300 to 1000 pounds of the richest, most nutritious fruit known, must have an opportunity to feed, or fail to give fruit in paying quantities. I think it is perfectly safe to say that half the trees which have been, and are being set out, will not produce enough fruit to prove profitable. This is, of course, not the exception in the fruit growing industry, but the rule.

Soil:—I have formed no conclusions as to the soil best suited to the avocado, only that it should be good rich soil. I think it should have good drainage. We see old trees growing well in rather heavy adobe, and also in sandy loam. Perhaps the best growth is to be found on rich, heavy sediment soils. I do not think clay and hard-pan soils worth considering, not that it is not possible to grow avocados on such soils, but I do not think they can stand the competition of groves on better soil.

Frost and Water:—A frostless location is desirable, for while some of the thin-skinned Mexican varieties will stand a very low temperature, even lower than oranges, the hard-shelled varieties now growing in Southern California will not, and the big freeze of January 7, 1913, cut one year out of the production of most of the old bearing trees in Southern California, and in some instances practically destroyed the trees. An abundant water supply is necessary for the best development of the trees. They will grow with the same or less irrigation than that given citrus trees, but my experience and observation is that they will do best with considerably more water than is usually given citrus orchards.

Propagation:—My personal experience with the avocado is meager, but our president informed me that he desired personal experiences in order that we might begin to get some conclusions. About six or seven years since, we planted a number of seedlings, partly for experiment and partly for ornament. Later we attempted to work them over to desirable varieties by top-grafting, with very indifferent success,—in fact if it were my neighbor's case, I would call it a failure. My first venture in growing an avocado nursery was about five years ago. We began by planting a thousand or so small seedlings in nursery rows. These trees had been sprouted and grown in pots, a method to be avoided, as the small space afforded by the pot often causes congestion of the root system harmful to the future prosperity of the tree. Avocado seeds should be sprouted in flats from which they may easily be removed to the nursery row, where they should be irrigated by a small stream of water immediately after planting. We have not found any best season of the year to bud, the best results seeming to come when the stock and the weather have been most suitable, stock sap flowing well, and the climate warm and moist, rather than hot and dry. With some varieties we have experienced much more difficulty in successful budding than with others.

Varieties:—I have set out a number of Northrops and Ganters and a Harman or two for the thin-skinned varieties. They each begin to bear at two years from setting. The Ganter has proven the most

prolific of these varieties, one tree giving one hundred fruits at two years from setting, although I should judge that the trees were two-year-old buds when set.

It has always been a question of doubt in my mind as to whether the thin-skinned varieties will ever have any considerable commercial future, so I have only set a few dozen, more for ornament and variety than for profit. Of the commercial sorts I have planted more heavily to Taft than any other variety, not because I think it the only variety worth cultivating, but because it was the first good, well-proven hard-shelled tree that came to my attention. I have also planted three or four acres to Challenge, Monroe, Royal, Walker, and Sharpless, with one or two each of a dozen or more unproven varieties which are of good promise,—according to the nurseryman. The Taft trees have set fruit at three years from setting in the orchard, the buds being one year old at the time of transplanting. The Walker has set fruit which matured at nineteen months from budding. The Challenge has borne at two years from setting. The Royal has not yet borne although the trees blossomed very freely the past spring. The Sharpless have not yet borne at two years from budding. The Monroe has borne at two years from the bud.

I do not care to discuss the relative value of various varieties, and I am unacquainted with many of them, but I think it must be apparent that we want different varieties maturing their fruit at different seasons of the year. We already have proven hard-shell varieties which cover every month but December and January, with new varieties which it is claimed will fill these months. The most of our proven fruits ripen during the spring and summer, with the thin-skinned varieties covering the fall. We have always supposed the Sharpless to be a summer fruit, probably because an insistent demand on a limited supply caused the harvest to be carried on earlier than necessary. This year the tree is now full of fruit, much of which apparently could be carried until December. If this should prove to be the habit of this tree, the Sharpless, already classed among the best of our fruits, will be a doubly valuable variety, as the fall and winter varieties are those on which we are shortest. In fact, an inferior hard-shell which would mature its fruit in the fall and winter months would at this stage of the game be most valuable, as that is the season when the market is most bare. Of well proven fruit trees, we now have the Challenge and the Royal for February, March and April; the Monroe, the Lyon and a number of others for the spring months; the Taft, the Walker, the Bartley, and others for summer; and if, as I hope, the Sharpless proves to be a fall fruit, we have left only a couple of months when we are not maturing fruit. An ideal avocado farm is one where the harvester is at work every day in the year.

In conclusion, avocado orchards should be set on good, well-drained soil, protected from wind storms, with little or no frost. They should be given an abundance of water, and the trees for setting should never be propagated in pots, but should be from trees well proven in Southern California.

OUR EXPERIENCES IN GROWING THE AVOCADO

By W. G. Fraser, General Manager Riverside Orange Company, Riverside.

We rather hesitated to prepare this brief paper on "Our Experience in Growing the Avocado," to be read at the Third Semi-Annual meeting of the California Avocado Association for the reason that we are mere novices in this line of horticulture; however, we are glad to give what little experience we have had so far in the growing of the avocado tree.

The location of our 5-acre avocado grove is on Arlington Heights about eight miles south of the city of Riverside at an elevation of about 1100 feet above sea level. The soil is a mixture of decomposed and disintegrated granite and reddish clay of a good depth. The drainage is good as on the southerly and westerly side of the avocado grove there is a deep arroyo into which is drained the surplus irrigation and storm water.

The trees are planted 24x24 feet apart and are made up of the following varieties,—Harman, Northrop and Taft, about one-third of each, and from one to nine each of the following were also planted as more or less of an experiment,—Solano, Redondo, Chappelow, Puebla, Walker Prolific, Meserve, Ganter, Colorado, Dickinson, Grande, Fowler and Atlxco.

We also planted about an acre to the Dickey variety but for some reason the trees did not do well and practically all of the trees of this variety have been replaced with another variety.

The trees that have made the most vigorous growth are those in the following order,—Northrop, Harman, Taft. The land upon which these trees are planted was thoroughly plowed to a good depth, then leveled, so that the water would flow at a reasonable rate of speed while the trees were being irrigated, thus assuring good drainage for all the trees.



Figure 31.—Avocado tree ready to be planted; note roots protruding through sacking.

The holes to receive the trees were dug somewhat larger than is generally the custom in digging holes for citrus trees, (See Fig. 31), thus giving ample room for the roots to extend in the loose soil. The trees were then carefully planted and irrigated (See Fig. 32) in the same manner as that employed in planting citrus trees. After the trees were planted we protected them from the hot sun by a covering of cheese cloth supported by four stakes, (See Fig. 33).

For the first season after planting the trees were irrigated about every eight days for a period of two months and the time was gradually extended between irrigations according to advice from the West India

Gardens. The next season they were irrigated as often as the condition of the soil required irrigation in order to secure best results in the growth of the trees, or on an average of about every 30 to 40 days during the irrigating season.

The soil has been cultivated in the ordinary manner and while possibly a little more care was given to the irrigation and cultivation of the avocado grove as compared with the citrus grove yet the trees were not "nursed" or "coddled" if I may use these terms.

Last February we pruned a few rows of the avocado trees and endeavored to lift the branches off the ground.

We also pruned some in March; we cannot see that it did much good as the branches are all down to the ground again and while a good many trees looked misshapen in the spring, this fall they have put out new branches and filled up the spaces, and in discussing the question of pruning with others we think that until some definite system for pruning has been settled upon it looks as if we will be very slow to do much pruning. Where we made any cut we waxed the same so that there would be no chance of the branch dying back.

Last April we noticed that the avocado trees in our section dropped a large percentage of their old leaves; this was the first time that they



Figure 32.—System of irrigating the avocado tree thoroughly.



Figure 33.—Method of Protecting Trees.

had done so and to a novice it certainly looked as if something had gone wrong with the trees but in the course of a month or six weeks the trees looked better than ever.

As to the results secured,—the trees are, we think, silent spokesmen for themselves, and in order to give those interested in the development of the avocado an idea of the present size of the trees we have taken a few snap shots of them which we have attached to this paper. (See Fig. 34).

We have been told by those far better qualified to judge than we are that our trees have made an exceptionally good growth and equal to any of the trees planted for the same length of time. The bulk of our

trees were planted in the month of May, 1914, making them about two and one-half years old from the planting in the orchard to Nov. 1916.

It may be interesting to note that there are quite a large percentage of the trees of the Northrop variety which have from one to a dozen or more fruits on them this season and we are placing a few of these fruits on exhibition. Half a dozen or so of the other varieties, Puebla, Grande, etc., have a very few sample fruits this season.

We are naturally very much interested in the development of the avocado industry as we think there ought to be a large demand for the fruit if it is brought to



Figure 34.—Two year old Northrop tree, approximate height 11 to 12 feet.

the attention of the consuming public in a proper and intelligent manner and while it is more or less of an experiment with us we have confidence that the product can be marketed in such manner as to give the producer a reasonable profit on the investment and at the same time give the consumer a fruit of considerable food value at a reasonable cost.

A BARK DISEASE OF AVOCADO TREES

By Howard S. Fawcett, Pathologist, Citrus Experiment Station,
Riverside, Cal.

Description of the Disease.—In May, 1914, attention was called to a bark disease of avocado trees by K. A. Ryerson, who sent part of a diseased trunk of an avocado tree with the request for information regarding the nature of the trouble. The bark was killed and slightly sunken over an area of 8 inches in length and $2\frac{1}{4}$ inches (one-half the circumference) in greatest width. A kind of gum had exuded and hardened in small beads on the surface, and in addition a white, powdery, chrySTALLINE substance was deposited over the surface at the lower part and below the diseased area. The freshly killed bark and wood were still firm, not soft or watery. The wood was not affected more than one-eighths of an inch inward. This was typical, as was afterwards learned, of a bark disease occasionally occurring on avocados in a number of localities in Southern California. The following information regarding its occurrence was obtained from Mr. Ryerson. The disease occurs most often on the trunk not far from the surface of the soil, but occasionally it is found higher up and on limbs, beginning especially at the base of a leaf. It occurs not only on the trunks of larger trees, but is found on small seedlings, especially if overwatered or if the drainage is not good. This disease, while not frequent enough to cause serious damage unless on particularly valuable trees, is likely to appear suddenly and spread fairly rapidly in spite of care exercised to check it. It does not appear to be confined to any particular variety, but has been found on a number of different kinds.

Isolation of Pythiacystis Fungus.—Three culture tests were made from this specimen from Mr. Ryerson, by flaming the surface, cutting off the surface of the bark, flaming again, cutting out small bits of the bark and wood from the junction of the dead and live tissue, and dropping them into slant cornmeal agar tubes. A Pythiacystis fungus grew out from the pieces in the three tubes.

In July, 1914, specimen of an affected avocado limb which had been unsuccessfully treated by cutting away the diseased bark and disinfecting the area, was sent from the same locality as the first. The bark had begun to heal at the cut edges, but the wood underneath was dark in color. The same fungus was again isolated from three different places in the darkened wood about one-fourth of an inch from the surface and in one case 4 inches beyond the point where bark had been cut away for treatment. In five out of six tubes made as before, the Pythiacystis fungus grew out from the pieces.

Inoculation Experiments With the Fungus.—On October 6, 1914, the trunks of two Mexican seedling avocado trees at the Whittier laboratory were inoculated with this Pythiacystis by inserting into longitudinal cuts three-fourths of an inch long, bits of the mycelium from the culture of the fungus. The cuts were then covered with paraffined paper held with

raffa. On one tree a cut of the same kind without inoculation was made and covered as the others to serve as a check.

When the inoculated trunks were first examined on October 22, 1914, a watery, slightly colored liquid was running from both cuts, and below one of them the white crystalline substance seen on the original specimen, was being deposited as the exuding liquid dried. The check cut was already beginning to heal without any deposit.

On January 14, 1915, a considerable deposit of the white crystalline substance had formed at both of the inoculated cuts and the larger area of killed bark was three-fourths of an inch wide and two and one-half inches long. The wood was affected only to a slight depth. The affected bark and wood were cut out at this time to save the trees and four culture tests made as described before from the advancing edge of one of the diseased areas. Three of these cultures developed *Pythiacystis* as before. The incision on the check tree healed rapidly without apparent injury to the adjoining bark.

One of the original cultures was kept alive by transfers every one to five months, and on March 28, 1916, further inoculations were made into avocado trunks with it and also with the fungus *Pythiacystis citrophthora* isolated from diseased bark of lemon Gummosis. Two inoculations from each culture were made and two additional cuts were made to serve as checks. All were wrapped in the same manner as in the previous inoculation. All inoculated cuts were showing the white crystalline deposit by April 7, 1916, and the bark about the cuts was discolored. On May 15, a large deposit of this white substance had formed below all the inoculated cuts. The effect on avocado of the lemon *Pythiacystis* was about the same as the avocado *Pythiacystis*. A diseased area of each kind was cut out. These showed the cambium killed over an area of three-fourths of an inch wide and two and one-half inches long. The avocado *Pythiacystis* was again recovered from the advancing edge of a diseased area. The cuts serving for checks healed rapidly without apparent injury to the tree.

The same two cultures were tested out on young orange trees at the same time. The lemon *Pythiacystis* produced Gummosis on the orange with killing of bark adjacent to the cut. The avocado *Pythiacystis*, however, produced no effect, the cuts healing almost as rapidly as the checks.

Preventive Measures Suggested.—Since the fungus itself and the effects of the disease are similar to that of *Pythiacystis* on citrus trees, the same methods for prevention and treatment, if carefully carried out, will probably apply to a large extent at least to the avocado. Good drainage, an avoidance of too much water at the base of the tree, keeping the soil from washing in and piling up against the trunks and avoiding planting too deep, especially on heavy soils, will undoubtedly serve to prevent the disease. If it occurs on large trees and is found before it has gone too far, the dead bark can be carefully dissected out and the wound thus made disinfected. After the cut edges begin to heal the exposed wood can then be covered with wax or other good covering. If the bark is killed all the way 'round when discovered, the tree will, of course, eventually die. Mr. Ryerson writes, "The spots were not common and in reality did not cause serious damage unless found on par-

ticularly valuable trees. They were likely to appear suddenly and spread rapidly in spite of the care exercised to check them. Sometimes with the use of Bordeaux paste, after very careful removal of all diseased tissue, the trouble was overcome."

Summary.—That a *Pythiacystis*, similar to *Pythiacystis citrophthora*, may, under certain conditions become at least a wound parasite of avocado trees, is shown by these tests. The fungus was isolated from two different specimens, was grown in pure cultures, was introduced into avocado trunks at two different seasons and produced effects similar to those on the trees from which it was isolated. It was twice recovered in cultures from the inoculated trees, in one case six weeks and in another three months after the inoculation.

The same preventive and control measures as used for *Pythiacystis* Gummosis of Citrus will probably apply to this disease, though few experiments of this kind have as yet been tried out.

FOUR YEARS' EXPERIENCE WITH BUDDED AVOCADO TREES

By J. T. Whedon, Yorba Linda, California

I planted my first avocado trees at South Santa Anita, in the spring of 1912. The cold winter of 1912-13 convinced me that I would have to find a warmer climate to make a success of the avocado business, which I had decided to engage in.

On April 1, 1913, I sold out and relocated at Yorba Linda, Orange county, in May, 1913. I planted 77 trees that summer and finished planting five acres in March, 1914. The trees planted in March, 1914, did much better than those put out in mid-summer, 1913.

Yorba Linda is located on rolling ground and about 20 miles in an air-line from the ocean. My place is at an elevation of 500 feet, and the trees are planted 24 feet apart on the equilateral system, irrigating better on account of the lay of the land.

I lost six Harmans, and two Tafts, from sunburn and one Harman from wind when first put out in 1913, because they were not properly protected from the sun and wind.

All trees set out in 1914 and since are staked, shaded from the noon-day sun, and the trunk protected, for the first year, with paper mattress, such as newspapers are printed on. The second year the trunk is protected with whitewash, (Wickson formula). After the second year, if trees are not headed out too high, they will protect themselves from sunburn. I am now letting all of my trees branch out low, as it protects them against the wind, of which we have considerable, and sunburn, gives a larger and stronger trunk, and holds the moisture much better than when kept trimmed up.

I think 24 to 30 inches is as high as any avocado tree should be headed out, and this heading out should be done in the nursery on all

strong growing trees. Some of the Harmans first planted were headed out at 48 inches, which is entirely too high. Of course, trees only 18 to 24 inches high when planted will have to be taken care of in the orchard.

It is a serious mistake in my judgment to plant out any number of avocado trees, expecting to water them through the weir once per month. On heavy soil, well cultivated after each watering, one can raise the strong growing kinds, but when they come into bearing if not watered every week or ten days during warm or hot spells in the summer, they will drop their fruit.

Of the thin-skinned varieties, the Harman has proved the most vigorous grower and the most symmetrical tree, but practically all of its fruit matured to date has had the skin cracked open in several places. It furthermore has quite a large seed for the amount of edible matter. I will bud them all over just as quickly as a first class, winter-bearing fruit shows up.

The Queretaro is a strong, upright grower and a good fruiter for its age, but the fruit is smaller, 6 to 10 ounces, and the seed is larger than one had a right to expect from the description published in the Association's official booklet.

Of the thick skinned varieties, the Fuerte and the Taft are the best growing and spreading trees. The spread almost equals the height.

The Fuerte and healthy Dickeys are the best fruiters up to date. Of the 50 Fuertes planted, all are fruiting with from two to 54 fruits per tree at the time of writing, October 10, 1916. The 16 healthy Dickeys have from six to 80 fruits. I planted 50 Dickeys, have dug out 25, and there are nine more that may have to go, as they have a slight tinge of yellow, but of the 16 healthy trees one could not ask for a better grower and fruiter at their age.

The Grande is making a good growth, and of the two trees I have, each has one fruit that will now weigh close to one pound.

Most of the Tafts blossomed, and quite a number set fruit. One tree had over 60 fruits from the size of a pea to that of a cherry, but they all dropped off except four, two on one tree and one each on two other trees.

Of the hardshell varieties, the Rey, Linda, Queen and Knight are all making good growth for the time set out. The Knight is an extra good grower, and its new foliage is a beautiful bronze, different from any of my other varieties. The Linda has the drooping habit, the same as the Grande and practically all other trees bearing large fruit.

The following table shows all varieties planted:

BUDED AVOCADOS

Varieties Planted	No. Trees	Date Planted	Commenced Blossoming	REMARKS	OF WHOM PURCHASED
Harman	50	8-12-13	10-1-14	Had 12 fruit, 1915, and about 10 dozen 1916.	E. K. French
Taft	27	8-12-13	8-18-16	4-1-16 About 50 per cent blossomed and quite a number set fruit, but all dropped off except 4.	E. K. French
Harman	48	3-1-14	8-18-16	4-1-16 set fruit, but all dropped off except 4.	E. K. French
Pollock	3	3-1-14	4-1-16	Proved to be Millers instead of Pollocks.	E. K. French
Chappelow	2	3-1-14	10-1-15	Dropped all fruit except 6.	E. K. French
Ganter	2	3-1-14	12-22-15	One dozen fruit on two trees.	West India Gardens
Dickey	50	3-12-14	3-10-16	to 80 fruit now on each healthy tree.	West India Gardens
Fuerte	50	3-12-14	11-15-15	to 54 fruit now on each tree.	West India Gardens
Queretaro	10	3-12-14	11-1-15	to 30 fruit on each tree now maturing; all trees bearing.	West India Gardens
Atlixco	10	3-12-14	3-10-16	All fruit dropped.	West India Gardens
Murrieta	2	3-12-14		Cannot get trees to grow.	West India Gardens
Sinaloa	3	3-12-14		Poor growers.	West India Gardens
Grande	2	3-12-14	3-1-16	Have one fruit on each tree.	West India Gardens
Redondo	1	3-12-14		Proved to be a Fuerte.	West India Gardens
Trapp	1	3-12-14	4-1-16	Fruit dropped.	West India Gardens
Verde	1	8-5-14		Could not get it to grow.	West India Gardens
Popocatepetl	1	8-5-14		Making good growth.	West India Gardens
Volcan	1	8-5-14		Making good growth.	West India Gardens
Lyon	1	2-16-15		Lived only two weeks, account of being raised in a box. Roots dead when received.	West India Gardens
Rey	2	3-5-15		Making good growth for time out.	Armstrong Nursery
Linda	2	3-5-15		Making good growth for time out.	E. E. Knight
Queretaro	7	3-7-16		Doing nicely.	E. E. Knight
Fuerte	12	3-7-16		Doing nicely.	Budded from my own trees.
Sharpless	2	3-8-16		Making fair growth.	Hart & Barber
Blakeman	1	3-9-16		Making fair growth.	Hart & Barber
Solano	1	3-9-16		Making fair growth.	Hart & Barber
Val de Flor	1	3-9-16		Making fair growth.	Hart & Barber
Perfecto	1	3-13-16		Making good growth.	A. B. Williams
Perfecto	1	3-20-16		Proved to be a Grande.	A. B. Williams
Knight	2	3-20-16		Extra good grower.	E. E. Knight
Queen	1	5-19-16		Good grower.	E. E. Knight
Surprise	1	9-14-16		Starting fairly well.	Armstrong Nursery
Walker's Prolific	2	3-1-14		3-1-16 Profuse bloomer; dropped all fruit.	E. K. French

PLANTING PLANS FOR AN AVOCADO ORCHARD

By H. J. Webber, Director, Citrus Experiment Station

The avocado, while well known, and widely grown in tropical countries, has nowhere been cultivated in extensive orchards on a commercial scale. No literature or experience is available to guide the grower in the laying out of the orchard. The oldest trees in California are still young, twenty to twenty-five years of age, and thus little evidence is obtainable here to indicate how large avocado trees will normally grow in California. Again, in all fruits the trees of different varieties may differ considerably in their size, and judging from the rate of growth observed in the different varieties now being grown, the varieties of avocado apparently present no exception to this rule. It is clearly evident that nobody at the present time can do more than hazzard a guess at the distance apart the trees should stand in a permanent orchard. Furthermore, it is evident that satisfactory information on this point cannot possibly be obtained for a number of years—probably at least ten years.

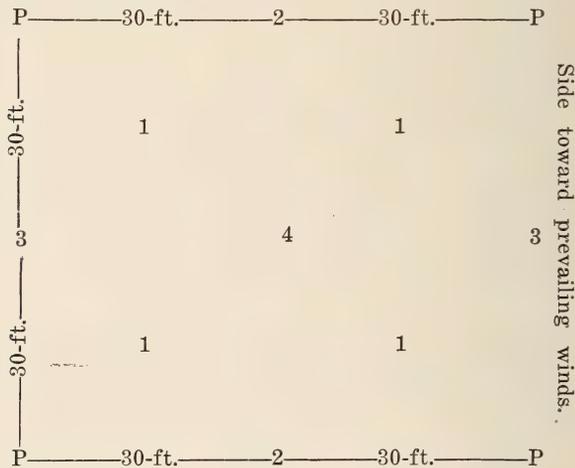
In the meantime, the avocado industry is developing rapidly, and it is very probable that serious mistakes may be made that will be difficult to correct. Are there any precautionary measures that can be taken? It seems to the writer that the only thing to do to guard against loss is to plant the orchards on some flexible plan that will provide for changes in distance without loss, and this, it seems to me, is possible by carefully planning the orchard in advance. The writer would not assume to be able to make a plan that would fit all conditions, but the suggestions made below may be of value in stimulating growers to devise even better plans.

The largest tree in the state, known to the writer, is the Chappelow tree, twenty-two years old, which has a spread of about 60 feet. The Challenge tree, 19 years old, has a spread of 38 to 40 feet, and the Taft tree, sixteen years old, about 35 feet. A number of trees of a size equal to the two last mentioned exist in the state. All of these trees are comparatively young and give an indication of the size the trees may reach. True, we may keep them down in size by pruning, but it has not been determined that this is feasible. It seems to the writer that no distance of less than 50 to 60 feet apart can at the present time be safely adopted for the permanent orchard. At the present time 25 to 30 feet apart is the space at which the trees are most commonly planted. This plan will allow the taking out of every other row and every other tree in the permanent rows, leaving the final spacing 50 to 60 feet.

The plan the writer desires to present (see diagram No. 1) is based on the permanent trees being placed 60 feet apart. These permanent trees are indicated with the letter P in the accompanying diagram. It will be seen from an examination of this diagram, that in the first planting the rows are placed 30 feet apart, with a filler tree in the centre of each square. The trees indicated by the figure 1 in the diagram are to be the first filler trees, to be removed when the planting becomes crowded.

These first filler trees should be of some precocious variety similar to the Lyon. The removal of the first fillers will leave the trees 30 feet apart each way in squares. When the trees next become crowded, remove the second filler trees indicated with the figure 2 in the diagram. This will allow the permanent trees to spread out into the space occupied by the second fillers, 2. When now the trees become crowded again, remove the third fillers, 3 in the diagram, which will leave the permanent trees in squares 60 feet apart, with a filler tree in the center of each square. (4 in diagram.) These center trees should have been planted with some good variety desired permanently, and are designed to remove if the trees again become crowded. Fillers 1 and 2 should be planted with quick fruiting varieties, as they will certainly require to be removed. Fillers 3 and 4 should be planted with varieties permanently desired, as they may not require to be removed.

Diagram 1.—Avocado Planting Plan
Irrigation Headline



A variation of this order of removal would be to take out the fourth fillers, 4 in diagram, before the third fillers are removed, leaving the rows 60 feet apart and the trees 30 feet apart in the rows. If the trees then should not grow so large as to require further thinning, this will give an orchard arranged on a plan similar to some of the best lemon groves—a plan favored by some good growers. In this case the trees will come close together in the rows, and if the rows are run in opposite direction to the prevailing winds, each row will form a windbreak for the next row. Again, this plan leaves a good space between the rows one way to accommodate the hauling of fruit and the distribution of water.

This plan of planting will give approximately 96 trees per acre when first planted, 48 trees per acre with the first fillers removed, 36 trees per acre with the second fillers removed, 24 trees per acre with the third fillers removed, and 12 trees per acre with the fourth fillers removed.

several different varieties, any one of which may be used ten years later as the permanent trees. Either plan suggested would permit of using four different varieties and yet when the fillers are removed leaving a uniform solid orchard of one good variety. If, for instance, after ten years, it was found that the variety used as the first fillers (1) had proven to be the best sort in the orchard, these could be left to form the permanent orchard. In view of the impossibility of judging at the present time which varieties are likely to prove the most satisfactory, some such system of planting may prove helpful.

GROWING AN AVOCADO TREE

F. O. Popenoe, President, West India Gardens, Altadena, Cal.

The germination of an avocado seed and the growing of a fine young seedling tree from it is such a simple, easy and interesting process that it has seemed the subsequent steps necessary to produce a budded tree must be equally simple. This, perhaps, is one reason for many of the efforts among amateurs to propagate budded stock for their own use.

And lured by the seemingly high price of trees, nearly all of the nurserymen of Southern California have, during the past five years, also undertaken to propagate the avocado. Not only have practically all of the amateurs failed, but now many of the nurserymen have retired from the field, leaving the work to a few who have devoted their entire time and much study to the business, and who, through such larger experience, have acquired a sufficient knowledge to enable them to go ahead.

Propagating the avocado is a work for the specialist. The many disappointments and the costly failures of the intelligent amateurs and the most skilful nurserymen referred to, fully confirm this. A history of avocado budding in California, including all efforts, would possibly reveal a ten per cent success. This seems a startling statement but with positive knowledge of numerous instances where nursery rows of seeding stocks reveal from four to seven scars on each tree, showing that many repeated efforts, and then only an occasional budded tree in a row as the result, I believe this statement of a ten per cent success for first bud insertions is ample. Moreover, the successes are largely based upon the use of buds from strong growing, easily worked varieties such as Harman, while the propagation of the more difficult Lyon and Sharpless may be said to be a practical impossibility for the beginner.

I do not hesitate to say, therefore, that the amateur, unless he has rare and exceptional skill, will only meet with discouragement and failure in his efforts along this line. Knowledge to be gained by experience, of the necessary conditions of buds, (which varies greatly with the different varieties), the method of budding and the details of subsequent treatment, are all so vital that one lacking a considerable experience may well take this warning and leave the field open to those who have earned a more enlightened understanding through having traveled the long and costly road leading to a fairly successful effort.

So costly has been the work on account of the difficulties referred to and the many failures in consequence thereof, that I believe it is entirely

within the bounds of accuracy to say that no avocado nurseryman has realized a sufficient income during the five or six years in which budded trees have been grown, to equal his expense account.

Seeds and Seedlings

Seeds from the thin skinned Mexican highland fruits grow stocks that are at once vigorous and hardy. If the seeds selected are of good size, weighing from two to three ounces each, they will produce stocks large enough to take the bud in six months, while a tree grown from a seed weighing one ounce or less requires about two months longer to reach this stage of growth. Taken from a fully ripened fruit and planted immediately—the correct practice—germination begins at once (it is assumed that the seed is taken from a fall ripened fruit) but is retarded by the cool weather of winter and does not assume activity until April or May.

With many of the hardy Mexican trees in bearing, an adequate supply of seeds is now obtainable in California for the development of the industry. Such seeds may be purchased for \$2 or \$3 per hundred, but with the naturally increasing supply each year this price will tend downward. It ought to be a matter of honor with every nurseryman to use only seeds of the hardy character referred to, avoiding those from Tahiti or other tropical regions.

Germination is carried forward in a lathhouse for frost, heat and wind protection. The seeds may be planted either collectively in deep flats, or individually in four-inch pots.

Planting in flats is the most economical method, but has the drawback of some difficulties when the young plants are transferred to nursery rows in the open field, as they must then be planted with bare roots. If a hot spell is encountered the plants suffer somewhat before they become established. It may even be necessary to shade each plant with a shingle for the first two or three weeks after planting.

A box six inches deep of convenient size for handling, filled with a mixture of three-quarters clean, sharp sand and one-quarter soil, will afford a suitable receptacle. Set the seeds an inch apart with the pointed end up and just slightly showing above the ground. A few holes in the bottom of the box must be provided for drainage. Keep this mixture of sand and soil moist, not wet. When the young trees are eight or ten inches tall the boxes may be taken to the field, one side knocked off, and the young plants easily removed by breaking up the loose mixture with the fingers. They should, of course, be planted as rapidly as taken out, with no opportunity for the roots to become dry.

The method of starting the seeds in four-inch pots is perhaps the most efficient and satisfactory. The unfilled pots may be set in beds and a mixture of sand and dirt thrown on with a shovel. Thus the spaces between the pots are also filled, which is desirable, as this tends to an even degree of moisture. Level off the soil and plant, a seed in each pot, water thoroughly and keep moist. Little loss is realized in transferring plants so grown to the nursery rows in the field. An objection to this method has been made and much discussion has resulted therefrom on the ground

that the roots are curled by the pot and the tree on that account is not so thrifty or desirable. This objection has been overrated. The curled roots may remain so, but they are immediately replaced by others, which grow naturally and form the real root basis of the tree. True, a plant or tree may become stunted or pot bound by long growth in a pot, and a long time be required for its recovery. But the process of starting seeds in pots and planting them in the field early is in my judgment the ideal one, with no disadvantage whatever attending it.

The Budding Process

While propagation has been accomplished by the rooting of cuttings and by grafting, experiment reveals many objections to each of these methods, and shield budding is the accepted practice.

The young trees should be set eighteen or twenty inches apart to allow for an adequate sized ball of earth at transplanting season. When the plants are as large as a lead pencil (or preferably slightly larger) budding may begin. This may be at any time from the first of May to the first of January, the season not being so important as the condition of the stocks, which must be in vigorous growth, with an abundance of sap running. A copious irrigation three or four days before the budding work begins is an advantage. A shield bud averaging one inch in length cut to include a thin, small slice of the wood itself, is used. The knife should have a keen, razorlike edge, and be kept so. Insert the bud in a T or inverted T incision—it makes no difference which—and wrap fairly tight with a strip of cotton cloth one-half inch wide and ten inches long.

If at the end of three weeks the bud is green and healthy, take the wrap off, and using the same strip, rewrap. This loosens the tie so that it will not cut the growing stock. At the end of three weeks more, repeat this process, and if the bud is still in healthy condition, cut back the top of the seedling tree two or three inches, to start the bud into growth.

From now on great care should be exercised to keep the young seedling in healthy, vigorous condition, and to remove from time to time any suckers or branches thrown out before they have made much growth. When the bud is six inches long, draw it up to the seedling tree with a raffia tie, in order to train it to a straight upward growth. When it has grown to a height of twelve or fifteen inches, stake it and cut the seedling top back to within six inches of the bud. In this condition it may be allowed to continue to grow until the bud is three feet high, when the remaining seedling top should be "stubbed back" to a point just above the bud, slightly tapering to the opposite side of the seedling tree. This junction or union point will subsequently heal over and the tree have a tendency to become straighter each year.

Given seedlings in vigorous growth, and a budder with skill and judgment, still a large factor in successful work is the selection of the bud for insertion. This should not be from tender, sappy growth at the end of a limb, but usually from a partially matured wood further back, averaging roughly speaking four to six months of age. Here experience alone is a sufficient guide. Broadly speaking a plump, fat bud not yet

leaved out should be selected. However, the variation is so great that buds of this character are never available on trees of some varieties, and the closest approach must then be taken. A thin, peaked bud is to be avoided where possible. If the bud growth is too far advanced the eye will usually drop off and the result is a blind bud of no value, even though the shield may have properly affixed itself to the stock.

The Young Tree

As the young budded tree advances in growth, great care should be taken to keep it properly staked with a light stake that will not interfere with balanced leaf or branch development. Low branches that assume too great prominence should be removed, the object being to gain a straight, symmetrical growth with light side branches beginning about a foot from the ground, and a well branched top, commencing say two feet above the ground, retaining its main stalk or leader.

During the period of active summer growth, irrigation every seven to ten days is not too much. Be prepared to turn on the water at a time of excessive heat, to prevent the burning of tender tips. Check the irrigation work sharply by October 1 to harden leaf and branch growth, watering only enough to keep the trees in good condition.

By the first of January the most dormant period of the young tree has been reached, and balling may be begun. Here again great care and the work of skilful men only should be employed. The balls should weigh forty or fifty pounds each. Handle carefully and as few times as possible, and place in the lathhouse with slightly moistened shavings filling the spaces between the balls. Water lightly from time to time, and thus hold until the trees are removed for orchard planting.

Orchard Planting

This work should take place preferably in March. At this time the young tree is practically a one year old bud on a two year old root, and should average four feet in height. A tree smaller than this size is quite as likely to be desirable as one larger.

In general it may be said that any good soil is satisfactory for avocado growing. If tight, close or hard, take the proper means of loosening and preparing, always providing good drainage. Money spent on advance preparation for orchard planting is an investment that pays big returns. Large holes dug in the fall and dynamited if the ground requires it, then two thirds filled with a mixture of one-half rotted manure and one-half top soil, allowing all to weather until March, is the ideal preparation. In planting, mix in more top soil, and after setting in the ball to about its previous depth, and two-thirds filling in the hole, lay back the burlap covering, fill in more dirt, leaving a top basin, then water thoroughly and subsequently level off with loose soil.

Probably there is no better cultural treatment for the first or second year than that afforded by the basin system, with a heavy mulch of loose stable manure.

Orchard trees may be spaced 25 or 30 feet apart if of the low

spreading type such as Fuerte or Taft; but it is not too close to space Lyon, Perfecto, Sharpless and upright types 20 or 22½ feet apart.

A stake with rounded edges and sufficiently strong and high to act



Figure 35.—Newly set avocado trees, protected from wind and sun injury by cloth covers. Judge Silent place, Glendora, Cal. (Photo by H. J. Webber)

as an adequate support for the first two years growth should be provided. And a lean-to shade made of a piece of bur-lap 4x4 feet, tacked to two five foot stakes placed to protect the young tree from 10

o'clock during the first summer, is highly desirable. (See Fig. 35 for illustration of similar method.—Editor.)

Irrigation the first summer should average fortnightly, with extra irrigations in hot spells. Much of course depends upon the nature of the soil, and the specification mentioned is a general one, to be varied with good judgment according to circumstances.

Pruning

Unquestionably the avocado tree should be kept low, with branches touching the ground, thus affording necessary shade to the trunk and keeping the ground cool. These lower branches should be kept secondary in size. Frequently these lower branches will assume too great a growth and importance, detracting from the symmetry and desirable frame development of the tree. In such cases they should be trimmed back, the purpose always being kept in mind to have a broad, low, stocky tree, capable of withstanding wind and from which the fruit may be easily picked.

Certain upright growing types do not readily lend themselves to this treatment, and with them some latitude must be allowed.

Pruning for avocado fruit wood is to a great extent an unexplored field, and only general principles can be applied.

THE AVOCADO IN FLORIDA

John B. Beach, Proprietor Indian River Nurseries,
West Palm Beach, Florida.

The avocado may be said to be as nearly indigenous to Florida as the wild orange, lemon and lime. All were introduced from elsewhere, either by the Spaniards or later settlers, none dating back to pre-historic times. Old government records show that in 1835 "Alligator pears were killed at St. Augustine", and they were very likely introduced from the Bahamas or Cuba in the early part of the last century. The more tender West Indian type to which our trees belong, has been kept confined to the more tropical portions of the peninsula, gradually working up farther north, only to be destroyed by such severe freezes as that of 1835. For instance at the present date there are seedling trees on the lower St. Johns and at St. Augustine which are bearing fruit, the fact being that no cold severe enough to kill them has visited the state at large since 1905. The more hardy Guatemalan and Mexican types, which are grown in California exclusively, have never gotten a foothold in Florida, owing to the rapidity with which the seed loses its vitality, and the fact that these types do not appear in any of the nearby islands, the only exception which the writer knows of is a tree at Earlton, near Waldo, belonging to Baron von Lutichau. This tree, which belongs to the Mexican type, is about 30 feet high, and Prof. H. H. Hume writes that it first came to his notice in 1901, at which time it looked to be six or eight years old. It is reported to have never been injured by cold, and to bear fruit more or less regularly, while orange trees close by have twice been killed to the ground.

About the largest tree of the West Indian type is found at Dunedin, on the Gulf of Mexico, due west from Tampa. This tree was frozen to within 25 feet of the ground in 1895-6, but has apparently been unharmed since that time. It is about 5 feet in diameter and 40 feet high, with a spread of 60 feet. It produces regular crops of 2500 to 3000 fruit annually, averaging $1\frac{1}{2}$ pounds each, and is owned by Mr. B. C. Bass. During the past eight years various seedlings of Guatemalan, Mexican, and Hawaiian origin, as well as budded trees, have been introduced by the United States Agricultural Department and have been distributed for experiment among growers in south Florida, and planted at the Miami Experimental Station. Among these, one of Guatemalan type, called Taylor, has been fruiting for four seasons, and has been deemed worthy of description in the Department publications. It is a seedling. Following is a description of fruit by Wilson Popenoe:

"Description of the fruit: General form pyriform to obovate; size—length 4 to 5 inches; breadth $2\frac{3}{4}$ to $3\frac{1}{2}$ inches, weight 12 to 18 ounces; stem rather long, rather slender; base tapering, but not usually distinctly necked; apex rounded; surface undulating to rough, dull green in color; skin 1-16-inch thick, granular, woody, separating readily from the flesh; flesh yellowish-cream color, pale green near the skin, $\frac{1}{2}$ to $\frac{5}{8}$ -inch thick,

fiber none or very little, texture smooth and fine; flavor fairly rich; quality dessert, good; good shipper; good keeper; seed cavity rather large; seed conical, 2 by 2½ inches, tight in the cavity with the seed coats closely adhering, season January 15th to April 1st at Miami, Florida."— (Wilson Popenoe.)

The variety called Chappelow (Mexican type) has also been fruiting for six or eight years on the plantation of Prof. Rolfs at Buena Vista. It ripens from May to July, but is not considered of any value as a market fruit being treated merely as a curiosity, coming when no other avocados are in season. There are quite a number of other trees, scattered about, from these government introductions, and from private importations from California, or elsewhere, of the hardy types, which are fruiting for the first time this year, or have set their second crop, though the Taylor and Chappelow have the longest records in Florida.

So far as we can gather from our brief experience, the various trees mature their fruit in Florida at approximately the same season they do in California, but chance for observation has been so limited, it is impossible to make any definite statement on this subject. One thing has been observed, which is likely to be of considerable importance in propagating trees for the middle and upper portions of Florida: trees of the hardy types, when worked upon stock of the same type, seem to be fully one month earlier in starting their spring growth than when the native West Indian stock is used. This will greatly militate against the frost resisting value of the tree, and tend to loss of crop and damage to foliage from late frosts, which the dormant tree on native roots would never feel.

The Trapp is the only variety which is being propagated extensively for commercial purposes, and while not quite an ideal fruit, it combines so many good qualities that it will be hard to find a rival for it, and it has already established its name and reputation in the markets, like the Riverside Navel, and the Indian River Orange. The original tree is a chance seedling growing on a rock ridge near the shore of Biscayne Bay, south of Miami, and bears the name of the pioneer who planted the seed. In shape it is, roughly speaking, spherical, flattened at the blossom end, and just a trifle one-sided, owing to the stem being placed at a slight angle with the axis of the fruit. In actual practice it packs like a grapefruit, and coming into market after the weather has become cool, may be safely transported to our most distant markets, some growers sending much of their crop to Seattle and Tacoma with perfect safety. The color is bright, glossy green, not changing when mellow; weight 1 to 2 pounds, meat rich butter-yellow, shading to green at rind.

In the most southern portion of Florida it matures about a month earlier than in the middle portion of the Peninsula, reaching maturity in October and November. After it has completed its growth, the fruit hangs upon the tree with wonderful tenacity, often enduring severe winter storms in exposed locations into March. Of course there is always a certain amount of fruit which falls off from week to week and month to month, varying very much from year to year, so that the earlier one can market his crop to advantage, the greater the quantity of fruit. In

actual practice December is the favorite month, because by that time all seedling fruit is practically over with, and the market bare. Mr. Chas. Montgomery, who in 1912 was using a peculiar system of packing with corrugated cardboard and excelsior, is one of our most progressive and experienced shippers. I will here quote a letter just received from him, which gives the result of his later experience in packing and marketing, and contains much interesting information.

"At whatever date the Trapp avocado seems matured (because it is a late fruit only in the ability of hanging on the tree a long time after it is ripe), I go over the trees very carefully, attempting to inspect every fruit and remove from them whatever fruit will pack 44 or larger that has been rubbed by the limbs or has creases in the side or anything whatever that would lead me to believe that it would be a drop, hence a cull. Within a period of two weeks after I believe the Trapps have reached maturity I remove the fruit that appears to be overripe and that within a period of five days drops and hence would become a cull. I continue this method throughout the season excepting on the trees I reserve for very late fruit. From these trees commercially I stand the loss of drops and culls because normally after you begin removing fruit from the Trapps, you must continue the operation or nature will throw all of them off. I use a bomboe rod on the end of which is a semi-circular wire quite heavy that will not bend with the weight of the fruit. I sew to this wire a piece of canvas that will hold three or four Trapps. At the extremity of this bag I have a section of the same wire bent in a fishhook shape to break the fruit from the tree. I gather all the fruit by hand that can be reached from the ground or six foot ladder. For fruit higher than this I use a pole. This fruit is handled mostly in picking baskets,—occasionally in Wilson picking bag. Each fruit is handled individually. The stem cut smooth with a knife using the same care as for eggs intended for setting purposes. I use a special crate for packing with $\frac{3}{8}$ -inch board in the center, such as might be used for citrus fruits. The crate in outer dimension is the same as the six basket standard tomato crate. I have the crates made especially. The bottom boards being extra wide, are placed $\frac{1}{4}$ of an inch apart from the center which would make an opening on each corner of approximately $\frac{3}{4}$ of an inch. The opening between the slats on the side measure $\frac{3}{4}$ inch.

"The top is solid the same as the standard tomato crate. With the exception of the middle board, all of the material in the entire crate is made of gum which is white and gives an attractive appearance. For packing this fruit 36 size use 4-5 4-5 which gives 18 fruit to the side. The four fruit are not packed in the corners. 44 size are packed two in the corner and one in the middle. When I ship three crates to a man I mark each end with his name and address and on the top with a heavy blue pencil "On", placing beneath it a dash and beneath the dash the figure 3. Should it be five packages I would write "On" and beneath it a dash and beneath the dash the figure 5, then the expressman employed as he picks it up sees right away that there are more packages marked to that consignee which will eliminate errors. I have found in

two years experience out of my eleven years' experience that using the middle board divides the weight of fruit in half, eliminating the loss in over-ripe fruit during August and September, and some times early in October, between 75 and 85 per cent which for my own fruit practically pays for all of the crates used in the entire season. I have found only a few who object to the package and in every instance they are commission men who are not familiar with it. I use neither corrugated paper nor excelsior; only tissue wraps and make a complete full solid pack without bulge."—(Chas. Montgomery).

I will say that I have a few old Trapp trees which I keep for home use, and never pick a single fruit. I allow them to drop as they will normally and find that they are never damaged by striking the sand, being invariably hard when they fall. They will take from one to three days to become mellow and eatable if kept in ordinary temperatures, while if placed in the refrigerator, at a temperature of 38 to 50 degrees, they will keep from one to three weeks.

Last year Trapps brought \$6.00 per doz. on the trees after Dec. first, and sales as high as \$35.00 per box f.o.b. were common, while what few were left after Christmas brought even higher prices. The largest grove in the state belongs to Mr. J. S. Collins, and is located close to the ocean at Miami Beach. There are about 100 acres in the grove, but they have not had proper attention until this past season, when for the first time they received mulching and a fair supply of fertilizer. Nevertheless, enough fruit was produced last year to pay expenses, while this year the crop is very promising. The trees are four to five years old, and the water table about 4 to 8 feet below the surface. The soil is deep sand, in some places underlaid with rock, but at a several foot depth, where it occurs.

The Pollock is another variety of great merit, but coming in August, September and October, it is of less market value. It is pear-shaped, solid and rich with a comparatively small seed, usually tight in cavity, and weighs from 2½ to 4 pounds, color same as Trapp. One specimen grown by Mr. C. C. Haight of Palm Beach, this month tipped the scales at 5 pounds even. It is an ideal fruit.

Family is the name applied to a tree originating on the plantation of Prof. P. H. Rolfs at Buena Vista, and named by him, because it seems such a desirable tree for family supply. Fruit is eatable from as early as July first to latter part of September, and is of excellent quality, being produced in enormous quantities, trees beginning to bear when very small. It is a long pear-shape, with a very small seed, loose in the cavity, and some seasons has been without seed. It is of no value as a shipper, owing to large cavity and loose seed; weight 1¼ to 2½ pounds, turns deep mahogany or purple when mellow.

Estelle is an early sort, which is sometimes good in late June, and has a tight seed generally, which makes it a shipping fruit. It originated on the plantation of H. H. Harrison of Fulford, on rocky hammock land. It is short pear-shape like the Pollock, but only ¾ to 1½ pound in weight; color persistent green like Trapp and Pollock.

THE CULTIVATION AND FERTILIZATION OF THE AVOCADO IN FLORIDA

By Wm. J. Krome, Homestead, Florida.

While the avocado has been grown in Florida since the days of the earliest settlements along the lower East Coast, the planting of orchards and the production of the fruit on a commercial basis dates back little over a single decade, and it has been only in the past few years that the industry has begun to assume proportions of real importance in the horticulture of the state. It can therefore hardly be said that any very definite systems of cultivation or fertilization have been determined upon, but while the various cultural methods have been almost as many as the number of actual plantings, and have all been more or less experimental in nature, some of the general principles are becoming fairly well understood and are gradually being adopted by those interested in avocado growing.

One of the first points upon which observers came to agree, was that though the avocado tree demands a plentiful supply of water and flourishes under irrigation, it will not thrive except upon well drained land and any conditions that make towards a soggy or water logged soil are almost prohibitive to the success in its growth. The trees, particularly when young, are damaged to a greater extent than citrus by prolonged droughts and at the same time there are many fine orange and grapefruit groves, budded on sour orange stock, growing on land that is too low and wet for the avocado.

It has also been accepted as a fact that the avocado is a gross feeder and to do its best requires a heavier supply of plant food than citrus trees of the same age. This is evidenced on the Florida Keys where lime trees thirty years old are to be found, in good condition of growth and producing heavy crops of fruit annually, without any other source of food supply than that obtainable from the deposits of humus filling the interstices of the coral rock where the original hardwood jungle has been cleared away. The avocado on this type of land makes a rapid growth when young and will produce two or three good crops but after reaching an age of five to six years the tree ceases to put on growth, begins to die back and in a comparatively short time will die from starvation, unless the supply of plant food available from the soil is augmented by the application of fertilizers. The same fact has been demonstrated repeatedly in the avocado groves on the main land and the writer has had frequent opportunity to observe that where fertilizer has been applied sparingly not only have the trees shown the effects of the insufficient food supply, but any fruit which may be borne on them will invariably be small in size, with thin meat and poor color. The flavor of such fruit, however, seems fully equal to that produced upon trees in better condition.

The nature of the plant food required by the avocado has not been very satisfactorily determined, but it has become evident that a scheme of fertilization must be worked out differing considerably from that which

has been generally adopted for citrus. Broadly speaking the application of commercial fertilizers deriving their elements of plant food from wholly chemical sources has not proven successful. In many instances, through lack of more definite information, growers have given their avocados the same fertilizers which they have used on their citrus trees. Where the formulae have been those most frequently applied to citrus, with nitrogen derived from sulphate of ammonia or nitrate of soda, potash from sulphate of potash, and phosphoric acid from acid phosphate, the results with the avocado have been generally unsatisfactory. However, when the formula used has been of the type known as "young tree" fertilizer, carrying a proportionately higher percentage of ammonia, largely derived from organic sources, better effects have been obtained.

Many isolated avocado trees are to be found throughout the Southern part of Florida, chance seedlings usually of unknown origin, and it has been commonly observed that such of these trees as are located in the vicinity of cow pens, chicken yards or where kitchen slops are thrown out, are almost invariably lusty growers and heavy bearers. This has given ground for the theory that the avocado is partial to a food supply derived from organic sources and chance applications of such fertilizers as cottonseed meal, tankage or stable manure have borne out the same idea.

During the past few years the writer has done more or less experimental work in an effort to arrive at formulae best suited to the avocado and also to determine the frequency and approximate seasons of the year at which to apply the fertilizers. Along these lines several problems must be solved and the probabilities are the same solutions will not fit the West Indian, Guatemalan and Mexican types equally well.

Avocado trees of the West Indian types, when in good condition of growth, are prone to put on a tremendous bloom from which a setting of fruit is apt to result so heavy as to be entirely beyond the carrying capacity of the tree. Following this abnormal effort there is often a period of apparent exhaustion during which the tree seems to realize that it has "bitten off more than it can chew", and to be seeking the best method to recoup from its over exertion. This is a critical time in the life history of the tree and calls for intelligent handling on the part of the grower. If left to its own devices the tree will endeavor to carry the over crop, draining upon its reserves until its vitality has been seriously impaired. Evidences of this condition are usually very apparent. The tree drops a large portion of its leaves, the younger branches change in color from a dark green to a saffron yellow and no new growth is put on. Lack of sufficient foliage to provide proper shade often results in serious sun-burning of the more tender branches, and the low state of vitality lays the tree particularly liable to the inroads of disease, especially the anthracnose fungus which seldom loses such an opportunity for making an attack. Finally the tree is compelled to drop practically its entire crop of fruit and is left in a condition which means, at the very best, a set-back of two seasons in its development and not infrequently results in its actual death.

To obviate overblooming, particularly in the case of young trees, is very difficult, for the better the cultural condition of the tree, the more

likely this is to occur. The usual procedure has been to thin the over crop of fruit and this method of handling works quite satisfactorily provided the set-back to the tree has not already been brought about through the excessive bloom. However, the avocado requires a longer period than most fruits between the first appearance of the bloom and the setting of the fruit and it often happens that the damage to the tree has made considerable advance before relief by stripping can be obtained. In this event removal of the entire crop and further careful attention is necessary.

In an effort to overcome this difficulty, the writer has during the past two seasons, resorted to frequent applications of fertilizer, in order to offset the heavy drain upon the vitality of the trees during the blooming period. In the spring of 1916, following a season favorable to growth, the avocado trees at Medora Grove began to bloom about the middle of March. Immediately afterward a light application of fertilizer, carrying ammoniates from readily available sources was made. The bloom was the heaviest known in a number of years and persisted until about the middle of April. Between April 15th and 20th another light application of the same fertilizer was made and this was followed by a third application the latter part of May, when a fertilizer somewhat higher in phosphoric acid, largely derived from low grade tankage, was used. As a result of this treatment a full crop of fruit was set and in most cases carried through to maturity without damage to the trees. When an over crop was set at first, as a rule dropping took place without a reduction in vitality, until the proper carrying capacity had been reached, and the remainder of the crop was matured. In a few cases stripping was necessary, but among nearly two thousand trees of varying ages, not more than eight or ten showed any appreciable damage.

A second problem in regard to fertilization arises later in the season. Avocados of the West Indian type begin to ripen in Florida about the middle of July and the heaviest portion of the seedling crop matures between August 20th and October 10th. At that period the crop from Cuba and other West Indian islands is likewise being shipped and the large quantity of fruit thus thrown on the market, together with the fact that during the summer and early fall the avocado must compete with northern-grown fruits and vegetables, tends to force prices so low, that at times it is difficult to dispose of the Florida seedlings with any margin of profit. After the middle of October the price of avocados begins to climb and during November and December very satisfactory figures are usually obtained. For this reason the large plantings of budded trees which have been made during the past few years have practically all been of late maturing varieties such as the Trapp and Waldin. These varieties mature their fruit so that it may be picked early in October if desired, but under proper conditions will carry at least a portion of their crop into December and in some cases until well along in January.

To so fertilize and cultivate the trees that the fruit may be held for this later market constitutes the second problem to which I have referred.

It has become fairly well established as a fact that of two avocado trees of the same variety, one which is well nourished and kept in growing condition during the entire summer and fall will produce larger finer

appearing fruit than one which is permitted to become more or less dormant through lack of fertilizer, but it is quite certain that the semi-dormant tree will carry its fruit with out dropping for a considerably longer time. There is therefore a rather delicate adjustment to be made in order to bring the tree into condition such that it will hold its crop until late in the season and at the same time will not "go back" to an extent that will be seriously detrimental to its further development or jeopardize the crop for the following season.

Following such applications of fertilizer as are made to restore the tree to good condition after it has passed through the period of bloom and fruit setting there should certainly be at least one further fertilizing during the summer or early fall to provide the nourishment necessary for the production of the crop. And it may be added here that the drain on an avocado tree in bringing its fruit to maturity seems to be vastly greater in proportion than the same effort on the part of a citrus tree. The writer cannot vouch for the soundness of the theory, but it has been his thought that this is probably due to the different character of the fruit. In the case of any citrus, water constitutes a large percentage of the fruit either by weight or volume, while with the avocado the proportion of oils is much higher and it would seem reasonable that to supply these components would be a heavier draft upon the tree. At any rate the fact is certain that an avocado tree must be furnished with a sufficiency of plant food if it is to be expected to produce full and regular crops.

Just how late in the season an application of fertilizer can be made without bringing about a tendency for the tree to mature and drop its fruit at too early a date depends somewhat on weather conditions. Fertilizer applied to Trapp trees about the middle of August of the season just passed, apparently had no detrimental effect as to the fruit holding well, while an application of fertilizer given the same trees about the first of September of the proceeding year was followed, within a few weeks, by heavy dropping of fully matured fruit. The application made in August of the present year was at the beginning of several weeks of dry weather, while that of the previous season was followed by heavy rains and these differences in moisture probably had considerable to do with the effects of the fertilizer.

This second problem is one of great importance to the Florida avocado grower as between December 1 and December 15 the value of his product not infrequently more than doubles and the premium to be gained by being able to carry his fruit until the latest possible date is well worth his very best efforts.

It is our plan at Medora Grove to give the trees a heavy fertilizing immediately after the crop has been picked and a light application about the first of February, which brings them to their blooming stage in good condition, quite thoroughly recuperated from their fast during the fall.

This program provides for five or six applications of fertilizer during the year, which is probably one or two more than is given by most growers, the difference being in the method of carrying the trees through

the spring period. The quantity of fertilizer used at each application varies of course with the size of the tree, quantity of fruit it is carrying and the analysis of the fertilizer. For ten year old trees as high as 25 pounds at a single application has been used with good results. For four year old trees, bearing their first full crop, four applications of from three to four pounds each, one of four and one half and one of five pounds have brought the trees through the year in fine shape. As materials from which fertilizers suitable for avocados may be compounded, cottonseed meal, castor pomace, tankage, ground tobacco stems and ground bone are to be recommended, with a certain amount of nitrate of soda used as a source of nitrogen when quick results are sought as in the case of trees which have "started back". Previous to the war scarcity of potash, it was thought advisable to use formulae giving from four to six per cent of that element, but the enforced limitations to the percentage of potash obtainable during the past two years has had no apparent ill effects upon the trees or fruit and seemingly a range of from zero to four percent will provide all the potash that an avocado tree requires under Florida conditions. A formula that has given good results is built up of cotton seed meal, castor pomace, tankage and ground tobacco stems, analyzing 4 per cent to 5 per cent ammonia, 6 per cent to 7 per cent phosphoric acid and 2 per cent potash.

The trees are usually cultivated by hoeing three times each year and a heavy mulching of dead grass or weeds during the dry winter season. If instead of the dead grass a mulching of compost or well rotted stable manure is used the results are even more satisfactory and the February application of fertilizer may then be omitted entirely.

The foregoing methods are those which have been used by the writer and others, largely with the avocados of the West Indian type. When applied to Guatemalan or Mexican varieties budded on West Indian stock, the results have been entirely satisfactory, but just what changes may become necessary when Guatemalan or Mexican stocks are used it is yet too early to say as these stocks are of quite recent introduction in Florida and the opportunity for observation has been quite limited.

Climatic differences and soil conditions will undoubtedly make many changes from the Florida methods advisable in the culture of avocados in California, but a few of the essential principles apply to these trees wherever they may be grown and it should not be difficult to work out a cultural program for any locality, the climate of which is suited for the avocado, providing the following points are borne in mind:

The avocado demands plenty of moisture, but must be planted only on well drained land.

The avocado is a gross feeder and prefers plant food derived from organic sources.

The production of a full crop of fruit is a severe drain upon the vitality of an avocado tree and this must be compensated for by adequate nourishment.

Mulching is beneficial and almost essential. The avocado does not thrive best under conditions of clean culture.

THE GROWING OF THE AVOCADO IN HAWAII

By J. E. Higgins, Horticulturist Hawaii Experiment Station.

Ladies and Gentlemen of the California Avocado Association:

Your president has requested me to prepare a paper relating to the avocado as it is known in Hawaii. It gives me much pleasure to respond to this request because of my deep interest in your rapidly developing infant industry which I have watched attentively from its earliest beginning, having made several visits to Southern California to observe the progress being made.

First permit me to congratulate the members of the Association on the change in the name of the organization adopting the name "Avocado." The name "Avocado" is now so firmly established in all English-speaking parts of the tropics and it had taken so long to eliminate the many undesirable terms applied to the fruit, that it seems unquestionably best to retain Avocado as the most appropriate.

Perhaps it will be of most interest to consider the subject in its relation to the avocado growing industry in California and in its contrasts as seen from the standpoint of California. In California you have the beginning of an industry and one that appears to be destined to be of very great import. In Hawaii, there is no industry of avocado growing in the strict sense of the term and yet there are probably many more bearing avocado trees in Hawaii than there are in California. The trees are to be found in almost every dooryard and the fruit is common in the markets, yet few if any people are making a business of producing it. The markets of the city of Honolulu and those of the smaller towns of the Territory are supplied with the surplus from dooryards and from a few irregular plantings of very small extent. Orchards are almost unknown.

Why is it that with so grand a fruit as the avocado in a country so admirably adapted to its growth and fruit-bearing, there has been no development of an industry in its production? It will be remembered that it is only a few years since the avocado began to be thought of as a commercial fruit. It was also said to be extremely difficult of propagation by budding or grafting. These problems were attacked by horticulturists in different parts of the tropical and sub-tropical world and the difficulties of propagation soon passed away. The avocado was by this time attracting considerable attention and a number of progressive men in Hawaii were ready to plant orchards. Then the Mediterranean Fruit Fly made its appearance in Hawaii and established itself. Although its attacks upon the fruit are so few that it does not materially interfere with production, it has cut off the possibilities of marketing the fruit on the mainland of the United States for the present. As this was the chief outlet that was looked to by those who considered the business seriously there have not been any considerable developments. Methods of refrigerating the insects, immune varieties of the fruit and other outlets for the fruit may in time make a change in this matter. The production of

avocado oil is also to be considered in this connection and perhaps other manufactured products.

Another contrast is in the familiarity with the fruit. In Hawaii every child as well as adult is familiar with it while in many parts of California it is still spoken of as the "new fruit". But with the present rate of planting it will not be long before the same familiarity will be established.

There is no frost resistance problem in Hawaii since all the avocados are produced on the low lands where frost and even cold weather is unknown. Hawaiian experience in this matter is therefore of no value to California.

In propagation, budding with the ordinary shield bud inserted in comparatively tender wood has become the established method for multiplying the best varieties. Comparatively young wood is also used for buds and the incision is made in the form of a "T" or an inverted "T" with no apparent advantage in either form. Budding is done chiefly on seedlings in one gallon tins or in the young trees where they are to remain permanently. There is very little growing of trees in nursery form and "balling" them for transplanting, first because it has been found that with many inexperienced planters the tree in the pot is safer. Potted plants are also less likely to distribute a very noxious weed known as "nut grass". Under California conditions, the regular nursery practice of balling the trees has much to recommend it.

Hawaii abounds in varieties yet many of them have not been tried out under varying conditions. Perhaps it would be more correct to state that Hawaii abounds in seedlings from among which not a few appear to be worthy of propagation and naming as varieties. The classification of these does not conform to the terms which have become more or less common in California, "Hard shell" and "Thin skinned" or "Mexican". Many of the varieties with thin skin are not of Mexican origin and certainly not of the type grown in highland Mexico. They are in many cases, large, vary greatly in shape and have no odor resembling anise. It has been suggested to avoid confusion, that these be called "West Indian", that the term "Mexican" be reserved for those varieties from the highlands of Mexico with thin rind. For the type with the hard and woody rind, perhaps the term "Guatemalan" is as appropriate as any and is in little danger of producing any confusion.

Most of the varieties in Hawaii are of the type just designated as "West Indian"; the "Guatemalan" is not uncommon, but the "Mexican" is comparatively rarer. A number of varieties from Hawaii have been tested out or are being tested by two of your foremost growers, Mr. W. A. Spinks and Mr. Joseph Sexton, as well as by others in a smaller way. Either of these gentlemen can give accurate information as to the behavior of Hawaiian avocados in California. It is probable that many of them will not prove as resistant to frost as those that have come to California direct from Mexico. It has been stated that some of the Guatemalan types from Hawaii have shown considerable frost resistance.

The breeding of new varieties of avocados is a field of much promise. Merely by seed selection much has been done through the many years

of cultivation in Hawaii to secure excellent varieties; but by the careful selection of characters and the crossing of varieties it is probable that new forms may be originated better adapted to the requirements of a commercial fruit than any now in existence. Most of the selection of seeds in Hawaii during past years has been from the standpoint of flavor and texture only, little regard being paid to the requirements of a commercial fruit in other particulars. The form of the fruit, the tightness of the seed, the keeping quality, productivity, and such characters have been too often overlooked. Much can be done to secure excellent sorts of this fruit by the judicious selection of chance-fertilized seeds, but more is to be expected from careful crossing. The Hawaii Experiment Station has begun some preliminary work along these lines and probably workers in other parts of the tropics and sub-tropics have also made a beginning.

In the matter of marketing, some of the experience of Hawaii, prior to the advent of the Mediterranean Fruit Fly may be of interest to growers in California. Experiments were conducted in shipping the fruit to San Francisco and also to Chicago. A shipment in a refrigerated car to Chicago arrived at its destination in excellent condition. These were packed in single layer crates, were promptly placed in refrigeration after being picked and were out of refrigeration only long enough to be transferred to a pre-iced car. The varieties used in the several experiments tried showed great variation in the carrying qualities. It is a mistake to suppose that the hard-shelled varieties are necessarily the best shippers. Without a doubt the hard shell is a protection to them from outside bruising, but fruits may be poor carriers because of the internal breaking down of the tissues, entirely apart from injury of a mechanical nature. One of the best shipping varieties tested in the experiments of the Hawaii Station was the Farnsworth, a large and comparatively thin rind fruit. This was at one time shipped to Washington, D. C., by way of San Francisco, Lodi, and New York, having been out of refrigeration from San Francisco to Lodi and from New York to Washington, but it arrived in excellent condition at the capital.

Another consideration in the matter of marketing is the relation of supply and demand. When the shipping experiments referred to above were carried on the avocado was very little known even in San Francisco and in most cities of the United States they were almost wholly unknown. A very few fruits would then supply the demand. Today they are becoming very popular in California, but in the interior cities there are surprisingly few people who have ever heard of an avocado. I entertain no doubt as to the ultimate triumph in the markets of this highly nutritious fruit so universally relished in the tropics where it is grown, but unless there be at the present time a carefully carried out program of preparedness in advertising, there may be a period when for a time the supply will exceed the demand. This always means disaster for some and discourages the progress of the industry. It can be avoided by judicious advertising.

There are a few insect pests and diseases of the avocado which are quite generally distributed, but which may not yet have entered Cali-

fornia. The most common insect pest of the species in Hawaii is the avocado Mealy Bug (*Pseudococcus nipae*). Fortunately it is not difficult to control either by spraying with some of the oil sprays or by the use of natural enemies. Several species of ladybugs help to keep down the numbers of the insect, which fortunately seldom attacks the fruit. This insect is widely distributed, having, been seen by the writer in the West Indies, Florida, and Hawaii.

Another insect of less importance is a small wood borer, a species of *Xyleborus*, which penetrates the old wood particularly of trees that are weakened by other causes. These insects may be controlled by keeping up the general vigor of the trees and by the use of a wash on the infested tree trunks and main branches. This wash consists of one gallon of soft soap, three gallons of water and a half pint of carbolic acid. It can be easily applied with a whitewash brush.

There is a disease caused by a species of the fungus *Gloeosporium* which is known to exist in Porto Rico, Cuba, Florida, Hawaii and in other parts of the tropics. Varying results have been reported in the treatment of the disease with fungicides, probably due to the varying weather conditions where it has been tried. It is a difficult matter to make a fungicide adhere to the foliage in many parts of the tropics where showers are frequent.

Any who may be interested in the further details of the experimental work with the avocado carried on at the Hawaii Experiment Station may secure a copy of Bulletin No. 25, on application to the U. S. Experiment Station, Honolulu, Hawaii.

AVOCADO GROWING IN PORTO RICO

By Tracy Bartholomew, Manager of The Rico Tropical Fruit Co.

Garrochales, Porto Rico.

The avocado or aguacate is cultivated generally throughout the island of Porto Rico. The fruits are of good quality and are highly esteemed by all. Regular shipments to northern markets are not yet being made, nor are there yet any bearing trees in orchard form plantings. But the natural and political conditions are so peculiarly advantageous that a very profitable future for the avocado industry is assured.

The avocado is perfectly at home in Porto Rico and thrives in the dooryards and fence corners of rich and poor alike. The fruit is appreciated both as a delicacy and as a substantial food, and is an important item of diet.

The bearing trees are all seedlings, of the South American or West Indian type, flowering in the spring and fruiting in the fall months. They are vigorous, precocious, and prolific, and seem to be remarkably free from serious diseases and insect pests. The wood, however, is quite brittle and even large branches are frequently broken off by winds that would not bother most trees. Furthermore the heart wood is quite soft and rapidly decays upon exposure. In windswept localities avocado trees are not found in Porto Rico.

The fruits vary considerably in size weighing generally from 9 to 14 ounces, and in shape range from almost spherical to quite long necked. The skin is tough and leathery but of course not so thick nor so brittle as in the Guatemalan varieties. However it is more attractive, being smooth, yellowish green, and capable of taking a polish.

The flesh is almost always yellowish, rich, and oily. Very rarely is it watery or of poor flavor. The seeds are more frequently than not loose in the cavity, and are often unnecessarily large. Government Horticulturists consider the better Porto Rican varieties to be fully the equal, if not the superior, of any they have known in many years experience in Cuba, Hawaii, etc.

The trees are given no attention whatever but successfully shift for themselves even under quite dissimilar conditions. There are places, however, as at the Experiment Station at Mayaguez where the soil is very heavy and poorly drained, and the avocado will not grow even with exceptional attention.

The fruit is consumed locally and may be had in the markets from late June until December. From August until October it is most plentiful and sells for one to two cents each. Late in October it is selling for as low as 3c in Ponce, 6c to 7c in Mayaguez, and up to 10c each in San Juan. With a million and a quarter people on the Island and every one of them appreciating the fruit, there will be some local demand for out of season fruit at good prices once the Guatemalan type begins to bear here.

The marketing in the north of seedling avocados from Porto Rico has not yet been done with entire success. Many have shipped a few boxes, and even shipped on several occasions, but none have been justified in making regular shipments through the season, though fruit sells for 35c and 50c in New York compared with 1c and 2c in San Juan.

There is a general belief among the fruit growers of the Island that avocados will not stand shipment. A few years ago a prominent New York fancy fruit house sent a man here to buy and ship them avocados. He shipped large quantities,—and lost it all in transit. Investigation shows he bought the fruit delivered in town and that it had been shaken, and clubbed from the tree, as well as bruised in the handling. Many well informed citrus and pineapple growers have had similar results even after careful picking, and packing. Most of them have packed in orange or other deep boxes where the several layers of fruit could mash each other.

The successful shippers have not only picked and handled the avocados carefully, but have packed them in single layer boxes, as tomato crates, and with a little excelsior to prevent movement. By so packing, repeated shipments have been made without any loss whatever. It has been demonstrated that the fruit will carry satisfactorily to market if properly packed.

Probably most of the avocados shipped north from Porto Rico have arrived showing heavy loss; and the fancy fruit houses do not encourage further shipments. They have even discouraged shipments on consignment from those who have demonstrated their ability to deliver the fruit

in good condition. Direct sales at auction have not been encouraging. Recently with fruit of not a bit better quality retailing at 35c to 50c each, good Porto Rican avocados in sound condition brought \$1.50 to \$1.65 for 24s and 36s and a maximum of \$2.25 to \$2.50 for 18s. At these prices the shipments were not continued.

Closer co-operation between the shipper and salesman should make possible a considerable business in wild avocados from Porto Rico.

The growing of named varieties of avocados in orchard form has only recently been taken up by American fruit growers. Many of the best known varieties of both hard and soft skinned types have been imported and are making a vigorous growth. None are yet in bearing. The fruit growers as a class are just beginning to realize the possibilities of the Island as a tropical hot house located so accessible to New York and the great eastern markets.

The future of the avocado in Porto Rico is bright. The rapid and still vigorous growth of the grapefruit and pineapple industries in Porto Rico indicate, in a manner, what may be expected of the avocado. Porto Rico's position is so peculiar, her advantages so unique, that what may happen in the future is hard to guess. Can you imagine your own section with plenty of labor at 50c to 70c per day, with spring weather the year around, ample rainfall well distributed, no possibility of frost, two and three boats per week direct to New York, and freight rates of but 25c to 35c per orange box to market? Porto Rico enjoys all these advantages, and more, over her competitors for the American markets. She is just beginning to realize her good fortune and to plan to prepare to make the most of it. A movement is already on foot to establish a tropical fruit propagation and demonstration station on the Island to assist in the building of the avocado and similar industries.

AVOCADO CULTURE IN THE PHILIPPINE ISLANDS

(Letter from Mr. P. J. Wester of the Bureau of Agriculture).

Lamoa Experiment Station, Lamoa, Bataan, P. I.

August 30, 1916.

Dear Dr. Webber:

Your communication of the 17th ult. is at hand and contents noted.

Referring to your request for a paper on the avocado in the Philippines I should indeed be pleased to comply, but the fruit is here of no importance as yet, with the consequence that there is scarcely anything to write about as you will note from the following statement. I shall be glad to have you use the information contained therein in any manner you see fit. To me it appears to be too brief and unimportant for publication as a separate paper.

The date of the introduction of the avocado into the Philippines by the Spaniards is not known, but it was probably accomplished at least 25 years prior to the American occupation, for, according to the late Mr. W. S. Lyon, there was a large avocado tree growing on the Plaza in front of the Delmonico Hotel, in the old walled city of Manila, that was

destroyed by a typhoon about 1910. As a matter of fact, the introduction of this fruit by the Spaniards is merely of historical interest as whatever introductions the Spaniards may have made never gained a permanent foothold. All trees now growing in the Archipelago are of American introduction, the first having been made in 1903 by Mr. Lyon, then horticulturist in the Bureau of Agriculture. This was followed by other introductions during the next few years. The annual importations of from 1000 to 3000 avocado seed since 1911 by the Bureau of Agriculture have been made because of the interest in the introduction of this fruit by Mr. O. W. Barrett, formerly chief of the Division of Horticulture, and myself. Travelers from the United States have also brought a few avocado seeds from time to time. All of the above introductions have come from Hawaii.

In 1912 budwood was received of the Dickinson and Cummins avocado from Mr. F. W. Popenoe, Altadena, California, which was successfully propagated at Lamao. Mr. David Fairchild, Bureau of Plant Industry, U. S. D. A., in 1913 sent a collection of budded avocado plants from Florida to the Bureau of Agriculture, but the plants arrived in weakened condition and nearly all died. Subsequent shipments of budwood sent direct to me during the next year were more successful, and we have now growing at this Station the Baldwin, Family, Largo, Pollock, and Wester, and 24 unnamed varieties, all of South Florida and West Indian origin.

Of Mr. Lyon's early introductions about 50 plants were set out at the Lamao Experiment Station, a few were planted at the Singalong Experiment Station, Manila, and the rest were distributed throughout the Philippines. Those at Singalong proved to be an inferior type and were destroyed. Of those at Lamao only two have been found worthy of asexual propagation, the Lyon and one unnamed variety. Of those that were distributed outside of government institutions, a number of trees have fruited for several years for Mr. E. R. Case, Manila; there is also a tree in bearing in Imugen, Nueva Viscaya; one at Camp Overton, Mindanao; and another at Lipa, Batangas. A large tree also fruited this year for the first time for Mr. W. S. Lyon in Manila.

The trees from the more recent introductions and distributions naturally have not yet come into bearing. Many have of course perished, but it is probably true that there are now young avocado trees in all except the more remote provinces in the Philippines.

The growth of the avocado in the Philippines is all that can be desired.

In the nursery stage the plant has a very serious enemy in a species of *Helopeltis*, a sucking insect that attacks the tender parts of the plants. There is also a borer that is very destructive, attacking the trunk and larger branches. Some damage is done by a stem borer which enters the small twigs.

You will note from the above that there is no avocado industry in the Philippines at present. However, the introduction of this fruit may be considered permanent. Just how rapidly it may spread is difficult to say. The Filipinos do not seem to take much interest in the avocado as yet. In this connection it may be of interest to know that though

the avocado has been introduced both in Java and the Malacca peninsula for years it is not yet cultivated by the natives and is never found in the markets.

Sincerely yours,

P. J. WESTER,

Horticulturists in Charge

THE AVOCADO IN VENEZUELA

(Letter from Homer Brett, American Consul to Venezuela.)

AMERICAN CONSULATE

La Guaira, Venezuela, August 5, 1916.

California Avocado Association,

Gentlemen:

I have to acknowledge, with thanks, receipt of your letter of July 25 and of the invitation to prepare a paper on the growing of avocados in Venezuela. I regret exceedingly that my knowledge of the subject is too small to permit me to write anything worth while on the subject and I know of no one to whom I can go in search of authoritative information.

A great many avocados are produced here but growing them is nowhere reduced to a science or even to a business; the fruit that appears in the market is the product of scattered trees that are planted by twos or threes near every cabin in the country.

Some of these avocados nearly approach perfection and others are of poor quality but there appears to be no local distinction of varieties. There is no export market and, in the season, the fruit is so abundant as to be almost worthless. After being transported seven or eight miles on burro back a perfect avocado sells for two cents at retail and the inferior ones six for five cents.

Regretting that I know of no way to obtain more valuable information, I am, Gentlemen,

Very respectfully yours,

HOMER BRETT,

American Consul.

THE AVOCADO IN EGYPT

(Letter from Thos. W. Brown.

Minister of Agriculture, Horticultural Division.

Giza Branch, 24th. August, 1916.

Cairo, Egypt.

The President, California Avocado Association,

Dear Sir:

I am in receipt of your letter of July, 20th., and beg to inform you that the cultivation of avocados is entirely in its infancy in Egypt. The

trees which now exist in the country are found mostly in the Cairo district, although the tree grows well everywhere from the northern coast to Assuan in the extreme south. A few of the trees produce fruit abundantly whereas in many cases the flowers fall without setting fruit. This does not appear to be due to any variation in cultivation or watering. It is possible that it may be due to some defect in the sexual organs of the flowers. This is now under investigation. All the trees which have arrived at the fruiting stage have been grown from seed.

I shall be greatly obliged for information as to whether sterile trees have been found among those grown from seed in California.

Yours Faithfully,

THOS. BROWN.

California Avocado Association

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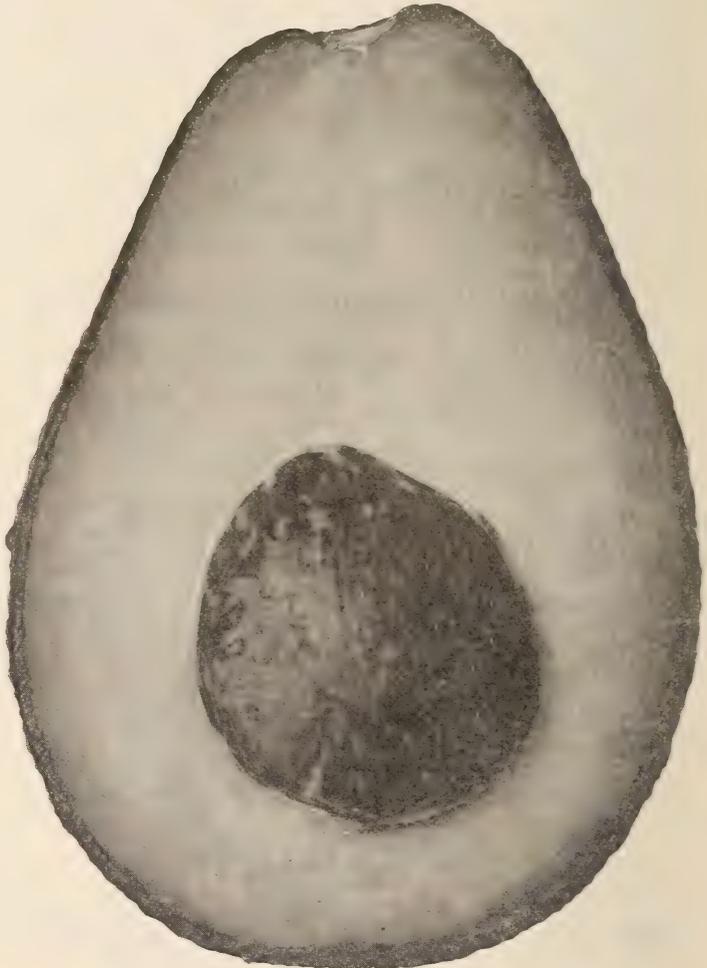
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Points to Look for in Selecting a Variety of *Avocado* for Commercial Planting

By W. A. SPINKS, Duarte, California

THE TREE First. Your tree must be strong. There is a vast difference in varieties in this respect. It must grow rapidly and erect, withstanding cold, wind and heat. Without these essentials as a foundation, your planting will be a failure, no matter what size and quantity of fruit you may expect to produce. Many orchardists already realize the folly of planting weak and invalid varieties, because they were supposed to bear fine, large fruit. You must have a tree before you can have fruit. Nearly all varieties grow strong and erect from seed, but many when budded grow weak, limber and droopy. Some will live a year or two and then die, others until they bear a few fruits, while still others will live on from year to year, but make slow and unsatisfactory growth. Some varieties grow many times as rapidly as others. Select one which makes rapid growth and bears young. You don't want to wait forever for results.

Second. Your tree must be a true annual, bearing a full crop each year. With the avocado as with other fruit trees, there are varieties which bear a full crop only once in two, three or four years.

Third. Your tree must not only mature at least a portion of its crop early, but must be able to hold it on the tree for months after maturity, thus enabling you to select your own time for marketing. Since there are varieties known to possess this very valuable characteristic, why plant one which does not?

Fourth. Your tree should have beauty. Abundant foliage protects the fruit and branches from the sun, as well as other dangers, while an ornamental grove adds to your own joy of living and the value of your property.

THE FRUIT Must first of all be beautiful and striking in external appearance. Any dealer will tell you this is half the battle in marketing.

Second. It should surely weigh no less than one pound, my own investigation in the markets leading to the conclusion that one and a half or two pounds would be none too large.

Third. It must have quality; richness of flavor and abundance of oil content. It must also be attractive to the eye when cut open, free from fibre and with not too large a seed. No other fruit varies so much in quality as the avocado, some of the varieties containing as high as nearly 30 per cent of oil; others lower than 4 per cent, with corresponding variation in flavor. Consumers will in time learn to know the poor kinds and reject them.

Fourth. It must have a thick skin for convenience in serving and protection in shipping. A thick skin also makes it resistant to the aggressions of birds, squirrels, other animals and insects, and protects it from injury by wind.

We respectfully submit that the SPINKS is the only variety so far known to embody all of the good points above mentioned and none of the bad ones.

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California
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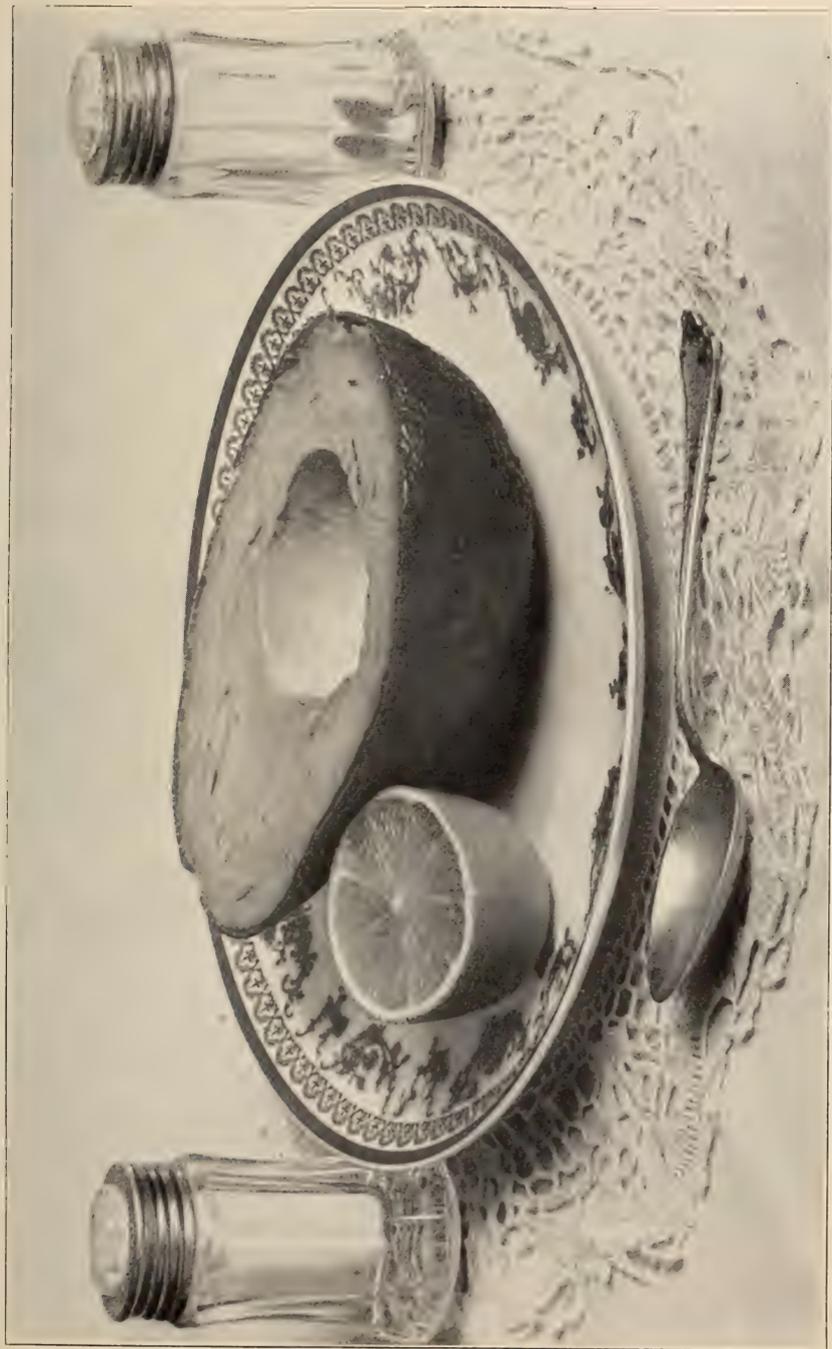
Including Reports of the 4th Semi-Annual
Meeting held in Los Angeles, May 18,
and 19, 1917, and the 5th Semi-
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AVOCADO SERVED IN THE HALF-SHELL [Photo by L. B. Scott. See Page 58]

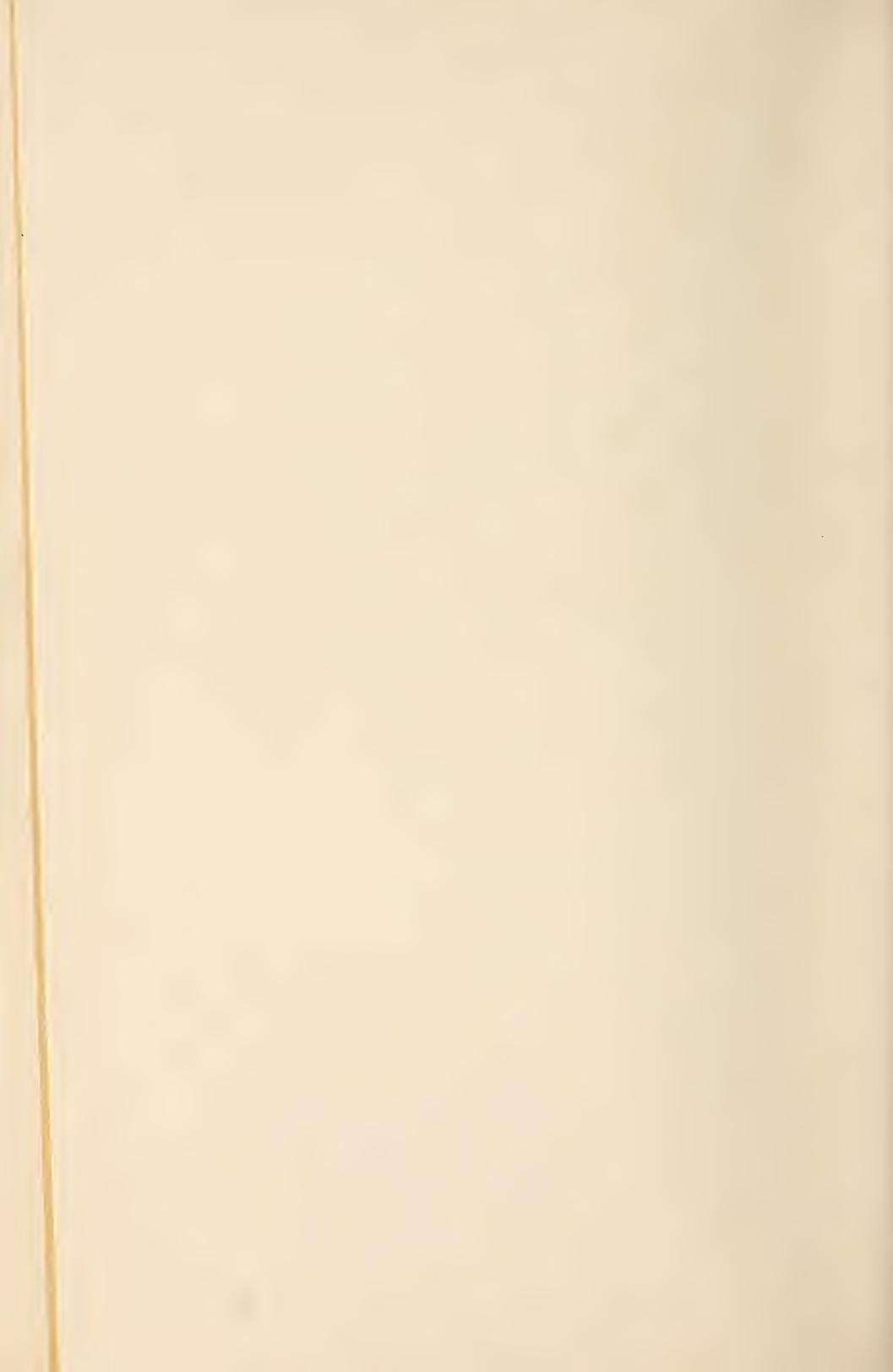


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Foreword

THE ASSOCIATION—At the close of the third year of its existence, the California Avocado Association is stronger than ever before, and the membership more enthusiastic. Confidence in the industry is rapidly growing as experience increases. Cold waves and hot blasts have come and gone, and the best varieties have withstood the crucial tests successfully. Young trees have not been seriously injured, and old trees have shown no appreciable injury in the majority of sections where they are growing in Southern California. As in the citrus industry, experience is rapidly demonstrating the areas where the industry may be safely extended. A careful study of the reports of the Association indicates very clearly that the Guatemalan varieties may be expected to succeed in those sections where the lemon industry is considered successful, and Mexican varieties may be safely planted in any good orange section.

VARIETY STUDIES—The problem of greatest importance before the avocado grower is the selection of satisfactory varieties. It is almost impossible for the beginner to make an intelligent selection from among the 150 or more varieties that have been listed. The Association through its Committee on the Classification and Registration of Varieties has made a careful study of all varieties available, and in October of this year, the Directors approved a list of varieties to be recommended by the Association. This was printed and distributed as Circular No. 1 of the Association. (See this Report, p. 101). This list has already had a profound effect in stabilizing the industry and creating confidence. Copies of this circular may be obtained by addressing the secretary of the Association.

PUBLICATIONS—The most reliable information regarding the avocado is to be found in the annual reports of the Association. The reports are unique in that, up to the present time, they are almost the only literature available on the avocado. Copies of the 1915 and the 1916 Reports still remain for distribution and are sold at \$1 per copy. The present report (1917) contains much new and valuable matter and will be sold at \$1.00 per copy.

STATISTICS—The avocado plantings in the state have been greatly increased in the last few years, and no data exists as to the number and age of trees planted, or the total acreage in the state. It is highly desirable that fairly reliable data of this nature be available, so that market conditions may be anticipated and proper plans perfected for distributing the crop, and new markets developed as necessary. Such data is also desirable as a guide in the extension of the industry. Recognizing the desirability of having such data available, the Board of Directors authorized the secretary to make an avocado census of the state. Blanks have been printed, and data is being collected, from which reliable summaries can soon be compiled and published.

MEMBERSHIP—The membership in the Association is gradually increasing. At the end of the first year, the Association had 85 members; at the end of the second year, 139 members; and now at the end of the

third year, the membership stands at 193. While this is not as rapid an increase as it was hoped would be realized, it nevertheless is very satisfactory and evidences the growing interest in the industry. The meetings and exhibits of the Association are increasing in interest and have a high educational value for those interested in the industry.

H. J. WEBBER, Secretary.

MEMBERS

CALIFORNIA

Adams, Chas. D. Upland
 Albertson, Emery 145 North Painter Ave., Whittier
 Allen, A. C. Bonita
 Anderson, H. T. Yorba Linda
 Andrews, W. L. 1552 Pioneer Drive, Glendale
 Armstrong Nurseries Ontario

Ballard, R. L. R.F.D. 1, Orange
 Barber, T. U. 518 Van Nuys Bldg., Los Angeles
 Barnes, Mrs. Arthur J. 1875 Summit Ave., Pasadena
 Barrett, Carter Puente
 Barron, A. Ellis P.O. Box 992, San Diego
 Bartlett, Rev. Dana W. 1437 Malvern Ave., Los Angeles
 Bartley, E. D. R.F.D. No. 1, Santa Ana
 Bates, Mrs. K. R.D. San Diego Co., El Cajon
 Beattie, A. C. Upland
 Beattie, G. W. Highland
 Beck, G. W. La Habra
 Bell, David C. Santa Clara County, Saratoga
 Bell, E. F. Route No. 2, Anaheim
 Bennett, Chas. L. Lodsburg
 Billingsley, Ray R.D. 1, Box 115, Orange
 Bishop, R. F. 100 Bay State Ave., Alhambra
 Bissell, H. Box 86, Altadena
 Blackwood, Gordon F. Glendora
 Blakeslee, H. I. Fullerton
 Bliss, F. A. 844 Wild Rose Ave., Monrovia
 Booth, Chas. F. 837 E. Ocean Ave., Long Beach
 Bradford, A. S. Placentia
 Brady, DeWitt J. 1807 Gramecy Place, Los Angeles
 Browning, V. A. R.R.2, Box 34, Anaheim
 Bryant, O. T. Fillmore
 Burrage, Albert C. Redlands
 Buxton, G. E. Sales Agent, S. Coast Land Co., Carlsbad

Camp, E. W. Sierra Madre
 Carter, Peter T. Box 496, Riverside
 Cavanaugh, W. A. Kern Co., Fellows
 Chapman, A. S. 306 E. 25th St., Los Angeles
 Chase, E. A. Riverside
 Chidester, Arthur M. 446 S. Painter Ave., Whittier
 Collins, Isaac 608 N. Painter Ave., Whittier
 Cook, Max H. Chula Vista
 Coolidge, D. W. Colorado and Hill Sts., Pasadena
 Coulston, J. B. President National Bank of Pasadena, Pasadena
 Cubbon, John Santa Ana

Daily, C. J. Ventura Co., Camarillo
 Danziger, J. M. 1006 Security Bldg., Los Angeles
 Dibble, William Covina
 Dixon, F. A. Care Hunt Bros. Co., 112 Market St., San Francisco
 Dorsey, Clarence W. 520 S. St. Andrews Place, Los Angeles

Elliott, J. M. First National Bank, Los Angeles
 Englehart, J. P. Glendora

Fancher Creek Nurseries.....	Fresno
Fargher, Robert J.....	Harper
Fesler, Martin.....	Covina
Field, C. M.....	Chula Vista
Fly, E. M.....	National City
Flynn, W. Earl.....	Monrovia
Fulton, S. M.....	Val Vista and Cleveland Sts., Pomona
Gage, Earl D.....	R.F.D. 2, Box 12, Fullerton
Gane, Henry S.....	Santa Barbara
Goodrich, E. B.....	337 S. Hill St., Los Angeles
Gould, F. H.....	268 Mills Bldg., San Francisco
Graves, J. J.....	911 Merchants National Bank Bldg., San Francisco
Gray, E. R.....	Puente
Greenwald, O. H.....	702 W. 17th St., Santa Ana
Haldeman, H. M.....	214 N. Los Angeles St., Los Angeles
Hall, M. O.....	3320 30th St., San Diego
Hamilton, E. E.....	1803 Morgan Place, Los Angeles
Hardin, C. H. E.....	Ocean Park
Hardin, Willett L.....	Mount Washington, Los Angeles
Hart, Edwin G.....	518 Van Nuys Bldg., Los Angeles
Healy, G. B.....	1322 Laurel Ave., Los Angeles
Hertrich, Wm.....	San Gabriel
Hills, R. W., Jr.....	175 Fremont St., San Francisco
Hislop, Wm. F.....	R.F.D. 13, Box 121H, Los Angeles
Hoff, J. E.....	1850 Vista St., Hollywood
Hoffman, Geo. D.....	P.O. Box 438, Pasadena
Hunt, John A.....	North Pomona
Jaffa, M. E.....	College of Agriculture, Berkeley
Jamieson, S. W.....	R.F.D. 1, Box 159, Burbank
Johnson, C. W.....	R.F.D. 1, Pomona
Keller, Lester.....	Yorba Linda
Kirkman, Wm. T., Jr.....	Kirkman Nurseries, Fresno
Knight, E. E.....	Yorba Linda
Kramer, Henry J.....	1500 South Figueroa St., Los Angeles
Leeke, W. T.....	Upland
Lemona Heights Co.....	Riverside
Lesperance, Leo B.....	521 Central Bldg., Los Angeles
Littleton, C. H. S.....	370 Arroyo Terrace, Pasadena
Lyon, N. M.....	El Monte
McKay, Ellen G.....	1430 Fielding St., Hollywood
McLaughlin, J. B.....	405 Bullard Bldg., Los Angeles
McNaghten, Malcolm.....	819 Investment Bldg., Los Angeles
Mann, O. A.....	Yorba Linda
Manning, Dr. Will R.....	Fillmore
Manz, A. F.....	Philadelphia & Pierce, Whittier
Martin Brothers.....	Claremont
Marvin, B. K.....	P.O. Box 525, Riverside
Mason & Doerr.....	Claremont
Mather, James.....	137 N. Fair Oaks Ave., Pasadena
Matthews, Roy P.....	Fresno Co., Navelencia
Mead, Mrs. Wm.....	2401 N. Vermont Ave., Los Angeles
Merritt, Geo.....	1202 Garden St., San Luis Obispo
Moore, Elizabeth A.....	340 S. Kingsley Drive, Los Angeles
Moore, Stephen P.....	Cerritos St., Azusa
Morris, R. R.....	R.F.D. 1, Whittier
Morrison, Alex.....	2822 Huron St., Los Angeles
Murry, Wm. D.....	1285 Laurel Ave., Hollywood

Needham, C. E.	Glendora
Newkaemper, Wm.	788 Curtis St., Pasadena
Nichols, C. O.	Bostonia
Olshausen, B. A.	143 1-2 S. Broadway, Los Angeles
Pacific Guano & Fertilizer Co.	718 Central Bldg., Los Angeles
Paine, C. W.	San Fernando
Petersen, Edwin D.	Altadena
Phillips, Titus	828 S. 4th St., Alhambra
Pickerill, W. O.	1309 N. Douty St., Hanford
Pickering, A. C.	R.F.D. 2, Box 308, Fullerton
Pitcairn, Robert	289 State St., Pasadena
Popenoe, F. O.	West India Gardens, Altadena
Price, R. O.	Upland
Puerner, Mrs. Harriet H.	R.F.D., Puente
Randall, Robt. S.	Altadena
Ransford, J. E.	500 Crescent Heights Blvd., R.F.D. 10, Box 281, Los Angeles
Rechstemer, V. M.	James Nurseries, 483 E. Villa, Pasadena
Rhoades, Mrs. S. B.	R.F.D. 106, Covina
Rideout, A. R.	Whittier
Rideout, W. L.	27 Pine Ave., Long Beach
Rixford, G. P.	1813 Pierce St., San Francisco
Robertson, F. D.	Fullerton
Ross, Geo. F.	2158 W. 21st St., Los Angeles
Roth, Paul M.	82 S. Marengo Ave., Pasadena
Rugg, W. F.	Upland
Russell, Grover T.	518 Van Nuys Bldg., Los Angeles
Sallmon, Wm. H.	401 So. Title Bldg., San Diego
Sandusky, Earl	406 W. Pico, Los Angeles
Shaffer, Geo. B.	First National Bank, Los Angeles
Sharpless, B. H.	17th and Newport Road, Santa Ana
Shedden, Thos. H.	231 E. Lemon Ave., Monrovia
Sherlock, W. P.	Box 213, R.F.D. 2, Pasadena
Silent, Charles	Glendora
Simcoe, B. F.	1828 Orange St., Bakersfield
Skinner, R. W.	Yuba City
Smith, Maltby,	R. R. 1, Box 395, San Gabriel
Spaulding, E. A.	Harper
Spinks, Wm. A.	Duarte
Staley, Arthur	Fullerton
Stearns, A. G.	601 Story Bldg., Los Angeles
Stearns, Henry A.	937 Atlantic Ave., Long Beach
Stephens, Wm. D.	Montebello
Stevens, Sherman	Sec'y San Joaquin Fruit Co., Tustin
Stevenson, Arthur L.	969 Topeka St., Pasadena
Stewart, Mrs. J. T.	2319 W. 11th St., Los Angeles
Stratton, B. C.	La Verne
Sunshine Co. The	407-8 Consolidated Realty Bldg., Los Angeles
Swift, A. L.	Alta Loma
Taft, C. P.	Orange
Thacher, E. S.	Nordhoff
Townsend, Dr. E. L.	R.F.D. 1, Box 175, San Gabriel
Underhill, E. F.	Glendora
Utt, C. E.	Tustin
Wagner, Chas F.	1295 Fairfax Ave., Hollywood
Walker, J. H.	1547 Las Palmas Ave., Los Angeles

Walker, T. J.....	San Fernando
Waterbury, G. W.....	Corona
Waters, Genetta H.....	Lemon Grove
Wetzel, Hugo.....	R.F.D. 3, Anaheim
Whedon, J. T.....	Yorba Linda
White, Cornelia B.....	Riverside Co., Palm Springs
White, Ralph A.....	Box 263, Glendora
Whiteley, Mrs. F. J.....	Box 55, Arcadia
Wilder, G. W.....	Redlands
Williams, A. B.....	987 N. Raymond Ave., Pasadena
Wimberly, L. W.....	Ontario
Woods, Robert S.....	919 Bonnie Brae St., Los Angeles
Yaggy, A. F.....	2138 Emerson Ave., Santa Barbara
Zapf, A. E.....	755 N. Kenmore Ave., Los Angeles
Zuill, W. L.....	427 S. Madison Ave., Pasadena

NON-RESIDENTS OF STATE

Beach, John B.....	West Palm Beach, Fla.
Bow, Mrs. L. L.....	Homestead, Fla.
Bryant & Greenwood.....	1301-06 Westminster Bldg., Chicago, Ill.
Carrier, W. D.....	Winter Haven, Fla.
Cellon, Geo B.....	Miami, Fla.
Doerr, Chas. P.....	Aguascalientes, Mexico
Elizabeth Nursery Co. The.....	Wilder St., Elizabeth, New Jersey
Fisher, I. L.....	Victoria de las Tunas, Oriente, Cuba
Harn, Sam P.....	Gainesville, Fla.
Metz, Emma K.....	548 Menominee St., Chicago, Ill.
Niles, L. D.....	Lucerne Park, Fla.
Ostrand, Edward.....	156 Van Buren St., Chicago, Ill.
Schaeffers, Jos.....	Doctors Inlet, Fla.
Wright, A. P.....	Mission Nurseies, Mission, Tex.

HONORARY MEMBERS

Webber, Dr. H. J.....	Citrus Experiment Station, Riverside
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Fourth Semi-Annual Meeting of the California
Avocado Association, Held in Auditorium of
Normal Hill Center, Los Angeles,
California, May 18-19, 1917

DR. H. J. WEBBER, President
T. U. BARBER, First Vice-President
CHARLES SILENT, Second Vice-President
CHARLES D. ADAMS, Secretary
C. P. TAFT, Treasurer

MINUTES OF THE SECOND ANNUAL AND THE FOURTH
SEMI-ANNUAL MEETING

AFTERNOON SESSION, MAY 18

The meeting was called to order by the president, Dr. H. J. Webber. The minutes of the Third Semi-Annual meeting were read and on motion were approved as read. The president stated that the directors had found it desirable to appoint a slightly later date for this meeting than the time named in the By-Laws and that it would be well for the Association to confirm this action and legalize the meeting. The following resolution offered by J. E. Hoff, was presented and carried:

Resolved that this meeting of the California Avocado Association held in Los Angeles, May 18 and 19, under arrangements made by the Board of Directors, be declared the regular annual May meeting of the Association.

The following amendments to the By-Laws and the following new By-Law were recommended by the president in behalf of the Board of Directors and were carried by two-thirds majority of members present on motion duly made and seconded.

AMENDMENT TO SECTION XI OF BY-LAWS

That Section XI of By-Laws be changed to read as follows:

Meetings

The *Annual Meeting* of the Association shall be held at some convenient period during May of each year, the time and place of such meeting to be designated by the Board of Directors; special meetings shall be called by the president with the approval of the Board of Directors as occasion may require.

NEW BY-LAW NO. XII.

Amendments

These By-Laws may, on the recommendation of the Board of Directors, be changed or amended at any regular annual meeting of the Association by a two-thirds vote of all members present at such meeting.

The attached financial report for the fiscal year was read by the president and the financial conditions considered and compared with previous years.

TREASURER'S REPORT OF
THE CALIFORNIA AVOCADO ASSOCIATION

Receipts and expenditures for the year from May 11, 1916, to
May 10, 1917

RECEIPTS—

Cash on hand, May 11, 1916.....	\$ 249.73
Dues, 1916	70.00
Dues, 1917	525.00
Sale of 1915 Reports	25.45
Sale of 1916 Reports	61.10
Donation—J. M. Elliott	10.00
Advertising in 1915 Report	30.00
Advertising in 1916 Report	150.00

Total receipts\$1121.28

EXPENDITURES—

General expenses (including expenses of October meeting)	\$ 60.44
Clerical work	70.55
Postage	60.40
Stationery and miscellaneous printing.....	62.60
Engraving in 1916 Annual Report	106.17
Printing 600 copies 1916 Annual Report.....	350.70

Total expenditures\$710.86 710.86

Balance in bank 410.41

RESOURCES—

Cash in bank	\$410.41
Due on advertising—1916 Report	7.50
Membership dues 1916 unpaid	35.00
Membership dues 1917 unpaid	195.00

Net resources\$647.91 647.91

Total membership—139.

The president then explained the recommendation by the Board of Directors of an amendment proposed to Section 3 of the By-Laws, the reasons for it, and if approved, the method this meeting would need to prescribe to put it into effect.

In accordance with this recommendation the following amendment to Section 3 of the By-Laws and the following resolution, were moved by F. O. Popenoe, seconded by J. T. Whedon, and carried.

AMENDMENT TO SECTION III. OF BY-LAWS

Resolved that Section III. be changed to read as follows:

Directors

The governing body of this Association shall consist of a board of nine directors, three of whom shall be elected at each

annual meeting of the Association and serve for a term of three years.

Resolved in putting this new amendment into operation; that, of the directors elected at this meeting, the three having the highest number of votes serve for a term of three years; that the three having the next highest number of votes serve for the two year term; and that the three receiving the lowest number of votes serve for a one year term. In case the ballot electing the directors does not serve to designate the terms of service as above indicated, it is recommended that the newly elected directors at their first meeting determine by lot the length of their respective terms of service.

The election of the Board of Directors under the new by-law and according to the resolution just adopted was declared in order, and the secretary, as chairman of the Nominating Committee appointed by the Board of Directors, presented the committee's report, explaining that it was in accordance with their own requests that the names of some of the most valuable members of the old board did not appear on the printed ballot, which itself was only the suggestion of the committee, ample space being provided on the printed ballot for the substitution of any other names desired.

The president announced that word had just been received from Mr. Thacher, whose name was included in the ballot presented by the committee, that he would be unable to serve and requested that his name be withdrawn. Other nominations being in order, E. G. Hart was nominated but withdrew his name; W. P. Sherlock was nominated; Dr. Lester Keller was nominated; and E. E. Knight was nominated by W. A. Spinks to take the place left vacant on the ballot by the withdrawal of Mr. Thacher.

The president appointed as tellers B. K. Marvin and W. A. Spinks, and the vote was taken. Before proceeding far in the count, the tellers asked for instructions how to count certain ballots. From their report, so many defective ballots and uncertainties as to the intention of voters were found, that a motion, made by Dr. C. W. Johnson, to destroy the old ballots and take a new vote was carried, and the old ballots were destroyed and a new vote taken, after a motion had been lost, that the secretary cast the vote of the meeting for the list of names as printed, only substituting the name of E. E. Knight for that of E. S. Thacher.

Moved by F. O. Popenoe, seconded by Wm. Hertrich, that the Board of Directors be empowered to appoint as honorary members of the Association without fees, such scientists, especially interested in avocado culture as, in their judgment, are worthy of this honor. Moved as an amendment by C. P. Taft, seconded by E. Albertson, that the Board of Directors recommend such names to the Association for appointment. The amendment was adopted and the original motion as amended was carried.

The following resolution offered by E. G. Hart was carried:

Resolved:

That the Association does hereby instruct its officers and directors to take every legitimate and proper means to counteract and prevent any fraudulent practice in connection with the avocado business.

The tellers announced they were ready to report and brought in the following report of the election: Total number of votes cast, 56; necessary to a choice, 29.

The names as listed according to the number of votes received were:

1. Chas. D. Adams	55	10. W. P. Sherlock	14
2. H. J. Webber	54	11. C. P. Taft	6
3. T. U. Barber	54	12. Wm. A. Spinks	4
4. B. H. Sharpless	54	13. E. G. Hart	4
5. Thos. H. Shedden . . .	53	14. J. M. Elliott	2
6. Dr. W. L. Hardin	52	15. Dr. L. Keller	2
7. Wm. H. Sallmon	51	16. W. L. Rideout	1
8. F. O. Popenoe	50	17. W. D. Murray	1
9. E. E. Knight	42		

The tellers pronounced the first three names in the list as presented, to be elected directors for three years, the next three to be elected directors for two years, and the next three to be elected directors for one year. Their report was accepted and the directors as named, declared elected for their respective terms of office.

After the announcement of the election the following papers were read:

"Avocado Varieties in Florida," by E. D. Vosbury, United States Department of Agriculture, read by Professor L. B. Scott.

"History of the Sharpless and Monroe Avocados," by B. H. Sharpless, Santa Ana.

"The Wagner, Lambert, and Surprise Avocados," by Chas. F. Wagner, Hollywood, read by his son.

The president announced that the evening session of lectures with lantern slides would begin at 8:30 and that in the meantime the exhibit of fruits and nursery stock would be open to the public, after which the afternoon meeting adjourned.

The program for the evening session was carried out as follows and proved as attractive to the public as a similar one had done in San Diego at the semi-annual meeting last October.

EVENING SESSION, MAY 18

The evening session was called to order at 8:30 p. m. with Vice-President T. U. Barber presiding. The following addresses were given:

"The Avocado in California," lantern slide lecture, by Dr. H. J. Webber. Director, Citrus Experiment Station, Riverside.

"Notes on Methods of Pruning," (with lantern slides) by Burdette K. Marvin, Riverside.

"Avocado Varieties," lantern slide lecture, by Professor I. J. Condit, College of Agriculture, Berkeley.

FORENOON SESSION, MAY 19

The second day's session was called to order by President Webber at 10 a. m. on Saturday, May 19, and was opened by Professor I. J. Condit with a paper on

"The Avocado in Central and Northern California," followed by a paper by Thos. H. Shedden on

"How Shall We Eliminate the Misnomer 'Alligator Pear?'" and

a paper by Professor M. E. Jaffa, read by Professor Mattill, on
"Further Investigations in the Nutritive Value of the Avocado."

There was a discussion after these papers on mulching methods and optimum use of water by Messrs. Whedon, Knight, Hamilton, Wright and Rixford.

The president called the attention of all present to the value of the avocado industry in providing an actual food, and to the possibility of its worth in California being such as to make it a rival of the citrus industry, and to the importance in this connection of our Association and of all becoming members of it who are interested in the avocado industry.

He announced a short recess in which those present, not already members, could become members. At the conclusion of the recess he was able to state that some fifty new names had been added to the membership roll.

There followed to conclude the morning session, a symposium discussion on "The Susceptibility of Avocado Varieties to Frost Injury," the discussion being led by F. O. Popenoe, of Altadena, H. J. Webber, of Riverside, and T. U. Barber, of Puente. A general discussion then took place, participated in by Messrs. Chidester, Keller, Sherlock, Knight, Fesler, Whedon, and Payne, which was followed by an adjournment until the afternoon session.

AFTERNOON SESSION, MAY 19

The afternoon session was called to order at 2 p. m., President Webber in the chair.

Papers were read in the following order:

"Notes on Avocado Varieties for Commercial Orchards," Charles D. Adams, Upland.

"Interplanting and Changing Varieties," Wm. A. Spinks, Duarte.

"The Taft Avocado and Its History," C. P. Taft, Orange.

"Comparative Merits of the California Avocado Varieties," Professor L. B. Scott, United States Department of Agriculture.

"My Experience in Growing Avocados," Mrs. Margaret Stewart, Los Angeles.

"My Experience in Growing the Avocado," Martin Fesler, Covina.

"The Avocado for the Table," Victor Hirtzler, Maitre de Cuisine Hotel St. Francis, San Francisco, read by Thos. H. Shedden.

After the paper by C. P. Taft, Mr. Taft offered the following resolution which was seconded by Thos. H. Shedden and carried unanimously:

Resolved that the California Avocado Growers Association do hereby request the various Los Angeles papers publishing market reports to use the name "avocado" instead of "alligator pear" or "avocado pear," and to class the same under the appropriate head of fruits and not vegetables, and that the secretary be instructed to send each paper publishing market reports a copy of the above resolution or its equivalent.

The Committee on Resolutions presented their report which was adopted as follows:

Report of the Committee on Resolutions, at the close of the second annual convention of the California Avocado Asso-

ciation, held in Los Angeles, California, May 18 and 19, 1917.

The young and growing avocado industry in California is grateful to all who extend a helping hand. In this spirit, the avocado growers upon finishing the proceedings of their second annual meeting, desire to give thanks to the following:

The Chamber of Commerce of Los Angeles for the free use of the Auditorium, Normal Hill Center;

Mr. Edwin G. Hart, the Reed & Miller Company, and the Los Angeles newspapers, for publicity;

The many men of science who have come, or sent, from afar to give us of their learning and experience,—Professor Vosbury and Professor Jaffa, also Mr. Tenny and Mrs. Rolfs, of Florida, Mr. Bell, Santa Clara County, and Victor Hirtzler, Hotel St. Francis, San Francisco, and particularly to Professor Condit, of our own University, and Professor L. B. Scott, Pomologist of the United States Department of Agriculture, who has come from Washington, and spent so much time among us, delving with head and hands into the development of the avocado in California;

All others who have contributed papers for our edification and instruction, one being the first avocado lady to tell of her experience in the fascinating industry;

All those who have given such gratifying displays of beautiful avocados, hand picked, the "ocular proof" of what is now growing in our own land;

The four retiring directors who have done so much in bringing the Association thus far in successful growth, Judge Charles Silent, and Messrs. Wm. A. Spinks, C. P. Taft, and E. S. Thacher;

President Webber for his untiring and whole-hearted work, and Vice-President Barber who, at the meetings, works with his coat off and sleeves rolled.

Respectfully,

THOS. H. SHEDDEN,

W. L. HARDIN, Committee.

In the general discussion following the reading of the papers, Leo B. Lesperance spoke in favor of the thin-skin avocados to supply the poor man's table and Messrs. Metcalf, Hall, and Door, about the preference in Mexico by the Mexicans for the thin-skin kinds. Professor Scott stated emphatically that the thin-skin kinds were too small to market to advantage, that the market in the East had been developed by the Florida growers for the large fruit, and he had no doubt the Western market would demand the same class of avocados and that they could be supplied from our commercial varieties here as they have been in the East by Florida. Mrs. Bradbury remarked, as an indication of their great oil content, that avocados were made use of in Central America for axle grease, and W. L. Rideout hoped Professor Scott at our fall meeting, would give us a list of the best thin-skin varieties.

At the conclusion of the general discussion, the meeting adjourned on motion duly made.

CHAS. D. ADAMS, Secretary.

REMARKS MADE IN OPENING THE FOURTH SEMI-ANNUAL MEETING

BY PRESIDENT H. J. WEBBER

Gentlemen and members of the California Avocado Association:

In opening this Fourth Semi-Annual meeting of the California Avocado Association, I wish, as president of the Association, to express to all members my heartfelt appreciation of their kind support and enthusiasm.

We are pleased to note by your presence in such large numbers your continued support of the Association and its ideals. This Association is made up of a body of enthusiasts. It is the type of enthusiasm that is characteristically American.

We are now engaged in the great world war. All of our resources as a nation are being taxed to the utmost in the conduct of the war. Many of our members individually are daily laboring to the utmost on war measures: to increase our quota of fighters, to augment our food supplies and prevent suffering, to endow the Red Cross with sufficient funds to conduct its great work efficiently; and yet despite all this extra activity in the nation's service, we do not forget the future and the demands of our developing industry. Only an inherently great industry can engender a lasting interest. It is your confidence in the final success of the avocado industry and its benefit to the state and nation that holds your attention and stimulates your enthusiasm.

This high idealism may in many individuals be subconscious only, as in many cases it is the possibility of financial gain that first attracts attention. Yet no individual is likely to strive to improve and develop an industry in a broad-minded way, as this Association as a body is doing, unless he is inspired with higher ideals than simply the benefit to accrue to himself individually.

In no way is this high-minded purpose demonstrated more clearly than in the service rendered by your Board of Directors. The directors serve without pay, or even a return of expenses. To attend a meeting, each must travel a distance of from 20 to 75 miles, spend an entire day and sometimes more. From two to three meetings of the directors are regularly held between each semi-annual meeting and yet time after time every director has been in his place at each meeting. At no time has any director been absent, unless compelled by illness to remain at home. So strikingly has this interest of your directors been manifested that I desire especially to direct your attention to it. Never have I served on any public board where each member has shown such interest and attention to duty. I can assure you that every member of your board is abundantly worthy of the confidence you placed in him, by electing him to his respective position.

The activity of the Association has served to call attention in a striking way to the importance of the industry. Our membership during the year has increased from 96 on May 10, 1916, to 144, May 10, 1917.

The annual report published during the year is recognized as a valuable addition to the literature of the avocado. Indeed it can be said without boasting to contain the most reliable information regarding the avocado that has appeared in any published work.

In the year ending May 10, 1916, the total receipts were \$955.55 and the total expenditures \$705.82, leaving a cash balance on hand of

\$249.73. In the year just past, ending May 10, 1917, the total receipts were \$1121.28 and the total expenditures \$710.86 leaving a cash balance on hand of \$410.41. The net resources May 10, 1916, were \$313.63 and May 10, 1917, they are \$647.91.

The Association is thus on a good financial footing, but it must be admitted that the Association has not reached the magnitude that will enable it to take up an advertising campaign such as will soon be needed as our new plantings come into bearing. It is highly important that the membership of the Association be greatly increased if the funds are to be provided to do the work the Association is organized to do. During this meeting every effort possible should be made to enlarge our membership. Only by the united support of all growers, can the work of the Association be made fully effective.

The Association is again under obligation to its members and friends for their hearty co-operation in the fruit exhibit. The excellent exhibit staged in the adjoining hall is an evidence of the extent of this co-operation. As president of the Association, I desire to extend to each exhibitor the thanks of the Association for his kind co-operation.

We will now proceed to the regular business of the meeting.

AVOCADO VARIETIES IN FLORIDA

BY E. D. VOSBURY, U. S. Department of Agriculture

In Florida, as in California, the most important problem before the avocado growers is that of varieties. In each state the extension of planting awaits in large measure the testing of the many varieties now available and the selection therefrom of those half-dozen or so, best suited to rank as the standard commercial sorts.

WEST INDIAN VARIETIES

With few exceptions, bearing avocado trees in Florida, both seedling and budded, belong to the so-called West Indian race. Of the many varieties of this race which have already been propagated and named, the most important and the best known variety on the market today is the Trapp, introduced by Mr. George B. Celson, of Miami, in 1902. It has proven a reliable heavy bearer, and the fruit is good in quality, maturing from October to January after most of the other varieties have gone. The fruit, moreover, has a distinct characteristic shape which has served to identify it on the market where Trapps command a substantial premium over unknown varieties. Of the 500 acres of budded groves in Florida, upward of 90 per cent are Trapp. Other satisfactory West Indian sorts are now available which ripen from July to January. While most of these, including Trapp, are ideal commercial sorts, they are all somewhat more susceptible to cold than the Mexican lime or lemon guava, so that their culture in this country will doubtless be limited to the best protected sections of south Florida. Within this reasonably safe area, however, there is room for a considerable development and it may be expected that Florida will ship in the near future large quantities of avocados of the West Indian varieties from July to January.

GUATEMALAN VARIETIES

Guatemalan varieties of avocados have recently attracted great interest in Florida on account of their late season of maturity and superior



Plate I, Figure 1
Fuerte Top-worked on Seeding Stock
Fifteen months' growth. U. S. Plant Introduction
Garden, Miami, Florida.



Plate I, Figure 2
A Packed Crate of Trapp Avocados
Some growers prefer a partition across center of crate.

hardiness as compared with the West Indian sorts. The first trees of this race bore in Florida in 1912 and during the last six years budwood of many varieties has been introduced from California. Several trees have already fruited but none of them have been sufficiently tested to determine fully their value in Florida. Fuerte bore for the first time in Florida at the Miami Plant Introduction Station last November and December, where the tree has attracted much attention on account of its exceedingly vigorous growth. The fruits of the first crop were somewhat disappointing in quality, possibly as a result of the excessively rapid growth of the two-year-old tree on which they were borne. This behavior indicates that even the best California varieties must be thoroughly tested for Florida conditions. Taft also has fruited once or twice in Florida, ripening from February to May, and is considered worthy of further trial. Taylor is the only Guatemalan variety that has originated in Florida, having been grown from seed at the Miami Station. Its season here is January to April, and it has so far been a fairly profitable variety. Murrieta has fruited in Florida but shows the same tendency of lack of vigor noted in California. A very interesting variety introduced from Guatemala, by way of Honolulu, is now fruiting at the Miami Station. This has been propagated recently under the name of Beardslee but may have the prior name of McDonald. The first fruits ripen in April and in vigor of tree, lateness of season, and quality, this is considered by Mr. Edward Simmonds, in charge of the station, as one of the most promising of the many varieties which he has tested.

The Guatemalan varieties, as clearly indicated in the recent Florida freeze, are considerably more frost resistant than the West Indian type. At a temperature of 26° they were for the most part untouched, while West Indian varieties nearby were severely cut back. At 22°, however, four-year-old trees of several Guatemalan varieties were killed to the ground, indicating that the average Guatemalan ranks in hardiness about with the lemon. Even a superior hardiness of 2 to 4 degrees would prove of great advantage in extending avocado culture to parts of Florida too cold for the West Indian race. Moreover, there is a much greater variation of frost resistance among Guatemalan than among West Indian varieties, and some,—Fuerte and Puebla for example,—promise to be much hardier than the average. No attempts have been made so far to protect Florida avocado groves by firing; doubtless because the frosts in that state, while severe, appear only at long intervals of ten years or more.

The factor of late season interests Florida growers fully as much as hardiness. In Florida the Guatemalans mature from one to three months earlier than the same varieties in California. With the Guatemalan season from December to May, and with the West Indian ripening from July to January, Florida growers expect to harvest avocados practically every month in the year. At the present time Guatemalan varieties may be considered as very promising for Florida although the most conservative growers and nurserymen fully realize that they must be more fully tested before they can be extensively planted.

MEXICAN RACE

Mexican varieties have never attracted much attention in Florida, the few Mexican trees in that state being seedlings bearing very inferior

fruit. Interest has been created in this race, however, by the marked hardiness shown, during the recent freeze, of several trees which withstood temperatures of 20° and proved to be as hardy as orange trees. The hardiness, together with the excellent quality of the best Mexican varieties, will doubtless result in a considerable planting, especially for home and local use, in sections of the state too cold for the West Indian and Guatemalan types. Harman is perhaps the most promising of the Mexican varieties which have as yet fruited in Florida. It ripens at Miami in July, and the fruit, while small, is excellent in quality. The tendency of the fruit to crack and decay at the apex at maturity was noted here as in California but to a much smaller degree. Chappelow has fruited for several years at the home of Professor P. H. Rolfs, near Miami, but is very poor in quality there, in contrast to the high quality reported in California.

While most growers consider Mexican varieties too small for commercial planting, many feel that it is quite probable that large fruiting varieties combining desirable size with hardiness and high quality will eventually be found. A seedling Mexican tree at the Miami Station now bears fruit of a pound in weight and of fine quality. While this tree is unfortunately a shy bearer, it illustrates the possibilities of the type.

Until the Guatemalan varieties are more thoroughly tested, commercial plantings in Florida will consist largely of West Indian sorts. Most growers will plant 75 per cent or more of their acreage to Trapp. Many will plant a small part of their groves to the best summer varieties, as these are already in excellent demand and doubtless have a great future as an ideal hot weather food. In most groves a few each of the most promising Guatemalan and new West Indian varieties will be planted for testing. A heavy demand is anticipated in Florida for avocados for home plantings. Even the more tender sorts can be grown in sheltered dooryards with some weather protection as far north as their commercial range, while the Mexican varieties can doubtless be grown throughout the orange belt.

Prospective Florida growers fully realize the importance of testing most carefully the many varieties now on trial and selecting from each the most desirable strains as well as eliminating all inferior types. To this end, several of the leading nurserymen of the state are keeping careful book records of the production and behavior of each individual tree in their groves. Records of this sort will make it possible to determine accurately and fully the comparative value of new varieties as well as strains within these varieties. With their wide range of hardiness, season, quality, and their future possibilities, avocado varieties offer a fascinating field for careful horticultural study of this sort.

HISTORY OF THE SHARPLESS AND THE MONROE AVOCADOS, AND MY OBSERVATIONS AND EXPERIENCES IN PROPAGATING THE SAME

BY B. H. SHARPLESS, Santa Ana, California

According to the best information we can gather on the subject, the avocado tree, cataloged as the Sharpless avocado, is a seedling, set out in the year 1901 by David Gockley. Mr. Gockley having died before the tree came into prominence, we have been unable to learn defin-

itely where he got the seedling, but the fruit is of the thick, hard-skinned Guatemalan type.

The tree was planted under the overhanging branches of an immense old blue-gum row, which caused it to grow rather tall and slender, but young trees in my orchard, budded from the Sharpless tree, show sturdy, spreading growth.

The Sharpless tree bore its first crop, consisting of 20 fruits, in 1912, being at that time eleven years old. Buds from the Sharpless tree, put into top-worked trees, set fruit at twenty-two months from budding, and buds put into nursery stock are in heavy bloom this spring, three years from budding. In 1913, the Sharpless tree bore 20 fruits; in 1914, 75 fruits; in 1915, 250 fruits; and the crop harvested in the winter and spring of 1916-17 consisted of 700 fruits.

Because of the insistent demand and the limited supply, we cut the fruit from the tree only when it showed by a slight change of color, that it was beginning to ripen. We adhered strictly to this plan and made weekly shipments from the first of October to the middle of February. Later in the season we found by experimenting that the fruit would stay on the tree in perfect condition several weeks after it had colored all over. From these facts I am convinced that the entire crop might have been harvested a month later. We propose to establish this fact this coming season by beginning shipments in November.

The Sharpless avocado shows remarkable tenacity in holding onto the tree. One fruit on exhibit today was cut from the tree this morning (May 18th), being two years from blossom.

Although several fruits hung on the tree during March, according to analysis made by Professor Jaffa of the University of California, the fruit reached its highest state of perfection in January. The analysis made in January showed 20.54 per cent fat content, while previous analyses made in August and September showed 15 and 16 per cent fat.

One dozen of the Sharpless fruits on exhibit today were cut from the tree February 24, having been in cold storage nearly three months, which fact speaks for itself in regard to the keeping quality of this fruit.

The Sharpless avocado is a pyriform fruit, weighing from 1 to 1½ pounds, the average being about 20 ounces. The skin is thick and hard, and is maroon in color when fully ripe. The flesh is cream color, with a rich, nutty flavor, and practically free from fiber. The seed is very small in comparison with the edible portion and is tight in the cavity.

The Monroe avocado is just coming into prominence as one of the very desirable, early spring fruits, ripening in April, May and June. The tree came into bearing at ten years of age, producing 5 fruits at that time. Its second crop was 60 fruits, and the crop for 1917 is estimated at 150 fruits with a heavy blossom at present for the coming season.

It is easy to bud, a vigorous, erect grower, and young trees, budded in the nursery on Lemon Heights near Tustin, have come into bearing at two years of age.

The fruit is of the thick-skinned, Guatemalan type, and is dark green in color, which turns a lighter shade, showing a creamy tinge when ripe. It weighs 1 to 1 1-4 pounds. The flesh is smooth and creamy, free from fiber and of delicious flavor. The seed is of medium size,

completely filling the cavity. Fruits have been submitted for analysis, but reports have not been received in time for this paper.

Having had considerable experience in budding citrus nursery stock, I anticipated no difficulty when I decided to propagate from the Sharpless tree. My first experience in avocado nursery work in 1915 was very much like that of the average novice in avocado budding, and I will not bore you with a record of its failures and disappointments, except to say that only about 5 per cent of the buds took.

I found a great difference of opinion among those whose advice I sought as to what kind of bud to use, some advising me to use buds that were only a tiny, undeveloped knot above the leaf stem, and from that on up to buds in full growth, an inch or more long. By experimenting with all kinds, we were able, by the process of elimination, to learn what type of bud would give the best results.

This may not apply to other varieties of the avocado, but in budding from the Sharpless and the Monroe trees, I get good results by cutting buds from the young, vigorous growth, using plump, full buds that seem almost, but not quite, ready to burst into growth. Last year (1916), I put 1800 buds into vigorous field-grown stock of different ages, and when winter came, I estimated that I had a set of 95 per cent.

Of this 1800 seedlings, 400 were from seed from Florida fruit, which in my inexperience I had bought and planted, thinking such large seed would make fine, thrifty plants. I was not mistaken in this, as they grew rank and fast, and set the buds well, but during the cold spell in December they froze to the ground, being a total loss.

My nursery was located in the lower corner of my orchard on the north side of a big blue-gum row, which served, I think, to back the frost up and hold it in the nursery. The seedlings from the local, hardy stock were damaged to the extent that the top foliage was more or less browned, but when the spring growth started, I found that a good percentage of the dormant Sharpless buds in the hardy stock had weathered the winter frost and other misfortunes, and with the first warm weather they pushed out into fine, vigorous growth.

Young two and three-year-old Sharpless trees, 100 yards from the nursery, were untouched by the frost.

THE WAGNER, LAMBERT AND SURPRISE AVOCADOS

By CHAS. F. WAGNER, Hollywood, Calif.

The Wagner avocado is a seedling from the Walker Royal, the seed of which I planted sometime in 1908. In 1913 the tree had 3 avocados, and about three dozen in 1914; 440 in 1915, and 190 in 1916. The last two years the fruit was mostly picked in April and May. I think they will be four to six weeks later this year. The average weight is about 10 to 12 ounces, but a good many weigh 14 to 15 ounces. The seed is rather large; the fruit round and of good quality. I kept some of the fruit on the tree until December last year. I think there are about 400 to 500 on the tree now.

The Lambert is a seedling from a Mexican fruit, planted in 1909. It bore 3 fruits in 1915, and 4 in 1916. This year (1917) it had 10 dozen. The fruit is green and round, and weighs about 1 pound; flesh,

rich in fat and very smooth. Picked most of fruit in March. There are still a few large fruits on the tree. Seed is of medium size. The tree is a vigorous grower and is in full bloom now (April). About 10 per cent of the fruit cracked at the blossom end, causing some of them to have a dry rot almost to the seed about the size of a fifty-cent piece, but it didn't seem to affect the balance of the fruit.

The Surprise is also a tree from a Mexican fruit which I planted in 1909. It bore 1 fruit in 1915; in 1916 it had 81 fruits; and this year we will get about 250 to 300 fruits. Average weight of fruit is 20 ounces; oval shape and green; flesh, very smooth grain, but not so rich as the Wagner and the Lambert. Last year I picked the fruit in February and March, but I think they will improve very much by letting them hang several months longer. The biggest part of this year's crop will still be on the tree in May. The tree is making new fruit buds now (April). The tree has a fine shape and is also a vigorous grower. The cold weather didn't seem to affect any of my trees here in Hollywood. The seed of the fruit weighs 3 ounces.

MY EXPERIENCE IN GROWING THE AVOCADO

BY MARTIN FESLER, Covina, California

I have been requested to read a paper on my experience as an avocado grower. I do not know whether I have a message worth while on the subject or not, but if my experience is of any value to the industry I am only too glad to give it.

The avocado industry, like the orange business at its beginning, is groping in the dark with a lot of unprofitable varieties, and a great deal of money and time is being spent trying out the various trees and finding out what is worth planting.

I planted my first trees in 1912, and as they were potted, they were all badly root-bound. The freeze came on and settled them, and I dug most of them up and learned what my troubles were. One seedling came through without much damage, and as it had refused to support the high-priced buds that I had repeatedly stuck into it, I decided to allow it to remain a seedling. The second year it matured 4 fruits; the next year it had 36, and last year it had about 350. My enthusiastic avocado friends advised me to place a 32-foot fence around it with a lock on the gate and a burglar alarm appliance to prevent people stealing the buds and begin selling them at two bits per. As it had no especial merit over many others that I knew of, I decided not to afflict the dear, suffering public with any more varieties but allowed all that wanted them, to have buds free. Very few availed themselves of the opportunity, though the fruit was better than some of those behind the fence.

I bought Blakes that turned out to be Harmans and Murrietas that were Tafts. A Mexican No. 6 must have been 4-11-44 or some other number. At any rate it was not a winner.

Like some others, I thought there was some easy money in the nursery business raising the trees, and I broke into the game with about 2000 seeds. I planted these in a hot-bed very close together, and when they sprouted and got a top on them about 2 inches high, I transplanted

them to the nursery row. Just why one should go to the expense of starting them in a pot is something I could not quite understand.

Some trees have a tight bark that will scarcely ever take a bud, and I got hold of a bunch of local seeds of this character and fattened the bud seller for quite a while before I got next to it. We will learn that it is not all in the bud, but there is a lot of our troubles in the character of the tree, and this will help us a lot in selecting our seeds. I saw a bunch of big, fat, Tahiti seeds and bought some of them. It seemed to me that they froze before the thermometer got to 32. At any rate, if all are like the ones I got they will not do for this country. I helped to replenish the gold reserve of the bud seller with my nursery for three years and then gave the proposition away to a fellow for nothing. Up to date he has not brought an action against me for damages but I feel rather guilty every time I meet him.

I have observed many failures among the growers, and most of them are due to a lack of care. If one plans to raise avocado trees among orange trees and depends on their growing by watering them with the regular run, he will find that they will not do well. Avocados should be watered at least every two weeks, and with small trees, oftener is better. Much depends on the character of the soil. They will stand a mighty lot of hardship and still hang on, but they will do no good. The trunk of the tree should always be protected from the hot sun until it grows its own shade. I had very poor success heading out trees too high. As they grow, I have found that one can prune off the lower limbs, but the avocado is a tree that winds and twists more or less, and it is hard to train certain varieties and get them to make a good looking tree.

I bought trees that had been budded on two and possibly three-year-old rootstocks. This had been accomplished by sawing off the trunk at the ground and allowing a sprout to grow up, placing the bud in that. When balled, this stump is hid, and you think you are getting a fine tree, only to learn later that it does not grow. You can figure on the loss of about a half year's growth or more on trees of this character, no matter how much care you give them. The second year, they will take hold and grow, but I find it does not pay to plant that sort of a tree.

There is much to learn about what buds will grow on a bud-stick. Many of you learned this in the good old days when you bought high-priced ones, and the seller counted in the weak buds. The bud seller in many instances did not know this and of course did not mean to sell worthless buds. There are certain kinks in every variety, and the only way you can learn this is by actual experience. I have found that the early spring budding is the best. Others claim different times, but at the best I have met with numerous failures in certain kinds, and I find I am not alone in this. Some buds will take hold and give great hopes, only to disappoint one later. I nursed a Murrieta for two years, and at the end of that time it was not over 2 inches larger than it was when I planted it. I have some Royals that grew fine last year and this spring they look like a picked chicken.

Where budded trees are to be rebudded, in many cases I think it will be advisable to get back to the seedling stock, in preference to budding on the budded tree. This can be accomplished by stubbing back the tree

at the ground and allowing a shoot to come up from below the old bud, then working from that. As some trees grow so much more thriftily than others, it is not advisable to mix them up too much. This is not practical with trees of any considerable size.

I have a Challenge bud, growing in a Harman trunk, and a similar one in a seedling stock about 25 feet away, and there is no comparison between the two. The one on the Harman is a year older than the seedling, and it is not as large. I know of instances where growers have been advised to plant Harmans to be top-worked later, when we know more definitely what we want to grow. My experience has taught me that we are going against trouble when we pursue this course. I have sometimes thought that our nurserymen were over-persuaded that this was true because they were long on Harmans.

Quite a few people in my neighborhood thought well of the avocado outlook and planted quite liberally, only to learn that the variety they have is not worth while. One man dug up about 2 acres because he was unable to determine what variety was best to grow. So much has been said about the different trees, and some are condemning them while others will pronounce them all right, that the uninitiated are unable to determine who is right, and so they let it alone.

I am very optimistic about the future of the avocado, despite the fact that I have bought about all the trees that did not pan out.

A man in Florida had a secret process for grafting avocados that he assured us was a winner. He asked \$500 for it, but I could not think he had very much over us here in California, and later he sent it to me for the same price I got for my nursery. It would not work for me.

I had 14 trees that fruited last year, ranging from a half dozen fruits to 350. On account of the high cost of potatoes, we only sold a few. The price we received was very satisfactory. When I learned that some of them were bought by Mexican laborers, I thought they sold too high.

The thin-skins showed a tendency to drop just before they ripened. I was unable to determine why this was so. Possibly it was from a lack of water, as I withhold irrigation in the fall to prepare the trees for winter.

I could not grow the Trapp variety. It froze badly each winter, and I dug all the trees out.

With foot-rot and gum disease in our orange orchards, and black scale that is immune to cyanide, the avocado looks mighty good to me. Those of you that have tried replacing an orange tree in an old grove know what you are up against. I can get more results with an avocado tree in three years than with an orange tree in seven. Next year will see every unprofitable orange tree in my grove removed, and there are a mighty lot of them in most groves I know anything about. The avocado is going to be a great boon to orange growers who have a lot of trees that should be dug out.

NOTES ON AVOCADO VARIETIES FOR COMMERCIAL ORCHARDS

BY CHAS. D. ADAMS, Upland, Cal.

To the increasing number who want to make a start toward planting commercial orchards of avocados there is no more important and

puzzling question of which to find an answer than what to plant to produce an orchard that will prove permanently profitable.

One may frequently hear the current opinion expressed that we must wait ten years longer before we shall know what are to be our standard varieties. Possibly we may have to wait that long to get that knowledge, but we do not intend to wait that long to do our planting and from what we already know about it and what we already have in trees and fruit we can be reasonably sure we can produce orchards that will be permanently profitable even though no trees in them should ever find a place in the final standard class.

The discovery during the past season of the late ripening period of two imported budded varieties and one of California origin has given us three first-class winter maturing kinds, so that we now have avocados of superior merit to market during every month in the year and that without needing to use very many varieties, so few that even three or four can be made to cover the whole season.

Since we can now cover the whole year with varieties that are as good as any that we have, there is no need to be unreasonably timid about planting an orchard if we use few enough kinds, selected with sufficient study and good judgment.

The main puzzle that remains to solve pertaining to the effect of future planting on what we may plant now, is whether the superiority which we may find in the best new kinds from Guatemala will prove very marked as compared with our present best kinds. Among the hundreds of thousands of trees amid which the United States government expert is now seeking the best, and among the selected imported Guatemalan buds soon to fruit here, there are almost certain to be some for which we shall want to reserve a space in our orchards.

Not too many kinds, is a well proven element of success in orchard planting. Buyers are most interested and pay best prices where they can find large and continuous supplies of a definite article and growers find such marketing simplest and most economical. The California orange has been brought down to one standard variety for one half the year and one for the other half. The greater variation in taste, shape, size, color and period of maturity in the avocado compared with all other fruits will not permit of quite so few, but the nearer we can approximate to it with the very best for each period the better.

We are not here considering a few trees each of many kinds for our own testing or pleasure. That is quite a different matter.

Probably the main ripening season for the greatest number of our thick-skin varieties is the summer, some of them beginning earlier and some continuing later. Then we have those maturing most of their crop in the spring, some of which would begin in the winter, and finally we have those maturing most of their crop in the winter, some of which would come earlier and some later.

We find a general agreement to eliminate from consideration those sorts, however good otherwise, that have been found weak and sickly in their growth, such as the Colorado, Dickey, Royal, Murrieta and Presidente.

For the spring including some years the latter part of the winter

and earlier part of the summer, we have most prominent the Challenge, Blakeman and Dickey A, also Lyon and Spinks.

We must bear in mind that all varieties are later this year than usual, many growers state 30 to 60 days later.

The objections brought against the Challenge are its large seed, very low oil content, and only fair flavor with some stringiness, but its beauty places it in the highest grade as to external appearance and the attention it will attract in any market. It averages a full pound or more in weight, it is round in shape, at maturity turns to an attractive deep maroon color, and it comes from a hardy, vigorous, immense in size and enormously producing tree. Budded trees of the variety come into bearing early and produce heavy crops.

The Dickey A needs an introduction to a great many of us, not being as well known as the others, perhaps for want of a better name. Neither the original tree nor any of the buds have displayed the weak symptoms of the original Dickey. The quality of the Dickey A is very superior, the seed one of the smallest in proportion to flesh of any variety we have, the shape pyriform, and the color red as it matures and then maroon.

In the past the fruit on the parent tree has averaged a pound or more, but this year, owing perhaps to the very large crop it has carried, it does not average over three-quarters of a pound.

It and the Challenge are the varieties that have been most prominently and continuously on sale during April and May in Los Angeles grocery stores.

The original Dickey being discarded, it would be a gracious act on our part toward Mr. Dickey, who is one of the members of our Association and who would naturally rather have a good thing associated with his name than a tree failure, if we would agree to drop out the original Dickey variety entirely and transfer the name Dickey to the Dickey A.

The Blakeman is showing itself to be an exceptionally hardy, vigorous, and precocious tree. The growth is spreading. To obtain the best form, the young growth in its early state should be pinched back or headed in to promote compactness. A grower who has many varieties, writes about it as follows:

"As to frost the Blakeman made a particularly good showing this winter; a little tree in my orchard, 4 or 5 feet high, went through without turning a leaf, Taft and Dickinson in the same neighborhood being badly hit."

Snow fell in an orchard in another locality, melting nearly as fast as it fell, though remaining as much as two inches thick on the ground and trees for a time. It caused the leaves of the citrus trees to curl up and look for days as they would after a decided freeze, and it browned the leaf edges of some other avocados, but not the Blakeman leaves, which came through bright and shining, showing no sign of anything wrong. This is one of the fruits of high quality, of a green color turning to a yellow shade of green as it matures, form broadly oblique and average weight previous seasons 1 to 1¼ pounds, but this year only a scant 1 pound, owing perhaps to the heavy crop. Budded trees two years from the nursery indicate a good setting of fruit and the five years' bearing

record of the parent tree indicates a continuous bearer without off-years. The record is, first year a few, then 25, 50, 250, 500.

In the Lyon we have a fine fruit and the tree, the most precocious known, blossoming and setting fruit so abundantly from the first year that it tends to dwarf and enfeeble the tree unless it be carefully and rigidly thinned.

The Spinks tree is remarkably hardy and vigorous. It does not sunburn as do many varieties. Observation of many kinds show it and the Fuerte to be among the most rapid growers of any of the thick-skin type. The year's growth of some Spinks buds placed in old stock surpasses anything of the kind known. The fruit has been too large but has redeemed itself this year by coming down to an average of a pound or over. The color when mature a purplish black, and the form obovate to pyriform. The fruit is handsome and has a long period of maturity.

The Taft and Dickinson are two main season fruits that are less hardy than some others, yet do well in many groves and with a little protection the first year or two, should do well wherever lemons will. Their fruit is so superior as to make them worthy of this care. The Taft is longer in beginning to bear than most varieties. The Dickinson is receiving more attention this year than ever before, displaying many good qualities.

A fruit we all admire for its size, color, high quality, beauty, and very small seed, is the Sharpless, and more than ever now since it has been found to have been picked and marketed too early in the main season and has been found to be really a fall and winter fruit. Its crop this year was 700; its shipping to market began in October and continued until March 15th, some fruit staying on the tree to the end of April, and one remained to be picked to exhibit at this meeting. The heaviest shipments were in October, November and December, after that the ripening was slower. Mr. Sharpless states that half the fruit would have been better had it been left on the tree one or two months longer and that there is no question about its being a winter-ripening fruit. Other years the fruit was simply picked immature. The analysis shows this. The chemist stated that the specimens sent in August and September were not ripe, while a fruit sent January 15th analyzed 20.54 per cent oil and specimens analyzed on April 4th showed 24.23 per cent of oil. This is a real brittle-skin or hard-shell fruit, the skin making an excellent protection in shipping and an ideal cup from which to eat it with a spoon. The fruit weighs from a pound to a pound and a half, averaging 20 ounces.

The budded trees on Mr. Sharpless' place are strong growing and he states have never had a trace of die-back or sickly appearance. The blossoming time is April and May and the fruit begins to mature in October of the following year, similar to the Valencia orange, making the fruits from sixteen to twenty-two months at picking.

The other two winter bearing kinds are the Puebla and Fuerte. They are both hardy and satisfactory as trees in every way.

A Puebla tree, which was under my observation, at two years from the nursery set 15 fruits, which were of a very handsome appearance at maturity by reason of their smooth, glossy skin of a purple color. The first one was picked December 17th, and the last January 28th and could only have been held a day or two longer. The analysis shows 25 to 26

per cent fat. There is some fibre but not enough to be objectionable. The size was a disappointment. Last year's report of an average weight of three-quarters of a pound was not confirmed. One or two out of the fifteen reached three-quarters, but others only 6 ounces and the average did not exceed 8 to 10 ounces. The tree is very hardy, very precocious, and very prolific.

The same is true of the Fuerte tree and the Fuerte fruit reaches a more satisfactory size, averaging, as stated, from $10\frac{1}{2}$ to $12\frac{1}{2}$ ounces. It ranged in a five dozen shipment from an $8\frac{3}{4}$ ounce average, to an 18 ounce fruit, the largest of the season. A specimen under my observation, picked February 9, weighed 17 ounces and its seed $2\frac{1}{2}$ ounces. Shipments of the Fuerte were made regularly from January 1st to March 15th and a few until April 17th.

A striking variation in shape and size of fruit on the same tree has been found in this variety, even round fruit together with the usual obovate form, but it is desired to have it clearly understood that no such finding of round fruit is general, it having occurred only on three trees.

The fruit is green in color, with a very high oil content, one analysis shows 25.32 per cent of oil and another is still higher.

A wide range of planting distances has been proposed, at which to start an avocado orchard, ranging from $16\frac{1}{2}$ to 60 feet, together with various plans for interplanting and subsequent removal of interset trees.

Let me call your attention to a simple method, which is not an untried theory—but which I have already put into practice in an olive grove and found satisfactory. It saves any need of interplanting and thereby mixing in the same row trees that may gain by being treated differently.

Start the orchard by planting the trees 20 feet square, having at least two rows of the same kind so as never to lose the variety when thinning out trees to wider distances. When they crowd at 20 feet, take out every alternate diagonal row, which will leave the trees in squares, forty feet apart, with one in the center of each square, which equals as many trees to the acre as if they were planted 28 feet square.

Whenever they crowd again, if they do, take the center tree out of each square, the remaining trees will then stand 40 feet apart each way, which ought to be ample if we aim to keep our trees under control. If one wishes the final distance apart of the trees in a grove to be greater, simply increase the starting distance of the planting in proportion and have the final distances whatever may be desired.

THE AVOCADO IN CENTRAL AND NORTHERN CALIFORNIA

BY PROF. I. J. CONDIT, COLLEGE OF AGRICULTURE, BERKELEY

Avocado culture in central and northern California and in the coast valleys is still more or less in the experimental stage, although the success of small plantings in many sections is encouraging and conducive to further and more extensive trials. Some of the experiences of growers in a few widely separated districts may be of interest.

The presence of large seedling trees of the Mexican type, ten years old or more, at Visalia, Los Gatos, Berkeley, Napa Soda Springs, and Youngville, and two of the Guatemalan type at San Luis Obispo, was

noted in the 1915 report of this Association. The trees at Los Gatos, Visalia and Napa have borne fruit for several seasons. Budded trees of the Pomona, Fowler, Blake, Harman, and Wagner, produced fruit in 1916 in the interior valleys, and scores of trees are blooming heavily this season. At Oroville a large tree of the Mexican type grown from a seedling started in 1905, bore 1 fruit at nine years, 2 at ten, and 5 at eleven years of age. The tree is now 25 feet high and has proven perfectly hardy. At Sunnyslope in Butte County such varieties as the Harman and Northrop have been grown and propagated for several years.

The success of the avocado in the middle of the Sacramento Valley away from the foothills is questionable. In the spring of 1914 Mr. Skinner, a member of this Association, planted 140 high-land Mexican seedlings in orchard form among standard prune trees at Yuba City. The following winter about one-half were frosted on account of their tender growth due to late irrigation. Budded trees of the following varieties were also set out early in 1914: Chappelow, Sinaloa, Walker, Meserve, Dickinson, Taft, Queretaro, Harman, Atlixco, Dickey, and Ganter. These came through the winter without serious injury although they were not covered or protected. During the winter of 1915-16 the minimum temperature was 22°, but the cold was not prolonged. The Taft, Dickinson and Dickey frosted most, while the Walker and Ganter had only the tender branches injured. Four inches of snow fell after the heaviest freeze; this settled on the branches of one tree near the house and broke 4 feet out of the top, leaving 5 feet of trunk and branches. The Sinaloa trees showed no signs of frost injury.

During 1916 a number of other trees representing twenty-two varieties, were set out, while neighbors in town planted nine more; there were altogether forty different varieties in the vicinity for testing. The winter of 1916-17 was unusually severe as shown by the following report by Mr. Skinner on January 1, 1917: "It has been freezing steadily for the past six weeks and I could not tell just what would become of my avocado trees. I have five large seedlings, 8 to 10 feet high, that will come through in good shape; all the rest are frozen to the ground, or at least down to the protectors around the trunks. One Sebastian and one Knowles which were in a more protected place look better. The thermometer ranged from 21° to 26°, and for a long time every morning the ground would be frozen until noon, and a cold north wind often blew for days. The trees will likely start up strong from the roots and make new tops." A later report states that: "The avocado trees stood more freezing than any of the citrus trees of the same age. The latter were all killed and are not starting from the roots; the avocado trees are sprouting out, some at 3 to 6 feet high, others near the ground."

The trees in town came through in much better shape. One grower wrote that the Chappelow, Northrop, Harman, and a couple of seedling trees were blooming heavily the first of May. He believes that some of the hardy varieties can be grown in that section, although they should not be tried as a commercial proposition. His place is undoubtedly much warmer than it would be a mile or more away from the river and away from buildings which serve as a protection.

On the Regua Ranch at Orland 60 Northrop trees planted in 1916 were uninjured by the cold of the following winter. All with one excep-

tion, were protected by burlap shelters, and it came through in about as good condition as those which were protected. The wind in fall and winter seems to be the limiting factor for avocado trees at Orland and the advisability of planting Guatemalan types, the fruit of which hangs on the tree over winter, is doubtful. Planting near buildings, windbreaks, or among other evergreen trees may obviate this difficulty to some extent.

Near Dunnigan, Yolo County, trees of several varieties were planted in March 1916, but all were burned by the sun because of disregard of the instructions to protect them with sacking. Three Harman trees seemed to show most vitality from the start and survived the winter in good shape.

Reports from Sacramento County are so far not very encouraging. Northrop, Taft and Ganter trees in the Carmichael Colony were all badly injured with the exception of one Northrop tree from which the burlap covering was blown by the wind. This tree, though unprotected, proved the hardiest of all and stood the frost better than the rest. At Folsom one Taft and one Ganter tree, planted in the spring of 1913, were about 5 feet high and well branched by 1916, but the past winter both were frozen back some, the Ganter more than the Taft, which was protected by other trees and vines. Three more Taft trees and one Ganter planted a couple of years later froze to the ground during the winter of 1916-17.

One grower at Fair Oaks is of the opinion that the avocado tree will not do well in that section, as it does not seem to endure the frosts or the heat. Several years ago he planted 100 Mexican seedlings which lived through the winter with protection but died the following summer even though pains were taken to shade them. Two years ago 100 more plants were raised from seed, but they were all killed during the winter of 1916-17 with the exception of three plants, one Harman, one Chappelow and one seedling, which stood near a building and came through unprotected. The seedling is very hardy and was uninjured by the severest frosts, but it is very slow growing. It is now three years old and full of bloom. The Harman is two years old and is also in bloom.

At Lincoln in Placer County there is a Harman tree now three years old, which is reported to have escaped all frost injury although some of the surrounding orange trees of the same age were killed by the frosts of last winter. At Newcastle in the same county, however, budded trees of several varieties both Mexican and Guatemalan, were killed during the past winter. Several Mexican seedlings, however, escaped and were blossoming heavily in April. These trees were in a fairly low, unprotected locality and the test is probably not a fair indication of the possibilities of the region for avocado trees.

In many of the protected valleys and hillsides of the San Francisco Bay region, orange and lemon trees laden with fruit are a common sight and thriving lemon orchards are by no means uncommon. In some of these places the possibilities of avocado culture have already been recognized and many thriving trees are to be found. One of the most extensive and promising plantings is on the Ostrand place, two miles east of Walnut Creek. During the past winter a self-registering thermometer showed a minimum temperature of 30° F. at the house near which most of the trees are planted. Some of the trees are now one year old from planting, while others were set this spring. They include such varieties as Fuerte, Lyon, Blakeman, Taft, Murrieta, Spinks, Linda, Rey, and Queen. A Harman

tree two years from planting was in full bloom the first of May. At a near-by place on the floor of the Ignacio Valley, a Northrop tree passed through the winter uninjured by a minimum temperature of 22° and was full of bloom May 2nd. A Taft tree near-by was frozen back to the ground, while one Fuerte and one Sebastian were seriously injured but were sprouting from the trunks and main branches.

In the Santa Clara Valley proper, attempts to grow the avocado tree have been on the whole discouraging. One fairly old seedling on Judge Leib's place near San Jose, has managed to survive but has been frozen nearly every winter and the injury during the past winter was especially severe.

Along the western foothills, however, greater success has been attained as the bearing tree of the Mexican seedling at Los Gatos shows. Most of the budded trees planted have been of the Harman, which at Saratoga was only slightly injured at 26° . A number of varieties including the Taft are growing successfully at Los Altos.

Small plantings of the avocado are found in the San Joaquin valley, not only in nearly every citrus section, but also on the floor of the valley. Along the foothills in protected situations, thriving trees already show much promise of future commercial success, but in the center of the valley only a few of the most hardy trees may be expected to succeed. One attempt to grow a Northrop tree at Oakley was unsuccessful but at Elk Grove where the winters are not so severe, the results were much more encouraging. Mrs. Gage of Elk Grove has 11 trees growing out of 15 originally planted. The trees lost were of the Taft variety; there is one Chappelow, while the rest are Harman. She reports that she firmly believes the avocado can be grown successfully in the valley by giving some protection during the first winter or two. Three of the trees are three years old, about 14 feet high and well branched. They stood the cold much better than the Villa Franca and Lisbon lemon trees, as the branches of the avocado trees had to be cut back 2 to 4 inches, and the lemon trees 2 to 4 feet.

It may surprise some to know that there is now a railroad station in California bearing the name Avocado. This is in the foothills of Fresno County, on a branch line of the Santa Fe running northeast from Reedley, where the Kirkman Nursery has an experimental planting of avocado trees. About two dozen varieties were planted during the month of May 1913, in sandy nursery soil, citrus stock being grown on the land at the same time. In 1916 the Fowler, Harman, Northrop and Blake matured fruit, the Fowler being exceptionally fruitful.

The writer visited this planting on April 4th, 1917, and made the following notes as to the condition of trees observed:

HARMAN: Some trees in full bloom, others in bud, showing practically no frost damage.

NORTHROP: Trees mostly in bud, showing practically no injury.

MESERVE: Badly injured, branches up to 1 inch in diameter being killed.

WAGNER: Injured; branches up to one-half inch in diameter killed.

CHAMPION: Small tree, practically killed; surrounded by orange and lemon nursery trees uninjured.

BLAKE: In full bloom; very little injury.

FOWLER: Some trees in full bloom, some in bud, uninjured.

Another valuable variety test is that being made at Navelencia, Fresno County, by Mr. R. P. Mathews, who planted trees on five acres of dry bog soil in 1915. The list of varieties includes: Wagner, Taft, Sharpless, Canyada, Fuerte, Queretaro, Sinaloa, Puebla, Northrop, and Harman. He has found the Taft and Sharpless the least hardy in the district. The most satisfactory growers are the Queretaro, Canyada, Fuerte, and especially Sebastian, which is wonderfully vigorous. The trees are on an especially warm slope where drainage is good. Mr. Mathews thinks it useless to attempt to raise the Guatemalan types on the flats of the San Joaquin Valley. The Sebastian, Harman, and Northrop, however, should thrive wherever the orange tree thrives. During the winter of 1916-17 the Puebla, Fuerte, and Sebastian proved most hardy and the Taft most tender.

Ten miles east of Porterville in the south Tule River foothills, Mr. Frank Frost has some seedling Mexican trees which are doing well. One tree, which bore fruit in 1916, has been named the Alpine, as the drooping branches turn up at the tips, giving it somewhat the appearance of a pine tree. The fruit is reported as 3 to 4 inches in length and 2 to 3 inches in diameter; seed, exceptionally small; season, October to December. Tree about 15 feet high; planted in 1912.

These reports from various sections indicate that many varieties of avocados can undoubtedly be grown in the more protected places of the interior, especially along the foothills. In conclusion I wish to repeat the statement made in California Station Bulletin 254, published just two years ago: "Those who contemplate avocado planting in untried localities should proceed cautiously and not plant any variety extensively unless they are willing to assume the risks of the pioneer."

ADDITIONS TO THE CHECK LIST OF VARIETIES

BY PROF. I. J. CONDIT, COLLEGE OF AGRICULTURE, BERKELEY

The following variety names have been noted since the publication of the Check List in these Proceedings for 1916:

BEARDSLEE (*Guat.*)

This variety is undoubtedly identical with Macdonald which name has the priority.

The seed was introduced into Hawaii by Admiral Beardslee from Guatemala, and planted on the Macdonald place, Honolulu. Budwood recently introduced into Florida by the United States Department of Agriculture, where it has proven unusually promising at Miami, being uninjured by a temperature of 26° F.

Described as follows in a letter from Mr. Lloyd Tenny of Miami, April 27, 1917: "Fruit round, mahogany colored, very beautiful and attractive; weight 12 ounces; flesh creamy yellow, shading to deep green near the skin; fiber none; seed comparatively large but tight in the cavity. Season early spring when there are no other varieties at present to compete. Two-year-old buds bearing at Miami."

CUMMINS

Reported by P. J. Wester in these proceedings for 1916, p. 180, to

have been sent as budwood in 1912 from Altadena, California, and successfully propagated at Lamao, Philippine Islands.

STEPHENS (*W. I.*)

S. P. I. No. 26691. Budwood obtained from Judge White's place, Buena Vista, Florida, by Mrs. P. H. Rolfs, May 4, 1905. Illustrated and described in the Florida Grower, February 17, 1917, p. 11, by P. H. Rolfs. Season December and January. More glossy and more uniformly green in color than the Trapp.

WALDIN (*W. I.*)

A Florida seedling originating on the home place of B. A. Waldin, Homestead, Florida. Seed planted in 1909; first fruit produced in 1912-13. Described as follows in a letter from Mr. Lloyd S. Tenny of Miami, February 19, 1917: "Skin green, smooth and tough, not bruised by rubbing as is the Trapp during heavy wind storms; fruit of unusually fine quality with a very tight seed and firm flesh; weight 18 to 20 ounces. Season December 15 to January 10."

CARIBOU (*Guat.*)

A variety originating on the place of W. A. Spinks, Duarte, 1916-17. Fruit almost spherical, somewhat oblique, $3\frac{3}{4}$ inches long by $3\frac{3}{8}$ inches diameter; weight about $\frac{3}{4}$ pound; color deep green; surface slightly roughened by the large, numerous, raised dots, glossy; apex broad, somewhat flattened, center a point; base oblique, rounded; cavity none; stem medium, 0.4 inch diameter; skin granular, $\frac{1}{16}$ inch thick, separating readily from the flesh; seed spherical, oblique, 2 by 2 inches, smooth, 21.8 per cent. of the weight of the entire fruit, tight in the medium-sized cavity; seed-coats adhering. Flesh deep creamy-yellow, $\frac{1}{2}$ inch thick, firm, buttery, fairly rich and nutty in flavor, of good quality, with very little fiber. Season, May. Tree dormant in winter and exceptionally hardy, with bright green foliage.

I. X. L. (*Guat.*)

A variety originating on the place of W. A. Spinks, Duarte, California, 1916-17. Fruit very large, 5.8 inches long by 4.2 inches diameter; weight $1\frac{1}{2}$ pounds or more; shape pyriform; color deep green; surface roughened by protruding dots which are large and light green; apex slightly flattened with the center very slightly depressed; basal half tapering; stem stout in a slight cavity. Skin granular, $\frac{1}{10}$ inch thick, peeling readily. Seed large in a large cavity, oblique-spherical, with adhering seed coats and smooth surface, tight in the cavity, comprising 19 per cent of the weight of the fruit. Flesh yellow, shading to greenish near the skin, 0.4 to 0.8 inch thick, soft, melting, slightly watery, fairly rich but hardly nutty, of good quality, with a slight amount of fiber most noticeable near base of seed. Season, May.

KEY LARGO (*Guat.*)

A true Guatemalan hard-shell originating on the place of W. A. Spinks, Duarte, 1916-17. Fruit almost spherical, of medium size, $3\frac{5}{8}$ inches long by $3\frac{1}{2}$ inches diameter; weight over $\frac{3}{4}$ pound; color very dark green; surface warty especially the basal half, with a few, small, light green or russet dots; apex flattened, center slightly depressed; base oblique; cavity none; stem very stout, wrinkled, 0.6 inch diameter. Skin

very granular, brittle, unusually thick, separating readily from flesh. Seed oblate-spherical, 1.9 inches long by 2.1 inches diameter, smooth, 24.8 per cent of weight of entire fruit, somewhat loose in the rather large cavity; seed coats adhering. Flesh deep golden-yellow, greenish near skin, $\frac{3}{8}$ to $\frac{1}{2}$ inch thick, decidedly buttery and oily, very rich in flavor and of excellent quality; fiber noticeable, somewhat stringy at base of seed. Season, May. Tree prolific, often bearing 2 to 4 fruits on one stalk.

HOW SHALL WE ELIMINATE THE MISNOMER, "ALLIGATOR PEAR"?

BY THOS. H. SHEDDEN, MONROVIA, CAL.

Mr. President and

The Lady and Gentlemen Friends of The Avocado:

The good Dr. Webber has again prescribed me to be administered to the infant avocado. I hope its growth may not be retarded thereby.

The interrogatory character of my topic indicates that the alligators are still crawling around among the avocados, although they do not seem to be so numerous, or conspicuous.

The formative period of anything is the proper time to prepare it for its ultimate purpose. Fundamental, afterthought alterations are always expensive and difficult—oftimes impossible. Right now is the best time to stamp indelibly upon this splendid food, which we are preparing for our fellow creatures, that newly coined name, clean and fresh from Uncle Sam's agricultural mint in Washington, "*AVOCADO*," obliterating thereby that animal-vegetable conglomeration, "alligator pears," so that in the next edition of Webster's, alligator pear will be followed by that quiescent word, "obsolete."

Some have feared that it may be too late in life to change the name of this fruit. Not so. It wasn't born alligator. It wasn't discovered alligator. Long ere the old half of the world knew that the other half existed, it lived, and bore the beautiful Aztec name, ahuate, which, alas, as a title, has seemed to be too mellifluously lingering and dulcet for our practical American tongue to maintain—a fact proven in our very midst—witness the blue pencil drawn through the original name of our association, The California Ahuate Association, a combination of sweet sounds, for the retention of which, Mr. Hart ably contended, as long as harmony would permit. The many modern cognomens (plural) of the fruit have been shifty enough not to have the fruit's feelings hurt, or flavor injured, by one more change, to mark, as it were, its new life in the warm bosom of Mother Earth in Florida and California.

Regarding the origin of the name alligator pear, which is merely one of forty-three aliases under which this fruit has played hide and seek for four centuries, I once read, that some cold climate sailors, while sauntering around in a tropical port, obtained a lot of the fruits from the natives. The Indian name, Ahuate, is as often spelled with the "gua," and the northern tongue is prone to pronounce the "g" hard. The word looked and sounded to the sailors like alligator, (try it yourself), and as the skin of the particular variety they had was thick and wartlike, it

suggested an animal familiar to these sea-farers, the alligator. As the fruit was shaped like a pear, they called it alligator pear.

The particular variety they got is said to have been a thick, rough, verrucose-coated, pear-shaped fruit,—I've heard Mr. Popenoe describe it. I think, from the description, they must have gotten his fruit from the Dickinson tree, just opposite the entrance to the University of Southern California, when Balboa one dry season discovered the headwaters of the Los Angeles River.

The name alligator pear is illogical, because many hundreds of varieties have neither pear shape, nor alligator skin. If the name alligator pear must be used, let's put it over onto—the Hubbard squash.

The superb fruit gets in wrong with many who would otherwise be its friend, when, instead of its name suggesting its coming down from a celestial direction, from one of the truly great trees of the earth, as does the benign avocado, the other, hyphenated name, is suggestive of the crawling and sprawling on the ground, of one of the three ugliest, biggest mouthed animals of creation, the hippopotamus, rhinoceros and crocodile. Take this from one who ever carries the beloved avocado in his heart, (and elsewhere whenever he can get it) and has had training in first aid to those who have been in any way affected by the avocado, that he has found many hotel guests, men and women seemingly healthy, who were prejudiced against this superlatively fine food, simply because of the name, and the unpleasant thoughts it starts. Their expressions were varied and numerous; lack of space crowds them out of this edition.

Hyphenated names are not popular nowadays. The one in question is awkward, and in these days of short-cuts and saving lost motion, is unnecessarily long. In writing, it requires just double the space occupied by avocado. Those who are constantly handling the fruit use the nickname, "'gators." This makes it misleading. One day a raw recruit down in the storeroom of the hotel, in the absence of the storekeeper, received a box marked as containing 'gators. The deliveryman had, also, told him they were 'gators. The employee was one of those "meant-wells" of the Happy Hooligan order, and he hurried upstairs, what he supposed was a box of shoes, to the room of a well-known San Francisco wholesale shoe dealer.

Sometimes the entire word alligator is used, which is fully as misleading. Witness a result: A recently come over Irishman, attendant in the kitchen, who was as fresh and green as the grass in his native land, in helping unload a great turtle and some giant San Francisco crabs, expressed amazement that such things should be eaten by human beings, but when the deliveryman handed out a box which he said was full of alligators, the astonished son of Erin almost dropped it in exclaiming: "Alligators! Will fer hivin's sake, what nixt'll they be ate'n in this hotil!"

It is not too late in the young American life of the fruit to change its haphazard name to something better. Mistakes in names are often corrected by the courts, and no dishonor attaches thereto. And surely, there is no more honorable or commendable act in the life of a good woman, no matter how late in years, when, in the happy presence of God, good angels and witnesses assembled, she stands up and joyfully changes her name.

In an unguarded moment, down at the meeting in San Diego, I got

myself a job of hard work by making a move to attempt the extermination of the ugly alligator from our beautiful avocado world. Until the receipt, a couple of months ago, of the Association's year-book, I really didn't know that I was the lone committeeman to start the war, especially among the hotels, cafes, etc., and was awaiting the appearance of some companions in arms, for I'm not an old campaigner in this war. Until recently, the only destructive weapon I ever raised against the alligator pear was a spoon. While waiting to hear of the appointment of some valiant alligator hunters, I have, upon numerous occasions, twisted the tail of the alligator, and with every twist have realized how big the tail is, and the wish has gone forth that some St. Patrick, or Siegfried might arise and rid the avocado world of the alligator. It will be hard, but not impossible work. It is simply one feature of the great problem of educating the public up to the eating point, which now confronts the expanding production of the avocado orchards.

The expenses of this general campaign of publicity will have to be borne by all those who are in any way interested in the production of the avocado. Few others will help, for the general public has an idea that the avocado grower will be able and ready, willing and waiting, to pay off Uncle Sam's war debt, as soon as the trouble is over.

The Association has no war chest, and so, the lone committeeman, not having been provided with any of the "sinews of war," has been able to carry on only a sort of guerrilla warfare, for the love of the sport. Hence this partial report of incomplete work.

While most of the hotel and cafe men still use the name alligator pear, so far I have found but one who positively refused to favor any move to change. He said he had always used alligator pear, considered it right, and would always call it that, regardless of what others did. I will not name him, but he it was, of whom Martin F. Tupper, the proverbial philosopher, wrote:

"Habit, with him, was all the test of truth;
It must be right, I've done it from my youth."

In general hotel men seem to be not unfavorably disposed to the movement, provided the public is satisfied.

This reason, alone, explains their chariness about changing. The true caterer aims always to give the public that which is pleasing thereto,— in other words, give what is wanted. For example, some years ago, a notorious bad man of the West went into Sam Dutton's hotel cafe in Denver. He was full of bad whiskey and some appetite, and ordered the waiter to bring him some rattlesnakes, fried, well done, with plenty of Tobasco, punctuating his order with profanity and an exhibition of his gun. When the quick-witted chef got the order he happily thought of some eels which he had in the ice-box, and which he promptly prepared and served, coiled up like a rattler pointing its head at the would-be diner. At the St. Francis Hotel, in San Francisco, guests can order nice fresh whale steaks, chops and cutlets for breakfast. If hearers doubt this statement, I refer you to Victor Hirtzler himself who is responsible therefor, and whom I am much pleased to see on the program today.

In Mr. Hirtzler's presence and participation in this convention of avocanks, I see one of the best signs of the times in the avocado world,

for he has as much practical and paid-for knowledge of the quality and consumption of the avocado as anyone in the United States. I have quoted him once before as to his expressed love for the California avocado and approval of its name, and will say of his discernment regarding the name, that when a diner at the St. Francis orders an alligator pear, he is served a pear-shaped fruit. If the order calls for an avocado, he gets a round one.

The alligator line of defense does seem to be wavering. I have had inquiries from different parts of the country as to the comparison of the two names, their relative value, the proper pronunciation of avocado, etc. I was surprised at getting two of the latter queries from Florida. One earnest inquirer from that state submitted three different pronunciations, asking me to check the one which was correct. None of them were right. Several have asked: "Should the word a-v-o-c-a-d-o be pronounced 'avo-car-do'?" I have heard it distorted that way. One inquired: "Is the new name of the alligator pear pronounced, 'alavacardo'?"

No, dear seekers after the truth, the pronunciation is simplicity itself: a(ah)vo-ca(cah)do. It is a beautiful word,—not a whit more logical as a name than alligator, but far more pleasing, and sponsored by authorities vastly greater than those aforementioned jolly sailors on shore leave.

Just here, as I was about to begin on a peroration, an avocado man came, like one of Job's comforters, to tell me that he thought the alligator pears were entrenched and couldn't be dislodged. I admitted the truth of the first part of his statement, and congratulated him upon the up-to-date and warlike idea of the trenches, but expressed unbelief in the latter half of what he said.

The producer of a new, exclusive, or uncommon article surely, in reason, has a right to say what his product shall be called. The avocado growers of Florida and California are in accord upon the new name. It would seem an easy matter to have these earnest men and women of both states combine in an effort to familiarize the public with that gentle and euphonious word, avocado. A suggestion of this nature has the approval of President Webber, and a move in that direction will probably be made.

Printers' ink and personal attack will disentrench the alligators. They have been entrenched in the public mind, in dictionaries, encyclopedias and other forms of cold type, but with a fairly well financed campaign, in the words of Henry Ford, "We'll have the boys out of the trenches by Christmas." May be.

INTERPLANTING AND CHANGING VARIETIES

BY WM. A. SPINKS, DUARTE, CAL.

I am offering for your consideration a plan for the planting and interplanting of orchards, which so far as I know, is new and which seems especially suited to the needs of the avocado grower at this time. Its adoption would solve to a very considerable extent the vexed question of varieties, while at the same time offering the grower better prospects for early profit. Those who have planted orchards so far have been compelled to make decisions as to varieties, and while they have proceeded to plant rather than remain inactive, no one has felt quite certain that he was not making a mistake. Those who have planted strong trees have made no mistake, but on

the contrary have gained time, as I shall have occasion to explain later on when speaking of top-working. The weak and sickly varieties, of which there are many, will net the planter disappointment and loss.

The question of varieties is clearing to some extent and we now begin to feel that a selection may be made offering reasonable assurance of permanent value. Surely among four of the best known commercial varieties at present available, one will be found having permanent value. My plan contemplates the planting of either two or four varieties in the same orchard, and in such way that all but one may be removed at any time, leaving the remaining one in perfect orchard form. The grower would have four times the use of his land for the next twelve to fifteen years, the period during which prices will probably be highest, also the period when he would most desire to have returns from his land, that is to say, while he is alive; and at the end of that time he will have the great advantage of being able to select any one of four varieties for his permanent orchard.

It has already been pointed out by Mr. Knight and others that the very close planting of avocado trees, with a view to taking some of them out in years to come, offers greater and quicker profit than the generally practiced method of planting 30, 40 or 50 feet apart and waiting the necessary years for the trees to grow together. I suggest that a foundation planting be made, say 40, 50 or even 60 feet apart, of whatever variety the grower may consider most likely to remain the permanent one. Let him then make a second choice, planting in the squares formed by the first planting. This would leave the two varieties some 28 feet apart, if the first were planted 40 feet apart. A third variety might then be planted between the rows of variety "A," and a fourth between the rows of variety "B," leaving no trees closer than 20 feet and the trees of each individual variety 40 feet apart and each forming a perfect orchard by itself.

As the average of the more acceptable varieties bear considerable fruit at five years of age, it appears that the grower would have a revenue from all of the trees for a number of years before he would have to consider the question of taking any of them out. I have it on excellent authority, though I do not know this to be a fact by my own experience, that in certain lines of orchard work it has been found profitable to plant the trees as close together as 10 feet, taking out the entire orchard and replanting every ten or twelve years. It would seem that such a plan would be as feasible in avocado growing as in any other line of orchard work. The avocado, however, being very long lived, there would be no object in removing all of the trees.

The objection to the plan would be that it involves four times the initial cost for trees. The answer is that the grower already has a certain investment in his land out of which by this plan, he would get four times the use for a number of years with the option of any one of four varieties for his permanent orchard. Should none of the four prove to be the one he wants, he still may resort to top working with the loss of only two years.

And now let us consider this very important subject of top-working. An avocado tree may be easily changed to any desired variety by being cut back in the early spring and properly budded or grafted. Grafting gives somewhat quicker results, but calls for a much greater expenditure of labor and many times the quantity of scions. With the present high

prices demanded for budwood and scions of the best varieties, grafting is practically out of the question to all but those who themselves possess the wood.

For those who possess or are able to get budwood, the best plan I know is to graft in February. This necessitates cutting the tree back, and if for any reason the grafts fail to live, budding may be resorted to later in the spring when the tree has made new shoots of sufficient size. Last year we worked over an orchard of some two hundred trees by following this plan. All of the trees were grafted in February and we seemed in a fair way to succeed by this method, but unfortunately were caught by a protracted spell of unseasonable hot weather which destroyed nearly all of the grafts. This left the trees cut back and ready to make new sprouts for budding, which they did by June and into which we proceeded to insert buds. This work was followed up through the summer, new buds being placed where the first had failed, either in the same shoots or others. Also each bud was carefully watched and when it seemed to be living, the shoot or young limb into which it had been placed was gradually cut back so as to throw the energy into the bud instead of the limb. Three or four cuts were made in each case before the shoot was finally removed down to the bud. The stub of the limb was then painted over with grafting wax and the bud, by this time perhaps 6 or 8 inches long, with its dozen or more companions, allowed a free hand to go on and make a new top for the tree. At this time, about eleven months from budding, all of my trees have beautiful new tops, some of which are already blooming. When two years have elapsed, the time usually allotted for making a new top on a tree, these trees will doubtless be quite as large as they were before being cut back and will be bearing some fruit. Had the grafts not met with disaster, they would have been much further along. You are all invited to visit this orchard and receive such practical instruction in the art of top-working as we are able to give.

It is not my purpose in this paper to deal technically with the science of budding and grafting, for it is a science as old as time and there are many experts far more competent to instruct than myself. Methods of avocado budding and grafting do not differ essentially from those employed with other plants. You will find many men of experience to execute your work once you have decided on the variety you want and arrange for the budwood. Just a word, however, on the all-important point of following up the work after the bud is known to have "taken." If the young limb or shoot in which the bud is growing is not cut back from time to time as the bud comes out, it will, in most cases, gradually overcome the bud and kill it. A bud once started must be kept growing and not allowed to suffer a check by reason of suckers or the limb in which it is placed being neglected. I believe more buds are lost from this cause than from all others combined. A well known expert has likened the bud to a rolling log: "Keep the log in motion and your task is easy, but once stopped it is hard to start again."

Another plan for top-working practiced with great success by a well known Pasadena expert, is to bud direct into the old wood after first scraping the bark to make it thin and pliable, the mechanical difficulty of placing the tender bud under the old bark being thus overcome. The expert re-

ferred to is so very clever in executing his delicate work that he succeeded, with one assistant, in rebudding 60 large trees in a single day. Several buds were placed in a ring around the trunk of each tree 4 or 5 feet above the ground and all wrapped at the same time with a single piece of tape. "There," said he, "in 28 days take off the tape and one week later if the buds are alive, just saw the tree square off right above them. They will come out in a hurry and make fine new tops for your trees." "That seems like rather drastic treatment," I said. "Is there not danger of killing the trees?" "Not at all, just do as I say and you will find that everything will come out all right. Goodbye."

In 28 days we removed the tape and found the buds in fine healthy condition. One week later, the date set for the wholesale decapitation, we had, despite our own misgivings and some advice by other experts, mustered enough courage to cut off just one tree. This now has the most beautiful top of any in my orchard. The buds in the other 59 eventually died because of our nerve having failed us and the tops of the trees not being cut off as ordered. They were later cut back and top-worked by the method first herein described and are now making fine new tops, though of course some months behind the one tree before mentioned. Probably the most valid objection, if there be a valid one, to the Pasadena method of top-working, is that it brings the limbs all out in one place on the tree, opponents of the plan holding this to be a weakness in the method. It is argued that a better formed and stronger tree could be made by growing a single bud in each of several limbs. This objection may be well founded, though it would hardly seem so from the present appearance of my one tree. In favor of the method may be urged speed, simplicity and cheapness. Unless the objection to the limbs all coming out in one place is a valid and vital one, it seems to me that the Pasadena method of top-working is the best.

In our own experiments we have used in a small way still another method which seems to give excellent results, namely, cutting the tree back first and budding into the old wood just as the new shoots start. The tree at that time being eager to grow and recover its lost top, seems to carry the bud rapidly along with the other new growth. Also I believe that the best time to move a tree "open root" is, not immediately after it has been cut back, but just when the new shoots have started.

Top-working by any of several methods is a very practical thing, always providing there is a strong foundation tree to work on, though it must be said that some varieties are very much easier to make grow than others. As a rule the ones easiest to bud have the greatest vitality and make the most satisfactory trees, so the grower for more reasons than one should look long and well before deciding. Don't be in a hurry; we shall all know more about varieties in two or three or four years than we do now. I think the greatest obstacle to success and satisfaction in top-working will be found in the grower's own impatience. I believe no tree should be top-worked before it is four or five years old. It should be allowed first to make a strong, straight trunk, say 6 or 8 inches in diameter. It is then able to sustain a top and keep it off the ground, should the buds prove to be of limber or droopy growth. Don't forget that your tree is growing all the time and that you are really not losing much, if any, time by patiently waiting to be

sure about the variety you want. Those who have strong growing trees need have no misgivings as to the future. Only two years will be lost in making them over to any desired variety. Those who contemplate planting should have always in mind one idea. Be sure your trees are of the sturdy kind. Don't plant weak, tender varieties under any circumstances, no matter what kind of fruit they may promise to bear. Consider the tree first and the fruit next. If you can find a sturdy tree and fine fruit combined in one variety, so much the better, but be sure you get the sturdy tree. This has been my hobby for some time and is still the best advice I can give you.

Returning to the subject of interplanting, there are some who say it is good for the nurseryman. I believe it is. I most earnestly hope so, for whatever is good for the nurseryman is good for the business as a whole, and if there is anyone on earth who needs and deserves to have something happen that is good for him, it is the avocado nurseryman. He has been on the job all the time that this industry has been developing from a molecule to a good healthy infant, and his lot has not always been a happy one. Ignorance of varieties and correct methods of propagation have fallen heavily on the nurseryman. Time and again he has seen his labor of months come to naught, because of one misfortune or another,—frost, wrong methods of propagation, or over-confidence in the value of certain varieties. Some have weathered the storm and are still ready to serve you; others have dropped out of the race and gone to work.

This industry has needed the nurseryman; it has been exceedingly fortunate in having its cause espoused, and its trials in a measure shared, by such men as our distinguished President, Dr. Webber, Mr. Sallmon, Mr. Adams, Judge Silent and others. These men exercise a restraining influence. They make for moderation, conservatism, sanity, dignity and poise. Their services have been indispensable in placing this Association on the firm foundation where it stands today. They are the safety valve which keeps us from getting up too much steam. The nurseryman is the one who keeps throwing coal under the boiler.

When the seed, which is destined to become a great tree, lying in Mother Earth, feels the impulse to grow and begins its long hard fight for life, it needs something more than conservatism and sanity and dignity and poise; it needs fire and enthusiasm and optimism and courage and aggressiveness, and the help of God to carry it through. The nurseryman supplies the "pep" which this business must have to be a success, and surely he is performing a genuine service to you, to California and to posterity. He has scraped the earth with a fine-tooth comb for varieties, and brought them to your door. He has hustled, investigated, dreamed, schemed and labored, all to the end that you might have the best. "He who has planted a good tree has not lived in vain." Likewise he who has introduced and propagated a good tree has not lived in vain, especially if he is able to sell the tree at a good price, and it is well for you and for the good of this industry that he sees or thinks he sees a little profit in it for himself, however much he may be disillusioned later. Headway in human affairs is not made without incentive. It is your business man in this and every line, in this and every age, who is the constructive genius, who forever builds and never tears down, who pushes aside obstacles, fights his way to the front and blazes the way for others.

COLD RESISTANCE OF THE AVOCADO

BY H. J. WEBBER, DIRECTOR, CITRUS EXPERIMENT STATION, RIVERSIDE, CALIFORNIA

Several rather cold periods of weather having occurred during the winter of 1916-17, it was thought desirable to collect information regarding the effect of the cold on the different varieties of avocados. It is highly important in this early stage of the industry to have as reliable information on this matter as it is possible to obtain. Early in the winter, the writer sent a letter to each member of the Avocado Association, requesting him to make observations as to comparative injury on his different trees and report these observations. Carefully prepared statements were received from some fifty different members, and the writer desires to extend his thanks to these members for their kind co-operation.

The conditions were so variable in different places, and the temperature records reported so unreliable in many instances, that it has not appeared to the writer to be profitable to report the different observations in detail. Certain points were reported, however, in sufficient harmony to indicate their reliability, and these observations may thus be taken as fairly conclusive evidence. A summary of the conclusions from a study of the various reports follows:

FACTORS INFLUENCING INJURY

AGE OF TREE.—Of the same variety, young trees are much more easily injured than old trees. In several instances nursery trees of a variety were killed to the ground, while five to eight-year-old budded trees sustained no appreciable injury, only the young, growing tips being injured. In analyzing the reasons for this result, it must be remembered that the cold is usually most severe near the surface of the ground. The tender shoots and branches on an old tree are much further from the ground than on the young tree, and in a warmer zone. Wood of the same age on an old tree may be just as tender as that on a young tree.

CONDITION OF GROWTH.—The observation was very generally made that trees in a condition of rapid growth were much more injured than similar trees of the same variety that had completed their growth and were more or less dormant. In the same orchard, trees side by side frequently showed marked differences. One tree, in rapid growth, exhibited injured young leaves all over its surface, while a tree of the same variety, next to it, having no young growth, showed no indication of injury. This is apparently not merely a difference of age of wood or branch injured, as the older leaves on a rapidly growing tree showed more injury than similar leaves on the dormant tree.

CONSTITUTIONAL CONDITION.—Vigorous, healthy trees showed much less injury than trees weakened by disease, transplanting, or other causes. Trees, newly planted, that had not fully recovered from the shock, were severely injured. Weak, sickly looking trees, which occur to some extent in almost every planting, suffered much more than good, vigorous trees of the same variety and age. Trees with weak tops from poor bud unions showed severe injury. Apparently any condition that results in weakening the trees,—such as, poor cultivation, poor irrigation, disease, or mechanical injury,—renders the tree more susceptible to cold injury.

TIME WHEN IRRIGATED.—The evidence on the effect of irrigation is very meager, but there are some observations to indicate that trees that were suffering for water and needed irrigation when the freeze came, suffered rather severely, as did also trees that had been irrigated three to five days before the freeze and were thus gorged with water. The least injury seemed to be on trees that had been thoroughly irrigated two or three weeks before the freeze, and had water supposedly in what might be termed optimum amount. This degree of injury, with reference to water condition in the soil following irrigation, was very clearly brought out with citrus trees in the great freeze of 1913 and evidently applies also with the avocado.

COMPARATIVE HARDINESS OF VARIETIES

The data regarding the comparative hardiness of the different varieties is so conflicting that only a few statements can be safely made.

All observers agree in placing the Mexican varieties as the most hardy, with the Guatemalan varieties coming second and the West Indian and Hawaiian sorts, third. Several cases were reported where a tree of a Mexican variety was more injured than similar-aged trees of Guatemalan varieties nearby, but in all such cases the greater injury of the Mexican tree was apparently due to the sappy, growing condition in which the tree was caught.

Of the Mexican varieties, the Knowles and San Sebastian appear to be slightly the most hardy, but the degree of difference between the true Mexican sorts is very slight. Queretaro, which may be a hybrid and not a true Mexican type, proved rather tender. Puebla, which is thought to be a Mexican-Guatemalan hybrid, in general proved to be about as hardy as the true Mexican.

Observations on the various Guatemalan varieties were very conflicting, and no very positive statements can be made. Apparently, the following classification of the degree of hardiness of a few varieties is about correct:

- Most hardy—Fuerte and Lyon;
- Medium hardy—Taft, Spinks, Sharpless, Dickinson, and Challenge;
- Most tender—Meserve and Miller.

The following statements of temperature endurance is based on a very large number of observations made in different places and is as nearly correct as can be determined from the data collected:

- 30° F.—Nothing injured so far as could be observed.
- 29° F.—No injury of account; only traces on most tender growth of West Indian and Guatemalan varieties.
- 28° F.—New foliage scorched on Guatemalan types; West Indian varieties showing considerable foliage damage.
- 27° F.—Mexican varieties, with new tips slightly scorched; Guatemalan, with almost all new foliage injured; West Indian badly damaged.
- 25° to 26° F.—Mexican varieties, with new foliage injured but some dormant trees uninjured; all Guatemalan sorts, with new foliage badly injured and some old foliage scorched.
- 24° F.—Some dormant Mexicans uninjured; Guatemalan varieties badly injured, small limbs frozen back.

21° F.—All Guatemalan types killed to bud; a few of hardiest Mexicans, such as Knowles and San Sebastian, with young leaves only, injured.

It must be remembered that the above statements at best can only be approximately correct; and much variation will always be found, due to tree condition and environment.

THE AVOCADO FOR THE TABLE

BY VICTOR HIRTZLER, MAITRE DE CUISINE, HOTEL ST. FRANCIS,
SAN FRANCISCO, CALIFORNIA

Brillat-Savarin once said that the man who invents a new dish is of more use to humankind than he who discovers a new star in the heavens. As wide as is the range of dishes which appear on our bills of fare; yet they are derived from a comparatively limited amount of foodstuffs. Chefs and Epicureans have for years tried to devise new dishes to tickle the palate of those blessed with earthly goods; yet these new dishes resolve themselves into new combinations and mixtures of known foodstuffs and become popular only through new flavors, or savory combinations, or gain an ephemeral success and vogue through the fad of the hour or through the predilection of a celebrity of the stage.

But given a new food product, either of the gardens, fields, or woods, or the streams or oceans, a new material is given the expert cook to test his ingenuity in bringing out the characteristic individuality in its most original form. The remotest places in the Temperate Zone have been ransacked to produce something which may become of use as human food, and the supply is so varied as to present a large assortment wherefrom to pick according to season. Preservation has further extended the amount to choose from during the whole year, and the development of transportation gives today to the average man a variety on his bill of fare which a hundred years ago not even princes could afford.

Today it is the explorer in far-off countries who meets with new dishes, and having acquired a liking, introduces them at home. The world traveler in his peregrinations meets with new creations of the chef's art, and wishes to find them on his home table. Governments in their search for new foods for their increasing populations send out scientists in quest of material likely to prove of value as promising foodstuff.

It is such new products in the hand of an expert chef that enables him to produce those new dishes which make him famous and incidentally bring a welcome addition to the table. Among these new introductions which have been found of value and for which a ready market is found, is the avocado, erroneously named alligator pear, of tropical origin. This fruit has been introduced on the table of the Temperate Zone and has immediately found a welcome acceptance. The demand being stronger than the supply, cultivation of the trees has been started in regions congenial to the best growth of the plant. Today we find extensive plantations of avocados both in Florida and in Southern California, which will come into bearing in years to come, and the fruit of which will become available to the same extent as that of another tropical fruit, the banana.

If in former years, haphazard experiments have sometimes led to the discovery of lucky combinations or preparations of a new food product,

today the up-to-date chef turns to the physiologist and nutrition expert to receive exact and reliable information on the composition of said food-stuff, which will give indications of which way the new material will prove the most popular as a new dish.

The avocado in the country of its origin, where it goes by the more euphonious name of ahuate, is eaten in its raw state, and cannot be very much improved by culinary preparation, except as pleasing variety from the too monotonous serving as a salad.

The composition of the avocado reveals a large amount of fats, readily digested by the average stomach. Besides the big amount of water, it also contains some protein and minerals to a larger extent than the average fruit. The absence of carbohydrates makes it a valuable food for persons afflicted with diabetes.

As stated before, the avocado is largely served in its raw state, and the fruit is indeed adapted to a variety of preparations to which most fruits do not so readily lend themselves. The characteristics of a good avocado are: thin skin, small stone or pit, flesh of the consistency of butter, smooth and free from fiber. Maturity of the avocado can be determined by pressing with the finger on the skin, when the flesh should give way; also when halved, the outer skin or covering of the stone should adhere to the stone when removing same. Shape has nothing to do with flavor or quality, but it is claimed that small, thin-fleshed varieties of Guatemalan avocados have a finer, more delicate nutty flavor than the large, thick-fleshed varieties.

There is not a course with which the avocado cannot be served, either in the raw or the cooked state, from cocktail to ice-cream. If we consider the raw state first, we can serve this fruit chilled on ice, halved, and served with a French dressing. The most primitive way of serving it, is to halve it lengthwise and remove the stone, making incisions in the flesh pretty near to the skin. Sprinkle salt and lemon or lime juice over it and chill it on ice. Again, the flesh can be scooped out, lightly mixed with mayonnaise, and refilled in the shells. It also blends well with other salad ingredients, such as celery, apples, tomatoes, walnuts, pineapple, grapefruits, red pepper, etc. The dressings may vary from plain salt and lemon juice to French dressing, mayonnaise, and thousand island dressing; also it is sometimes served with sugar and cream.

AS A COCKTAIL, the flesh is cut in cubes, mixed with cocktail sauce, and green peppers, chilled, and served in glasses.

AS A SANDWICH, the flesh is rubbed through a sieve, seasoned, mixed with mayonnaise, spread on lettuce leaves, and pressed between two slices of bread. For more elaborate affairs, procure some small boats made from puff paste. Press the flesh of an avocado through a sieve, together with the yolk of a hard-boiled egg; season with salt, pepper, a little lemon or lime juice; fill the boats with this mixture in dome shape; sprinkle the top with the white of the hard-boiled egg chopped up; and add a dusting of paprika, or put a strip of red sweet pepper on top.

AVOCADO EN SURPRISE.—Cut an avocado in two, scoop the flesh out, press it through a sieve, season, add a little mayonnaise to bind the whole to a smooth consistency, and refill the shells, leaving the hollow space in center where stone was. Rub part of the flesh with the yolk of a

hard-boiled egg through a sieve, season, and color with a few drops of Soya sauce. Shape this mixture into the form of the kernel and replace in the center to imitate stone. Serve on a bed of lettuce leaves.

TO SERVE AS A SPECIAL COURSE or salad for cold meats, line a mold with a good Madeira wine jelly, when same has set on the ice; put in a layer of avocado cut in cubes; fill up with jelly; let set again; add a layer of the meat of tomatoes cut in cubes and previously drained; add another layer of jelly till the mold is full. Place on ice until firm; serve with mayonnaise in a sauce boat.

AS A DESSERT, the avocado can be served scooped out and dished up in a glass dish, and served with a sauce "Dame Blanche," which consists of whipped cream, sweetened with vanilla sugar and flavored with cherry brandy (kirschwasser).

The prevalence of serving the avocado as a salad fruit has led many people to believe that it cannot be accommodated any other way than the ones previously mentioned; but the composition of this valuable addition to our line of foodstuffs indicates that it can be cooked and accommodated in a variety of ways.

AVOCADOS IN SOUP.—In Mexico, the avocado is used as an ingredient of soups, to which it is added cut up in small pieces. In gumbo or mulligatawny, the addition of avocado cut in small cubes is a welcome novelty; or shaped into small balls with a small potato scoop it can serve as a garnish to any clear soup. They may also be cooked in chicken broth, rubbed through a sieve with the liquor in which they have been cooked, put back in a pot, brought to a boil, and a little arrowroot added which has been previously mixed with cold water. To this add a little sweet cream before serving. As a cream soup, the nutty flavor of the avocado comes to its best advantage. The absence of starch in the fruit, where the amount present is insignificant, requires that a binder be used. This may be a base of rice cooked in some rich stock and then rubbed through a sieve. To this the meat of the avocado is added and cooked soft; then strained again to procure a smooth cohesion of both, and served with cream slightly flavored with a little grated nutmeg. Another method is to cut some celery in small pieces, smother these in butter, add some flour to form a paste, fill up with veal or chicken stock, add the avocado cut in pieces, and let slowly cook for an hour. Rub through a sieve and bind with a yolk of egg beaten in some sweet cream.

FISH BAKED WITH AVOCADO is a novelty worth trying. Most fishes when baked in a dry state, without the addition of a generous amount of fat, be it either butter or oil, dry out quickly, being in general deficient in fat. The addition of avocado, rubbed to a paste with either butter or olive oil and seasoned with paprika and salt, then spread on the fish and baked in the oven, is a decided novelty. As a garnish with a planked fish, the combination is also pleasing.

AVOCADO WITH MEAT OR FOWLS.—The high price at the present time prevents the more general use of this fruit with meats or fowls; yet sliced and fried in butter, it can be served with broiled meats or chickens.

AS A VEGETABLE, the avocado can be cooked either smothered in butter or boiled in a little chicken stock and served with Poulette sauce

or a cream sauce. When yet a little firm the avocado can be cut in slices, macerated with salt, pepper, and a little lemon juice, dipped in batter, and fried in deep grease.

STUFFED AVOCADO can also be served as a separate course. Remove the flesh of the avocado, cut in small cubes, and fry in butter with a few fresh mushrooms cut fine and cooked lean ham. Add a spoonful of cream sauce, some white bread crumbs, chopped parsley, salt, pepper, grated nutmeg, and bind with yolk of a raw egg. Refill in the shells, sprinkle liberally with grated Parmesan cheese, and bake slowly in the oven.

AS A DESSERT, the avocado can be prepared in a variety of ways. Raw, it can be served sliced, macerated with brandy, white wine, and sugar. Cooked, the avocado, cut in quarters, is served after having slowly cooked in syrup to which a few pieces of ginger have been added.

AS AN ICE-CREAM, a cooked custard is prepared the same as for Philadelphia ice-cream, the mashed avocado added, flavored with a little almond extract, frozen, and served with Japanese rice cakes.

AS A PUDDING, the avocado allows of several preparations where the ingenuity of the cook is given ample leeway.

AVOCADO PRINCE CUPID.—Blanche some rice in water, strain the water off, fill up with white wine, add some pineapple cut in small pieces and a stick of vanilla. Cook to consistency and cool off. Dish the rice on a platter or silver dish as a socle. Dispose the avocado, cut in halves, on this rice. Fill the cavity with guava jelly, flavored with maraschino. Add a small piece of angelica to the small end of the avocado to imitate the stem. Sprinkle a few chopped macaroons over the whole and serve with guava syrup.

AVOCADO EN SURPRISE.—Cook some rice in milk, sweetened with sugar and flavored with vanilla. When cooked, incorporate a little butter and cool off. Cut avocados in halves, macerate in vanilla syrup and cognac. When needed, dish up rice on silver platter, making a depression in the center, in which the avocados will be disposed in a ring. Cover the outer part of the border of rice with meringue (white of eggs beaten to a stiff froth and sweetened), powder with sugar, and bake in hot oven. Glace the avocados with orange jelly before serving.

AVOCADO QUEEN LILIUOKALANI.—Peel small avocados, figuring on one to a person. Cut off the tip at the larger end to remove the stone carefully without breaking the pear. Sprinkle a teaspoonful of Creme d'Anisette in the cavity and fill with pralince ice. Place the tip over the ice, wrap in wax paper and put back in conservator. Cut a ring for each pear out of sponge biscuit or Genoise, dip in Anisette syrup, and dispose on glass shells. Set the iced avocado on top of the ring, add a piece of angelica to simulate the stem. Decorate the lower part of the pear and the ring with sweetened whipped cream, sprinkle some crushed nougat on it, and serve with a fresh strawberry sauce.

THE TAFT AVOCADO AND ITS HISTORY

BY C. P. TAFT, ORANGE, CAL.

I have been requested to prepare a paper on the Taft avocado, its origin and prospects, this variety being one of the oldest and most widely planted of any of the thick-skin varieties of California origin and one which has probably a permanent place in commercial horticulture.

In the spring of 1899 I bought from Ludwig & Matthews Mott Market, Los Angeles, then one of the largest fruit firms in that city, a very much decayed specimen of the avocado. I think I paid 35 cents. It was not large and would weigh about three-quarters of a pound, and it was so far gone that it was impossible to judge of its quality. I remember that there was a spot or two inside which was not quick black and was of not unpleasing taste, which gave me a bare suggestion of what an avocado might be, but I had to depend very largely upon imagination and determination to be pleased if such a thing was possible. The skin was very hard and thick, and unquestionably it was by no means as good a fruit as afterward developed from its seed. Ludwig & Matthews were at that time importing avocados in a small way from Mexico, but handled also a few from Mrs. Buddington's tree on Alpine street, Los Angeles. If my fruit had been one of this latter kind, it would assuredly not have been decayed, so I have always assumed that it was one of the Mexican importations that I secured. Even if it were not, the trees on Mrs. Buddington's place came from Mexican seed, so I am quite certain that the fruit was of Mexican origin. In the spring of 1900, I planted the small tree, thus obtained. It grew rapidly, and today, just about eighteen years from seed, it has a spread of 25 feet and is equally high.

The first fruits, six in number, came in 1909. The next season there was none, but every year since that the tree has borne good crops, culminating in 1916 when it set about 700 fruits. This year there is a falling off; while the upper branches are fuller than at any previous time, the lower ones, comprising two-thirds of the tree, are practically bare. I estimate this year's crop at from 300 to 400. Every large limb, except one, has taken its turn in bearing, most of them every year. The exception is a large limb on the west side which has never even bloomed to any great extent until this spring. It is at present very full, and, I hope, making an effort to atone for lost time. The tree as a whole appears to be striving to net a record crop for 1918.

An instructive feature, and one more or less characteristic of all trees that I have fruited, is that at first the fruits come singly, one here and there scattered over the tree. In 1914 there was one cluster of 5; in 1915, two clusters, one of 5 and one of 7. In 1916, there were several clusters, and this season there are at least ten clusters with from 5 to 7 fruits, and one which I have in the exhibit has 16. This tendency to grow in masses increases with age, and will be found true of most varieties. It is similar to, but not exactly the same as, that found in apples and grapefruit. By this, I mean that owing to the long stems, the bunches will be loose, not tightly compacted, giving each fruit a better chance for development.

There is about all growth, a certain vitality which inheres to a greater

or less extent. The Taft shows a great amount of this, which is manifested by the vigor of growth, the size and quality of the fruits, and its readiness to respond when budded. When buds are properly selected, they rarely fail to grow, and it may be put down as a universal rule that the greater the inherent vitality of the tree, the easier it is to bud from. This does not necessarily mean that such a tree is an early fruiter. The Taft is not. It seems to require at least three years' growth before making any attempt to bear, and in cases of exceptionally vigorous trees, may go more than four years without fruits. My oldest budded tree of the Taft variety bore about 50 fruits in the fourth year. This year it has perhaps twice that number, and is exceedingly full of bloom. Other Taft trees of nearly the same age have already borne sparingly, and at the present time are blooming heavily.

The time of ripening for the Taft is from May to October. When in best condition to pick, the fruit assumes a somewhat lighter color and acquires a bloom. It is not absolutely necessary to wait for this change in appearance to take place, however. Any of the large fruits may be picked and will ripen up quite satisfactorily off the tree. They may be preferred by some as of milder flavor.

In addition to the Taft, I have other seedlings of some value and have given them names, to wit: Ultimate, Champion, Brodia, Purple Prolific, Beauty, and Rhoad. All of these I have discarded as inferior. In particular, they all have one bad feature which should always be absent in a good fruit. The flesh will not retain its natural color long after being exposed to the air. If served at once, that is, of course, no objection, but it is often desirable to keep the salad or whatever dish it may be for a few hours, and to have it turn dark detracts materially from the appearance, though it may taste the same. The Taft never behaves this way, and twenty-four hours after it is cut, while the flesh may be a little dry, the color is unchanged.

Another thing I like about the Taft is its shape. Considerable has been said about the round fruit being easiest to pack, and this may be true, but a pear-shaped one is not much more difficult, and it has the great advantage of containing more flesh. The neck is all extra. Of two fruits of equal weight from the same tree, I would always choose the longer one as being likely to have both more flesh and a smaller seed.

I say right here to those who have planted this variety several years ago and are disappointed because of lack of fruit, that they have the consolation of knowing that they planted a good kind, the best available at this time and one which will certainly bear sooner than any they could plant this year, no matter what variety. I do not claim the Taft is the best avocado we shall ever have, but I do think it will always be a good commercial variety. Indeed I am quite sure that better varieties may be and probably already have been found. Mr. Knight has gone about it in the best possible way by selecting budwood from the best of the thousand varieties in Guatemala, a work which the Department of Agriculture is continuing. Among the many choice seedlings Mr. Spink's is fruiting, there are doubtless superior kinds. I have a few of my own which seem promising; but looking to the not so very distant future, I fancy that the best varieties of all will be from seedlings of those very kinds which are

now being introduced, originating in every sense of the word right here in California.

The avocado is a most fascinating fruit; I doubt if there is any, more so. It is the most likely of any fruit to be taken up as the study and plaything of the horticulturally inclined men, who have both money and brains and who are able to devote both to the originating of new kinds. I think I foresee even an intense rivalry among them to see who can produce the best. The meetings of this Association or some similar association will, not many years hence, be second to none in general interest, and we shall have avocado days as we now have days devoted to the orange and raisin, and an annual avocado fair far exceeding in interest the present annual Orange Show held at San Bernardino, as the avocado surpasses the orange in intrinsic merit, and it is difficult to improve on the oranges we now have, but the avocado seems to be capable of indefinite development.

COMPARATIVE MERITS OF THE CALIFORNIA AVOCADO VARIETIES

BY L. B. SCOTT, U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

Mr. Chairman, Members of the California Avocado Association, Ladies and Gentlemen:

I had the pleasure of meeting with you at San Diego, and certainly appreciate the privilege of being here today. As one part of the subtropical fruit project of the Office of Horticultural and Pomological Investigations of the United States Department of Agriculture, which project I have the honor of leading, we began a year and a half ago a study of the comparative merits of the different Florida avocado varieties, and the variations within these varieties. It seemed worth while that our Florida work should be duplicated in California, and I have, during the last six months, devoted considerable time to a study of the California varieties.

A report on our Florida investigations was given at the San Diego meeting, and I have been asked by your President, as well as a number of the members of this Association, to present a report on our California work at this time. It must be clearly understood that the observations which we have been making the last year are simply preliminary and that these investigations will of necessity have to be continued for a number of years before conclusive results can be published. However, as the most important problem which confronts the California avocado grower is the proper selection of varieties, with the understanding of the audience that any remarks which I make today that now seem conclusive may be subject to revision even within a year's time, I am very glad to give a preliminary report of our California investigations.

In my observations I have tried to assume the role of a grower and not that of a nurseryman. The success of the California avocado industry will be determined entirely by the ability of the pioneer growers to agree on a few standard varieties which can be developed as typical California products. Just as soon as the growers,—the members of this Association,—can decide on a short list of five or six varieties which will assure a

supply of good commercial fruit throughout the year, the biggest problem confronting the industry today will have been solved.

The California avocado nurserymen have been severely criticized for carrying so many varieties. I think this criticism is unjust. I have talked with every important nurseryman in the state, and they have all said that just as soon as this Association takes definite action on the matter of varieties, they will fall in line and carry only the five or six which the Association will recommend. So the solution of the problem rests with you. Until the nurserymen can be given definite assurance that certain avocados will be developed as standard products, they will continue to list forty or fifty varieties.

When I returned to California last fall I had had some experience with avocados in Florida as well as in the Eastern markets, and my observations there had led me to believe that the ideal fruit for commercial purposes was one weighing a pound or a pound and a half, preferably pear-shaped, with a small seed, free from fiber, and last and probably most important of all, a fruit that would be served in the half shell.

At the San Diego meeting I heard some discussion of the small Mexican thin-skinned varieties and the place they would fill as commercial fruits. I wondered whether I was mistaken and whether the fruit men in the large Eastern markets and the hotel men in the East did not know the kind of fruit their trade wanted. I therefore was very glad to hear the excellent paper presented by Mr. Thos. H. Shedden of Monrovia, entitled "The Hotel and the Avocado," and to find my views confirmed by a practical hotel man. Further investigations in this state have convinced me that the ideal avocado for California and the Western markets will be the same as that demanded in the East. The tree should be hardy, a vigorous grower, and relatively immune to fungus and insect troubles; the fruit should weigh a pound, a pound and a half or possibly larger, have a small seed, be free from fiber, rich in oil, and one which can be served in the half shell. (See frontispiece.)

I wish at this time to express my appreciation to Dr. Webber and the members of this Association who have co-operated with us in our avocado studies. I have visited all the original trees of the important commercial varieties and whenever the grower was willing that we should, we have secured performance records of the amount of fruit produced by the original tree and budded trees of the different varieties. The record of the original tree is important, but of far greater importance is a knowledge of what the budded trees are doing.

I also wish to express my hearty appreciation to the growers and nurserymen who have co-operated in this work, especially Mr. Nusbickel, Mr. Whedon, Mr. Beck, Mr. Spinks, Mr. Taft, Mr. Sharpless, Mr. Wagner, Mr. Popenoe, and many others. I have tried to visit all the trees under observation a number of times, and through our co-operators have kept track and am keeping track of the amount of fruit produced by each tree. In many cases we have not only a record of the total crop produced by each tree, but also the fruit secured from each pick from the tree.

In addition to our field of work we have co-operated with Mr. E. M. Chace, of the Bureau of Chemistry, United States Department of Agri-

culture, whose laboratory is here in Los Angeles. He has made and will make further analyses of the varieties which we have considered merited further study. These analyses have not been made from a single fruit. At least three fruits from a single tree have been used for a sample, and in many cases samples have been secured at different times from the same tree. We hope by these and future analyses, that Mr. Chace will work out a picking maturity standard for the different California varieties, as he has so successfully done for oranges. Analyses have been made of the standard and Redondo strains of the Fuerte, the Sharpless, Monroe, Lyon, Surprise, and Lambert, and analyses are now being made or will be made of the Blakeman, Spinks, Dickinson, Taft, and Caribou.

Of the great number of avocados now growing in California, not a single one can be found which possesses all the desirable characteristics of the ideal variety. The following short list based on the past and present performance are those which seem to approach the requirements of an ideal avocado. This list which would insure in a single planting commercial fruit throughout the whole year, is: Sharpless, Fuerte, Surprise, Spinks, and Taft. A possible substitution might be the Monroe, or Lyon for the Surprise, and the Blakeman or Dickinson for the Taft. However, if all are included, we would only have a list of nine, which certainly is much better than 130. Further study probably would reduce the number to five or six.

The Sharpless is, in many respects, the most remarkable avocado in California today. The original tree is owned by B. H. Sharpless, Santa Ana, R. F. D. No. 1, and first bore in 1912, bearing 2 fruits that year, 20 in 1913, 75 in 1914, 250 in 1915, and over 600 in 1916-1917. Its season is from October to March, and 9 avocados in perfect condition were remaining on the tree as late as April 1 this year. The fruits average 20 to 22 ounces in weight, are pear-shaped, and when mature show a beautiful bronze color. The seed is small and the flesh free from fiber. The only objection that can be raised to the Sharpless is that the young trees are rather tender. However, these trees undoubtedly will acquire hardy characteristics as they grow older, as the original Sharpless tree passed through this last winter without any frost injury.

Next in the list is the Fuerte. Of the desirable kinds, this is the hardiest one of which I have any record. In Mr. Phales' planting near Placentia and in the Hardin and Keller grove at Yorba Linda, young trees of the Fuerte showed practically no frost injury the past winter, when even the Knight varieties in the same plantings were damaged. According to Mr. Chace's analyses, the Fuerte shows 25 and 26 per cent fat. The only other thick-skinned fruit which runs this high is the Miller, which has been reported as containing 26 per cent. At Yorba Linda, Fuertes were picked this last season from December 28 to April 15; at Altadena this variety was a month to six weeks later in maturing. A performance record of all the three-year-old budded Fuerte trees in the J. T. Whedon planting showed a range in production from 1 to 85 fruits. The only objection to the Fuerte is that the fruits are slightly undersized, only averaging 12 to 14 ounces. However, because the Fuerte can withstand more cold than any other desirable variety, it can be used in home plantings instead of the Mexican thin-skins, and as its season is slightly later

than the Sharpless, it matures at a time when there are no other desirable fruits in the market.

As the last of the Fuertes are being harvested, the first Surprise fruits begin to ripen. But for one characteristic, this variety would be pronounced ideal. The Surprise has been reported as only averaging 10 per cent fat. In former years this variety has been picked too soon, and as the analyses were undoubtedly made when the fruits were immature, this probably accounts for the low oil content. I tasted a Surprise fruit in February and another in March. Both of them had the typical sweet, watery, almost sickening flavor of an unripe avocado. Another fruit harvested in April had a fairly rich taste, and I believe the analyses which are now being made will show the Surprise ranking well in its oil content. The original tree is owned by Mr. C. F. Wagner, Fountain and Fairfax streets, Hollywood, and bore 1 fruit in 1915. The tree was seven years old at that time. It had 81 fruits in 1916 and has 300 or more this year. They average 20 ounces in weight, are pear-shaped, have a small seed, and are free from fiber. Even though the Surprise does not develop a high oil content, if allowed to remain on the tree as late as June, because of its beautiful exterior appearance and size, it will have to be ranked as a standard avocado for many years to come.

Some people no doubt would advocate the substituting of the Lyon for the Surprise. The Lyon is the most precocious avocado we have in California, and in many cases the trees literally bear themselves to death. This condition can be remedied by thinning the fruit the first two years, the best demonstration of this being in the Joseph Sexton planting at Goleta. The fruits average over a pound in weight, have a fairly rich oil content, a medium size seed, and show a slight trace of fiber. The tree has the habit of growing like a telegraph pole with no branching. This makes it unsuitable for a standard orchard planting. However, it has a distinct place, I believe, as a filler. If standard varieties, such as the Sharpless, Surprise, and Spinks, are planted in rows 24 feet apart and at intervals of 30 feet in the row, the Lyon trees could be planted as fillers so that they would be 15 feet from the standard trees. Because of their habit of growth, they could be left in the orchard for six, seven or possibly ten years, without materially interfering with the development of the other trees. One three-year-old Lyon tree in Mr. T. N. Beck's orchard, La Habra, had over 60 fruits this year. If this tree should annually average this production for the next three years, it would be a very profitable filler in any avocado orchard.

Another spring fruit that merits further study is the Monroe. The fruits are smaller than the Surprise, have a larger seed, and show more fiber in the flesh than the latter, but have a higher oil content.

Next in the order of maturing is the Spinks, the original trees of which are owned by Mr. W. A. Spinks of Duarte. Although these trees have been severely cut for budwood, they are bearing heavy crops this year. The season of this variety now appears to be from May to August, and a two-year-old topworked tree in the Spinks planting this year gives every indication of holding its fruits even later than this. The fruits weigh considerably over a pound, are oval to slightly pyriform in shape, and turn purple when mature. Of the desirable varieties, young trees of the Spinks

rank second to the Fuerte in hardiness and are much hardier than the Sharpless. They seem in this respect to be on a par with the Knight importations.

The Taft has long been looked upon as the standard summer California avocado. The fruit has a rich flavor, analyzing 18 per cent oil, and when the trees come into bearing they are productive. The Taft season is June to September. There are several serious objections that can be raised to the Taft,—the trees are very slow growers, the budded trees as a rule do not come into bearing early, and they are very susceptible to frost injury. For this reason it may be supplanted by the Blakeman as a summer fruiter or it may be found that the Spinks will completely fill the gap between the Surprise and the first of the Sharpless season.

An objection to the Blakeman is that it belongs to the Murrieta strain of trees, and budded trees of all the other varieties introduced by Mr. Murrieta appear to be very weak growers. The Blakeman shows this same characteristic at Mr. Spinks' place, and the trees which he has are making a very feeble growth; on the other hand, in Mr. Adams' planting near Upland, the Blakemans make a wonderful showing. Probably the best comparison of the Blakeman and Taft will be found in Mr. Adams' planting, where these varieties are planted alternately in a long row.

Another summer fruit that deserves further study is the Dickinson. Judge Silent of Glendora has the largest planting of this variety. In spite of the exceptional care which he gives his trees, a few of them are making a sickly growth similar to the Dickey or Royal.

Another avocado now fruiting in California that is worthy of observation is the Caribou. This is a variety that is fruiting for the first time at Mr. Spinks' place. There are six trees of the Caribou, five of which are bearing fruit this year. The tree is as beautiful an avocado tree as I have ever seen, both as regards the quality and quantity of foliage and the symmetry of growth of the tree. As an ornamental it would be a decided acquisition. The fruit is a hard-shell and will probably average a pound in weight. No idea can be formed now as to its probable fruiting season or quality, but it looks very promising.

I have paid very little attention to the thin-skinned varieties, for, while they might prove interesting in home plantings or in varietal collections, the fruits are too small to meet the market demands, and therefore cannot be given serious consideration as commercial possibilities. Of the other thick-skins, budded trees of Colorado, Dickey, Presidente, Murrieta Green, and Royal make a very sickly growth, or if they do live to produce one or two crops, they die. The Solano has a very low oil content and the trees are quite tender. The Challenge has a large seed, a low oil content, and a large amount of fiber. The Grande fruits in Mr. Whedon's planting developed a black decay at the blossom end, and also showed a large amount of fiber. This variety has been reported by George B. Cellon in Florida as not showing any fiber (I have not seen the variety in Florida, and therefore cannot give any first hand information concerning its behavior in that state.) At the West India Gardens, the Grandes have not shown the black decay noticeable in the Whedon orchard, but some of them cracked at the blossom end. The single Perfecto fruit that was saved out of three that matured at the West India Gardens (the other

two were stolen) weighed 1 pound. The seed weighed 4 ounces and the flesh showed a trace of fiber. It did not taste as rich as the Fuerte. Puebla, Wagner, and Walker are too small to be considered as standard avocados. They also mature fruit when they are in competition with larger, and better varieties; the Puebla comes in the earlier part of the Sharpless season and the Wagner and Walker mature at the same time as the Surprise and Spinks. The Lambert is a shy bearer and the fruits have a tendency to crack; the Bartley shows this same tendency. The IXL has too much fiber and the trees are not as vigorous as the Spinks. Miller, Meserve and Ferry are shy bearers. Most of the budded trees of the Sinaloa have a bushlike habit of growth and do not appear very vigorous. Beauty, Champion, Rhoad, and Senor have been discarded by Mr. Taft as not worthy of extensive propagation.

The Knight introductions are making a good growth. It is to be hoped they will mature fruit this coming year. Mr. Knight deserves a great deal of credit. He went to Guatemala, searched for the best varieties he could find in that country, and introduced budwood from these superior trees.

The Queen is blooming heavily and gives every indication of setting a crop. Linda and Rey are showing some blooms. All of Mr. Knight's introductions deserve close study this coming year.

Even though this Association should, in view of the present information and knowledge, recommend that the Sharpless, Fuerte, Surprise, Spinks, and the Taft or Blakeman be developed as standard varieties, with the Monroe, Lyon, and possibly the Dickinson carried as supplementary ones, the problem then is only partially solved. The accompanying chart (Table 1) shows the wide range of variation in a three-year-old planting of budded Fuertes in Mr. Whedon's grove, Yorba Linda. The lowest producing tree bore 1 fruit, the highest 85. Three distinct strains were found which were characterized by the shape of the fruit, round, oval, and pyriform. The round strain has been propagated as a distinct variety under the name of Redondo. Out of the whole planting not more than ten trees were found, possibly less, which should be used as sources of budwood.

A similar variation is seen in the G. W. Beck, Lyon planting at La Habra. The plantings are of different varieties, propagated by different nurserymen, but both show the great variation that will be found in all your avocado orchards unless the nurserymen are compelled to cut budwood from fruiting trees with a known record.

And so, even should you feel your Association cannot take any definite action on the matter of varieties, you can at least urge the nurserymen to cut budwood only from fruiting trees. There are or will be, next year, a sufficient number of fruiting trees of the desirable varieties to furnish a large amount of record budwood.

At the San Diego meeting I urged your Association to take definite action on the elimination of varieties. I wish to go even further this time. Your Association is bound to be a great factor in the development of the avocado industry of the country; your reports are the recognized authority on all subjects pertaining to the avocado; you as members and directors of this Association owe it to the industry to publish as soon as possible, a

short list of varieties which can be developed as California products. The only way you can be in a position to do this is by securing a record of the amount and quality of fruit produced by every desirable avocado tree in California.

AVOCADO VARIATIONS

GROVE OF J. T. WHEDON, YORBA LINDA, CAL., 1917
Fuerte Variety, Number Fruits Per Tree

Tree No.	Row Numbers						
	2	3	4	5	6	7	8
1	..	26	..	71	..	..	..
2	12	14	19	..	..	..	..
3	73	..	..	11	..	..	..
4	7	1	11	59	..	..	..
5	20	56	2	32	..	..	..
6	..	23	17	7	..	..	..
7	..	16	7	..	..	..	..
8	..	2	13	..	..	..	..
9	4	..	..	42	..	..	..
10	24	..	8	11	10	..	..
11	10	..	26	..	..	..	..
12	20	4	..	..	..	..	..
13	10	28	..	..	..	58	..
14	11	17	..	..	..	3	5
15	2	..	..	..	..	..	5
16	3	..	..	..	..	..	45
17	2	..	..	..	..	..	85

I hope I will be able to return to California next year and continue our investigations. I feel sure that the growers who have co-operated with us this year will continue their records another year. Although the state and federal officials may devote considerable time to a study of avocado varieties, the real solution of the question will rest with this Association. Urge every member to keep records of the output of his individual trees, appoint some official who can handle this work for the Association, and do not delay in taking some definite action on the elimination of many of your worthless varieties.

MY EXPERIENCE IN GROWING AVOCADOS

BY MRS. MARGARET STEWART, LOS ANGELES, CALIFORNIA

Whether we make the growing of avocados a science or a hobby, depends upon our natural inclinations, but I assume that every one here hopes to become at some time a commercial grower. To such as do, the experience of one who has in some measure been a pioneer in the industry may prove helpful.

In the summer of 1912 I became obsessed with the idea of planting an orchard of avocados, and as soon as possible in the spring of 1913, I planted five acres of budded trees, adjoining a lemon grove which we owned at San Fernando. So interested was I in the small trees that I

refused a trip to Europe, preferring to encourage in various ways the growth of my orchard. One of these ways consisted in bribing my chauffeur to shade the trees from the sun by placing a half shingle behind them. (They were about twelve inches high.) Then I, being a person of high enthusiasm and not timid, resolved to increase my acreage. With this in view, and with my husband safely in Europe, I bought the adjoining ten acres and made haste to plant more avocados.

Being compelled to wait until a hay crop, then on the land, was harvested, the planting was made about the last of July. The trees had been grown, for the most part, in pots in a lath-house, and being set out during a week of great heat, many died, and I lost considerably over a thousand dollars. This, together with the high-priced land, the cost of installing water pipes, the paying of from \$5 to \$15 a tree, and the expenses incidental to planting and caring for the orchard, was making my venture a decidedly costly one.

Thinking it the better way, I told my husband immediately on his return how I had employed my time, and incidentally his money. I may add that while he had no faith in the avocados, he rather liked me, and my orchard stands as a monument of that very fortunate condition. Thus encouraged, I finished the planting of the orchard as soon as trees could be gotten, and early in the spring of 1914 the planting was finished.

I had planted trees of the Taft, Meserve, Dickinson, Ganter, Dickey, Challenge, Royal, Fuerte, Puebla, Knight, and Linda varieties. Later, I planted one or two of the following varieties: Trapp, Walker's Prolific, Fowler, Carton, and, unfortunately, a few Harmans.

Having finished the planting, I began to look forward impatiently to the not-far-distant day, I hoped, when the trees would be loaded with fruit, and I could haughtily consider to whom among the clamoring and tearfully beseeching fruiterers I should consign my fruit. Need I say that no such conditions have obtained.

My orchard planted in 1913 consists of Tafts, Meserves, and Dickinsons.

The Tafts are beautiful trees of splendid shape and foliage, many of them over twenty feet high and correspondingly wide. Not one has bloomed as yet, and unless one expects to live to be a very old person, it seems a mistake to plant the Taft. The fact of its being a summer fruit is against it, and I am seriously considering rebudding my trees to either the Fuerte or the Puebla, or to the Knight trees.

If I were planting today, in the light of my small experience, these are the only varieties I should plant, making an exception possibly in favor of the Challenge. My Challenge trees bore very well last year for trees planted in 1914, producing beautiful, large fruit, whose oil content seemed unusually high, owing possibly to the hot growing season, which seems to develop very richly flavored fruit.

The Dickinson and Meserve trees are, this year for the first time, setting rather heavy crops of fruit. These trees are as large as the Taft trees, and the orchard is indeed a beautiful one with the vigorous new growth.

Perhaps I am too impatient for the trees to bear. The trees planted in the spring of 1914 have kept my faith alive. Every one who goes

about the planting of an avocado orchard will lose that first great enthusiasm and come to the more sober realization that bringing a grove into bearing is a slow and most expensive undertaking. We are all beginners, trying to establish a paying industry, uncertain as to the kind of trees to plant, their care, etc. I think we are too prone to give a roseate view to others about to engage in the same undertaking.

I do not believe that the avocados we are planting today will stand a great deal of frost, and I think many will plant in localities unsuited to the trees. My place is especially frost free, being a warm, southern slope along the foothills. During the cold spells of last winter and this spring, my trees were untouched, while three miles south where my foreman has a few trees of the same varieties, the frost injured them badly.

I understand that most of the orchards being planted for sale in acre lots are being planted to the Harman variety, which probably will stand a great deal of frost. If it does, that is its only virtue. I consider it absolutely worthless, and am rebudding the few trees I have. I know that bitter disappointment will attend the purchase of one acre of avocados, with the hope that a self-sustaining orchard will result in three years' time. Not only will disappointment come to those who can ill afford mistakes, but it will hurt the industry immeasurably.

My Pueblas planted in 1914 bore an average of 15 to 20 fruits per tree, and this year have set thousands. The Fuertes were smaller and did not bear so heavily, but are setting now a number of fruits. The Challenge and the Royal both bore some fruit, and the Ganters bore several hundred, many of the trees bearing over 100 fruits.

With all the faults of the Ganter before me, I have hesitated about rebudding the trees at this time. I personally prefer the flavor of the Ganter to that of any fruit grown here. By peeling the fruit with a sharp knife and serving it diced or in halves, as we often serve it, it is easy to manage with a fork and most palatable. The trees set such enormous quantities of fruit that we could well afford to give a daily demonstration in some prominent shop, where the thousands of people who have never tasted an avocado might be led to realize what a very welcome addition the avocado is to one's diet. However, the fruit people dislike to handle this variety, and offer very little for it. I find the main trouble with the fruit is that it is allowed to hang on the trees too long. If picked at the proper time, it keeps splendidly.

The most famous tree in my orchard is a small Dickey, not over 3 feet high, that last year matured 42 fruits which sold for \$32. My experience with the Dickey trees may prove interesting. I originally had 50 trees of this variety. After a time they began to turn yellow and die, notwithstanding all our efforts to save them. In watching the trees closely, it occurred to me that possibly a certain constriction at the union of the bud and stock was responsible for the trouble, causing a damming back of the nutrient fluid. I, therefore, made three longitudinal cuts with a sharp knife through the bark at each bud union. Much to my surprise and delight, the trees responded beautifully, throwing out a vigorous new growth and losing entirely the yellow tinge. The 16 trees that are left from the 50 planted are all growing splendidly.

I have since used the same method with two or three Royal buds, with the same result.

My trees have been very free from disease and are this year making a magnificent growth, owing to the great quantity of water we are giving them. We have used practically no fertilizer, except a small amount of nitrate of soda around the little Dickey which bore the surprising quantity of fruit. This last winter we planted alfalfa throughout the entire orchard of lemons and avocados and are using the heavy growth as a mulch about the trees. The soil is being kept in excellent condition. We have a long, hot summer in San Fernando, during which the ground becomes very hot, and this condition we can overcome by the use of the mulch.

I think, however, that the warmth has much to do with the early maturity of the fruit. My Pueblas were all ripe the first ten days of December, and the Challenge and the Fuerte fruits were picked dead ripe by the 20th of January. The Dickey and the Royal ripened early in February. I think most pears are picked too green, and much of the fine flavor is lost thereby.

I have done practically no pruning, preferring to let the trees branch close to the ground, providing shade for the roots and a better surface to withstand the winds. I have planted a windbreak of Monterey cypress, although I have never had a fruit blown off.

The cultivation and irrigation of the trees is continued all through the fall, as we have no fear of the frost and do not harden up the new growth early.

I have found that after the first year, when a tree is in good condition, any limb may be removed without danger of die-back. I have been interested in doing a bit of end-branch pruning and find that many more fruits remain on a branch as a result. Where a tree is growing very vigorously, the tendency is to drop the fruit, especially if the trees do not get almost continuous irrigation.

Fifth Semi-Annual Meeting of the California Avocado Association, Held in the Glenwood Mission Inn, Riverside, California, October 26 and 27, 1917

THOS. H. SHEDDEN, PRESIDENT

WM. H. SALLMON, VICE-PRESIDENT

H. J. WEBBER, SECRETARY AND TREASURER

MINUTES OF THE FIFTH SEMI-ANNUAL MEETING

EXHIBIT OF FRUITS

The fruit exhibit under the charge of a special committee consisting of Mr. Burdette K. Marvin, Chairman, Messrs. T. U. Barber, J. T. Whedon, G. W. Beck, and Mrs. J. T. Stewart, was held in the west dining room of the Mission Inn. In view of the scarcity of fruit caused by the severe hot weather of last summer, the exhibit was considered to be an exceptionally interesting one. The following is a list of the exhibitors:

A. L. Smith Monrovia	B. H. Sharpless Santa Ana
A. Foster Monrovia	A. F. Manz Whittier
J. Thompson Monrovia	C. P. Taft Orange
J. A. Crandell Monrovia	James Mather Pasadena
Manuel Garcia Duarte	Chas. F. Wagner Hollywood
C. A. Knuth Orange	Wm. A. Spinks Duarte
A. C. Pickering Fullerton	W. P. Sherlock Pasadena
Hugo Wetzel Anaheim	Thos. H. Shedden Monrovia
J. T. Whedon Yorba Linda	W. M. Boyes Lomita
F. O. Popenoe Altadena	W. H. Holloway Yorba Linda
G. W. Beck La Habra	A. R. Rideout Whittier

During the second day of the exhibit, Mrs. G. W. Beck served to the members and friends of the Association, a tea made from avocado leaves, which created considerable interest. The formula for making this tea will be published in the report of the Association.

EXCURSION

The excursion in the afternoon of October 26 was attended by about 60 persons in 18 automobiles. This included stops at the Citrus Experiment Station to inspect the new buildings recently completed and at the avocado groves of the Arlington Heights Fruit Company, and of Mr. B. K. Marvin.

GET TOGETHER DINNER

The "Get together Dinner," held on the evening of October 26 in the main dining room of the Mission Inn, was a great success, 104 mem-

bers and friends of the Association participating. President Shedden served as toastmaster and general inspiration dynamo. The Association was fortunate in having as its distinguished guest, Judge Dole, Ex-President of the Hawaiian Islands, who gave an interesting reminiscent talk on tropical horticulture. Short addresses were also given by Professor M. E. Jaffa, and Professor I. J. Condit of the University of California; Mr. A. D. Shamel of the United States Department of Agriculture; Dr. Willitt L. Hardin of Los Angeles; and Mrs. B. H. Sharpless of Santa Ana. On the completion of the dinner program the Association adjourned to examine the fruit exhibit.

FORENOON SESSION, SATURDAY, OCTOBER 27

The first regular session of the Fifth Semi-Annual Meeting was called to order at 10:00 A. M. in the Music Room of the Mission Inn by the retiring president, Dr. H. J. Webber, who introduced the new president, Mr. Thomas H. Shedden of Monrovia, California, who then gave the annual presidential address.

Following the presidential address the regular program of the day was taken up, as follows:

"Symposium on Irrigation"—discussion led by Dr. Lester Keller, Yorba Linda; special speakers, W. A. Spinks, Duarte; G. W. Beck, La Habra; C. A. Wilkinson, Harper.

"A Few Avocado Remarks"—J. M. Elliott, Los Angeles.

"Studies on the Chemistry of the Avocado"—Professor M. E. Jaffa, College of Agriculture.

Adjourned for dinner.

AFTERNOON SESSION

Meeting called to order at 2:00 P. M. by President Shedden. The following program was given:

"Joseph Sexton"—an appreciation, prepared by Mr. C. W. Beers of Santa Barbara, Cal., at the request of the Board of Directors; read by Mr. C. D. Adams of Upland.

"A New Sugar in the Avocado, Discovered by Dr. F. B. La Forge"—a review by Dr. W. P. Kelley, Citrus Experiment Station, Riverside.

"Symposium on Heat Injury"—discussion led by F. O. Popenoe, West India Gardens, Altadena; special speakers, DeWitt H. Gray, Fresno; Mrs. J. T. Stewart, San Fernando; G. W. Beck, La Habra; Thos. H. Shedden, Monrovia; Mrs. B. H. Sharpless, Santa Ana; F. A. Dixon, Fresno; O. A. Mann, Yorba Linda; Wm. H. Sallmon, San Diego; J. T. Whedon, Yorba Linda; Dr. Will R. Manning, Fillmore; C. E. Needham, Glendora.

Mr. Popenoe being ill, his discussion was presented by Dr. C. L. Bennett.

"Special Report of Directors on Avocado Varieties"—presented by T. U. Barber, Puente.

At the close of the meeting the following resolutions were presented and adopted by the Association.

RESOLUTIONS OF THANKS

Resolved that the California Avocado Association in closing its Fifth Semi-Annual meeting, extend its special thanks to the following persons who have largely contributed to the success of the meeting:

To the Glenwood Mission Inn and its managers, Mr. Frank Miller and Mrs. Alice Richardson, for their kind and courteous entertainment and helpfulness throughout the meeting. The environment of the Association's meetings in this beautiful Inn has added much to the enjoyment of our members.

To the citizens of Riverside and the Riverside Chamber of Commerce who furnished automobiles for our excursion.

To our Committee on Exhibits, Mr. B. K. Marvin and his co-workers, for their energy and faithfulness in securing and installing such a successful exhibit.

To our members who showed their interest in the Association by making exhibits of their fruit.

To Mr. T. U. Barber and Mr. James Mather for furnishing the fruits for the avocado salad served at our Association dinner.

To Mrs. G. W. Beck for serving avocado tea to members of the Association, thus demonstrating this additional use of the avocado.

To all of those who have contributed to the program and to the success of the meeting, we extend our sincere thanks.

There being no further business, the Association adjourned.

H. J. WEBBER, SECRETARY.

PRESIDENTIAL ADDRESS

BY THOMAS H. SHEDDEN, MONROVIA

Ladies and Gentlemen of the California Avocado Association, and the Friends who honor us with their presence at our fifth semi-annual meeting:

Fraternal and sympathetic greetings to all who come from the sun-kissed (?) avocado orchards of—June, 14-18.

The convening of the Association in the unique and exquisitely beautiful Mission Inn, famous the world over for its comfortable quaintness, is an event out of the ordinary, so far, in our Association life.

When I contemplate the quietude of Mr. Miller's peaceful sanctuary, there will creep in a reminiscent thought of the varieties of discordant sounds which have usually attended our assemblies, culminating, at the last one, in the thrilling trill of the steam riveter serenade, just outside the windows. Thanks to Dr. Webber for leading us into this restful seclusion,

where we shall be able to think and hear, and not have to wait until the proceedings are published in order to know what was said.

Since our annual meeting in May, at the election of officers, Dr. Webber who has so ably, satisfactorily and comfortably filled every nook and corner of the presidency, and whose enthusiasm for the avocado has endeared him to all, shook his head, and turned a thumb down when the subject of re-election was broached. He gave reasons therefor, in consequence of which the present incumbent was elected to succeed the scholarly Dr. Webber, "Whose shoe latchet I am not worthy to unloose."

The selection of such a raw recruit was a surprise to me, and the election was contrary to my protest. I am deeply appreciative of the confidence shown and the honor bestowed by the act, and by personal expressions. I thank you with all my heart while pledging my best efforts. "Guaranteed to work in single, or double harness," in forwarding the interests of our beloved avocado. I am a beginner in this unfolding life of the avocado in a strange land, but one who has at heart a hope to labor and live long enough to see this superb fruit become the attainable and acceptable food of rich and poor alike.

I am under instructions to deliver a presidential address, "To include some suggestions of policies to be pursued," was the wording, "in developing this fascinating industry."

The avocado is an interest worthy of our best thought and action. Its high characteristics call ladies and gentlemen to its culture. It has a charm for youth, and yet there is a seriousness about it which attracts mature men and women of all walks in life. There seems to be more old, than young, enthusiasts engaged in training the infant avocado for a useful future in California. This though recurs to me whenever I have looked over an avocado assemblage, and noted, in its makeup, the preponderance of white heads and bald heads.

What is the secret of its attraction for the senior class in life? Its delight and richness as a food cannot fully explain it, for conservative age does not seek new and strange foods to feed its declining capacity. I submit these two believable reasons:

First: The avocado holds out to all its devotees, the pleasing hope of attaining that which is prized by all humanity, a green old age. Proofs of this are plentiful in countries of its habitat, where nonagenarians and centenarians, and over, abound without causing comment. Some years ago, a gentleman who had lived long in lands where this fruit for unnumbered centuries had been the daily food of all classes, said to me, "In looking at natives who are healthy, hearty and active after one hundred or more years of ahuacate eating, I have sometimes thought of the Scriptural description of Moses, when he died at the age of one hundred and twenty, 'His eye was not dim, nor his natural force abated'."

The second reason is, that the avocado, as a food, fosters optimism and happy life among those who are really fond of it. I affirm this as the result of many years of observation among avocado eaters, in both hotels and homes. The pleasure in eating the fruit, and the effect of the food upon the system seem to create a cheerful state of mind. I have rarely ever met pessimistic persons who were fond of avocados. Have you?

I ask you to study this phase of the fruit, and tell it to others. It will be good missionary work.

Avocadoans appear to be happily and agreeably disposed. As contributing evidence, I might cite that we have never had any fights, or squabbles in our Association meetings, or board sessions—so far.

The avocado man stands unique in this world of rising prices. With a slim crop of one of the richest foods known, he has made no change. Some uncharitably disposed persons say he never makes change; always keeps the change, when a purchaser tenders him a dollar.

Doubtless the thought uppermost in the minds of members today, is solicitude for the avocado, which, in this present year has been, to a certain extent, menaced by excessive frost in Florida and heat in California. But happily these menaces have passed and gone; let us hope for a long time. It did keep us on the anxious seat, though, in passing, in memory of which in this presence of friendly feeling I make this individual confession: Having prepared and planted Florimel Orchard, cared for each of the trees, watched their growth, returned their welcome smile each morning, praised them for the way they came through the winters, with flying colors, and having partaken of the fine product of their young lives, I became fond of them, and when I realized the torture which they had endured last June, I was full of compassion for them,—for those that had succumbed and those that survived and stood up smiling cheerfully, but pathetically, at me. Anxious thought went to all the avocado centers, and soon we found that it was the weaklings that were stricken.

Many of my trees were not right, eugenically, or euthenically, when I got them in an avocado orphan asylum in 1914. Months of recovery and reconstruction have passed, and now, as an individual member, and as the mouthpiece of the Association and its wise directors, I can encouragingly say to you, that there is nothing in the avocado situation now, that need cause a whimper over the results of that conflagration in the avocado orchards. Sometimes fires have been "blessings in disguise." Every great city of the civilized world, from Rome to San Francisco, has been built upon the embers of its formative period. This was one such. It has taught us the absolute necessity of planting, not only strong varieties but healthy trees.

In passing through different orchards, "after the fire," I stopped, looked, listened, and everywhere, through the burned branches and rattling leaves, came the warning voice of nature—mingled with that of Mr. Spinks and Mr. Scott:

"Plant strong trees."

"Plant healthy trees."

"Plant pedigreed trees."

Nature has been helping in the process of elimination, and the "survival of the fittest," by thus destroying the weak ones in their youth.

The unbiased Committee on Varieties, and the Board of Directors, all men big enough to forget personal interests, deliberated long, and then heroically took up an axe that was as free from guile as was George Washington's hatchet, and chopped down a whole forest of avocado trees that have been confusing and impeding the progress of the industry. They

left only eight trees, including two or three fillers, but they are all standing in regular orchard form.

From these few trees even though no finer varieties should ever be developed, will come fruit every day in the year, for all parts of this country and Canada. Perhaps even our Florida friends will want some of our fruit, as they have already been calling loudly for California trees and seeds.

The sound of this chopping down of trees has been heard as far away as Washington, from whence has come an approving cheer. In California it has been commended. This action of the committee and directors is not a dogmatic dictum to the chosen eight, "Thus far shalt thou come, and no farther." They simply got us out of the woods and gave us a starting place, and when a materially better variety comes forward and proves itself in California, nothing will be able to keep it out of its proper high place in the Association's favor.

The nurseryman and the would-be planter have been, for several years, almost lost in the maze of growing number of varieties, but now the way has been made easy to plant an approved orchard. There are now, more than ever, intelligent reasons for planting avocados.

As a true lover of the noble fruit, and one who is simply an orchardist, I elevate my voice in saying to any one whom it may concern, "Buy the best." The future of the avocado demands that we plant trees that are right eugenically and euthenically. The avocado comes to us with clean life and habits. Keep it so. Treat it right and I believe that after the next "June drop" the tale told will not be so tragic.

These meetings of the Association and attendance of members are altogether important. We are pioneers blazing the way through the unmapped region of Avocado-land. Having neither sign-boards nor guide-books, we are compelled to rely upon each other for exchange of ideas, experience and knowledge gained. This spirit of mutuality seems to have taken possession of the pioneers. We are scattered over long distances; all are busy. It would be difficult for a single one of the two hundred or more units of the Association to go and exchange notes with each of the others; so we reverse this order of procedure, by bringing them all together, for a semi-annual "talk-fest."

The wise man of old said: "Iron sharpeneth iron, so a man sharpeneth the countenance of his friend." So friends, when these kindred spirits meet and rub ideas together, the sparks of wisdom fly, and throw light upon our uncharted way. Many members have wished aloud that we might have more time at our conventions for this very purpose of getting acquainted. They have asked, also, that opportunities be given for making inquiries at the meetings upon matters pertaining to orchard work. These suggestions are of practical value, and upon the present occasion we have given our affairs a turn somewhat in that direction.

Closely allied to this mutual benefit in our meetings is that of creating and extending in this collective way, an enjoyable and eating acquaintance between the public and the avocado. Because of the scarcity of fruit I have hesitated to speak upon this practical phase of our duty, for most of us this year have been much like "Old Mother Hubbard, who went to the cupboard"—and found it bare, just when we were dutifully trying to

follow the admonition of Dr. Hardin's little green stickers: "EAT AVOCADOS!"

But we will not always be bare of that which we are supposed to produce and we should aim to have at all our assemblages abundance of fruit for complimentary and educational use among visitors who desire to taste and learn to like. This might be done in one or more, or all of the following ways:

First: Fruit might be sold at a low or nominal price.

Second: Present a fruit to any visitor who shows appreciation.

Third: Give a part of a fruit to anyone desiring to taste.

Fourth: Have stacks of small avocado sandwiches for all who care to partake. This being such a good and unsuspected way to advertise, the Association might well afford to buy fruit at a nominal price to be so used.

I am an old believer in the life-giving and far-reaching influences of the dinner table in connection with associational and periodical meetings. The necessity of eating is, "One touch of nature that makes the whole world kin," and dining together brings the kinship still closer; fellowship, fraternity and equality play hide and seek among the plates and glasses; distances and differences are obliterated; misunderstandings and misapprehensions melt; widely separated ideas are fused and bring forth wisdom. Knowledge follows eating—proven by the case of Adam and Eve. We are to try one of these table sessions of the Association, and I truly hope it will be pleasing to all, and receive a hearty encore.

We had no thought of indulging in a banquet,—in fact advise against it in these times,—but as we all have to eat a dinner, we thought well to have a "Together Dinner" at a modest price, which modesty should prevail with us at least until, to the avocadoan, "the flowing tide comes in." The dinner is merely a pleasing accompaniment to an enjoyable meeting of avocado cranks, and the only item on the table which might suggest immodesty will be avocados, on which we should go the limit—from our own trees.

I urge the business wisdom of devoting more time and even money, to our exhibit. At least half our time should be given to the show, which in time should be competitive as well as educational, which latter it emphatically is. There is a demand for it. In fact the crowd is always loth to leave the fruit stands when the president starts to round 'em up to hear the platform eloquence of the thirty per cent oil avocado orators. If further proof is needed, I might mention, that upon the two occasions when the exhibit was in the assembly room or near it, the noise of those who lingered around the fruit stands was disturbing and continued, notwithstanding the protests from the chair and the audience in general.

Next in line with the collective idea of learning, I present a suggestion from the avocado's good friend, L. B. Scott, that we might have an occasional field day for the Association, or as many members as might care to attend and respond, so that suitable arrangements could be made for entertainment or for conveyance if necessary, beyond a certain point. The purpose would be to visit trees, orchards, and other avocado plantings in a certain locality, also to visit the members in that neighborhood. These excursions could be made at convenient times, and to different places, and

would be a pleasant way for the members to extend their knowledge of avocadodom, and I believe that the ones called upon would be pleased enough to hand out an avocado sandwich and a glass of cold water at lunch time.

It has been shown that there are many persons growing avocados who are not members of the Association. We need their help by membership, but how are we to get them? Who is to go after them?

The Board of Directors, recognizing the importance of increasing the membership, has evolved a plan. In order to popularize it, it has been thought wise to bring it before the members assembled. Here it is:

Inaugurate a contest for getting new members.

Every live human being enjoys friendly rivalry, when there is a goal in sight. Offer three prizes for the three highest numbers of new members secured before the next annual meeting. It is always better to give more than one prize, for consolation's kindly sake.

Prizes to be offered by the directors without expense to the Association, in this way, namely: Let the Executive Committee interview members who are original owners of certain proven, or promising avocado varieties that are now generally considered desirable and that are known to be candidates for popularity and standardization, and ask them each to donate one or more young, budded trees,—the trees so donated to be the prizes. The committee to be satisfied as to the physical condition of the trees.

The names of the trees and their donors to be mailed to each member when announcement of campaign is first made, with request that the list be published in the local papers of their district.

Invite all members to enter the contest. Name a date for entries to close, and then mail names of the contestants to the members.

Members of the committee not to enter the contest, nor divulge any knowledge they have of the contest.

The total number of trees donated to be apportioned as prizes in the ratio of 6, 3 and 1, for the first, second and third winners, respectively.

The trees all to be numbered, and a list of same kept by the committee; duplicates of the numbers to be placed in a box for use at close of contest.

The conclusion of the contest and distribution of prizes to be a feature of next annual meeting.

After the finals of contest are announced, some lady in the audience will be asked to come forward and favor the occasion by drawing the numbers from the box—with averted eyes, of course.

I omitted saying in proper place, that any member may secure new members, and turn the names over to any contestant he favors.

The membership fee has been waived, so that new members will pay only the annual dues, \$5.00.

Here now, is a splendid opportunity to do a good turn all 'round. I'd rather have the first prize, here specified, than the conventional gold watch which is usually the prize offered in contests.

No canvass has been yet made for trees, but I'll give you this tip, in a stage whisper: some have already volunteered offers, and one man promptly said he would give ten trees, mentioning a variety that has become very popular. It can be seen that the winner of the first prize might

receive enough prize trees to plant what would probably be the most blue blooded orchard in California.

Ah, my friends, that's the kind of orchard that can be planted now. That's the kind of orchard to plant henceforth in California. Plant and produce the best. Make a name and fame for the California avocado, and see that it goes, unsullied, into all the marts where California's wonder products are welcome.

Hail avocado!
 When through all the states of our dear native land,
 This fruit, with our orange, shall go hand in hand,
 May lips that with pleasure its praises proclaim,
 Be graced by the use of its soft sounding name.

Avocado's the name, Avocado's the name,
 Avocado, Avocado, Avocado's its name.

THOS. H. SHEDDEN.

(NOTE: the above verse and chorus can be sung to the tune of the well known children's New Year song: "Happy New Year to All.")

JOSEPH SEXTON—AN APPRECIATION

(Prepared by special request of Board of Directors by Mr. C. W. Beers, Horticultural Commissioner, Santa Barbara County)

It is a rare privilege to know a large-hearted, generous-souled man who is possessed of a dream reaching out to embrace all the individuals of a vast state.

To know such a man during the closing years of a long practical, eventful life, and to feel the breadth of his sympathies and his appreciation, at the time when his faculties were ripe and strong and virile was the privilege of many who knew Joseph Sexton of,—I was about to say Goleta, but it would be nearer the truth to say, of California.

Joseph Sexton was born in the state of Ohio, not far from Cincinnati, in the year 1842. He came to California when only ten years of age. In his youth he was in love with plants, and flowers, and fruits and this passion grew upon him and matured with him.

His early surroundings forbade him the privilege of scholastic associations; however, the world has numerous examples of men who succeeded without the university experience that is so necessary that most of us may become even passably useful.

It was this spirit of success that developed in the man through his love for the things that grow and spread beauty and usefulness to his fellowmen,—a spirit that makes man generous, broadly sympathetic, helpful, and heartily co-operative, with all that makes for excellence throughout the whole range of his acquaintance.

It was to his untiring care and sensitive appreciation that he owed the skill to detect excellencies as they appeared in the midst of the commonplace. And this it was which made it possible for Mr. Sexton to bring to such high perfection the Santa Barbara soft-shelled walnut. He had visions that could not be confined within his own local field of action and

one of them has broadened until it has encompassed the whole length and breadth of the country to which he was so loyal, the walnut which he propagated being found in every state in the union where such trees grow and prosper.

Our friend being of a congenial nature naturally sought out the association of kindred spirits and he had the friendship of all of the earlier horticultural dreamers who had imaged California as the home of every plant, shrub, and tree either of usefulness or of beauty. Coming to Santa Barbara in 1867 he made the acquaintance and found fellowship with other plant lovers and no doubt he looked with deep interest on the two little avocados which Dr. Kellog of San Francisco sent to his old friends Mr. Silas Bond and Judge Ord,—the two trees that became the parents of hundreds of avocados now growing throughout the city. A long-time friend, Mr. Taft of Orange, had become enthusiastic over the avocado industry and through him Mr. Sexton obtained in 1911, a number of seedlings which he planted at his home place in Goleta and which have developed into splendid specimens which have borne abundantly.

Without question the thrift of these trees and the heavy bearing nature which they manifested stimulated anew the visions in the fertile mind and heart of our friend. He conceived and elaborated a plan whereby the avocado industry of the whole world might be benefited through the introduction of new varieties carrying all of the excellencies and few of the undesirable qualities of those then known.

He became satisfied that in the Hawaiian Islands were hardy varieties that could be grown in California. And in the fall of 1911 he visited Honolulu for the express purpose of gathering the avocado from the trees, testing out the most desirable varieties, and saving the seeds from those choice fruits with the hope that by planting them in California the much desired improved fruits might be developed.

From the seeds brought home at that time a large number of thrifty seedlings were grown and potted and were distributed throughout the state. This custom Mr. Sexton followed at periods of two years, and today it is conservative to say that there are a thousand of these trees growing in different sections, from which not only can be determined the best varieties, but that equally important fact the sections in which the avocado will find itself at home. The beautiful part of this work was the generous attitude toward the avocado industry, absolutely free from any spirit of commercialism.

True to his natural instinct Mr. Sexton began experimenting with local varieties, hoping thus to improve those that had already made themselves a place. Into one of his seedlings he introduced a bud from the Dr. White avocado and in twenty-two months from the time of budding he had 60 mature fruits and had removed as many more that had definitely set. This tree has averaged two crops a year up to the present time and Mr. Sexton often remarked that it seemed likely a tree will be developed which will have mature fruits every month in the year.

On his return from Hawaii in 1913, Mr. Sexton brought home budwood from two choice trees growing in the island, the Nutmeg and the Inezholt. These buds have developed into magnificent trees but what the

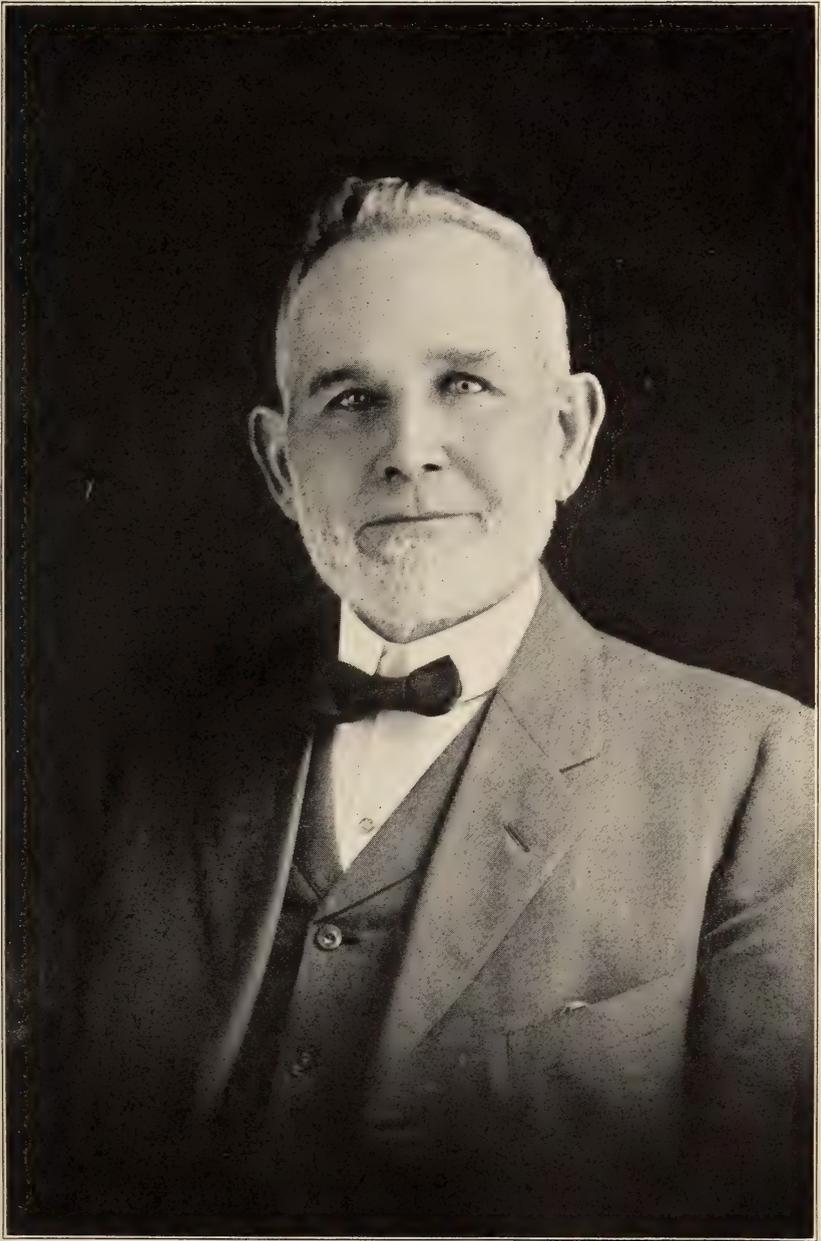


Plate II. Figure 3

Joseph Sexton of Santa Barbara
Pioneer Avocado Grower

fruits will be in California remains to be seen. In 1914 he secured budded trees of the Inezholt and found it as hardy as the Lyon.

In the experimental ground of Mr. Sexton's home are seventy-eight varieties including the best known fruits of California. Here the frost sweeps from the foothills at times and this has enabled him to test out the different varieties side by side as to hardiness. In these grounds he has found the Blake endures frosty weather like a young oak; the Lyon makes as large a fruit as the Taft; and he has also confirmed the fact that the Lyon seeds come true to type which makes it a very desirable variety.

In 1916 Mr. Sexton made his last trip to Honolulu, at which time he selected budwood from four trees bearing excellent fruits of large size. The budwood arrived after his death and today there are from seven to ten trees of each variety growing in the experimental grounds at his former home.

In August 1917 this friend of Nature and lover of the beautiful and excellent in plant life laid aside his activities, being called to his rest in the ripe maturity of a happy, helpful life. The fullness of his work will be realized only by those who follow after, and the avocado industry will ever have an occasion to be appreciative of the man whose vision led him into ceaseless activity without thought of commercializing the results of his earnest effort and whose broad sympathies made him happy in serving his fellow man.

In the passing of Mr. Sexton the California Avocado Association has lost an appreciative member, one whose presence was an inspiration and whose words always breathed a hopeful expectancy that stimulated the activities of all those associated in these early days of the avocado industry in the State of California.

RESOLUTIONS ON THE DEATH OF JOSEPH SEXTON

ADOPTED BY THE BOARD OF DIRECTORS OF THE CALIFORNIA AVOCADO ASSOCIATION

It is with feelings of sadness and bereavement that the California Avocado Association has learned of the passing away of the well loved Joseph Sexton, an honored member of the Association, and one of the revered fathers in California horticulture, who cherished the soil as a treasure house of comforts, delight, and happiness for humanity.

His peaceful passing from earthly life may be pictured and likened to a choicely ripened and mellow fruit falling to the ground in his well nurtured orchards and gardens.

A faithful friend of the avocado, he traveled far to find the best, and bring it to his own land, and among the last acts of his kindly life was to have painted, fac-similes of all the better known varieties of the noble fruit, for the purpose of presenting to the Association.

This testimony expresses our pleasure in his life, and our sorrow in his leaving it.

To his family we give our sympathy in their great loss.

SYMPOSIUM ON IRRIGATION

DISCUSSION LED BY DR. LESTER KELLER, YORBA LINDA

Dr. Lester Keller: I have 9 acres in avocados, 300 feet wide by 1400 to 1500 feet long, being planted in six rows. The source of water is approximately in the center of this tract, at the highest point. Irrigation pipes consist of a 2-inch main reduced to $1\frac{1}{4}$ inch which runs through the center of the tract, the long way. Coming off at right angles to this main, every 25 feet, are $\frac{3}{4}$ -inch pipes, this $\frac{3}{4}$ -inch pipe supplying the first two rows of trees. This is then reduced to $\frac{1}{2}$ -inch pipe supplying the second row, and to $\frac{3}{8}$ -inch pipe supplying the third row. Uprights extend above ground $2\frac{1}{2}$ feet from the tree. This distance should be corrected as it is sometimes too close. On top of this pipe I have placed a gas-cock instead of a faucet as it is more convenient. Pressure at the lowest point is about 40 pounds, and at the highest point is probably one-half of this amount. I always have plenty of pressure.

The first year I basined the trees and turned on the faucet with a slow stream, every ten days. The second year the basins were leveled, and the drip system started, watering the trees every two weeks. The drip runs for 48 hours, amounting to about two to three barrels of water per tree. The water goes on so slowly that it does not run off. A $\frac{1}{2}$ -inch pipe extends down from the faucet to one side or the other of the tree for distributing the water as it is required. About 36 hours after the water is turned off, the soil is cultivated lightly with a hoe rake to about $1\frac{1}{2}$ inches, making a dust mulch. With this treatment, the soil kept quite moist all summer.

Some of my land is too steep to plow. I simply dug holes for the trees, and have had the water running on this from the 15th of June almost continually. I have thus far discovered no sign of root rot or gum disease. These trees have made more growth than any others I have, and since these hillside trees are doing so well, I turned on the water on all the other trees for a run of about two weeks. The "norther" pushed over some of these latter trees which did not have stakes to protect them. This was on account of the soft ground.

I believe that the avocado needs water often, and lots of it. On a different type of soil, this amount of irrigation might give a water-soaked soil, but not in my case. I have had the water standing on my soil but have not been able to discover any disease or injury of any kind.

G. W. Beck: I have 10 acres in lemons interplanted with avocados, every fourth tree being an avocado. The oldest trees I have are five years old. I have always irrigated in furrows and find that they have taken the same amount of water as lemon trees. Occasionally the smaller trees get water once in two weeks and they have done pretty well under this treatment. Nursery stock, during the hot weather, received water once a month. I have a heavy clay soil, and by watering the trees once a month and with proper cultivation, they are doing well.

I am afraid Mr. Keller is laying the foundation for trouble in the future by the use of too much water. Mr. Keller has a more porous soil but even that can have too much water. I think Mr. Keller will have trouble later on. I have seen trees planted in similar soil on hillsides which were drowned out by winter rains. With a light top, and clay subsoil, the

water would come down the hillside and settle in the soil where the avocados were grown. The roots were all rotted out when removed.

A customer of mine, who bought a few trees complained that they were not doing well. On looking them up I found he had not been giving them enough water, and had just sprinkled them every day. The ground was very hard. One should use judgment in the application of water.

W. A. Spinks: Like Mr. Beck, I must differ with Dr. Keller as to the amount of water required. Several years ago I visited Honolulu and spent some weeks in investigating the avocado. I was much in the company of Mr. Higgins, who for fourteen years had been in charge of the department in the Experiment Station which had to do with the culture of avocados. He told me that his experiences led him to believe that the avocado required much less water than citrus trees. My own experience since that time has tended to confirm this belief. This year I had one row of eight-year-old trees which has received water but once, and they seem not much different from the others which have received water several times. They show a little less growth perhaps, and it must be remembered also that my soil is heavy, retaining the moisture a long time. I do not recommend so little water as only once during the summer, but cite this instance to show that the avocado in certain soils can live and apparently not suffer with very little water. I believe I have seen more definite damage done to avocado trees from over-watering than from under-watering.

The drip system of irrigation is my own invention and I believe is valuable for certain kinds of work. It is especially important to save water and where the planting is on a hillside or any place that it is difficult to comply with ordinary methods. At the present time, the high price of pipe makes it rather impracticable.

J. T. Whedon: If I were planting a new grove, I would plant 30 feet apart, and 15 feet apart in the rows. The rows would run north and south, because in Yorba Linda, the "northers" blow from the east. This method of planting would give a windbreak in a few years every 30 feet. I would then run a line of pipe in the center of the rows with a stand 6 feet high in each square, and water by spray where the pressure is sufficient; otherwise I would run a furrow to each tree and use the basin system for both watering and fertilizing.

As a protection against sunburn, I use the Wickson formula for white-wash, 30 pounds unslaked lime, 5 pounds salt, 4 pounds tallow. Commencing with the third year, if the trees are not headed out too high, they will protect themselves against sunburn and aid very greatly against wind-storm.

T. U. Barber: The constant drip irrigation which Dr. Keller is practicing will develop what are often termed water shoots, a soft fast growth which is very much more subject to damage by both frost and wind than the slower natural growth producing a hard and resistant wood suitable for the best tree development. I am sure we all hope the winter will be mild so that Dr. Keller will not have to grow new trees.

Most of the irrigation systems in California are worked on a monthly distribution basis; therefore the orchards in which it would be possible to irrigate by the drip system are very limited.

The constant drip irrigation under discussion will show very poor re-

sults on any soil with a tight compact subsoil or in adobe land. The only place it is possible is on well drained sandy soil or side hills of light soil. The avocado will not thrive in soggy land even if this condition lasts only a few months.

J. T. Whedon: The subsoil is very important. The subsoil in my grove in Yorba Linda is heavy clay, the first foot being a sandy loam with the next five feet a heavy clay loam with more or less sand. Last January, a year ago, there were almost continuous rains. I lost nine large Harmons on account of poor drainage. The avocado will not stand poor drainage, but with good drainage it is a difficult matter to give them too much water.

Dr. Keller: Part of my soil is sandy silt to about 8 feet. The hillside is black loam with disintegrated granite and clay subsoil. The subsoil does not take water very well, although the surface takes it readily.

E. E. Knight: For the first two years there is no doubt but that the drip system is the best, as the water is needed close to the tree, also less water is used than under any other mode of irrigation. But as the roots extend farther, it is more difficult to distribute the water properly. Also in most drip systems the stand is placed too close to the trunk of the tree. It is soon covered by the branches and difficult to get at. If an orchard is to be piped along each row, the stand should be placed in the center between each four trees; from there the water should be conveyed with either a short piece of pipe or by some other means to the trees while they are still small. The stand is in this case, always easily reached, and should an overhead system be installed later, the stands will be in their proper place. By placing a bean straw mulch under the trees, not only can much water be saved but at the same time the soil can be enriched.

The only sure way to know when to apply water to the trees, is to test the soil for humidity; but this is quite a task, so I lift up the mulch and if the fish worms are working I know the soil is still in good condition. As soon as the worms seem to be laying off, I fill the basin once; never soak the soil. I irrigate every week or ten days during the warm weather but use less water per month than is used on citrus. The amount of water used and frequency of irrigations depends on the class of soil. Most any system will keep an avocado tree alive and growing, but what we all wish to know is which system gives the best results.

C. F. Booth: Before giving my experience in irrigation I will say that my soil is different from most others in which avocado trees are grown. It is a sandy loam on top but becomes a sandy clay loam below. The soil is not deep being only 3 to 6 feet to bed rock. Last year I irrigated about every thirty days, using the basin system around the trees, with no ill effects.

This year having a much hotter summer, I irrigated every two weeks. The trees got along nicely until about September 1, when a large number of them—40 or 50 perhaps—developed what I have reason to believe is called black spot. Last year some children left a water hydrant running and flooded the basin around a young Lyon tree. The water must have been running three or four days before I discovered it. Some ten days or two weeks after that, a prominent Eastern nurseryman of wide experience, while looking over my place, noticed the Lyon tree and drew my attention to the leaves. They were spotted in the body of the leaf with purplish

brown spots from the size of a pinhead to that of a dime. "That tree has black spot," said he. I told him of the basin being flooded for several days and he expressed the opinion that the disease was caused by too much water. So when my trees about September 1 of this year began showing those same purplish brown spots, I came to the conclusion that my soil is too tight to irrigate every two weeks.

The Lyon tree I have spoken of dropped all its leaves after they had turned brown and withered, and new weak looking leaf buds started to break; but after lingering until this spring it died. The leaves of the trees affected this year, have also dropped off, in some instances leaving the trees entirely bare. Some of the trees have already withered and died, while others have developed new young leaves. On some of the trees these new leaves are fresh and healthy looking, while on others the young leaves, sometimes before they are an inch long, begin to show the black spot around the edges and the leaves curl and wither and in a short time drop off. In extreme cases the tips of the limbs also wither and die.

I have not found the disease restricted to any particular variety of tree. It has appeared on some of each of the following: Northrop, Val de Flor, Harman, Queretaro, San Sebastian, Taft, Fuerte, Grande, Solano, Dickinson, Merito, Ameca, Sharpless, Lyon, Walker, and Meserve. None of the Puebla trees were affected, nor the Spinks, Perfecto, nor Montezuma. So I suppose those trees can stand more water than the others as they were all treated exactly alike. The trees introduced by Mr. Knight were generally immune, only two or three out of over fifty being slightly affected.

As an instance showing how little water an avocado tree can receive and yet live, I will say that last year while planting some trees, the bud was broken off one tree. The ball was thrown aside and lay on top of the ground exposed to the sun for six or seven weeks until it was as hard and dry as a bone. Through curiosity to see if it would grow, I planted the stump near a house occupied by a Japanese. The waste water from the house flowed by a few feet away. That was all the irrigation it ever got. It has never been cultivated and never fertilized. It is now nearly 10 feet high and looks better than any of the trees upon which I have devoted so much work and care.

From my experience I am convinced that the amount of irrigation required depends entirely upon the nature of the soil. Next year I shall irrigate perhaps as frequently as this year but I shall not use the basin system nor shall I use so much water.

E. E. Knight: Some varieties seem not to be affected with the mottle or brown leaf. Others are hardly ever free from this condition. I selected a tree in the center of my orchard and irrigated it from two to three times each week. It developed the brown spots, but in the center of the leaf, none around the edge. As a rule the brown makes its appearance at the end or on the edge of the leaves. I would offer as a suggestion that too much water affects the center and a lack of water the outside of the leaf.

Dr. Keller: I think that the spots on the edge of the leaf are from lack of water.

Mrs. J. T. Stewart: I have an avocado orchard of 15 acres which is

not cultivated. For the first three years, this had the regular citrus cultivation. Last winter alfalfa was planted, leaving 3 feet on each side of the tree row. Shallow furrows were put in down the tree rows. The first cutting of alfalfa was used as a heavy mulch, with absolutely no cultivation. The water has been turned on often in the grove. The trees made a heavy bloom and growth this year. Those receiving much water set much fruit. I have not found that one can give avocados too much water. The ground is at all times very wet. The mulch is not removed and there is no cultivation. Trees have made the best growth this year, of any year before. Buds which were put in in June, have made a wonderful growth. The water ran almost continuously on newly budded trees. The soil is a rich loam to approximately 30 feet, at least. The orchard is on a gentle slope. I have never lost trees from too much water.

E. E. Knight: Mrs. Stewart could not run water that way if she cultivated the orchard.

E. A. Chase: I have been in the irrigating business twenty-five years. If I could have the money I have paid for water for this purpose, I would be quite rich. Most persons run water according to what they can get. Porous soil does not retain surplus water; hence is not damaged by it. The same amount of water applied to heavier soil might be in excess of what is beneficial. There is nothing about which we have had less actual knowledge in growing things out of the ground, than as to the necessary water to give best results. It has been mostly, if not wholly, guess work. In the last year or two there has been considerable work done in the way of testing soil moisture and through these methods we may be able to learn something as to the quantity of water required to give best results on different soils.

Wm. D. Stephens: I have been experimenting with the culture of the avocado for about six years. On my home place in Montebello, I have a deep rich clay loam soil of unvarying character for at least 6 feet in depth. For the past two years I have not irrigated oftener than once in six weeks and on several occasions have extended the periods to ten weeks. I usually cultivate the ground deeply twice, and in addition keep the ground around the trees stirred deeply with a forked hoe between irrigations. The distance across my grove is about 700 feet and I let the water run slowly, requiring about three days for the water to get through the furrows when it is at once shut off. At no time have my trees shown any wilting of the foliage or any visible indications that the trees lacked the proper amount of moisture and I challenge a comparison with any trees of equal age in the State, both as to size and vigor.

J. T. Whedon: How does Mr. Stephens account for the growth of the avocado in Mexico and South America without cultivation?

Mr. Stephens: Several years residence in the plateaus of southern Mexico where the avocado flourishes at its native best, side by side with the orange, lemon and lime, have satisfied me that there is not the slightest ground on which to base a comparison between the absolute lack of care under which all varieties of trees and fruits flourish in the tropics and the care and treatment essential to the best development of the same trees and fruits here in California.

I wish to state that in the municipality of Atlixco, State of Puebla,

Mexico, where the finest native seedling avocados in the world are found, it would be a very difficult task to gather together a finer exhibit of fruits than has been shown at either of our last three conventions. Many of these Atlixco trees are upward of one hundred years old; yet a yield of more than 1000 to 1500 fruits per year from one of these very large and ancient trees is the rare exception. Here we have trees less than twenty years old that far exceed such production and yield a grade of fruit that compares at least favorably with Atlixco's very finest.

There the rainy season lasts in normal years from early in June to the last of October, the total precipitation varying from 60 to 100 inches. The topography consists of rolling and sloping mesas giving always abundant and rapid drainage. The natural growth of a multitudinous variety of trees and plants is rapid and rank, and results in a continuous deposition of decaying vegetation which obviously enriches the soil and keeps it so covered that the sun's rays rarely reach the bare ground. Thus, it will be readily appreciated that under such conditions, the shiftless methods employed in those countries cannot logically be cited as any dependable guide to the treatment we should give the tree here where our conditions of soil and climate are so radically different.

It might be well for the gentlemen who advocate irrigation every ten or fifteen days and no cultivation, to review the development of the citrus industry during the past forty years and more. Remember that the orange, lemon, and lime are growing prolifically in the tropics, side by side with the avocado, and thriving and bearing in at least an equal ratio to the avocado; yet in production or quality of fruit do not approach our groves here in California. What would have been the results to our great citrus industry in California if the treatment advocated by these gentlemen for the avocado had prevailed? Would you gentlemen recommend that we give our citrus trees this same dose of water every ten days and no cultivation? I submit that it is as logical a suggestion in one case as in the other, and in conclusion I would like to predict that if some of our American energy and intelligent methods of cultivation, pruning, and general care were introduced into the avocado groves in their native homes, a vast improvement both in quality and production of fruit would result.

In a later discussion, Professor M. E. Jaffa stated that as a comparison, 25 per cent of oil was obtained from olives not over-irrigated, 18 per cent being obtained from olives which were over-irrigated. This he thought might in some measure apply to avocados.

UTILITY AND SENTIMENT APPLIED TO AVOCADO

BY J. M. ELLIOTT, LOS ANGELES

It would be quite a natural question to ask a man who had been confined by business to a desk for more than fifty years, why he had selected the growing of avocado trees as something to occupy his time and mind. Granted that I am asked that question. I say first that it is really a recognition on my part of what I owe to this section, for having given me health and an opportunity to work, when I was sadly in need of both.

Forty-seven years ago the largest orange orchard in Southern California occupied the ground on which the Southern Pacific depot, in Los Angeles, now stands. The question at that time was how to market the prod-

uct of these several hundred trees. They were seedlings, with long thorns, and the fruit had a rough skin and were full of seeds, but they were sweet as to pulp. We have found out both how and where to market these and now we ship 40,000 carloads of citrus fruit each year.

Remembering this remarkable development, it seemed to me that I should join gentlemen like yourselves who have devoted time and care to the development of the avocado, and do my bit toward testing the tree as a business proposition. My experiment is on a hillside, part of which is very steep, and if it proves a success in every way it will demonstrate the increased value of a large acreage of somewhat similar ground. If for any reason, it should prove a failure, it would be a warning to some prospective growers to try other means.

It has been stated that the banana will produce more food per acre than any other vegetable grown. My opinion is that the avocado, on account of the richness of its pulp, will prove better than the banana in this respect. When, in about four or five years, we have a production sufficiently large to need care and attention in marketing, one more man to assist in this might be of value to you. My hopes lie in this direction.

So much from a utilitarian standpoint. Now allow me a little in the way of sentiment. The avocado exceeds in the beauty of its growth almost all trees. To have your Mexican varieties budded by an expert and to watch the development, and care for the tree during the change that it makes to one of the better varieties, is a joy to any lover of nature.

Also, if I may be allowed further, what I may call personal mention, I am under obligation to my nephew, the late Mr. Habersham, of Hollywood, for introducing me first to this beautiful tree. He planted a number of seeds, given to him by Mr. John Murrieta, and from these seeds he brought almost to maturity a number of trees, two of which have proved famous, but neither of which bears his name. I would be glad if I could do something to repay his memory for the pleasure that I have derived from my acquaintance with the tree.

Having worked more than fifty years in the city of "Day by Day," in the land of "All the Time," I hope you gentlemen who have waited years and years for the fruition of your hopes in your avocados planted from seed, will not grudge me a trip in my mind to the "City of Sometime," in the "Land of Yet to Come," and following Mr. Wright's allegory, let me go there and meet the King of that country, "Looking Ahead," and his Queen "Anticipation," and seek an introduction to their two most beautiful daughters, "Fancy" and "Imagination," who will take me into the temple, whose dome blazes with a ruby flame and which is sacred to the God "It Might Be." I will make an offering on his altar, and he will give me an avocado seed, which I will plant close to its shadow, and I will watch the growth and expansion of its leaves, beautiful lustrous green when grown, but catching the glint of the rosy dome above and coming out of the bud like burnished bronze. I will watch its blossoms burst into stars and the fruit glow as great green globes turning to maroon as they ripen.

It should be perfect in its transmission, in its resistance, in its production, in its flavor. It should be an ideal tree, and I would name it with the name of my nephew, and send it down to posterity as a blessing to the human race.

STUDIES ON THE COMPOSITION AND NUTRITIVE
VALUE OF SOME SUB-TROPICAL FRUITS

PROF. M. E. JAFFA AND F. W. ALBRO, UNIVERSITY OF CALIFORNIA

AVOCADO

The accompanying tables indicate the chemical and physical analyses of the avocado and other sub-tropical fruits that have been completed at our station laboratory since the last meeting of the Avocado Association:

- A. Avocado
- B. Guava
- C. Sapote
- D. Feijoa

The main part of the report submitted herewith refers to work done on the avocado. The tables are arranged according to varieties rather than chronologically, as the latter seems to be the more logical way of presenting the results of our investigations. Tentative conclusions drawn by previous studies would seem to be pertinent at present writing. While it is true that the larger fruit appeals to the public and commands a higher price, it must be remembered that it is not the larger fruit that contains the highest percentage of oil; in fact, the reverse is true as indicated by the following tabular statement:

	Weight Fruit grams	Weight Seed grams	Seed Per Cent	Oil Per Cent
Large—				
	1060	399	38	13.1
	877	127	14	16.1
	800	90	11	13.5
	733	76	10	15.7
	928	93	10	13.4
	626	107	17	18.5
	669	80	12	16.4
	730	181	25	15.9
	705	110	16	14.1
	560	86	15	11.81
	Weight Fruit grams	Weight Seed grams	Seed Per Cent	Oil Per Cent
Small—				
	169	11	7	22.6
	158	43	27	26.1
	260	37	14	29.1
	168	36	21	31.6
	80	25	30	25.4
	148	37	25	27.9
	123	29	22	26.7
	150	31	20	25.5
	181	22	12	29.1
	218	45	20	27.6

More illustration could be given, but the same general showing would be made. It has been said that in the large fruits the percentage of seed is less than in the small. This statement, however, is not borne out by the above figures. The average percentage of seed in the fruits, whether it refer to the large or small fruits, differs but little. This is an important point when considering the total food value, because it will be noticed by an inspection of the tables of the analyses that the higher the percentage of oil the lower the percentage of water and vice versa. The other ingredients of the fruit do not vary to the same extent. The percentage of oil at present from the standpoint of food conservation is very important.

Experiments which have been conducted at the Nutrition Laboratory have shown that the digestibility of the avocado oil is equal to that of other oils. Therefore, this fat or oil can be very advantageously used as a substitute for butter fat.

The honor ration which the United States Food Administration has recently offered to the people of the United States with the hope that they will adopt it, includes 7 ounces of butter fat per week, or 1 ounce per day, per person. For many this would appear to be an insufficient amount. There are other varieties of fat for the adult which can be utilized if the amount of butter indicated by the ration appears to be too small. The avocado pulp offers itself as an excellent source of fat, and it can be spread upon bread similar to butter. It may be said that it would be an expensive substitute. This is true if purchases are to be made in the open market, but the foregoing suggestions are offered to those who grow the avocado and who consume considerable quantities of this fruit. Such consumption might not be considered as economical, but it certainly would be in the line of conservation. For feeding very young children it would be well to supplement the butter with the avocado, but not to use avocado entirely in the place of butter, owing to the fact that butter fat has properties essential for growth which the avocado may not contain. On the other hand, it must not be forgotten that when butter is consumed, it is only the fat which is really concerned. When the avocado is used we have not only a rich nutritive fat, but we have the mineral matter and organic salts which are so valuable to the human body.

Recorded examinations of avocados tend to show that the time of picking is materially concerned with the flavor. The best flavor is not as a rule associated with those fruits which hang for too long a period on the tree. The financial return for the time being from the sale of such fruit may exceed that of earlier fruits, but sooner or later this condition is bound to change in favor of the highest flavored fruit.

The advantage of the slight increase in fat which may result from a very late picking is more than offset by the deterioration of the flavor, etc. Quite often the fat does not increase after a certain point, no matter how long the fruit may remain on the tree. It is agreed by all that the larger use of the avocado is desired, and therefore, it must be borne in mind that it is very necessary that the fruit be marketed at its best, and in many instances this is not the case when the fat percentage is at its maximum. Several studies on different varieties during the past season has strongly emphasized this point. An increase of from 26 to 28 per cent in fat content has been accompanied with a much poorer quality of fruit.

SAPOTE, GUAVA AND FEIJOA

The results of the examinations of the guava, sapote and feijoa recently made at the Nutrition Laboratory are presented on Page 91.

The data is interesting, particularly with reference to the sapotes which contain about 20 per cent of sugar. Cane sugar predominates, in that 12 per cent of the 20 consists of this most desirable form of sugar. Two samples from different localities both show identically the same percentage of cane sugar, and the figure for invert sugar differs by less than 1 per cent. Two feijoas contain a much higher percentage of water and less than 5 per cent of total sugar, the remainder of the carbohydrate content being starch, etc. The starch figure for the sapotes, on the other hand, is less than 4 per cent.

The nutritive value of the sapotes far exceeds that of the other fruits mentioned in the table, with the exception, of course, of the avocado. This is clearly shown by the following figures representing the caloric value per pound of the edible portion of the fruits in question.

Lemon Guava	224	calories per pound
Strawberry Guava	287	calories per pound
Sapotes	483	calories per pound
Sapotes	440	calories per pound
Feijoa	226	calories per pound
Feijoa	240	calories per pound
Sp. Cacti	244	calories per pound
Avocado	984	calories per pound

The harvesting and palatability, etc., have to be taken into consideration in drawing conclusions regarding the market values of fruits and other foods. It can be seen readily, however, that if there were at hand a generous supply of sapotes, and this fruit met with public favor that the sugar content would help in the matter of conservation of sugar which is so urgently necessary at the present time.

The records of the various chemical and physical analyses are given in the following tables:

ANALYSIS OF AVOCADO
"A"—KNOWN VARIETIES

Lab. No.	Variety and Date	Submitted by			Analysis, Edible Portion					
		Fruit Grams	Seed Grams	Skin Grams	Edible Portion Grams	Water Per ct.	Fat Per ct.	Ash Per ct.	Carbohydrate Per ct.	
2147	Monrovia, Jan. 8, 1917	F. O. Popenoe, Altagena	36	9	121	64.18	2.09	25.34	1.66	6.73
2326	Meserve (1)	T. U. Barber, Puento	328	74	192		2.19	17.01	1.36	4.78*
*2329	Puebla, Jan. 24, 1917	T. U. Barber, Puento	334	82	203		74.66			
**2043	Puebla, Nov. 10, 1916	F. O. Popenoe, Altagena	168	45	111		80.59	1.76	11.32	1.11
2173	Puebla, Jan. 24, 1917	F. O. Popenoe, Altagena	280	63	14	203	69.47	1.66	20.94	1.28
2243	Puebla, Feb. 26, 1917	F. O. Popenoe, Altagena	158	43	14	101	67.53	1.83	26.14	1.34
2043-A	Puebla, Feb. 26, 1917	F. O. Popenoe, Altagena	165	42	9	114	63.32	1.80	26.63	1.56
2047	Queretaro, Nov. 13, 1916	J. T. Wheldon, Yorba Linda	216.5	64	18	134.5	71.46	2.85	17.45	1.45
2026	Royal Purple, Nov. 3, 1916	F. O. Popenoe, Altagena	164	44	16	104	71.46	2.34	18.21	1.43
	**Composite Sample I and II.	H. H. Himebaugh, San Diego	200	39	13	148	72.96	1.72	19.39	1.09

*Fruit Immature.

ANALYSIS OF AVOCADO
"A"—KNOWN VARIETIES

Lab. No.	Variety and Date	Submitted by			Analysis, Edible Portion					
		Fruit Grams	Seed Grams	Skin Grams	Edible Portion Grams	Water Per ct.	Fat Per ct.	Ash Per ct.	Carbohydrate Per ct.	
2164	Sharpless, Jan. 15, 1917	B. H. Sharpless, Santa Ana	594	93	456	71.21	1.70	20.54	1.12	5.43
2294	Sharpless, Apr. 4, 1917	B. H. Sharpless, Santa Ana	536	86	43	407	72.63	1.27	18.77	.94
2379	Spinks, Xmas, July 19, 1917	Wm. A. Spinks, Duarte	800	90	92	618	78.12	2.17	13.47	1.50
2380	Spinks (1), July 19, 1917	Wm. A. Spinks, Duarte	433	88	39.5	305.5	76.22	1.50	14.83	1.49
*2515	Spinks (large Fruit), October 10, 1917	Wm. A. Spinks, Duarte	343	78	39	226.0				5.96
2515	Spinks (Small Fruit), Oct. 10, 1917	Wm. A. Spinks, Duarte	877	127	51	699	75.72	2.10	16.01	1.43
2578	Spinks, Nov. 1, 1917	Wm. A. Spinks, Duarte	434	76	37	321			21.75	
2581	Spinks, Nov. 1, 1917	W. L. Rideout, Whittier	616	72	72	472	73.55	2.67	16.43	1.78
2579	Dr. Weldman, Nov. 1, 1917	Wm. A. Spinks, Duarte	520	89	39	128	74.76		16.74	
	**Overripe. [Too old and dry.	Wm. A. Spinks, Duarte	450	99	84	267	63.75	2.57	24.29	1.69

ANALYSIS OF AVOCADO
"B"—UNKNOWN VARIETIES

Lab. No.	Variety and Date	Submitted by	Fruit			Edible Portion Grams	Analysis, Edible Portion				
			Grams	Seed Grams	Skin Grams		Water Per ct.	Protein Per ct.	Fat Per ct.	Ash Per ct.	Carbohydrate Per ct.
2019	Unnamed, Grown at Eagle Rock, Nov. 1, 1916	F. O. Popenoe, Altadena.	733	76	63	594	74.68	2.30	15.67	1.62	5.73
*2335	Unknown, May 18, 1917	Ed. H. Rust, Pasadena.	343	90.5	35.5	217	74.75	2.06	17.55	1.12	4.52
2604	Unknown, Nov. 20, 1917	H. J. Webber, Citrus Experiment Station, Riverside.	315	64	30	261	71.20	.....	21.04	.....	.....

*Shape: pear. Color, green-brown mottled. Taste: O.K.; slightly sweet. Condition, ripe, soft.

ANALYSIS OF AVOCADO
"C"—SEEDLINGS

Lab. No.	Variety and Date	Submitted by	Fruit			Edible Portion Grams	Analysis, Edible Portion				
			Grams	Seed Grams	Skin Grams		Water Per ct.	Protein Per ct.	Fat Per ct.	Ash Per ct.	Carbohydrate Per ct.
1747	Seedling, Purple Skin, Mexican, Jan. 4, 1916	C. P. Wilder, Honolulu.	730	181	72	477	76.81	1.31	15.87	.86	5.15
2049	Variegated Seedlings, Nov. 15, 1916	H. H. Himebaugh, San Diego.	173	34	20	119	69.10	1.30	24.04	1.29	4.27
2061	Seedling, Nov. 27, 1916	H. H. Himebaugh, San Diego.	184	24.5	17.5	142	63.07	1.67	25.82	1.69	7.75
**2384	Seedling (I), July 6, 1917	Hertrick, Los Angeles.	338	79	22	237	70.10	3.33	17.10	1.23	8.24
**2384	Seedling (II), July 6, 1917	Hertrick, Los Angeles.	328	92	24	212					

**Skin peels off perfectly in quarters—flesh not sticking to it. Ripe.

ANALYSIS OF AVOCADO
"C"—SEEDLINGS—Continued

Lab. No.	Variety and Date	Submitted by	Fruit			Edible Portion Grams	Analysis, Edible Portion				
			Grams	Seed Grams	Skin Grams		Water Per ct.	Protein Per ct.	Fat Per ct.	Ash Per ct.	Carbohydrate Per ct.
2402	Seedling, Aug. 8, 1917	M. P. Hayes, Hollywood.	704.5	110	45	549.5	72.95	2.20	14.14	1.37	9.34
*2575	Unnamed Seedling, Nov. 1, 1917	Chas. Hamburg	187	37	11	139	76	1.93	15.09	1.59	5.39
2580	Unnamed Seedling, Nov. 1, 1917	Chas. Hamburg	173	41	12	130	70.53	1.79	21.34	1.44	4.90

*Seed loose

PHYSICAL AND CHEMICAL ANALYSES OF SOME SUB-TROPICAL FRUITS

PHYSICAL ANALYSES

Kind Fruit	Locality	No. of Fruits	Fruit		Seeds		Skin		Edible Portion	
			Grams	Per ct.	Grams	Per ct.	Grams	Per ct.	Grams	Per ct.
Lemon Guava.....	Southern California.....	6	300.0	27.0	9.0	28.0	9.3	245.0	81.7	
Strawberry Guava.....	Southern California.....	8	76.0	..	..	11.0	14.4	65.0	85.6
Sapotes.....	Altadena.....	2	13.0	15.0	11.4	18.0	13.7	98.0	74.9	
Sapotes.....	Whittier.....	2	140.5	7.5	5.3	11.5	8.1	121.5	86.6	
Feijoa.....	Sultana.....	9	216.5	..	..	34.2	15.8	182.0	84.2
Feijoa.....	Altadena.....	4	141.5	..	..	19.0	9.9	172.5	90.1
*Sp. Cacti.....	Santa Rosa.....	6	146.6	5.7	3.9	57.6	39.3	83.3	56.8	
**Avocado.....	Southern California.....	28	197.4	40.0	20.2	22.5	14.1	135.8	65.7	

CHEMICAL ANALYSIS

Kind Fruit	Water Per ct.	Ash Per ct.	Protein Per ct.	Fat Per ct.	Fiber Per ct.	Carbohydrates			
						Sucrose Per ct.	Invert Sugar Per ct.	Starch, etc. Per ct.	
Lemon Guava.....	84.00	.67	.76	.95	5.57	..	..	5.45	2.60
Strawberry Guava.....	79.42	.77	.88	.80	6.58	..	..	5.06	6.49
Sapotes.....	72.64	.44	.64	.46	1.26	12.20	..	8.44	3.92
Sapotes.....	74.74	.47	.87	.55	1.62	12.24	..	7.72	1.79
Feijoa.....	84.86	.56	.82	.24	3.55	1.58	..	2.66	5.93
Feijoa.....	83.87	.45	1.02	.05	3.45	..	..	11.6	..
*Sp. Cacti.....	86.02	.43	.76	.07	.26	..	..	10.25	2.21
**Avocado.....	69.16	1.26	2.08	20.10	..	..	..	..	7.40

*Average of 6 analyses. Bulletin 254, Agri. Exp't Sta., University of California.
 **Average of 28 analyses.

A NEW SUGAR IN THE AVOCADO

DR. W. P. KELLEY, CITRUS EXPERIMENT STATION

Despite the fact that various analyses have reported small amounts of sugar in the avocado, it has often been claimed that this fruit contains no sugar. Recently, however, some systematic studies have been made on this subject with the result that a new sugar has been discovered in the avocado. This investigation was made by Dr. F. B. La Forge, in the Bureau of Chemistry, at Washington, who has found a new sugar, one hitherto not known to exist in any of the natural fruits.

This sugar differs from all previously known natural sugars in that it contains seven carbon atoms, the first sugar of the kind ever found in nature. It is also peculiar in the fact that it is apparently unfermentable, a characteristic likewise not common among the natural sugars. The name that Dr. La Forge has assigned this sugar is D-Mannoketoheptose.

The investigations thus far have been of a very technical nature and little is known regarding the practical aspects of it. Nothing, for example, has been determined regarding its digestibility, nutritive value, etc., and for the present little can be said regarding the practical importance of this sugar. It is, however, a matter of special scientific interest and further investigations may reveal information of general interest.

It is, however, interesting to avocado growers to know that this fruit does contain small amounts of sugar. While this investigation is not very definite, it would seem that the amount of sugar contained in the fruit, varies from .5 to 1 per cent.

CHEMICAL CONSTANTS OF AVOCADO OIL

F. W. ALBRO, UNIVERSITY OF CALIFORNIA

In connection with an experiment to determine the digestibility of the oil of the avocado, carried out by Dr. H. A. Mattill in this laboratory, it was thought to be of interest to determine the chemical constants, and compare it with other common edible oils.

A great deal of difficulty was had in extracting the oil from the fresh pulp. Pressing, centrifuging, filtering and extracting with solvents met with but little success. Enough was extracted from the fresh pulp with petrolic ether, however, to compare it with oil from the dried pulp either by pressing or extracting with solvents. The pulp was dried at 50° C in a steam jacketed vacuum oven for ten hours and extracted with low-boiling gasoline. The dark colored solution was filtered through animal charcoal, which removed the rather unpleasant odor, bitter taste, and resinous material. The solution was placed on a steam bath and the solvent entirely removed with a stream of CO² bubbled through it. The oil was then cooled to 5° C, and decanted from a white precipitate, which, if not removed by cooling, will make the oil cloudy at room temperature. The oil so obtained was of a light golden color, bland and pleasant tasting.

The chemical constants found are given in the following table:

TABLE SHOWING CHEMICAL CONSTANTS OF AVOCADO AND OTHER OILS

Chemical Constants	Avocado Oil from Fresh Pulp	Avocado Oil from Dried Pulp	Olive Oil	Butter Fat	Cottonseed Oil
Iodine Value	88.0-90	85.0-88	79.0-88	26.0-38	108.0-110
Insol. Fatty Acids (Hegner Value) ..	.....	92.5	95.0	86.5-89.8	95.0-96
Acid Value (Free Oleic Acid)	8.0-12	4.0-6	1.5-8.3	0.45-35.0	0.0
Maumene Value .....	.....	65.0	41.5-45	.....	75.0-90
Specific Temperature Reaction .....	.....	156.0-157	89.0-94	.....	169.0-170
Av. Mol. Wt. of Fatty Acids .....	.....	282.2	280.0	255.0-267	269.0-277
Saponification Value	177.0-178	177.0-178	185.0-196	220.0-233	193.0-195
Reichert Meissl Value	3.8-4	3.8-4	0.6	25.0-32	0.95
Polenske Value	0.0	0.0	.....	1.6-3.5	.....
Acetyl Value (Real) .....	.....	11.3	10.6	1.9-8.6	7.6-18
Refractive Index of Oil (15.6° C) ..	1.469	1.47	1.4713	1.4536*	1.4737-57
Refractive Index of Fatty Acids 40° ..	1.455	1.454	.....	.....	1.446**
Oleic Acid	82.0-85%	80.85%	70.0-75%	30.35%	.....

*40° C.

**60° C.

SYMPOSIUM ON HEAT INJURY

Discussion led by F. O. Popenoe, of Altadena, and Dr. C. L. Bennett, of San Dimas.

F. O. POPENOE: (paper read by Dr. Bennett). It is not surprising that a catastrophe which cost the Southern California ranchers a loss of \$25,000,000 should so move us as to make us look it squarely in the face; but lightning never strikes twice in the same place, so probably it is not wise to give great consideration to an exceptional event.

Costly though it proved to be, the hot spell of last June was nevertheless an unusual occurrence. So in considering it, let us not only get the value out of the experiences connected with the event itself, but in addition so extend the scope of our consideration and inquiry as to cover the subject of heat injury in a broad and comprehensive way. In order that we may thus realize the greatest value from this discussion, I will ask those taking part in it, to view it in this light.

The questions before us then, are: Is excessive heat as injurious to the avocado as excessive cold?

What varieties of the avocado best withstood the excessive heat of last June?

What is it possible for the orchardist to do to prevent injury by heat?

What subsequent treatment for his damaged trees will bring them most promptly into good condition again?

What effect does excessive heat have on the fruit crop?

The answers in detail will be given by those who take part in the discussion.

Speaking in general terms, I believe the avocado suffers more from excessive heat than from excessive cold. Fortunately in California we do not often have a season of excessive heat. But there are those times of high summer temperature to be dealt with regularly, which have caused the loss of many a good tree through lack of provision for its safety. I urge our planters to provide the best possible growing conditions for their young trees. Based upon our present knowledge, these conditions seem to be, in addition to those ordinarily required, a suitable shade for the first year, and an ample supply of water for quick application at the beginning of any hot spell. A mulch of straw around the young tree is a great safeguard against reflected heat, which does injury to the bark of the trunk and lower limbs.

I believe 75 per cent of heat damage is caused by lack of adequate and prompt irrigation on the approach of hot spells. That young avocado trees require more water than citrus trees is an established fact, and we must provide accordingly. Wise is he who never allows his ground to dry out. Keep your irrigation work well caught up, so that the hot spell will not find your ground dry; because it is probable that before you can sufficiently irrigate your orchard the damage will be done and some of your weak trees or less resistant varieties will be burned up. The danger is greatest on our foothill slopes, where the soil is often of a coarse, loose, porous character. Such soil heats quickly unless moist, and root damage will also occur.

Of course the strong growing, resistant tree is as desirable for its immunity from heat damage as it is for its immunity from injury by other

causes, so that the varieties of this type which we have, and which at the same time bear good fruits and bear them early and prolifically, are truly the ones to select and plant. This goes without saying; yet the oft repeated truth is the one that impresses us, and we sometimes need to have our attention called to the most patent fact.

Therefore, wise man, do this:

Plant the strong, good tree;

Shield it from the sun during the first summer;

Give it a generous mulch of straw;

Attend promptly to your irrigation;

Be ready with a water supply for immediate application when a hot spell comes.

Doing these things, fear not the heat, and look forward in confidence to the season when a plenteous harvest will be yours.

G. W. Beck: La Habra does not get as much heat as inland. A few days before the hot spell the trees were whitewashed with whitewash containing linseed oil and salt. The limbs and trunks were whitewashed, and there was very little sunburning; only in cases where the whitewash was not quite to the ground on the trunks was there any sunburning. The leaf injury was very slight, though nearly all the fruit dropped.

The variety in the nursery which suffered most was the Taft. This was because, at the time when the heat came, the Taft trees had more new growth than any of the others. Just the leaves were injured; the limbs and trunks were no worse than the others. These trees had not been watered for nearly a month. Other varieties than the Taft are: Sharpless, Lyon and Sinaloa in the nursery; and in the field were the larger trees: Ganter, Taft, Lyon, Chili, San Sebastian, Walker, and Northrop; also about a dozen unnamed varieties from Atlixco, Mexico, of the thick-skinned type.

MRS. B. H. SHARPLESS: We can arrive at a more definite conclusion in regard to the heat resistant qualities of the avocado by comparing the avocado damage with that of the citrus trees in the same orchard.

A short time after the heat wave in June, tons of our mature lemons as well as all the young lemons, were on the ground under the trees, and most of the fruit left on the trees was so badly burned that it was worthless. No mature avocados dropped from our Sharpless trees growing in the same orchard with the lemons. We lost nearly all of our young fruit, having perhaps enough left for an exhibit next year. The original Sharpless tree showed no damage except the curling of leaves on the tenderest growth.

We have Sharpless trees set out in orchard form including one, two and three-year-old trees. These were apparently untouched by the heat.

Two buds set out this spring among the big orange trees were burned because they were dry.

In our home nursery, we had Sharpless buds in all stages of growth up to 3 feet in height. We discovered no sunburn among them.

We had 25 Sharpless trees balled from our nursery about the time the heat wave reached us. They were placed in the shade of the big tree with no other protection except a canvas stretched on the sunny side. We sprinkled them frequently during the hottest day and lost none of them. Only a few of them dropped their leaves.

Near our La Habra nursery the thermometer registered 112 in the shade. In this nursery we had no budded trees at that time. There were 2000 little seedlings of Mexican stock which had been planted from flats with bare roots a few weeks before the "hot spell." We had about 10 per cent loss among these, and other seedlings which had been out long enough to become established, were injured to some extent.

The damage would probably have been greater had it not been for the fact that the irrigating water was turned into the nursery the hottest day.

W. H. SALLMON: While the most of Southern California was blistering under temperatures in the nineties and hundreds from June 14 to 17, reaching a maximum of 124 degrees at Mecca in Riverside county, San Diego was favored with the lowest maximum, the Government thermometer showing 87 degrees on the 14th, dropping to 77 degrees on the 15th, and running to 82 and 85 degrees on the 16th and 17th.

This condition explains the comparative immunity of San Diego and vicinity from injury arising from the heat wave.

One orchard of 150 trees, consisting chiefly of Challenge, Harman, Walker and Puebla, was not affected in the slightest. This orchard is quite near the ocean on the east side of a ridge which separates it from the Pacific.

Another orchard of 250 trees, about 15 miles from the ocean, also escaped except for one tree which stood in the shadow of a tent where it received the heat reflected by the canvas. The leaves on this tree were shriveled and the bark cracked.

Another orchard of 280 trees, about 5 miles from the bay, consisting chiefly of Puebla, Northrop, Fuerte, Dickinson, Taft and Perfecto, had the foliage of all varieties severely burned. The tips of all young shoots were burned off and the large leafage curled and blackened. The bark was uninjured and the majority of the trees have recovered, though the growth of the trees was evidently checked. There was no fruit on either of these orchards.

It may be that two of these orchards escaped, partly because irrigation had closely preceded the heat wave, but it is significant that the trees in the orchard which suffered most were surrounded by burlap while the trees in the other two orchards cited were unprotected. It seems probable that the reflection of the heat from the burlap was the chief cause of damage to the orchard which suffered most.

DR. LESTER KELLER: The heat reached 103 degrees on the first day. So far as damage was concerned, about five Dickinson trees were lost, these being young trees without protection. Of the older trees, those that had the water turned on were not burned. Those without water had the tender growth injured in a few places. The trees least damaged were Fuerte. These also were least injured by frost and "northers." If the young trees had been protected there would have been no injury.

T. H. SHEDDEN: Those four blistering days in June furnished us much food for thought. Many surprises and contradictions developed.

First: In many instances, the so-called hardy varieties of thin-skins that so courageously weathered the winter, shriveled in the astounding heat wave.

Second: Many thick-skin and hard-shell varieties, suspected of being

susceptible to the caresses of Jack Frost, proved to be unaffected by the torrid fervor of Old Sol.

Third: In rows of same variety, age, planting and care, here and there trees stood the burning heat remarkably well, while the next several would have to be heavily trimmed, or cut back to stumps,—evidence that some trees had a better start in life than others.

Fourth: Certain of the varieties that have been much courted and sought after in the past, but whose seeming fickleness has tried the patience of all the Jobs in avocadodom, until they have become, metaphorically speaking, outcasts of the avocado world, stood the "fire test"—and cold test, too—remarkably well.

On the good old fashioned principle of "giving the de'il his due," I give their names: Murrieta Green, Murrieta Purple, (Colorado), Dickey No. 1, and Meserve. Through all the freezes and fires of this freak year 1917, like veritable "fools fer luck," they stood up cheerily waving their red bandanas (growing leaves) at me, and laughing hilariously, "Never touched me!"

Here are some of the comforting conclusions:

First: The records show that such heat waves are far between, and in well nurtured orchards the real maximum damage was the loss of crop in a year when Uncle Sam and all the world is crying for every pound of food that can be produced.

Second: The extent of the disaster was the result of the sudden change from a long, chilly spring and early summer, to the wholly unexpected and unprepared for outburst of seemingly long pent up heat.

Third: In case of fire, play the hose on it. Trees that were treated in this intelligent way were saved. The heat caught our orchard at the end of an irrigating period, a few days after which we had trouble with the water supply, and which gave us certainly an "unearned increment" of trouble. I mention this fact in proof of the wisdom of treating the avocado with hydropathy.

Fourth: We have no good reason to be discouraged or deterred from planting avocados. On the contrary, the extremes of heat and cold are showing us what to plant. Buy the best. For a yearling pedigreed tree, guaranteed, no producer is charging too much. Varieties sufficient to assure fruit in every month of the year have proven their worth, some having shown characteristics which might justify their being called "Salamander."

MRS. J. T. STEWART: The morning of the hottest day, the thermometer registered 120 degrees in the shade, the Ojai fires in the foothills contributing some of this heat. The varieties of avocados planted in the orchard are: Fuerte, Taft, Puebla, Challenge, Rey, Knight, Dickey, Ganter, Dickinson. These were heavily watered, and had a mulch over the ground. None were burned, as the alfalfa mulch protected the trees from reflected heat from the ground. None of the varieties were injured. One hundred twenty trees were budded on the 18th of June, during the hottest weather, with a result of 97 per cent successful. It is possible that the trees have become accustomed to the heat during the summers in San Fernando.

A. F. MANZ: Seedlings which had been watered just before the hot weather were sunburned. Lemon trees were burned also. The heat did

not hurt the fruit that was almost matured, but dropped most all the tender fruit. Some of the matured fruit on the lemon trees was burned also. I think the avocado can stand as much heat as citrus.

J. T. WHEDON: I had 91 Harmans that I was top-working over to the Fuerte. They were doing nicely but unfortunately we had made the second cut, taking the whole top of the tree off just two days before the hot wave struck us, causing a loss of 34 per cent of the buds that had taken, and as quite a number of the trees were badly sunburned, about 15 per cent more buds died. Any top-working of trees that I do in the future will be done in the fall, as there are too many chances for loss in the spring work.

The Fuerte and Taft trees were branched low, doing away with any protection. The avocado is more susceptible to sunburn than any other tree, and this low branching protects them.

I use the Wickson formula for whitewash as I think it affords best protection. This formula is 30 pounds unslaked lime, 5 pounds salt, 6 pounds tallow. The young trees are protected with whitewash for the first two years, after that time the limbs themselves are ample protection.

Regarding a burlap protection, the burlap should be placed at a little distance from the tree to allow air passage. If closely wrapped, it is injurious.

J. B. McLAUGHLIN: Does not the spraying of the foliage of the trees protect them to some extent in hot weather? I have 23 varieties of which only 4 were injured. I sprayed the foliage during the hot spell and only the bark on exposed trunks and limbs was injured on a few trees; the rest were not injured.

H. WETZEL: The heat can be reduced for a few degrees by evaporation from overhead spraying, but one would have to have this spraying in operation over the entire orchard and keep it going, to be able to influence the temperature. This difference amounts to about five degrees in temperature reduction, and in my opinion such spraying, wherever possible, would furnish the ideal condition of supplying the moisture for avocado plantings.

O. A. MANN: My experience in avocado growing is very limited. Last January and February I set out between 500 and 600 trees, and having put in the drip system of irrigation, I was as well prepared as I could be for the hot wave of June 14-17. I had turned on the water on the 13th so the ground was well wet. With this system of irrigation, the water is always available and can be turned on one, or all of the trees, at any time. This is not possible with the other system; therefore we are able to protect our trees when we have excessive heat. I have about half of my trees set out at the present time.

Of the 100 Fuerte and 75 Puebla trees, I lost none. I think these trees stood the heat quite as well as any variety I have. Of 160 Taft trees I lost none. These trees were quite large and were cut back a little more severely in the nursery than the others, so the limbs show considerable sunburn; but all are growing nicely. Out of 60 Lyon trees, I lost only 2. During the hot weather the last week in September, quite a number of them lost all of their leaves. I am inclined to think the Lyon tree is one of the varieties that should be shaded the first summer. The Sinaloa suffered the most; out of 20 I lost 3, and cut back several to the bud. Most of

those remaining are looking sickly. The San Sebastian, Ameca and Perfecto stood the heat very well.

My trees were well started previous to the heat. At that time they stopped growing as far as we could see, and were practically dormant for two months, since which time they have made a wonderful growth.

J. T. WHEDON: From my observations the heat wave affected all avocado fruit that had just set, up to the size of a pea. The Fuertes, which had reached the size of a cherry by the middle of June when the hot wave came, held on the trees. In Yorba Linda the Fuerte commences blossoming the early part of December and continues until June, giving at least six months in which the fruit may be picked. As to the actual time a fruit will hang on the tree after full maturity, I am not able to say.

The warm, dry "norther" setting in on the 18th of this month, with the continued hot weather ever since, has burned the tips of all new growth as badly as did the June hot wave. The Fuerte will stand more rough usage by being knocked about by the wind than any of my other varieties fruiting to date.

SPECIAL REPORT OF DIRECTORS ON AVOCADO VARIETIES

By T. U. BARBER, Puente, Calif.

One of the greatest benefits derived from an association is its ability to raise the standard of the production it represents and thereby bring greater returns to the producer and furnish higher quality to the consumer.

The first Board of Directors of this Association realized that the selection of varieties was the most important problem before them and, after due consideration, Edwin G. Hart, then president, with the approval of the Board, in February, 1916, appointed a special committee on Classification and Registration of Varieties consisting of Dr. H. J. Webber as chairman, Prof. I. J. Condit, C. D. Adams, H. M. Haldeman and Wm. Hertrich. This was an excellent selection of enthusiastic, thoroughly capable members of the Association, not one of them having any commercial interest nor a special variety to boost. After their appointment they organized and made a careful study of all varieties exhibited at our semi-annual meetings and also made trips of inspection to all the original trees and most important plantings located in this part of the state, so they might have first hand knowledge of each variety. After nearly a year of consideration, the chairman was instructed to place before the Board of Directors the first report. At that time the Board thought it wise to carry on another season's investigation with certain varieties before making public announcement of the conclusions. Therefore, the Committee went thoroughly over the subject during the spring and early summer of this year and on July 6 prepared a second report for the Directors. This was presented to a full meeting of the Board for consideration on August 16. To this meeting were invited the members of the Classification and Registration Committee and Mr. L. B. Scott, Special Pomological Investigator of the United States Department of Agriculture, who gave us such a comprehensive talk on this very subject at our last meeting. Mr. Scott was elected as an additional member of the committee. There were four of the six members present and they were invited to vote with the same power as the members

of the Board on the question of varieties. Under instruction of President Shedden each variety was taken in turn and each member requested to express his opinion of that variety before the vote was taken. This method took many hours but proved to be an excellent way to bring about the final decisions. It may be of interest to you to know that this report, now known as Circular No. 1, was passed unanimously by both the Board of Directors and the members of the Committee present.

In making our decision we did not consider so much the market value of our present production, but endeavored to plan for the future when the greater production will be sent to the markets of our country.

If we are to establish a famous brand, as the Citrus Exchange has in "Sunkist," it will be necessary to have but few varieties and these of the highest quality. If our varieties increase in number in the future as they have in the past, each being allowed to enter the list unchallenged, we will have great confusion and our fruits will be classed as seedlings, such as the fruit now being shipped to New York and other eastern cities from Cuba and selling in the same markets at a very much lower figure than Trapps from Florida. California is well known for its high standard in fruit production, and we are sure this Association wishes to do its part in upholding this reputation. By co-operation we can and will furnish a continuous supply of named and branded fruits to all our markets, a product we can guarantee and of which we may be proud.

With approximately 180 listed varieties, California has been absolutely without a basis from which a prospective planter seeking information could work. Many people have made a thorough canvas of the growers and nurserymen only to find that opinions were limited to the trees each was interested in propagating or had planted. The result in many cases was confusion and entire lack of confidence in the industry; many prospective growers gave up the idea of planting for this reason alone.

By the acceptance of this list we have set a mark upon which all future judging will be based. To be recognized, the new fruits, which will come into bearing, will have to show superior qualities to the standards already set; therefore the standing of the Association will not be lowered by the indiscriminate propagation and sale of unknown and unworthy varieties.

As an Association we are morally responsible to the many new investors joining the industry year by year. By our mere existence we invite them to invest their funds in the production of avocados, and they rightly expect our assistance. It becomes our duty to protect them from irresponsible people selling varieties which are known to be unworthy of commercial planting. The wide distribution of this circular will undoubtedly greatly reduce such unpopular business methods.

The nurserymen have already taken advantage of the decision and will be able to discontinue carrying many varieties for which there has been only an occasional demand. More time and study can be spent in the selection of budwood, pruning, and the development of the trees, resulting in better grade nursery stock for the future orchards.

Many people have orchards of Harman, Ganter and other thin-skinned varieties which have proven to be of little commercial value. They have been waiting for some such decided action before top-working. Even

since the results have been known, several thousand trees have been rebudded and many more will be during the next year, as the information spreads to the owners of such unprofitable groves.

This circular fills a long felt want, as the Association is constantly called upon for information concerning varieties, and this list furnishes official information in printed form. Many of the nurserymen have had extra copies printed for their own use and the distribution will be far reaching. It also eliminates to a great degree minor differences of opinion regarding descriptions as to weight, oil content, etc., as this information has been carefully collected from all possible sources and the average in each case printed.

There were undoubtedly many of us, with plantings already started, who felt somewhat disappointed because all our selections were not recommended, but we are all sure that, after thinking the matter over in a broad-minded way, we are ready to express our sincere thanks to the Committee for the hard task they have so successfully accomplished. The Board of Directors feel they have done a wise thing and we are sure the whole avocado industry will be greatly benefited by this action in the years of marketing that are before us.

Circular on Varieties

The Circular on Varieties prepared by the Committee on Classification and Registration of Varieties, and later modified and adopted by the Board of Directors, was published as Circular No. 1 of the California Avocado Association. For historical preservation and to further add to its usefulness this circular is reprinted here in full:

CALIFORNIA AVOCADO ASSOCIATION

CIRCULAR No. 1

Issued October 25, 1917.

AVOCADO VARIETIES RECOMMENDED FOR PLANTING IN CALIFORNIA
(A report of the special committee on Classification and
Registration of Varieties, approved by the Board of Directors for publication as a circular.)

The large number of avocado varieties that have been introduced, and the general lack of exact knowledge regarding varieties, render it very difficult for the prospective planter to obtain reliable information as to what sorts are the best and safest to plant. Recognizing this difficulty, the Directors of the California Avocado Association requested the committee on Classification and Registration of Varieties to prepare and publish a list of approved varieties. Such a list prepared by the committee and approved by the Board of Directors, is published herewith.

The list includes only varieties of the so-called thick-skinned or Guatemalan type, which in general it is believed is the best and most reliable type for commercial planting. The committee does not believe that it is possible at the present time with our limited knowledge and experience, to attempt to pass on the relative commercial importance of the different classes of fruits. Only time can determine what the market demands will be. The fact remains, however, that at the present time, a large majority

of the experienced growers in California favor the use of the Guatemalan type.

Many varieties that are frequently mentioned in discussions are not included in this list. The list must be taken merely as the best judgment of the committee, at the present time, of the varieties safest to recommend for planting. Several very promising varieties are not mentioned, as the knowledge of the committee concerning them is insufficient to justify passing judgment on their qualities and comparative value. Again, some of the varieties mentioned in the list will probably be discarded later. This list, the committee expects to be of temporary value only. It should be revised by the Association every year and brought up to date to keep pace with advancing knowledge. As soon as justified by experience, varieties of other types should be included.

EXPLANATION OF LIST

The varieties are listed according to season of maturing and not in the order of their merit. It is well recognized by growers that the season of maturing of a given variety is very variable and may extend more or less throughout the year. The placing of a variety in a definite season merely indicates its usual season of maturing when it may be expected to be at its best. Varieties may extend from one season into another, and when in the judgment of the committee, a variety may be considered as important in two seasons, it is listed under both. It thus happens that several varieties are listed twice.

The percentages of oil or fat given under each variety are taken from analyses made by Professor M. E. Jaffa, of the University of California, except in the case of the Spinks, which is from an analysis made by E. M. Chace of the U. S. Department of Agriculture. These are not averages, but are the highest percentages found in any single analysis of a variety. The percentage of fat increases as the fruit matures and in view of the few analyses that have been made of any one variety, it is thought to be more instructive at present to give the highest analysis rather than an average.

The other descriptive information relative to the varieties listed is self-explanatory, but it must be remembered in using the list, that there are many variations and extremes that cannot be given in a condensed table.

Avocado orchards require several years to reach full bearing age and size, and it is a somewhat common practice to plant the orchard more thickly than is ultimately desired, using some regularly devised system providing for the removal of a certain number of the trees. The trees that are intended to be removed are ordinarily spoken of as filler trees. Special attention is directed to the value of the Lyon for use as a "filler" tree in planting. Its upright habit of growth and early fruiting render it particularly valuable for such use.

ROOTSTOCKS FOR THE AVOCADO

So much injury may be done by the use of tender or poor rootstocks in the propagation of the avocado that the committee would strongly recommend that only seedlings of the hardy Mexican avocado be used for budding and grafting stocks. Nurserymen should use this type of rootstock only for trees propagated for sale, and planters should demand that the trees purchased for planting should be on this stock. Seedlings of the

LIST OF RECOMMENDED AVOCADO VARIETIES

Varieties	Season Dates (Inclusive)	Ave. Wt. of Fruit in Oz.	Ave. Wt. of Seed in Oz.	Percentage of Oil or Fat	Shape of Fruit	Color of Mature Fruits
SPRING VARIETIES						
Fuerte	Jan. to Aug.	12-14	1.52	30.72	Pyriform	Green
Spinks	Apr. to Aug.	16-20	3.25	16.46***	Obovate* to Pyriform	Purplish black
Blakeman	Apr. to Aug.	16	2.50	17.27	Pyriform	Green
Lyon	Apr. to Aug.	16	2.75	16.31	Pyriform	Dark green
SUMMER VARIETIES						
Spinks	Apr. to Aug.	16-20	3.25	16.46	Obovate to Pyriform	Purplish black
Blakeman	Apr. to Aug.	16	2.50	17.27	Pyriform	Green
Lyon	Apr. to Aug.	16	2.75	16.31	Pyriform	Dark green
Dickinson	June to Oct.	12	1.36	20.36	Obovate	Purplish black
Taft	May to Oct.	16	3.13	16.53	Obovate to Pyriform	Green
FALL VARIETIES						
Taft	May to Oct.	16	3.13	16.53	Obovate to Pyriform	Green
Dickinson	June to Oct.	12	1.36	20.36	Obovate	Purplish black
Sharpless	Oct. to Feb.	20	3.00	24.23	Pyriform	Dark purple maroon
WINTER VARIETIES						
Sharpless	Oct. to Feb.	20	3.00	24.23	Pyriform	Dark purple maroon
Puebla**	Dec. to Feb.	8-10	1.50	26.68	Obovate	Dark purple
Fuerte	Jan. to Aug.	12-14	1.52	30.72	Pyriform	Green

*Obovate, a term used to designate the shape of an inverted egg.

**Puebla is not strictly a Guatemalan type, but is supposed to be a hybrid.

***Since the publication of this circular Prof. Jaffa has reported one analysis of Spinks in which 21.75 per cent of oil was found.—
(Editor's note.)

ordinary varieties of the Avocado grown in Florida, the West Indies, Hawaii and Tahiti, are usually so tender that they cannot withstand the cold of California winters and are thus unsafe for use as stocks. Seedlings of the Guatemalan type are not such strong growers as the Mexican and are probably not so good to use as stocks, though they have not been thoroughly tested.

COMMITTEE

H. J. Webber, Chairman

C. D. Adams

Wm. Hertrich

I. J. Condit

L. B. Scott

Approved by the Board of Directors August 16, 1917.

Thos. H. Shedden, President

T. U. Barber

Wm. H. Sallmon, V. Pres.

Willett L. Hardin

H. J. Webber, Secy. & Treas.

E. E. Knight

Chas. D. Adams

F. O. Popenoe

B. H. Sharpless

AVOCADO TEA RECIPE

The members of the Association that had the pleasure of testing the avocado tea served by Mrs. G. W. Beck at the last meeting will be interested in the following letter:

La Habra, California, R. R. 1, Box 52

November 1, 1917.

Dr. H. J. Webber, Citrus Experiment Station,
Riverside, California.

Dear Sir:

The following is the formula as used by us for the making of avocado tea:

Take the *matured* leaves of the Northrop avocado tree, wash thoroughly, wrap in mosquito netting, and hang in shade to dry. (It takes at least two weeks to dry them.)

For the tea take 25 grains of the dry leaves to a quart of water, pour the boiling water on the leaves and let stand five minutes; then it is ready to drink by adding a little sugar. The tea should be a light amber color.

Yours respectfully,

(Signed) MRS. G. W. BECK.

EXPLORING GUATEMALA FOR DESIRABLE NEW
AVOCADOS*

By WILSON POPENOE, Agricultural Explorer,
United States Department of Agriculture

Ever since G. N. Collins** pointed out the remarkable commercial characteristics of the Guatemalan avocados, North American horticulturists have had their eyes upon Guatemala as one of the most promising sources of new varieties for cultivation in the avocado growing regions of the

*This article was not read at any meeting of the Association, but because of its general interest at this time, it is printed in the report in accordance with a resolution of the Board of Directors.—Secretary.

**In Bulletin No. 77 of the Bureau of Plant Industry, U. S. Dept. of Agriculture. Washington, 1905.



Plate III, Figure 4

The Guatemalan Avocado at its Best

This variety, introduced under the name Nimlioh, is one of the largest found during the course of the explorations in Guatemala. It weighs 3 pounds, and is of excellent quality, the flesh being deep yellow in color and of very rich flavor. Such fruits as this are rare even in Guatemala, where good avocados are more numerous than in most other parts of the American tropics.



Plate III, Figure 5

The Chisoy Avocado

This variety is almost a counterpart of the Trapp, the size and shape being practically the same. The seed, however, is comparatively smaller. In quality the fruit is excellent.



Plate IV. Figure 6

Bringing Avocado Budwood Across the Mountains

The search for good avocados necessitated many trips on horseback across the mountains of northern and western Guatemala, since many of the best trees are in small Indian villages far removed from the railroad. The shipment of budwood shown in this picture was carried from San Cristobal Verapaz to Guatemala City, a distance of about 125 miles.



Plate IV. Figure 7

Eight Thousand Avocados for Seed

These fruits were purchased in the markets of Guatemala City at prices varying from 30 to 50 cents a hundred. They are representative of the avocados sold in Guatemala City throughout the year. It will be noted that they are of good size. In quality the majority are only fair, but a few of them are excellent. The seeds from these and many other fruits were forwarded to Washington to grow seedling stocks on which to bud the selected varieties introduced into the United States from Guatemala during the course of our explorations in that country.

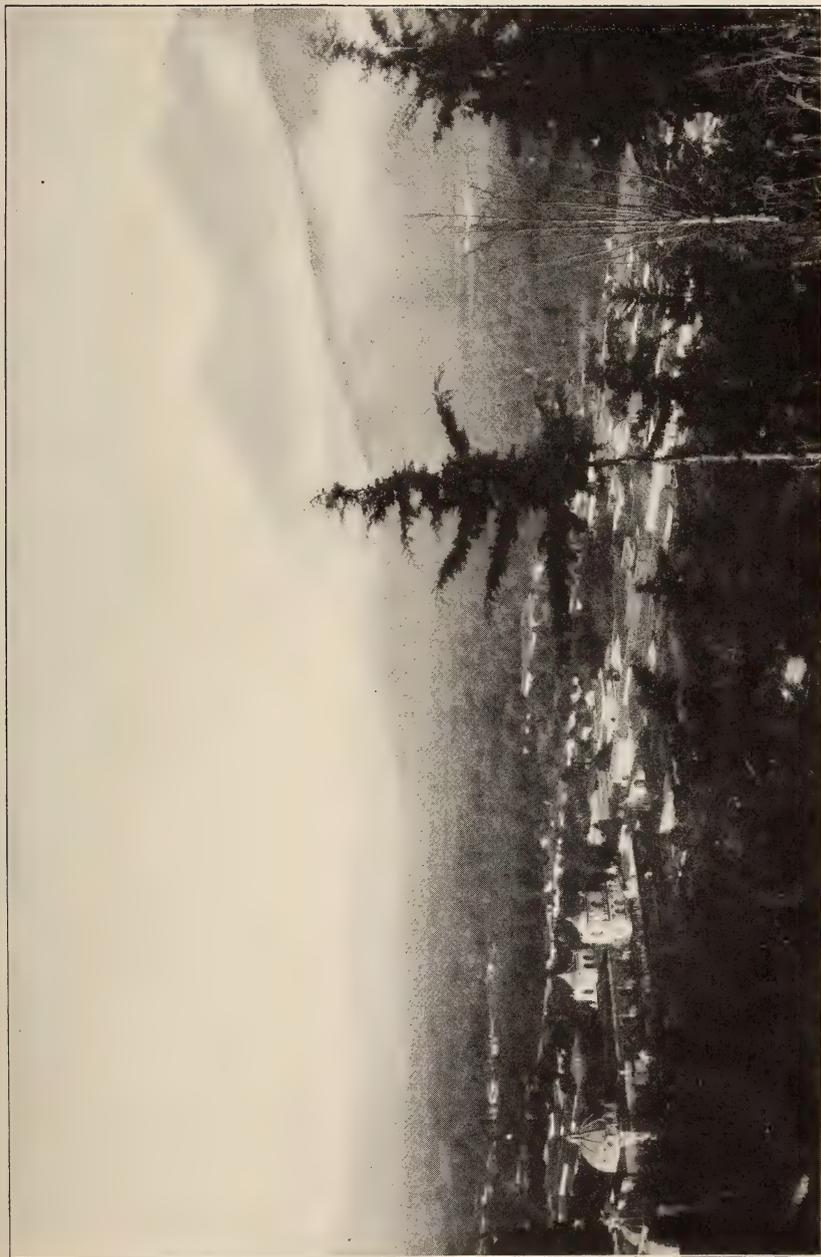


Plate V. Figure 8

The Valley of Antigua

Not only one of the most picturesque and historic spots in the New World, but one of the greatest avocado regions known. It was formerly the seat of the Spanish viceroy, who governed the territory from Mexico to Panama. At the present time it is a great coffee region, the trees which are seen covering the valley floor being planted for shade in the coffee fincas or plantations. Among these shade trees there are many avocados, some of them producing excellent fruit. The lower peak in the distance is the Volcan de Fuego, active as recently as 1887; the higher peak is Acatenango.



Plate VI. Figure 9

**Examining Avocados in the Expedition Headquarters at Purula,
Baja Verapaz**

While canvassing some of the remote Indian villages of northern Guatemala, it was sometimes necessary to make use of such shelters as this for several days at a time. As the climate is not cold, protection from rain is all that is necessary, and while the roof of this abandoned house does not appear to be absolutely impervious to rain, the floor always remained dry on one side.



Plate VI. Figure 10

In the Market at San Cristobal Verapaz

Avocados are among the principal foodstuffs sold in the markets of Guatemalan towns. The Indians have learned to look upon the avocado as one of their principal articles of diet. To a considerable extent it replaces meat. The price at which avocados are sold in these villages of the highlands is ridiculously low,—rarely as high as a half a cent each.



Plate VII. Figure 11

The Upper Limit of Avocado Culture in Guatemala

The city of Totonicapan, at 8500 feet elevation, is the highest spot in Guatemala at which avocados were found. Most of the trees here had been killed or badly injured by cold, but a few had escaped practically unhurt. The best variety found here, Pankay, was introduced into the United States for trial, in the hope that it might prove to be hardier than the average.



Plate VII. Figure 12

A Hillside near Solola

Here may be seen avocado trees growing in the small cornfields of the Indians at an elevation of about 7000 feet. At this elevation the avocado is less abundant than it is at 4000 to 6000 feet, but it does fairly well up to 7500 feet. There are many such scenes as this in the highlands between Guatemala City and Quezaltenango.

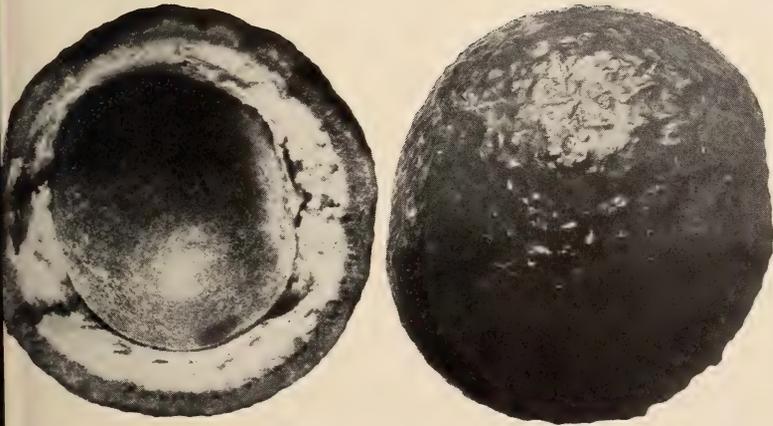


Plate VIII. Figure 13

Primitive Form of the Guatemalan Avocado

(Natural Size)

This small, thick-shelled fruit from the Alta Verapaz is probably a close approximation to the wild form of the Guatemalan avocado. It is the most primitive type which was found. When compared with some of the excellent varieties found in Antigua or San Cristobal Verapaz, the improvement which has taken place in the avocado under cultivation seems greater than that which has been produced in many of the temperate fruits.



Plate VIII. Figure 14

Parent Tree of the Nimloh Avocado

This tree, growing in a back yard at Antigua, illustrates the form commonly taken by the avocado in Guatemala, and shows also the absence of branches close to the trunk. Rarely are the trees allowed to branch low. The crown is nearly always formed 10 or 12 feet above the ground, so that other crops can be planted in the shade below.

United States. The success of Guatemalan varieties in California, where many have been tested during the past twenty years, served to increase this interest in the Central American republic from which they get their name.

It was natural, therefore, that efforts should be made to obtain the best varieties which Guatemala could furnish, for the horticulturists of California and Florida would be satisfied with nothing less. Mr. E. E. Knight, long a resident of Central America, and consequently a firm believer in the avocado, went to the expense of making a trip to Guatemala for the sole purpose of obtaining budwood of certain varieties with which he was familiar. Fortune favored him, and he succeeded in introducing the Rey, Linda, Knight, and Queen, all of which are now being tested in the United States.

At the meeting of the California Avocado Association held in Los Angeles in the fall of 1915, Dr. H. J. Webber introduced a motion to the effect that the Association should petition the Secretary of Agriculture to send an explorer to Guatemala for the purpose of conducting a more thorough search than had yet been attempted, not only for the best avocados in the republic, from the point of view of quality, but also for varieties which would extend the ripening season, varieties which would be particularly frost-resistant and so on.

It was my good fortune to be sent on this mission. I remained in Guatemala from the first of September, 1916, to the middle of December, 1917, thus having not only an opportunity to observe the trees during every month in the year, but also sufficient time at my disposal so that I could visit every portion of the country which gave promise of yielding anything of value. It must be understood that travel in Guatemala is tedious, unless one stays close to the railway which traverses the republic from east to west and runs up the west coast to the Mexican frontier. Most of the important avocado regions are not accessible by rail; hence I had recourse to the saddle for a large part of my work.

Who is it that has said, "a year in the saddle is worth a lifetime by the hearthside?" If his year was spent in the Guatemalan highlands, I believe I would be willing to admit the truth of his assertion, for, with the exception of some hard pulls through rain and mud in the Alta Verapaz, and equally hard pulls across the scorched and barren mountains which lie between Zacapa and the Honduran frontier, I have never spent any more enjoyable days than those during which I viewed the Guatemalan landscape from my McClellan, perched upon a white pony, closely followed, Quijote fashion, by my Indian boy upon a diminutive mule. Together we covered nearly three thousand miles of rocky trail and dusty road, and in spite of the rocks and the dust it was thoroughly enjoyable. Camping by the wayside at sundown, up and in the saddle before the first gleam of day was in the sky, halting from time to time as we came upon an interesting avocado tree, and finally stopping for a day or two in an Indian village which gave promise of yielding interesting avocados,—this was our program week after week. Finally, after locating seedlings which appeared worthy of introduction into the United States, budwood was cut, washed, and packed in tin mailing tubes; a forced march made to Guatemala City, sometimes a hundred and twenty-five miles across the mountains, and the precious freight was deposited in the mails, to be opened only upon reaching Washington,

where sturdy seedlings were waiting to be budded. Imagine our feelings when, after making one of these trips into the back country, and returning with a shipment of budwood, let us say of a variety which seemed especially promising, a cablegram arrived from Washington ten days later bluntly stating that the entire shipment was dead upon arrival! Two weeks' work, the last four or five days under pressure, all for nothing! But before the explorations were completed and I made my plans to return to the United States, every variety which I had selected for introduction was safely growing in the greenhouses at Washington or in the Plant Introduction Garden at Miami, Florida.

The successful establishment of these varieties in the United States is due in a large measure to the efforts of Dr. B. T. Galloway and Edward Goucher of the Office of Foreign Seed and Plant Introduction, the former having general charge of the work and the latter doing most of the budding. Mr. Edward Simmonds, of our Miami Station, and J. M. Rankin, of our Yarrow Station, also deserve much credit in the matter. Naturally enough, some of the budwood which came through was in very precarious condition,—scarcely seeming to be alive, yet not to be discarded as dead. But the skill of Mr. Goucher and Mr. Simmonds made it possible to save all of the varieties, when it appeared, at one time, as though it would be necessary to establish a nursery in Guatemala, propagate budded trees there and bring them home when large enough. Two nurseries were, in fact, started with such an object in view, one at Guatemala City, and the other at Quiriguá, but the difficulty in shipping budwood was later overcome and it was not necessary to bud young seedlings and bring home growing trees.

I say the difficulty was overcome; I might better explain that it overcame itself, and in this manner: toward the end of the rainy season, October, and from then until March, the young branchlets suitable for budwood were covered with a heavy growth of sooty mold and other fungi. In shipment the fungi developed vigorously, and the budwood was nearly all dead upon arrival at Washington. Avocado trees in Guatemala make new growth in February and March, a time of the year when there is no rainfall. This growth was sufficiently mature for use by May or June, and had not yet become discolored with sooty mold, but was green and bright. Nearly all shipments during May, June and July reached Washington in splendid condition. I do not say that the absence of sooty mold was solely responsible for the difference; I only state that nearly all of the shipments in May, June and July were successful, while the majority of those from October to March were failures, or at best only a few budsticks were saved out of each shipment.

METHOD OF SHIPMENT

It may be of interest to explain that our method of packing this budwood was the simplest possible, the budsticks being placed in moist sphagnum moss and wrapped in heavy oiled paper. Sometimes the shipments were forwarded in mailing tubes of tin, sometimes the bundles were wrapped simply in strong brown paper; both were equally successful. Given clean budwood to begin with, the essential point in packing is the amount of moisture added to the sphagnum moss. It is our custom to have the moss bone dry at the time of packing, and then moisten it at the rate of half an ounce of water to an ounce of moss, being careful to have the

measurements exact. Many experiments were tried during the course of the work in Guatemala, in order to determine whether a better method of packing could be devised, but nothing was found which gave such satisfactory results as the method just outlined. I believe if avocado budwood can be obtained clean and free from fungous spores, it can be shipped without the slightest difficulty, but budwood covered with sooty mold, *Colletotrichum*, and other fungi,—my bitter experience in Guatemala makes me prefer to avoid it.

Many thousands of avocado seeds were required at Washington for growing seedling stocks on which to bud these new Guatemalan varieties. We therefore purchased avocados in the markets of Guatemala City, hauled them by cart to our headquarters in the suburbs, and there cleaned and dried the seeds and boxed them for shipment. They were forwarded by freight to New York or New Orleans, and thence to Washington by express. The method of packing employed was the simplest imaginable, the seeds being dried in the shade, with perhaps a few hours in the sun just before they were packed in order to remove all moisture from the parchment-like seed coats, and packed in wooden boxes, with a little hay below and above to act as a cushion and keep them from rattling around. There was practically no loss due to decay in transit; some of the seeds were found upon arrival in Washington to be infested by the broad-nosed grain weevil (*Caulophilus latinasus*), and were thrown out; while some which were taken from slightly immature fruits shrivelled and became useless. But in general the percentage of loss was small. It may be of interest, *en passant*, to note that the fruits purchased for seed in no instance cost us more than 50 cents a hundred, and rarely more than 35 cents. Yet they were not culls or in any way inferior, but were good fruits which would bring 50 cents each in the eastern United States about Christmas time.

RACES

Before entering upon a consideration of avocado culture in the Guatemalan highlands, it is well to speak of the various races of avocados and their occurrence in Guatemala. It is becoming more and more apparent, as the years go by, that the first question to be asked concerning any avocado is, To what race does it belong? And it is equally important to ask, when considering any particular avocado region, What races are grown there? All three races at present known to horticulture,—the West Indian, the Mexican, and the Guatemalan,—are found in Guatemala, but the first two are far exceeded in importance by the third. It is only the Guatemalan race, in fact, that needs to receive our attention, since other regions possess much better varieties of the West Indian and Mexican races. The Mexican race is scarcely known in Guatemala, only two trees being seen during the entire course of my year's travel in the country. I had reports of others from the Indians in several places, and am inclined to think they may occur wild in some places, but they cannot be abundant. The varieties seen were small and horticulturally inferior, suggesting by their size that they had never been improved and were the product of trees not more than one or two generations removed from the wild. The West Indian race is well known in the lowlands of both coasts, ascending to about 2500 feet. It is nowhere grown very commonly, however, and many of the avocados seen in the markets of lowland towns are fruits of the Guate-

malan race produced in the highlands and carried perhaps fifty miles on the backs of Indians.

CLIMATIC CONDITIONS

There is probably no place where one gains a clearer idea of the different climatic requirements of the various races than in Guatemala. On the coast you meet with practically nothing but the West Indian race. Occasionally a tree of the Guatemalan race will be seen, but it does not seem to be at home, and it is said that they do not fruit well. Ascending toward the central plateau from either side, the West Indian race disappears at approximately 2500 feet, and at 3000 feet or slightly higher the Guatemalan commences to become common. The regions in which this race is most abundant lie between 4000 and 6000 feet. Above the latter elevation it becomes less common, being rare at 7500 and disappearing entirely between 8500 and 9000. The two trees of the Mexican race which I have mentioned were growing at elevations close to 7000 feet, but there is no doubt that they could be successfully cultivated much higher.

The mere mention of these elevations, without an explanation of what they indicate in terms of minimum temperature, will not mean much to North Americans. It is necessary, therefore, to consider in detail the relation between altitude and climate in Guatemala. In this republic, as in Mexico and some other parts of tropical America where high mountains are present, three climatic zones, dependent entirely upon elevation, are generally recognized. These are the *tierra caliente* (as it is called in Spanish) or hot region, extending from sea level to about 2000 feet; the *tierra templada* or temperate region, comprising the territory between 2000 and 6500 feet; and the *tierra fria* or cold region, which extends from 6500 feet to the upper limit of cultivation,—in Guatemala about 10,000 feet.

It has seemed to me that this division of all the territory between sea level and 10,000 feet into three climatic zones,—at best an artificial arrangement, since each zone merges imperceptibly into the next,—would be more useful to horticulturists if based upon the presence of certain well known plants whose climatic requirements, in regard to tolerance of cold, are well known. This is, in fact, practically the only means by which we can form a reasonably accurate idea of these zones, since climatological data are lacking, and there would otherwise be no way of determining, even approximately, the minimum temperatures of any particular region. Many of the well known tropical fruits, such as the mango, the tamarind, and the sapodilla, have been planted in California and Florida, and we have a fairly accurate idea of the minimum temperatures to which they can be subjected without injury. By citing the behavior of some of these fruits at various elevations in Guatemala we can perhaps obtain an idea of the temperatures in the different climatic zones. In discussing these zones, however, I am going to term them *tropical*, *subtropical* and *temperate*, in place of *hot*, *temperate*, and *cold*, as indicating more accurately their horticultural character. In the tropical zone, grow only those fruits which horticulturists term *strictly tropical*; in the subtropical zone, such fruits as the loquat and cherimoya are found; in the temperate zone, the fig thrives and even the temperate fruits are fairly successful.

The tropical zone is characterised by the breadfruit tree (*Artocarpus incisa*), the custard apple (*Annona reticulata*), the sour-sop (*Annona*

muricata), the tamarind (*Tamarindus indica*), the star-apple (*Chrysophyllum cainito*), and the sapote (*Achradelpha mammosa*). It is the zone in which all of the commercial banana plantations are found, the zone in which the pineapple is most successful, and in which the mango reaches its greatest development. It will thus be seen that it is never subjected to low temperatures, the minimum being considerably higher than that of any portion of either Florida or California.

The lower limit of this zone is the level of the sea, and the upper limit I would place between 2500 and 3000 feet. This, it will be noticed, corresponds with the range of the West Indian race of avocados.

The subtropical zone, which may be considered the great horticultural zone of the republic, is characterized by such fruits as the cherimoya (*Annona cherimola*), the jocote (*Spondias mombin*), the white sapote or matasano (*Casimiroa edulis*), and the loquat (*Eriobotrya japonica*). It extends approximately from 3000 feet to 7000 or 7500 feet. This is the zone of the Guatemalan race of avocados.

Toward the upper limit of this zone frosts are fairly common, and at about 7500 feet the citrus fruits disappear. The lower levels, between 4000 and 6000 feet, possess delightful climates, scarcely excelled anywhere in the world.

The temperate zone is characterized by the fig, and by most of the temperate fruits, which have, of course, been introduced into Guatemala since the Conquest. The ones most commonly grown are the peach, the apple, and the pear. The lower limit of this zone is about 7500 feet, the upper limit approximately 10,000, though it might be considered to extend to the summits of the highest peaks.

The amount of rainfall varies greatly in different parts of Guatemala. In some of the principal avocado regions, such as Antigua, it is 30 to 60 inches per annum; in some parts of the Alta Verapaz, it is as great as 130 or 140 inches. The avocado appears to make healthier growth in those regions where the rainfall is not over 75 inches. In most parts of Guatemala the rainfall is not distributed evenly throughout the year, but occurs between the months of May and October. In the Alta Verapaz the rainy season is much longer, March and April being the only dry months.

HARDINESS OF THE GUATEMALAN RACE

The hardiness of the Guatemalan race of avocados is being determined both in California and Florida, and we will soon have excellent data covering a number of varieties. It has been thought, however, that varieties might occur in Guatemala which were much hardier than any yet known in the United States. Everything tends to indicate, that hardiness, in the avocado, is much more a matter of *race* than of *variety*. No variety of the West Indian race has yet been found which is nearly as hardy as any of the Guatemalan, and no variety of the Guatemalan has been discovered which will withstand as much cold as the Chappelow or other varieties of the Mexican race. Within the race there is a certain amount of variation in regard to hardiness, but it is not so great, expressed in degrees of temperature, as the difference between the Guatemalan and the Mexican or the Guatemalan and the West Indian races in average hardiness.

Severe frosts are not experienced in Guatemala at elevations lower than 7000 feet. As we desired to find the hardiest varieties obtainable for

trial in Florida and California, I went to the upper limit of cultivation, and then worked downward until I encountered the first avocado trees, which were at 8500 feet. Here I found a number of trees, most of them killed back or severely injured by cold. One, however, had not been injured in the slightest degree, and as it was a good fruit,—small seed and flesh of excellent quality,—I secured budwood which is now being propagated in Washington. Whether this variety, which comes from Totonacapan and which we have named Pankay (Fig. 21), will prove to be much hardier than the varieties already growing in the United States, I cannot say. It seems to me it stands a reasonable chance of being distinctly hardier than the average; yet it is impossible to determine what external causes may have been at work to produce the appearance of superior frost resistance.

The avocado is cultivated in Guatemala about a thousand feet above the zone in which citrus fruits are grown. One might assume from this that the avocado is much hardier than the orange. Yet I do not know that this is the case. There are so few trees of either the avocado or the orange above 7500 feet that it is difficult to obtain trustworthy data regarding their comparative hardiness. Both of them are commonly cultivated only in regions free from injurious frosts. The Guatemalans have not carried citrus culture into regions so cold that the trees require protection from frost, and the number of avocado trees in the cold region,—above 7500 feet—is very small.

We know from experience that it takes generations to acclimatize a species so that it will stand a decidedly greater amount of cold. You cannot plant a tree in a climate colder than that to which it has been accustomed, and expect it, with protection for a few winters, to become more hardy. Nature does not work that way. Many trees must be planted, the hardiest ones selected and propagated; then the new generation thus obtained must be selected for hardiness. Continuing this process for many generations, a considerable increase in hardiness may be the result. But it does not appear to me that such a process has been going on at high elevations in Guatemala. I would expect, therefore, that varieties from 8500 feet, such as our Pankay, might withstand a few degrees more frost than the average Guatemalan variety, but I would not dare to hope for them to prove as hardy as the Mexican race. Time only will tell. We must wait and see.

AVOCADO REGIONS

The principal avocado growing regions of Guatemala are rather widely scattered throughout the highlands of the republic, thus possessing some widely different soil types. Antigua, certainly the most important region in all Guatemala if not one of the most important in the world, lies in a beautiful valley surrounded by volcanoes and high hills. The valley floor is about 5100 feet above sea level; it is planted to coffee, with some patches of alfalfa here and there, and much maize and black beans around the edges. The soil is a loose volcanic loam, almost sandy in texture, black, deep and very fertile. It seems very retentive of moisture, and well suited to the avocado, the trees in this valley being vigorous and healthy in appearance, and producing much fruit.

It is the custom in this valley to plant large trees to shade the coffee bushes; for this purpose the tree called in California the Australian Silk

Oak (*Grevillea robusta*) is largely used, often in conjunction with a native species of Inga, a leguminous tree of medium size and spreading habit. Avocados spring up in these coffee plantations, from seeds dropped by the laborers. When one of these seedlings occurs in a spot where it can develop and become a part of the shade tree system, it is usually left; if its situation is unfavorable it may be pulled up or crowded out by other trees which it happens to be near. In most of the coffee plantations of this valley there are numerous avocado trees scattered here and there. Two hundred was the largest number I counted in any one plantation, and rarely are there more than fifty, but the presence of even fifty avocados in a single plantation of ten or twenty acres is rare in the tropics, for fruit trees are usually scattered and almost never cultivated in regular orchards as they are in the North. Some of the best avocados in all Guatemala are to be found in these coffee *fincas* of Antigua, and I shall always look back on that delightful little valley as one of the pleasantest spots it has ever been my privilege to visit. Its climate is equable and not excelled by that of Southern California; its setting is indescribably beautiful; its historic background is fascinating, with its memories of Alvarado and Bartolomé de las Casas, Protector of the Indians; and its appearance is exceedingly picturesque.

Next to Antigua, I believe the most important avocado region is San Cristóbal Verapaz, far to the north of Guatemala City, and reached only by riding three days across the mountains, or by going down to the coast, taking a boat up the Polochic River to Panzos, the train twenty-eight miles further to Pancajehé, and a horse or mule from there for a long day's ride. I was fortunate in making the acquaintance of an American coffee planter in this region, a man of the type which Guatemalans would describe as *muy simpatico*. Without the assistance of R. W. Hempstead, in fact, I doubt if it would have been possible to obtain the excellent avocados from San Cristóbal which we finally succeeded in shipping to Washington. Twice did I cut budwood from the trees, pack it carefully, and forward it with all haste, only to receive a cablegram that it was dead upon arrival. With Mr. Hempstead's assistance, however, it was finally possible to land budwood of three splendid avocados from San Cristóbal, together with two from nearby Purulá, safely in Washington.

San Cristóbal Verapaz lies at an elevation of about 4500 feet. Consequently it is not subjected to low temperatures. It has a rainfall probably twice that of Antigua, and the soil is a heavy, tenacious clay. The town is filled with little patches of coffee, owned principally by the Indians, and many avocado trees are scattered here and there among the coffee bushes.

The village of Purulá lies southeasterly from San Cristóbal, just about a day's ride. Its elevation is 5100 feet, its climate much cooler than that of San Cristóbal, yet not cold enough to experience severe frosts. One can tell by the character of the cultivated vegetation approximately how much frost these mountain villages experience. In Antigua, for example, the presence of the royal palm (*Roystonea regia*) indicates very definitely that severe frosts are not experienced, though there may be occasional light frosts which scorch the leaves of the coffee bushes. Purulá does not grow royal palms, but has other plants characteristic of mild situa-

tions, and in addition one can judge from the altitude that it does not become very cold.

Not far from Antigua, the village of Amatitlán, close to the lake of the same name, possesses excellent avocados, some of them appearing to ripen earlier than would be expected at this elevation,—approximately 4000 feet. As will be explained later on, the ripening season in Guatemala is largely dependent upon altitude.

Westward from Guatemala City, the valley of Panajachél, on the shore of Lake Atitlán (elevation 5400 ft.) is a famous spot for avocados, but from my examination of them I did not think them equal in quality to those of other regions. The soil in this small valley, which opens upon the lake, is clearly alluvial in origin, and like most alluvial soils is excellent.

Momostenango, northward from Quezaltenango one day's ride, is the highest spot at which avocados were found abundantly. Its elevation is approximately 7500 feet. The situation is a protected one, and probably much warmer than most others of the same elevation. The soil here is a mixture of clay and volcanic tufa, very curious in appearance.

It has seemed to me, upon comparing the avocado trees grown upon these various types of soil,—sandy loams to heavy clays,—that the largest trees were found on clay soils. Yet there are some good sized trees upon the volcanic loam of Antigua, and I would personally prefer this soil to any other I saw in Guatemala for avocado culture.

HABIT OF THE GUATEMALAN AVOCADO

In character of growth, the Guatemalan avocado presents two extremes; the broad and spreading type and the tall and strict. There are intermediate stages, of course. In the Alta Verapaz most of the trees incline toward the tall and strict type; in Antigua the spreading form is perhaps more common. A notable characteristic of nearly all the trees is the absence of branches close to the ground. In coffee plantations especially is this conspicuous, the lower limbs being pruned off to prevent their interfering with the coffee bushes. The crown is rarely formed closer than 10 feet to the ground.

The Guatemalans do not observe closely the behavior of their avocados and rarely are able to give trustworthy accounts concerning the age of the trees, their bearing habits, or similar characteristics. In general, it seems to be the opinion that seedlings come into bearing at the age of six to eight years, which coincides rather closely with the behavior of this race in California. The bearing life of the tree is not definitely known, but it would seem to be at least 50 years, and in many instances considerably more. Some of the growers affirm that a tree does not produce its best fruit until 25 or 30 years old.

CULTURE

So little cultural attention is given avocados in Guatemala that it is scarcely necessary to touch on this subject. Experience obtained in California and Florida is a better guide than the observed practices of the Guatemalans, because the latter make no systematic effort to meet the tree's cultural requirements. The method followed in cultivating coffee plantations in Antigua has been recommended for avocados in California, but I do not know what success will result from its application. It con-

sists in clearing the ground two or three times a year with a hoe, but never cultivating deeply. The avocado trees which grow among the coffee bushes in Antigua plantations certainly appear healthy and vigorous, but it does not necessarily follow that this method of cultivation is the best. They might be even more healthy and vigorous under another.

REGULARITY OF BEARING

I was somewhat surprised to observe the irregularity in bearing which seems to characterize most of the trees in Guatemala. How much of this irregularity is due to faulty culture, and how much is inherent, I do not know. I hope that much of it can be eliminated when the trees are planted in our orchards and their needs carefully studied and supplied. But it was rare to find a tree which bore heavily two years in succession. The Guatemalans usually say that the trees bear a heavy crop one year and a light one the following, but I saw many trees which bore heavy crops one year and nothing the next. This is a point which I do not believe we have emphasized sufficiently in this country, and I would strongly urge all prospective planters of Guatemalan avocados to investigate thoroughly the bearing habits of the varieties they propose to plant. Unfortunately, we do not know a great deal about the bearing habits of many of our varieties, for they have been in cultivation but a short time. But it appeared to me, from my observations of seedling trees in Guatemala (it is, of course, understood by all North Americans that every avocado tree in Guatemala is a seedling) that there was a remarkable difference in this respect, and some varieties I would look upon as likely to be much more regular bearers than others. It is probably more important to have a tree that bears *regularly* than one that bears *abundantly*; by this I mean a variety which will produce a fair crop every year rather than one which will produce an enormous crop one year and nothing the following.

SEASON

Travelers have returned from Guatemala City with accounts of avocados every month in the year. It is true that there are avocados in the markets of the capital throughout the year, but it is a mistake to infer from this that avocados, in any given section of Guatemala, ripen continuously from January to December. Guatemala City draws upon all the surrounding country for its avocados, and the surrounding country varies in elevation. The ripening season of avocados, is largely dependent upon elevation, hence by bringing in avocados from an altitude of 3000 feet part of the year, from 5000 and 6000 the rest, the market can be supplied continuously. This ideal condition is also maintained in part by the custom, far from ideal, of picking green and immature fruit at seasons of the year when fully mature fruit is not available. I have purchased hundreds of fruits in the markets of Guatemala City,—fruits calculated to be eaten by the unsuspecting public,—which were so green they shrivelled upon softening, and the seeds within them were so immature they could not be used for planting. This matter is doubly important to us when we remember that a similar crime has sometimes been perpetrated upon the North American public by avocado growers in Florida and California. I know of nothing better calculated to discourage people from eating avocados than this. Except in those varieties which become purple upon reaching matur-

ity, it is next to impossible to distinguish an immature from a mature avocado simply by looking at it. But when it comes to eating it, nothing is easier. A mature avocado can be eaten, and an immature one cannot,—at least no connoisseur will stoop so low as to do it, and the tyro will not do it more than once. I urge upon the consideration of every avocado grower in California and Florida the importance of suppressing this pernicious custom in the United States before it has obtained a foothold.

In general, I found the variation in ripening season, due to differences in elevation, to be one month for every thousand feet. Where peculiar environmental conditions come into play, such as the protected situation of Panajachél, this rule does not hold good, but in most cases it does. At Senahú, in the Alta Verapaz (3200 ft.) the principal season of ripening is November to February; at Amatitlán (3900 ft.) it is January to April; at San Cristóbal Verapaz (4600 ft.) it is February to May; at Antigua (5100 ft.) it is March to June; at Purulá, Baja Verapaz (5150 ft.) it is March to June; at Panajachél (5300 ft.) it is February to May; at Chimaltenango (6000 ft.) it is April to July, and at Momostenango (7400 ft.) it is May to August.

We have noticed in the United States that the same variety of avocado does not ripen at the same time in Florida and in California. Climatic differences prevent it. Judging from the principal ripening season of Guatemalan avocados in these two states, it seems to me that California corresponds rather closely to an elevation of 6000 to 7000 feet in Guatemala, while South Florida corresponds to an elevation of 3000 to 4000 feet. It might be expected, then, that the average variety growing at 6500 feet in Guatemala would, if transplanted to California, ripen at approximately the same season, while the average variety from 3500 feet transplanted to California would ripen much later than it does in Guatemala, but if planted in Florida would ripen at about the same time.

The majority of avocados in any given section of the Guatemalan highlands ripen at approximately the same season. This would be expected. Considering Antigua, for example, only half a dozen trees were found which commenced to ripen their fruits in October and November, the vast majority not beginning to mature until February. With an occasional exception, the earliest varieties are of inferior quality. They are so scarce that they make no impression whatever upon the market, but from the standpoint of California avocado growers such varieties, if of good quality, are very important, as they may ripen sufficiently early, when planted in that state, to be marketable during the holiday season. This remains to be seen.

Summing up the question of season, it may be said that variation is due to two causes, first, altitude as expressed in its effect upon temperature, and second, the normal difference exhibited by seedlings. The first factor is of little importance to us, but by giving attention to the second we should be able to obtain avocados which will greatly extend the period during which ripe avocados are available.

PICKING AVOCADOS

The Guatemalans have an interesting rule governing the picking of avocados. I do not know that it will hold good in the United States, but as far as I could observe it was fairly trustworthy in Guatemala. They

consider that the fruit is mature and ready for picking when the tree comes into bloom. It is better to allow the fruit to remain on the tree several months longer, as its flavor becomes much richer; but the appearance of flowers is considered to indicate the earliest moment at which the fruit can be picked, if it is to ripen properly, without shrivelling, and possess reasonably rich flavor.

The maturity of certain varieties is indicated by the appearance of purple color upon the fruit, but fully half of the avocados found in Guatemala are green in color when mature and there is no reliable indication of maturity, unless it be the appearance of flowers upon the tree.

THE FRUIT

We now come to a consideration of the fruit itself, and I believe it will interest the horticulturists of California and Florida to know something of the range of variation which occurs in Guatemala in the principal fruit characters. I have made an effort to observe the extreme range, and also to note the average of each character. In the United States we are already familiar with a certain amount of variation in the Guatemalan avocados; it is interesting to compare the variations known to us with those which occur in Guatemala, especially where they concern characters of marked commercial importance, such as the season of ripening and the quality of the fruit.

In northern Guatemala it is a common occurrence to find avocado trees growing in a semi-wild state. One might almost infer that they were truly indigenous, yet after the most careful investigation which I could make I was unable to reach this conclusion. The region in question has been so many centuries under cultivation, and the forest has been cleared away so many times to make room for maize fields, that one hesitates to assume that any tree not common in the most infrequented places is truly indigenous. I have seen avocado trees in the edge of the forest, but the thought has always arisen in my mind that a seed might have been dropped there by some passing Indian. We must consider, then, that the native home of the Guatemalan avocado has not certainly been determined up to the present time; I am strongly inclined to suspect that it may be in extreme northern Guatemala or across the Mexican frontier in the states of Chiapas and Tabasco, but this remains to be proved. But what I started out to say was this: semi-wild avocado trees, those growing in the edge of the forest or in abandoned places throughout the mountains of northern Guatemala, where the most primitive forms of the Guatemalan avocado appear to occur, nearly always produce fruits of round form (Plate VIII, Fig. 13). I believe it almost safe to assume that the primitive form of the Guatemalan avocado is round, and that the pear shaped and elongated forms have arisen in cultivation. In the principal avocado regions of Guatemala, such as Antigua and San Cristóbal Verapaz, round and pear-shaped fruits are about equally common. Extremely slender ones are rare; the broadly pear-shaped fruits are very common. The majority of small fruits are round. Oval and elliptical forms are not rare, but are less common than the round and pyriform. It can thus be seen that we already have, in the United States, practically the entire range which this race exhibits with regard to shape.

In size we also have approximately the same range of variation which

is found in Guatemala. There are fruits of smaller size than any of those cultivated in California or Florida, but better cultivation would probably increase the bulk of such fruits and bring them up to six or eight ounces in weight. It is notable that avocado trees growing in unfavorable situations, where the ground is exceedingly poor and hard and there is a severe struggle with surrounding vegetation, usually produce small fruits in which the seed constitutes a large proportion of the entire weight. The smallest variety examined weighed three ounces. In this case, however, the size did not appear to be due to unfavorable cultural conditions, but was an inherent characteristic. The largest fruits found,—varieties included in our introductions under the names Nimlioh and Tertoh,—weighed about three pounds. The common size is from eight to twelve ounces. Fruits of a pound in weight are also abundant, and there are many which weigh 20 ounces, but above this there are comparatively few.

North American avocado growers have already come to recognize that an avocado need not have a rough skin to be a Guatemalan, though this was at first looked upon as one of the characteristics of the race. Many varieties have rough skins, but many do not. Some are as smooth as the Trapp or other varieties of the West Indian race, yet they are none the less Guatemalan avocados. A rough surface indicates a thick skin, and a smooth surface a comparatively thin skin. No variety was seen in Guatemala in which the skin was very thick, yet smooth on the surface, and conversely none was seen in which the skin was thin yet rough on the surface.

In the past we have probably placed too much emphasis in the United States upon the thick skin of the Guatemalan race. True enough, it is commonly thicker than in any other race of avocados at present cultivated, but there are varieties in Guatemala which are in every other respect typical of the Guatemalan race, yet the skin is no thicker than that of the Trapp. One of the varieties in our collection, the Ishim, has a skin thinner than that of the Trapp, yet it would be foolish to say that this fruit does not belong to the Guatemalan race. Some growers have desired to separate the Guatemalan avocados into two groups, the thick skinned and the "hard-shelled." This is perhaps possible, although there is every intermediate stage between the thickest and the thinnest skinned, so that no distinct line can be drawn separating the two groups. The question is, whether anything will be gained by such a classification, based solely upon one character. One might speak of thin-skinned Guatemalans and thick-skinned Guatemalans, but if we go farther and form two groups in our general classificatory system, we may lose sight of the important racial characteristics which are common to the thick skinned and the thin skinned alike.

It has been suggested that some of the thin-skinned Guatemalans might in reality be crosses between the West Indian and the Guatemalan races. This must be admitted as a possibility, yet I have seen no trees whose character strongly suggested such a cross.

In figures, the thickness of the skin varies from a sixteenth to a quarter of an inch. In the Alta Verapaz skins of such thickness and brittleness are found that it is difficult to open the fruits with a knife. They are usually broken in the hands. It has sometimes been thought that thickness of skin was correlated with altitude; that is, the thickest skins should be found at the highest altitudes, because the fruit needs more protection

when grown in a cold climate. This is not the case. There is no relation between altitude and thickness of skin. The thickest skinned varieties were found in the Alta Verapaz at elevations of 3000 to 5000 feet, while the avocados of Momostenango (7500 ft.) and Totonicapan (8500 ft.), the latter at the uppermost limit of avocado culture, had comparatively thin skins.

The two common colors of Guatemalan avocados, green and purple, are found everywhere; I was not able to notice that one was decidedly more frequent than the other in any particular region. Yellowish greens are sometimes seen, and varying shades of purple; of the latter, maroon is the lightest shade, and a brilliant purplish black the deepest. Bright green and deep purple are the two common colors, however. In some parts of the tropics the natives have a preference for avocados of a certain color, but I was unable to find any well-marked trend in this direction anywhere in Guatemala.

Comparing the Guatemalan avocados at present grown in California with those of Guatemala itself, I feel that California has been fortunate in having received so many fruits of good quality. For I believe many of the best California varieties, such as Sharpless, Dickinson, and Blakeman, are better than the average fruits sold in the markets of Guatemala City. But in a lottery the man who holds five tickets has a better prospect of winning than the man who holds one. The law of chance is inviolable. So it is that among the many thousands of avocados found in Guatemala, a few very superior ones are bound to occur, and these I believe to surpass in quality anything yet known in California. The California varieties apparently had good parentage, and they are as a rule of good quality; but an occasional variety which I have found in Guatemala has impressed me, viewing it as impartially as possible, as far superior to anything which I have ever seen in California. The flesh is of deeper yellow color, smoother, more buttery texture, and richer flavor than in any varieties yet known in the United States.

In many fruits grown in the Guatemalan highlands,—it might almost be said in the majority of fruits,—the flesh is cream colored. In some it is cream-yellow, and in a few it is deep yellow. Rarely is there any objectionable fiber. Fiber seems to be much more characteristic of the Mexican race than it is of the Guatemalan. Even the most primitive forms seen in the Alta Verpaz did not have noticeable fiber in the flesh.

The flavor of nearly all Guatemalan avocados is pleasant if the fruits are fully ripe, but some greatly exceed others in richness.

We have thought, from a study of the Guatemalan varieties cultivated in California, that this race of avocados was characterized by a smaller seed, in comparison to the size of the fruit, than either the West Indian or the Mexican race. It has seemed to me, however, that the California varieties are not typical in this respect of the Guatemalan race, most of them having smaller seeds than the average noted in Guatemala. Many of the fruits purchased in the markets of Guatemala City to furnish seed for planting in the United States,—and there were about 30,000 of them, from many different trees,—had seeds which were so large as to make the variety of no value horticulturally. It takes much searching to bring

to light a variety having a desirably small seed, combined at the same time with other desirable characteristics.

Pyriiform and elongated fruits are not so likely to have large seeds as round ones; but it is not true, as has sometimes been thought, that all round avocados have large seeds. Quite a few were found in which the seed was comparatively very small. Some such varieties are included in our introductions.

The seed is almost invariably tight in its cavity. I would consider this, in fact, one of the characteristics of the Guatemalan race. In one locality a few trees were found whose fruit had seeds slightly loose in the cavity, but these were the only ones out of thousands examined.

VARIETIES INTRODUCED FOR TRIAL*

I wish now to present brief descriptions of the twenty-three varieties which we have introduced from Guatemala for trial generally throughout the avocado growing regions of the United States. More complete descriptions of these fruits will appear in a bulletin on the avocados of Guatemala which the Department of Agriculture expects to publish in the near future, and they will also be sent to growers who receive budwood or trees of these varieties for trial. I will therefore limit myself at this time to a brief mention of the important characteristics and interesting features of each variety.

The names which we have given these avocados are taken from the Maya tongue, which, in some twenty dialectic forms, is the language spoken by the aboriginal inhabitants of Guatemala and southern Mexico. It has been thought that the use of Maya names might serve to distinguish these varieties of foreign origin from those developed in California.

Following the name of each variety I give the number under which the variety was collected in Guatemala. This series of numbers runs up to 36, but some of the varieties originally included in the set were, upon more detailed examination, found to be defective in some point, and were not introduced. Only 23 out of the original 36 varieties are therefore represented in the collection. Finally, I give the inventory number of the Office of Foreign Seed and Plant Introduction (S. P. I.), under which the variety is recorded in Washington.

Probably the most important point to be tested in connection with these varieties is the character of growth they will make in the United States. Most of the Guatemalan varieties which have been discarded in California during the past five years have had to be dropped because of some defect in habit of growth; the most common defect has been a tendency on the part of young budded trees of several varieties to die during the first or second year without any apparent cause.

It seems probable that these varieties, when grown under good cultivation in the United States, will in many instances produce fruits considerably larger than those which were borne by the parent trees in Guatemala. The weights here given may not hold when the varieties come into bearing in the United States.

*I am indebted to Robert N. Jones of the office of Foreign Seed and Plant Introduction for the drawings illustrating these varieties. They are all from photographs or diagrams made by me in Guatemala.

LAMAT (No. Three) S. P. I. 43476. From Amatitlan, Guatemala. Elevation 3872 ft. A very productive variety of good size, attractive shape and appearance, and good quality. It is broadly oval in form, and weighs 14 to 20 ozs. The surface is smooth, bright green, the skin of average thickness, about one-sixteenth inch or slightly more. The flesh is free from fiber, cream colored, and of pleasant flavor. The seed is comparatively small. The season of ripening at Amatitlan is from November or December to March; the variety may therefore be classed as early to midseason. (See Fig. 15)

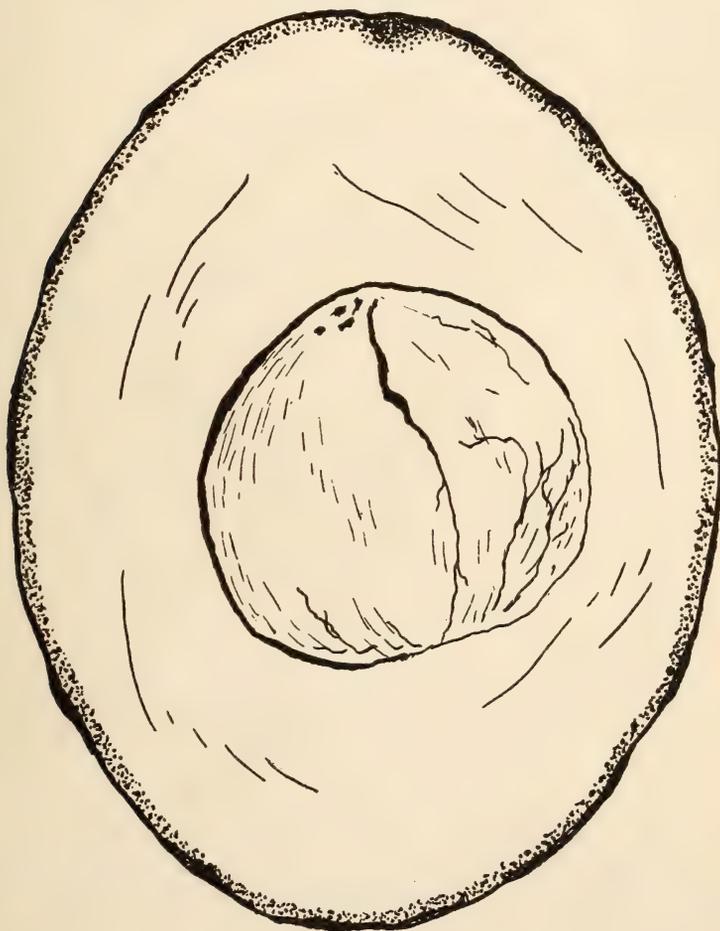


Figure 15

LAMAT

A smooth, green fruit averaging about a pound in weight. A productive variety ripening early to midseason.

KANOLA (No. Six) S. P. I. 43560. From San Lorenzo el Cubo, near Antigua, Guatemala. Elevation about 5600 feet. Interesting particularly for its earliness. It ripens two or three months ahead of most other varieties of its region. In addition it is a handsome little fruit of round form, and the tree is very productive. The weight is about 8 ounces, the surface almost smooth and deep purple in color. The skin is woody, the flesh yellow, of excellent flavor and quality. The seed is comparatively small. The season at San Lorenzo is October to April. Because of its long season this may be a particularly good variety for the home garden. (Fig. 16)

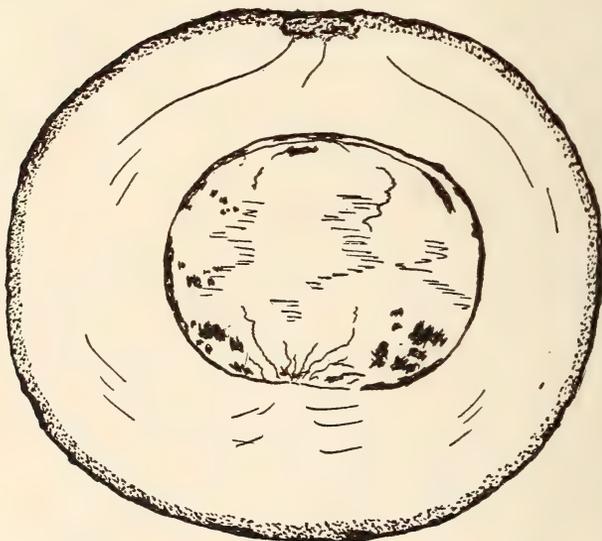


Figure 16

KANOLA

A very early and productive little fruit of fine quality. Slightly rough, deep purple in color, about 8 ounces in weight.

ISHKAL (No. Seven) S. P. I. 43602. From Guatemala City. Elevation 4900 feet. A variety possessing a considerable reputation locally as a fruit of fine quality. It is spherical to broadly obovoid in form, and weighs about 8 ozs. The surface is somewhat rough, deep purple in color, the flesh deep yellow and of very rich flavor. The seed is medium sized or slightly large. The fruits of this variety which were examined were not up to the usual standard, hence the description here given probably does not do the variety justice.

COBAN (No. Eight) S. P. I. 43932. From Coban, Alta Verapaz, Guatemala. Elevation 4325 ft. A fruit well known in Coban for its excellent quality. In addition it has a small seed and other desirable characteristics. It is pear-shaped or obovoid in form, and weighs about

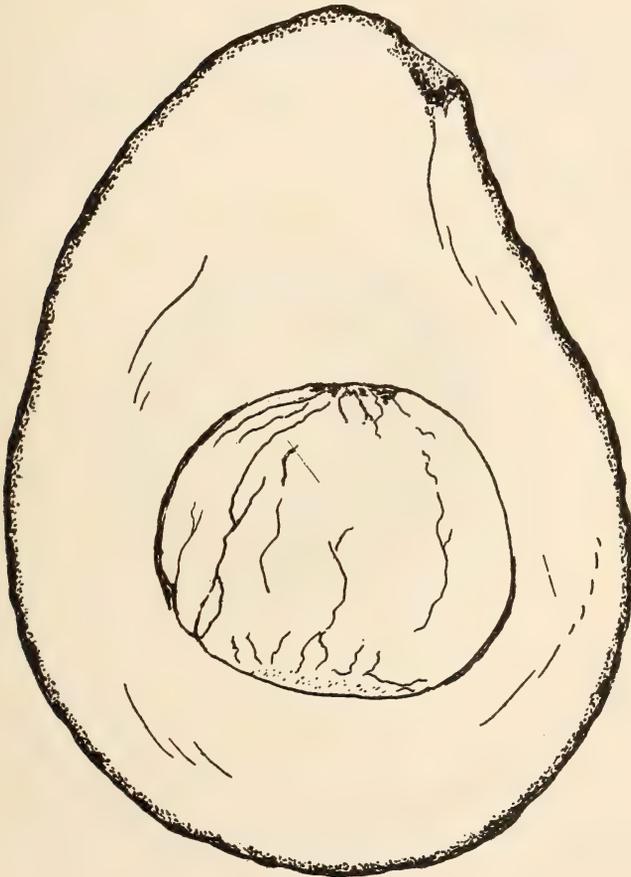


Figure 17 **COBAN**
Slightly rough, green, about 15 ounces in weight. A fruit of excellent quality, ripening midseason.

15 ounces. The surface is slightly rough, deep green in color, the skin moderately thick. The flesh is clear, deep yellow, and of very rich flavor. The seed is rather small. Ripening season February and March at Coban. A midseason sort. (Fig. 17)

KASHLAN (No. Ten) S. P. I. 43934. From San Cristóbal Verapaz, Guatemala. Elevation 4550 ft. A good sized fruit of attractive shape and unusually fine quality. In form it is broadly oval. The weight is about 20 ozs. The surface is almost smooth, green in color, the

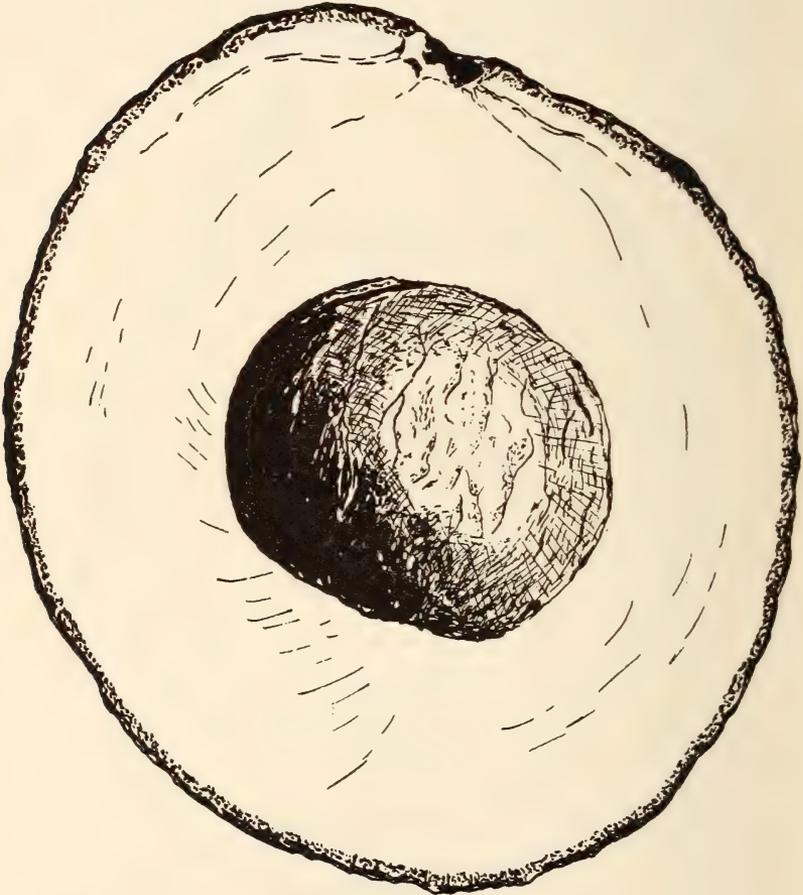


Figure 18.

KASHLAN

An unusually fine fruit, almost smooth, green in color, about 20 ounces in weight. Early to midseason.

skin moderately thick. The flesh is deep yellow, free from discoloration of any sort, and of very rich flavor. The seed is unusually small. The ripening season at San Cristóbal is January and February,—early to mid-season. (Fig. 18)

CHISOY (No. Eleven) S. P. I. 43935. From San Cristóbal Verapaz, Guatemala. Elevation 4550 ft. One of the finest varieties in the collection, almost identical with the Trapp of Florida in form and size. It weighs 20 to 24 ozs. The surface is pebbled, bright green in color, the

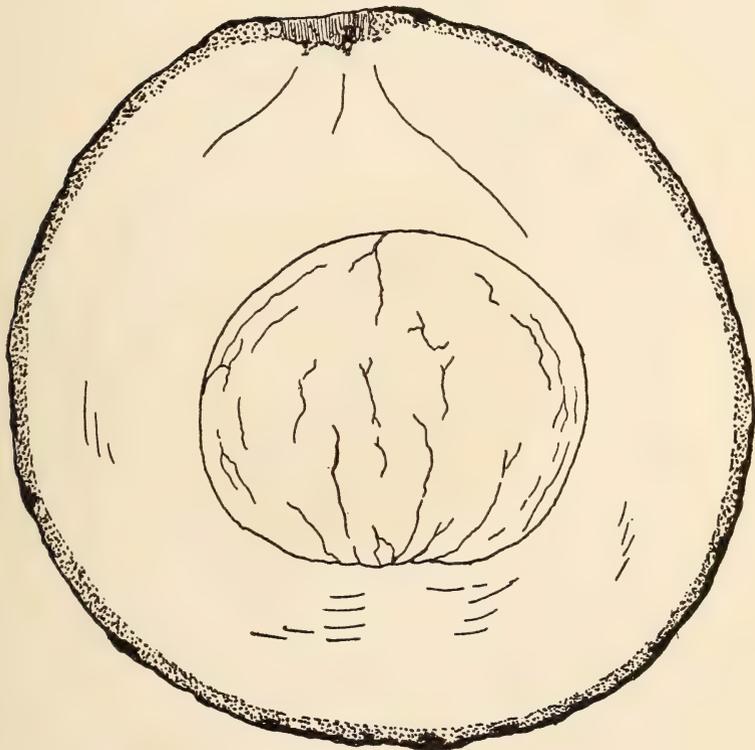


Figure 19

CHISOY

In quality one of the finest in the collection. Slightly rough, green, 20 to 24 ounces in weight. Midseason.

skin thick and woody. The flesh is deep yellow, of fine, oily texture, and very rich flavor. The seed is small to medium sized. The parent tree is productive. Ripens midseason, February to April at San Cristóbal. (Fig. 19)

NABAL (No. Fifteen) S. P. I. 44439. From Antigua, Guatemala. Elevation 5100 ft. A very productive little fruit of excellent quality. It is nearly round in form, weighs about 10 ounces, and is green in

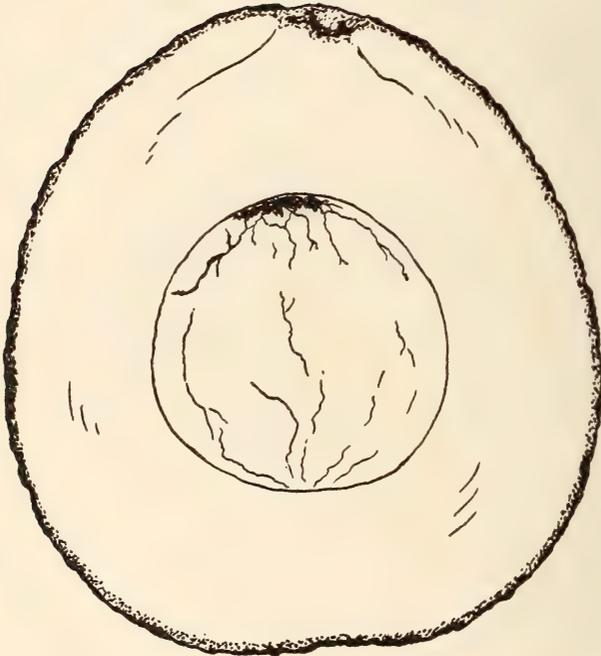


Figure 20 **NABAL**
Very productive and of excellent quality. Smooth,
green, about 10 ounces in weight. Midseason.

color, with the surface smooth and the skin moderately thick. The flesh is yellow, free from discoloration, and of rich flavor. The seed is rather small. The ripening season at Antigua is February or March to May. A midseason sort. (Fig. 20)

PANKAY (No. Twelve) S. P. I. 44785. From Totonicapan, Guatemala. Elevation 8500 ft. Obtained chiefly for its probable hardiness. The fruit is pear-shaped, weighs 12 ozs., and is green in color, with

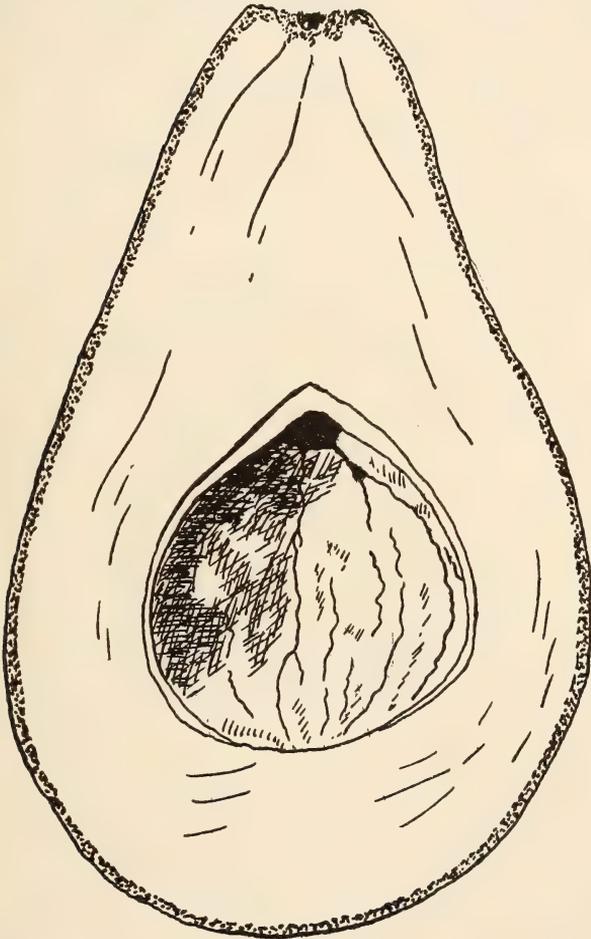


Figure 21 **PANKAY**
Should be the hardiest variety in the collection.
Smooth, green, of good quality, about
12 ounces in weight.

the surface smooth. The flesh is cream-yellow, of good flavor, and the seed is medium size. The ripening season at Totonicapan is from September to January. (Fig. 21)

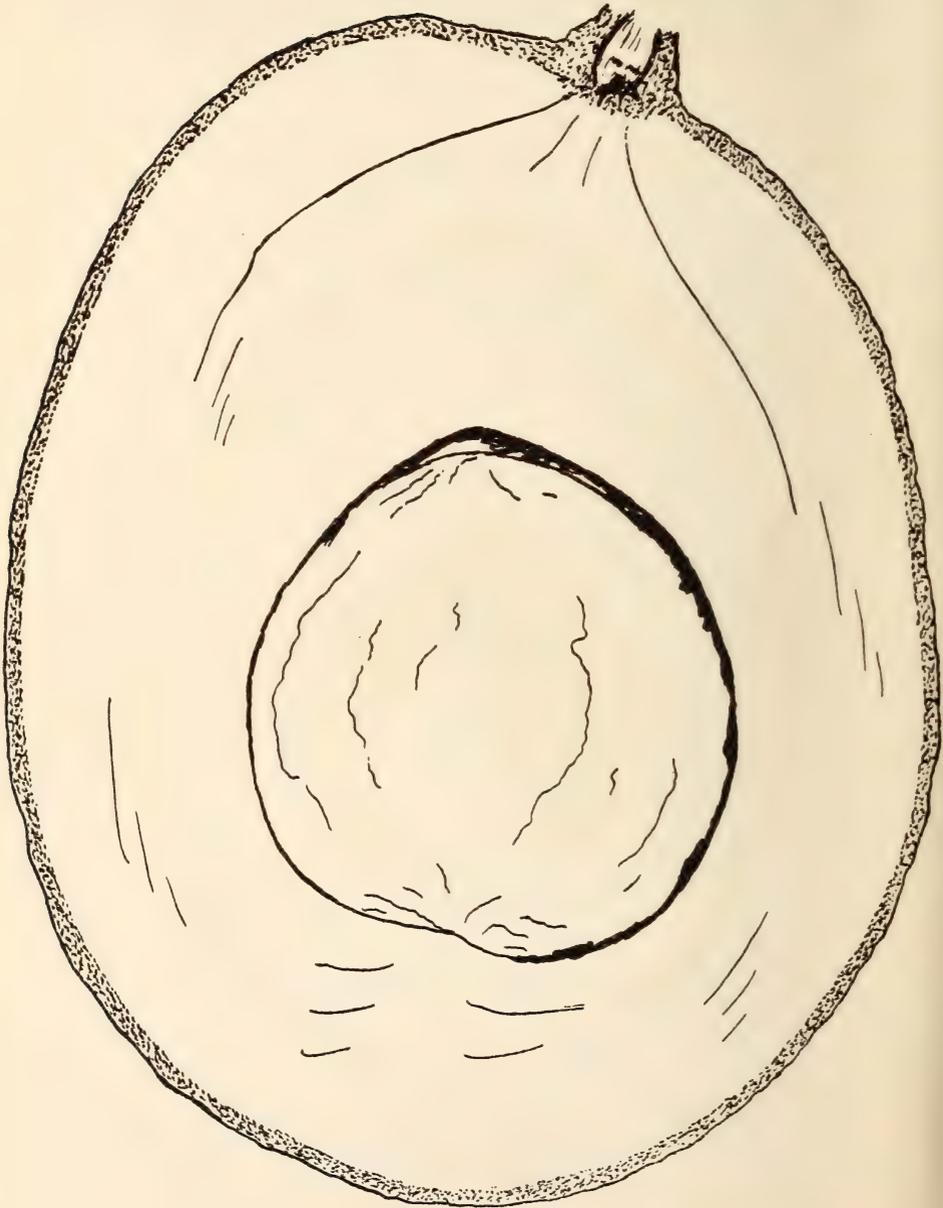


Figure 22

NIMLIOH

One of the largest varieties, and very productive. Rough, green, about 3 pounds in weight. Ripens rather early.

NIMLIOH (No. Seventeen) S. P. I. 44440. From Antigua, Guatemala. Elevation 5100 ft. A large-fruited variety which is at the same time very productive, and of excellent quality. The fruit is broadly oval in form, usually somewhat oblique. It weighs 36 to 45 ozs. The surface is deep green in color, rather rough, the skin thick and woody. The flesh is yellow, free from discoloration, and of excellent texture and very rich flavor. The seed is medium sized. At Antigua the ripening season of this variety is February and March, slightly earlier than that of most others. (Fig. 22)

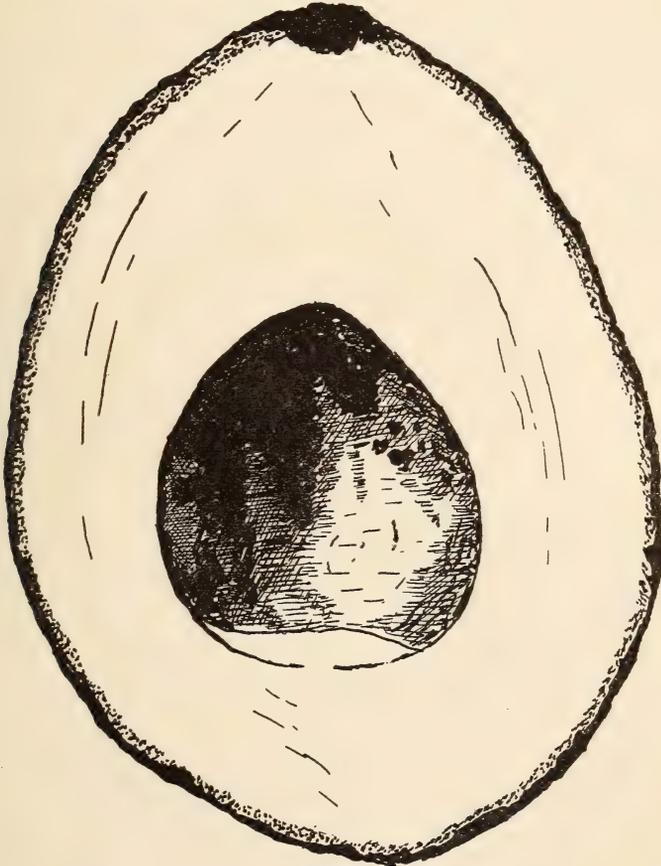


Figure 23

PANCHOY

A very thick-skinned fruit of excellent quality. Rough, green, about a pound in weight. Midseason.

PANCHOY (No. Eighteen) S. P. I. 44625. From Antigua, Guatemala. Elevation 5100 ft. A very thick-skinned fruit of unusually choice quality. In form it is broadly obovoid, in weight about one pound. The surface is rough, green in color, the flesh deep yellow, smooth, of very rich flavor. The seed is rather small. The ripening season at Antigua is January to April. A midseason variety. (Fig. 23)

TUMIN (No. Twenty) S. P. I. 44627. From Antigua, Guatemala. Elevation 5100 ft. Remarkable for its unusual productiveness, the fruits often being borne in clusters. In addition the fruit is of desirable size and form, and of excellent quality. It is slightly oblate, shaped

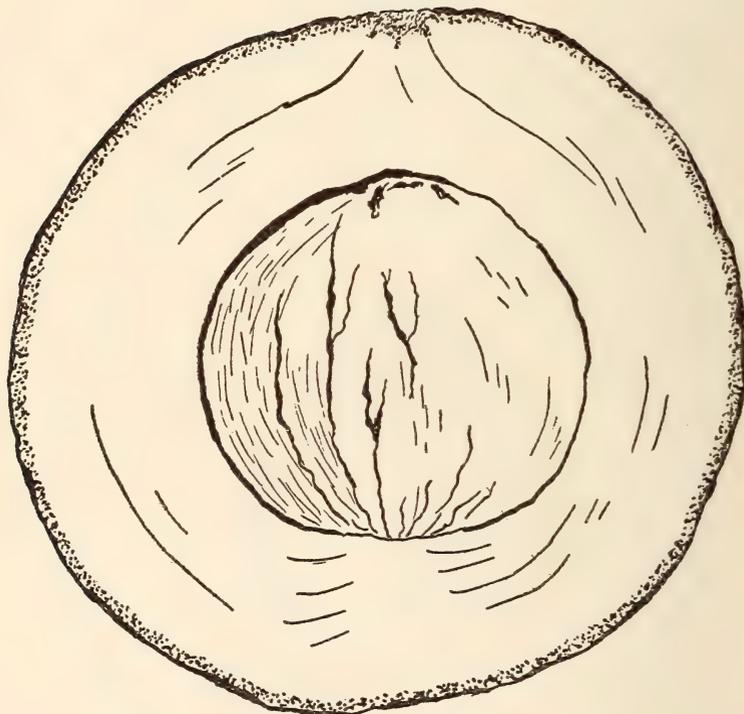


Figure 24

TUMIN

Unusually productive. Smooth, almost glossy, purplish black in color. Weight 12 to 15 ounces. Midseason.

like the Trapp of Florida, but weighs only 12 to 15 ozs. The surface is quite smooth, almost glossy, purplish black in color. The skin is rather thin, the flesh yellow, smooth, free from discoloration, and of rich flavor. The seed is medium sized, sometimes a trifle large. The variety ripens about midseason, March to May at Antigua. (Fig. 24)

BENIK (No. Twenty-one) S. P. I. 44626. From Antigua, Guatemala. Elevation 5100 ft. A very handsome fruit of fine quality. In form it is pear-shaped, in weight about 20 ozs. The surface is slightly rough, maroon-purple in color, the skin moderately thick. The flesh is

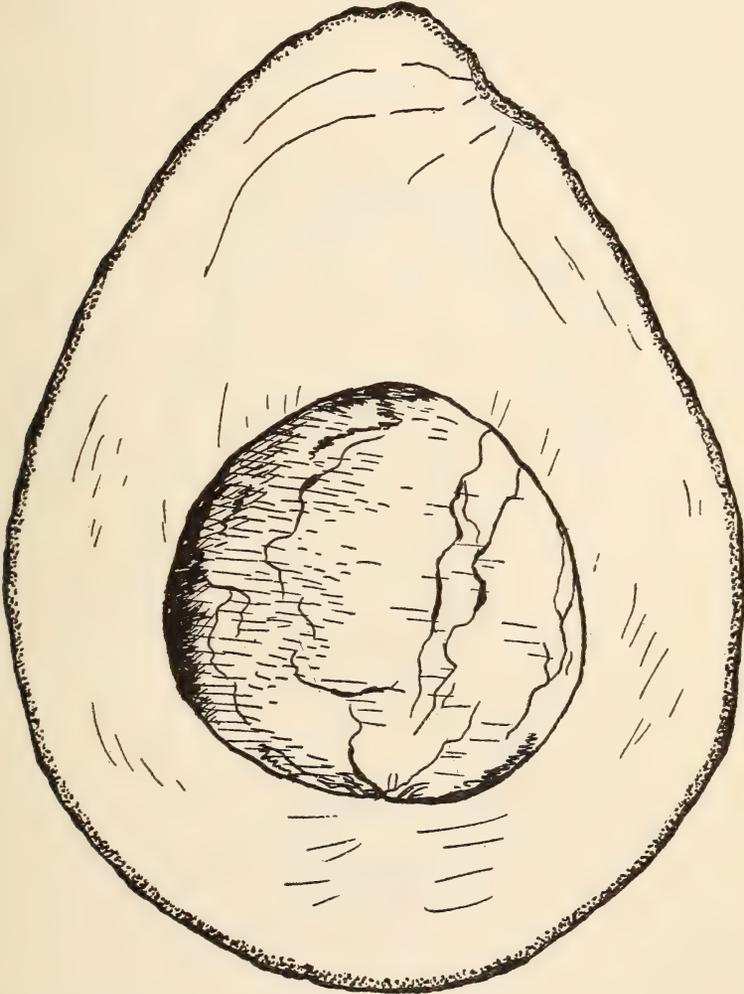


Figure 25 **BENIK**
Handsome and of fine quality. Rough, maroon-purple
in color, 20 ounces in weight. Midseason.

bright yellow, free from discoloration, and of very fine quality. The seed is medium sized. It ripens about midseason, February to May at Antigua. (Fig. 25)

KEKCHI (No. Twenty-two) S. P. I. 44679. From Purulá, Baja Verapaz, Guatemala. Elevation 5150 ft. A remarkable little fruit, early in season and very productive. In form it is pear-shaped or obovoid, in weight not over 6 ozs. The surface is slightly rough, deep maroon in color.

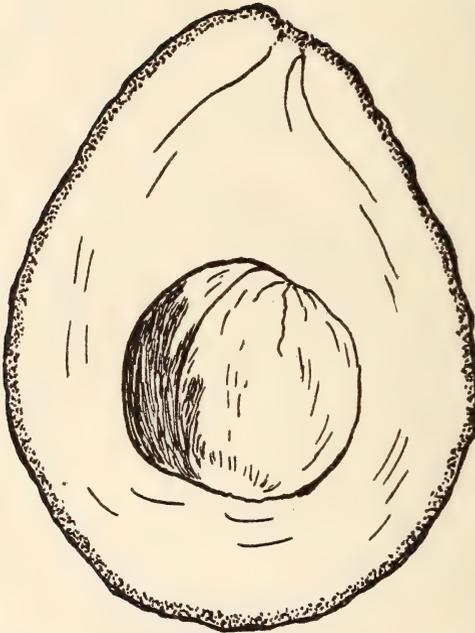


Figure 26 **KEKCHI**
Early and very prolific. Rough, purple, 6 ounces
in weight. The ripening season
is unusually long.

The skin is moderately thick, the flesh yellow, slightly discolored, and of very rich and pleasant flavor. The seed is comparatively small. It commences to ripen very early, December at Purulá, and continues until April or May. (Fig. 26)

MAYAPAN (No. Twenty-three) S. P. I. 44680. From Purulá, Baja Verapaz, Guatemala. A fruit of attractive form and size, and in quality excelled by none. It is nearly round, about a pound in weight, the surface slightly rough and deep maroon in color. The skin is very

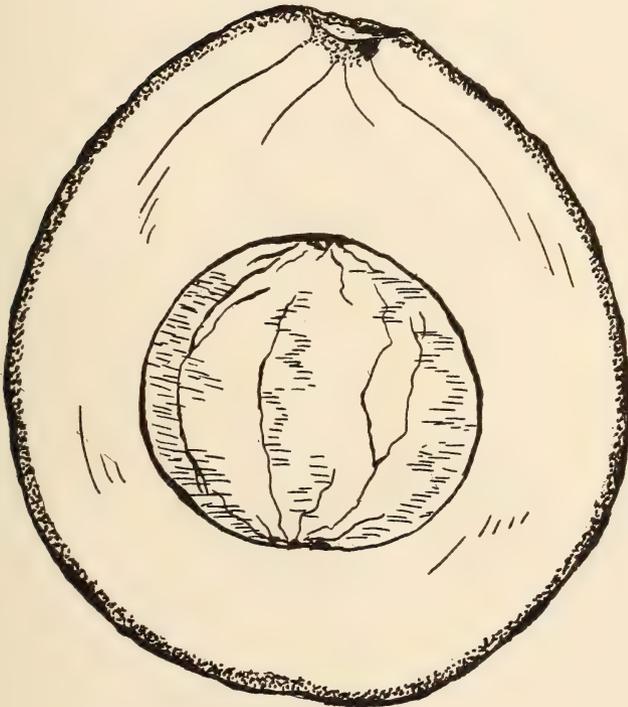


Figure 27 **MAYAPAN**
One of the very best in quality. Rough, deep maroon in color, about 1 pound in weight. Midseason.

thick, the flesh deep yellow, smooth, free from all discoloration, and of exceedingly rich and pleasant flavor. The seed is small to medium sized. At Purulá the variety ripens from March to July, hence it can be termed midseason. (Fig. 27)

KAYAB (No. Twenty-five) S. P. I. 44681. From San Cristóbal Verapaz, Guatemala. Elevation 4550 ft. A round fruit similar to the Chisoy. It weighs about a pound. The surface is slightly rough, the skin

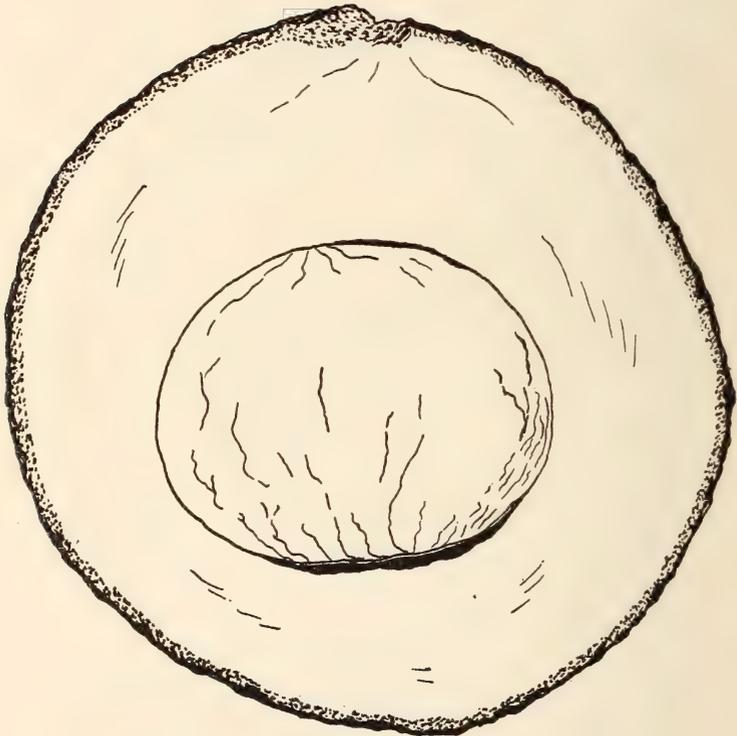


Figure 28 **KAYAB**
A fruit of fine quality. Rough, green, about a pound in weight. Midseason.

thick. The flesh is deep yellow, free from discoloration, and of rich flavor. The seed is small to medium sized. The variety ripens about midseason, February to May at San Cristóbal. (Fig. 28)

MANIK (No. Twenty-six) S. P. I. 45560. From Antigua, Guatemala. Elevation 5100 ft. A productive and rather early variety of excellent quality. In form the fruit is oval to slender pyriform, in weight

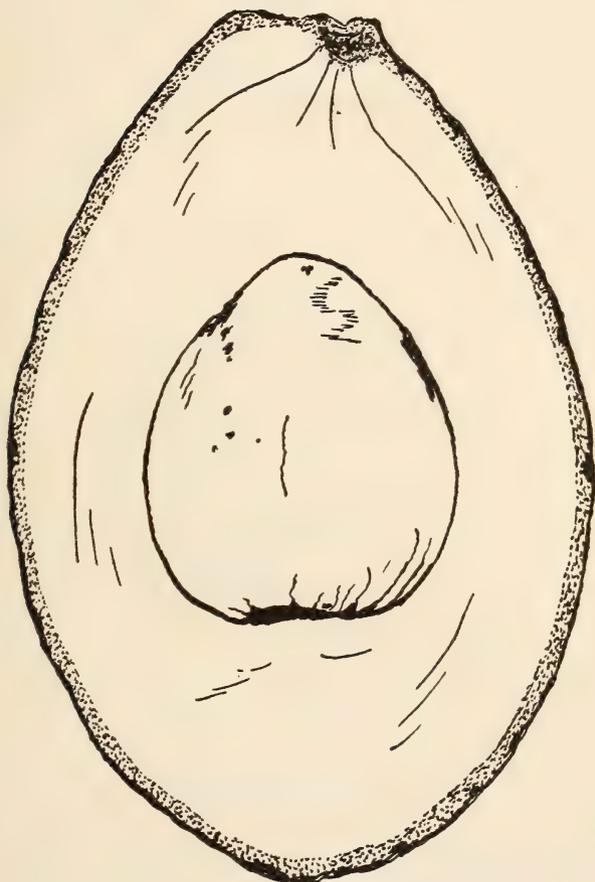


Figure 29 **MANIK**
Productive and rather early. Slightly rough,
green, 8 to 12 ounces in weight.

it varies from 8 to 12 ozs. The surface is green, slightly rough, the skin moderately thick. The flesh is rich yellow in color, free from all discoloration, and of very rich flavor. The seed is small to a trifle large. The season at Antigua is from January to June. (Fig. 29)

CABNAL (No. Twenty-seven) S. P. I. 44782. From Antigua, Guatemala. Elevation 5100 ft. A productive variety of attractive form and good quality. The fruit is round, and weighs 12 to 16 ozs. The

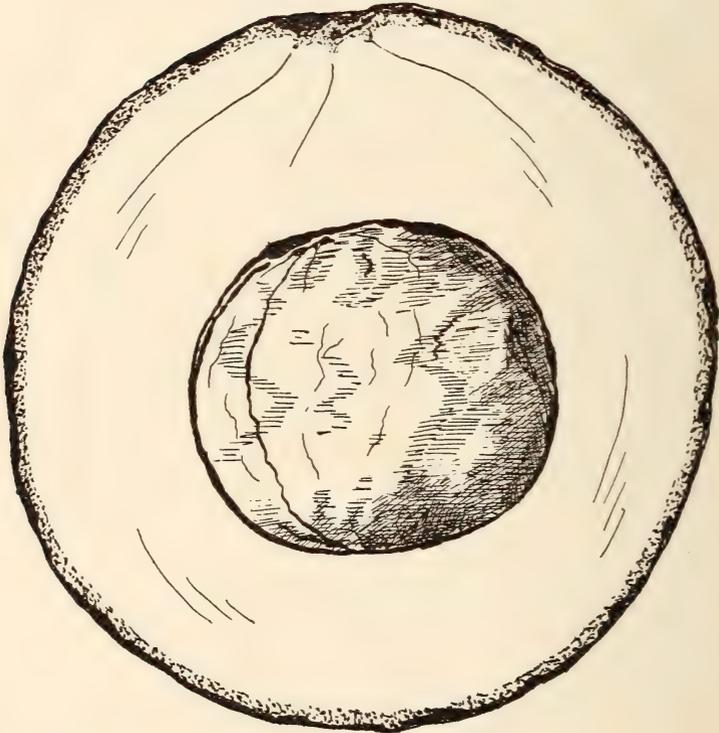


Figure 30

CABNAL

A productive variety of fine quality. Rough, dark green in color, 12 to 16 ounces in weight. Midseason to late.

surface is rather rough, dark green in color, the skin thick. The flesh is cream-yellow, oily in texture, and of rich and rather distinctive flavor. The seed averages rather small. The variety ripens midseason to late, March to June or later at Antigua. (Fig. 30)

CANTEL (No. Twenty-eight) S. P. I. 44783. From Antigua, Guatemala. Elevation 5100 ft. A round fruit having an unusually small seed. The parent tree is young, and has not yet produced a large crop. The fruit weighs about a pound. The surface is green, pebbled, the skin moderately thick. The flesh is cream colored, of rich flavor. The seed is usually small. Ripens midseason. (Fig. 31)

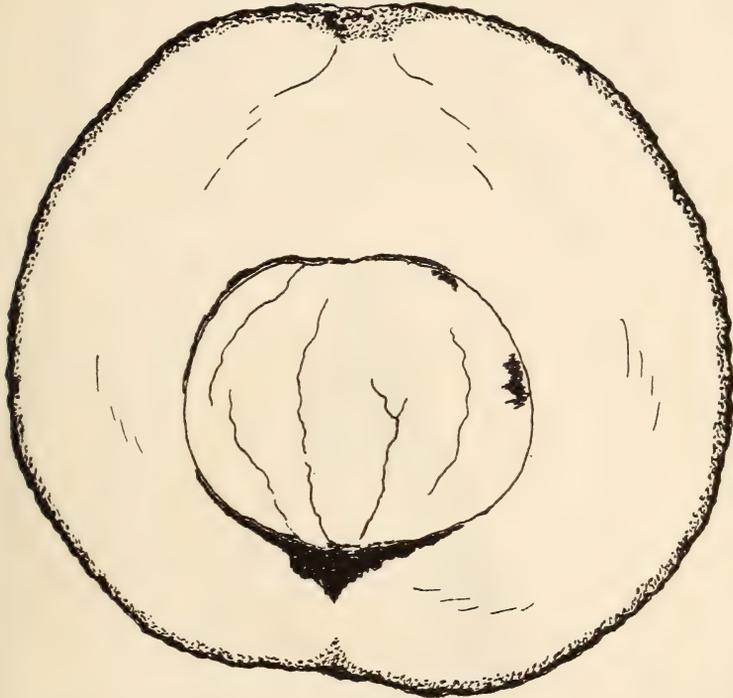


Figure 31 **CANTEL**
A variety of good quality, with an unusually small seed for a round fruit. Almost smooth, green, a pound in weight.

TERTOHO (No. Thirty) S. P. I. 44856. From Mixco, near Guatemala City. Elevation approximately 5700 ft. A famous avocado of very large size and excellent quality. In form it is pear-shaped or almost oblong, in weight up to 3 lbs. The surface is quite smooth, deep purple in color, the skin rather thin. The flesh is yellow, free from discoloration, and of rich flavor. The seed is comparatively very small. The ripening season is rather early, February to April at Mixco. (Fig. 32)

AKBAL (No. Thirty-two) S. P. I. 45505. From Amatitlán, Guatemala. Elevation 4200 ft. A particularly early avocado. In form it is long and slender, in weight about 12 ozs. The surface is quite smooth, bright green, the skin thin. The flesh is deep yellow in color, of rich and pleasant flavor. The seed is medium sized, not fitting quite as snugly within the cavity as in most Guatemalan avocados. The ripening season at Amatitlán is August to November, hence the variety may be classed as very early. (Fig. 33)

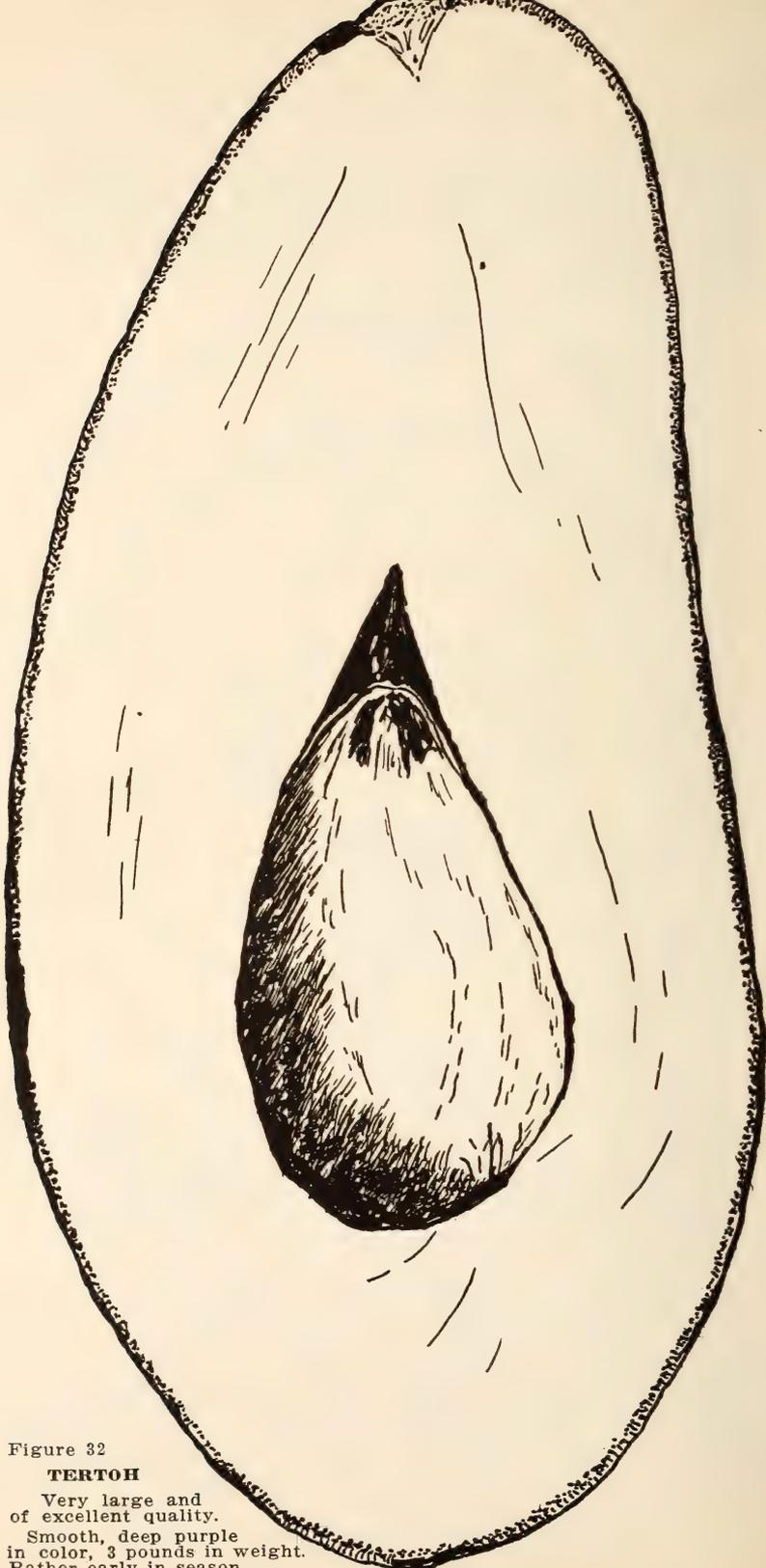


Figure 32

TERTO

Very large and
of excellent quality.

Smooth, deep purple
in color, 3 pounds in weight.
Rather early in season.

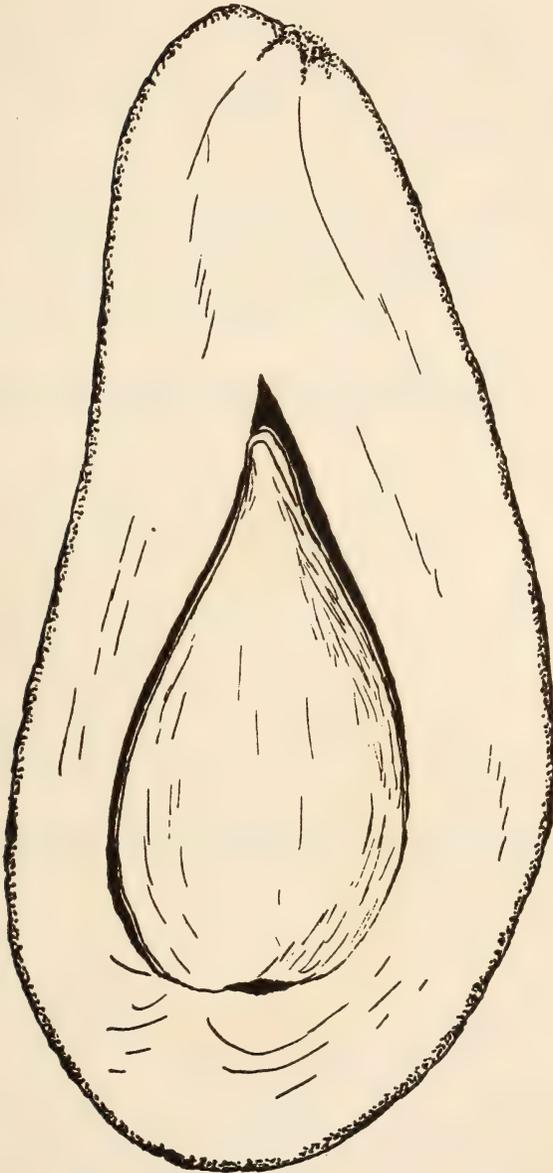


Figure 33 **AKBAL**

Very early and of good quality, though the shape is not as desirable as some others. Smooth, green, about 12 ounces in weight.

ISHIM (No. Thirty-four) S. P. I. 45562. From San Lorenzo el Cubo, near Antigua, Guatemala. Elevation about 5500 ft. A very early variety, not quite equal in quality to some of the others in the collection. In form the fruit is pear-shaped to obovoid, in weight about 12 ozs. The surface is quite smooth, deep maroon in color, the skin very thin for this race. The flesh is cream yellow, slightly discolored, of moderately rich flavor. The seed is a trifle large. At San Lorenzo the variety ripens from October to December.

KANAN (No. Thirty-five) S. P. I. 45563. From San Lorenzo el Cubo, near Antigua, Guatemala. Elevation about 5300 ft. A medium early variety of good form and rather large size. It is round, and weighs 16 to 20 ozs. The surface is bright green, slightly rough, the skin moderately thick. The flesh is yellow, free from discoloration, smooth, and of very rich flavor. The seed is rather small. The variety matures in January at San Lorenzo. (Fig. 34)

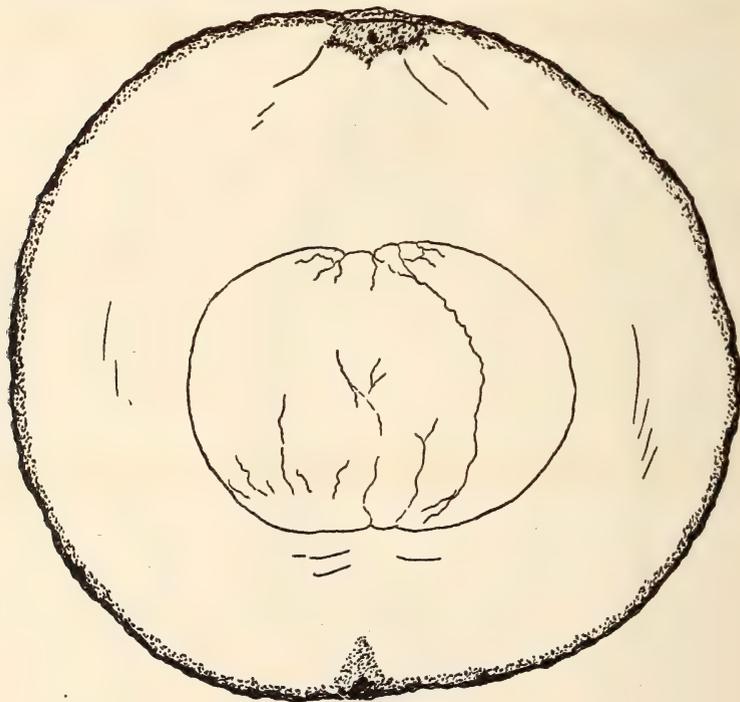


Figure 34

KANAN

An excellent fruit, and rather early in season. Slightly rough, green, 16 to 20 ounces in weight.

CHABIL (No. Thirty-six) S. P. I. 45564. From San Lorenzo el Cubo, near Antigua, Guatemala. Elevation 5500 ft. A small early fruit of excellent quality. In form it is round, in weight about 9 ozs. The surface is smooth, deep purple in color. The skin is quite thick and woody. The flesh is yellow, of rich flavor. The seed is rather small. The ripening season at San Lorenzo is November to March.

In Memoriam

Nathan W. Blanchard

Santa Paula

G. W. Hosford

San Dimas

Joseph Sexton

Santa Barbara

G. W. Tewksbury

Pasadena

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ITS HISTORY

From Atlixco, in the highlands of Southern Mexico, at an altitude of 6,000 feet, where the climate is dry, the summers hot, and the winters cold, a West India Gardens explorer in 1911 sent in budwood of several varieties, which represented the cream of this region, long famous for its superior Avocados. These varieties were propagated by us in California, and one of them seemed to deserve the name of Fuerte (*vigorous*) by its strong growth and hardiness. We accordingly introduced it under that name and grew it beside many other varieties of both local and foreign origin.

In the succeeding six years the Fuerte has steadily forced its way upwards. Its record has led J. T. Whedon an orchardist of Yorba Linda, and owner of fifty 4-year old Fuerte trees to declare:

"I believe there will be more Fuerte trees planted during the next 5 years than all the other varieties put together"

"The Fuerte is the hardiest variety growing in my orchard. I have 40 varieties growing here, and I am sure that the Fuerte is the strongest grower, the most heat resistant, and the most frost resistant. I have 60 Fuertes just two years of age, and all are now in full bloom. I am resetting a number of trees that have failed for various reasons, and all my resets are Fuertes."—Lester Keller, President First National Bank of Yorba Linda, and Proprietor of Aztec Ranch.

"As the introducer of the Fuerte Avocado, you are surely entitled to the thanks of all people who learn to know that particular variety. Its richness, productiveness, size, season of ripening, vigor of growth, and hardiness, make it an exceptionally desirable variety."—H. A. Stearns, of Stearns & Co., Mfg. Pharmacists, Detroit; California Ranch Owner, and Avocado Grower.

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Mr. L. B. Scott, of the Department of Agriculture, after many months of careful investigation of the avocado in California, said of the Sharpless avocado, in his report before the Avocado Association, in May, 1917:

"The Sharpless is, in many respects, the most remarkable avocado in California today. Its season is from October to March, and nine avocados in perfect condition were remaining on the tree as late as April 1st this year. The fruits average 20 to 22 ounces in weight, are pear shaped, and when mature, show a beautiful bronze color. The seed is small and the flesh free from fibre."

In his report Mr. Scott advised the association to "urge the nurserymen to cut budwood only from fruiting trees."

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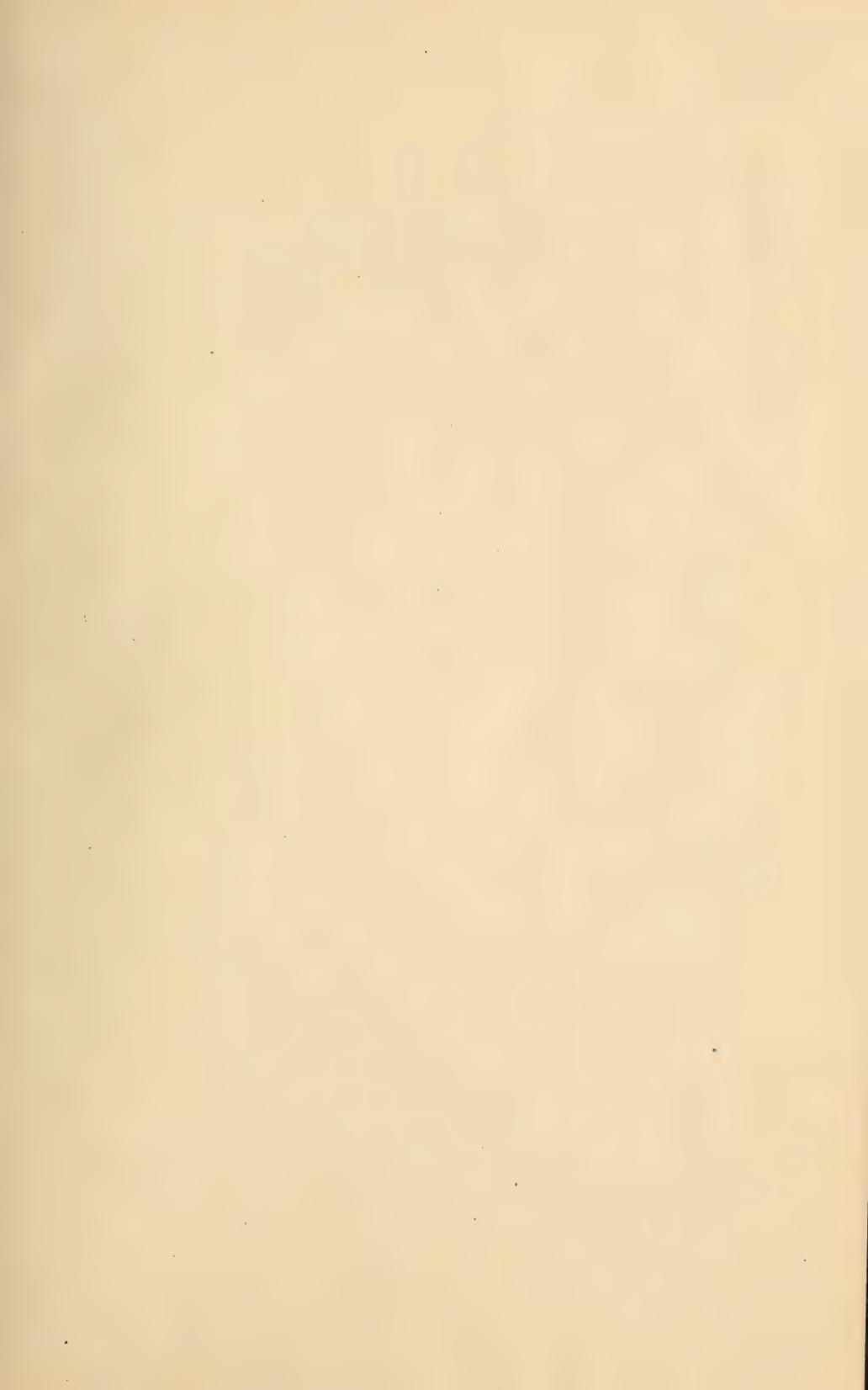
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