

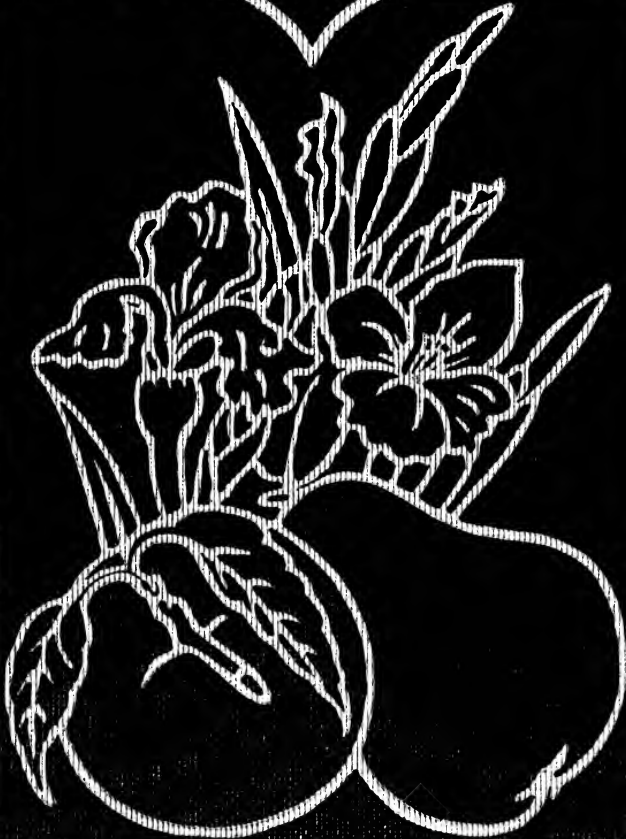
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FRUIT PRODUCTION

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BUSH FRUIT PRODUCTION

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A CLEAN, STRONG, WELL RIPENED GROWTH is the ideal of the grower of bush fruits. This Cuthbert red raspberry plantation is a heavy producer of high-quality berries.

BUSH FRUIT PRODUCTION

BY

RALPH A. VAN METER

*Professor of Pomology
Massachusetts Agricultural College*

ILLUSTRATED



NEW YORK

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PREFACE

THE object of this little book is to place before the gardener in a simple and direct way the knowledge needed for success with bush fruits—strangers to too many gardens. It is intended to answer the more important questions which arise in the mind of every gardener and to present concisely the few things which must be done rather than all the things which might be done.

There is little here that is new or original. The only merit that might be claimed is the exclusion of a multitude of details more bewildering than helpful to the amateur. The purpose has been to present a compendium of standard practice in clear and readable form.

Special consideration is given to short cuts and to things which may be left undone without seriously curtailing the crop, in the belief that a fair crop of good fruit, easily grown, is of greater interest to the gardener than the absolute maximum in yield to which plants may be forced by unremitting effort.

PREFACE

Emphasis is therefore placed on plant growth and the operations which affect it most directly. Special reference is made to the observation and study of the growth habits of plants as the basis for making every effort count.

It is a pleasure to acknowledge here the assistance of Professor Fred. C. Sears, who read the manuscript, and of Professor Frank A. Waugh, who edited it. Without the inspiration and kindly advice of these men the book would never have been written.

R. A. VAN METER.

Amherst, Mass.

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Bush Fruit Production

I

THE GARDENER AND HIS GARDEN

THE plant is the open book of the true horticulturist. Plant characteristics dictate cultural requirements and plant reactions govern the details of practice. The gardener or farmer who would become a skilled grower of plants must learn to pass beyond the printed word to the plant itself for the final settlement of cultural problems.

He must learn to read the answers to his questions in leaf and spur and branch and flower, and he must develop a sense of fine discrimination which will enable him to adjust cultivation and fertilization, pruning and spraying, more and more closely to the needs of the individual plant.

Books are useful and necessary. They contain the summarized experiences of thousands of plant manipulators who have gone before, but the rules and formulæ which they set forth

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are, at best, but rough approximations. They may be true on the average but they seldom fit exactly the particular conditions with which the farmer and gardener must deal.

Language cannot convey a true understanding. That can come only from experience and observation and comparison, until gradually there develops a sense of relative values, a comprehension of the meaning of subtle changes which follow our attempts to bend the plant to our purposes.

Study the plant! Learn to know it at its best, then learn to recognize the signs of trouble, especially those delicate but apparent growth and color changes which indicate a low or poorly balanced food supply, for malnutrition is the worst foe of cultivated plants.

Understanding can never be complete. Human senses are too limited and plant reactions too intimate and subtle for that, but the degree of mastery marks the difference between the "plant wizard" and the man who has no "luck" at all with plants.

GROWTH AND FRUITFULNESS

A clean strong growth is the first essential of heavy cropping. More growers of plants fail at this point than at any other, and two

misconceptions have contributed a great deal to this failure: the notion that vigorous plants winterkill easily; and the idea that growth is opposed to fruit production. Each has some foundation in experience but both are decidedly overridden by the fact that the most productive plants and those most resistant, both to climatic extremes and to pests, are plants in normal vigor.

It is a matter of common observation that plants in a half starved state, neglected, crowded, and choked by weeds, are beset by all the ills to which the plantation is exposed. It is equally true, on the other hand, that plants which are overfed, which make a rampant growth and are soft and ill conditioned when a trying winter comes, grow more leaves than fruit and are likely to be seriously damaged by low temperatures.

These extremes are to be avoided, of course, but growth and fruitfulness are both entirely in accord with nature. Within limits at all reasonable, increased growth is followed by larger crops of better fruit and by a greater resistance to troubles of all kinds. There is a middle ground, easily attained, in which growth contributes to fruitfulness and to the well-being of the plant. The greatest success depends upon the maintenance of this opti-

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mum growth. It requires something which cannot be written in books but which is born of experience and intimate contact with plants, a skill which soon comes to the gardener who observes and thinks and tries to understand.

BUSH FRUIT SOILS

Most of the bush fruits are quite cosmopolitan in their soil requirements. With the possible exception of blueberries, each may be grown successfully on a fairly wide range of soil types. Where several bush fruits are grown together, medium sandy or clay loams of considerable depth are best, for they combine in a measure the easy working qualities of sandy soils with the moisture retaining and plant food holding characters of the heavier types.

Wet, heavy soils are difficult to work and growth cannot be controlled. They usually are soggy late in spring and in autumn they encourage plants to grow until freezes kill the leaves. Then the plants, not properly hardened, are likely to suffer more or less winter injury. When part of a bush fruit plantation extends into an area where the soil is wet and heavy, winterkilling is almost invariably worst in that spot.



FIG. 2 (*above*). Red raspberries before pruning. The row is filled with weak canes and short suckers which crowd the best canes and are of little or no value for crop production.

FIG. 3 (*below*). The row pruned. Weak growth has been removed, the rows thinned and narrowed down to the width desired, and the winter-killed tips of the remaining canes cut off. When the canes are alive to the ends, only enough of the tops are cut off to enable the canes to stand erect under the crop.



FIG. 4 (*above*). Red raspberries laid down for the winter. About one-third of each cane is covered with earth, and snow is depended upon to afford some protection to the rest. In severe climates the whole cane is buried.

FIG. 5 (*below*). Red raspberries supported on wires. On either side of the row a single wire, fastened to posts, holds the canes erect. When the rows are narrow a single line of posts, in the middle of the row, will carry both wires.

Berries ripen at a time of year when long periods without rain are to be expected. Since the size and quality of berries depend largely upon adequate moisture at ripening time, light drouthy soils are to be avoided. They also leach plant food rapidly, and vigorous plant growth is not easy to maintain.

IMPROVING SOIL CONDITIONS

Much may be done to correct the physical condition of soils too light or too heavy for best results. Especially on small plots is the soil under a certain amount of control. It is even possible and worth while in special cases to transport enough light soil to mix with and ameliorate a heavier one, but chief reliance must be placed upon the addition of humus in one form or another.

In this day of cheap synthetic chemical fertilizers too little attention is given by many gardeners to the humus content of the soil. It makes heavy soils more loose and friable, and it adds to the fertility and increases the moisture holding capacity of soils too sandy for best results.

Well-rotted stable manure has no rival as a humus-forming material. Unfortunately it is becoming scarcer every year, and some other

BUSH FRUIT PRODUCTION

material must be substituted in many gardens. The farmer inserts into his crop rotation a green crop to be plowed under. Such soiling crops might be grown often on garden plots in late summer but they aren't because it is too much trouble and it may interfere with the harvesting of late crops. Both of these objections are more imaginary than real, but doubtless they will continue to be effective.

A compost pile affords a more practical substitute for a supply of manure. Leaves, grass clippings from the lawn, tomato vines, cornstalks and other garden refuse, and much of the other vegetable waste which usually finds its way to the bonfire may be composted to good advantage. There is enough material of this kind around the average premises to maintain at a high level the humus content of any ordinary garden plot.

Humus corrects many soil deficiencies, and is of special value in making soils drouth resistant. In the growing of bush fruits it is important that the soil should contain plenty of organic matter when the plants are set, for they need a supply upon which they can draw for several years and it is not easy to incorporate it with the soil after planting, or at least it is easier not to do it.

II

RASPBERRY CULTURE

TYPES AND VARIETIES

THE RASPBERRIES which are commonly grown in the United States fall naturally into three groups: red, black, and purple, according to the color of the berries. Each has certain advantages over the others and each is a favorite in those sections where it is adapted best to the requirements of the growers.

Black Raspberries—Black caps usually yield more heavily than red varieties, but the berries are not so much in demand and consequently sell at lower prices. They are grown most extensively near New York City and in the Middle West. Black raspberries are highly prized for the making of jams and jellies and their preeminence in this field should, in itself, make a place for them in the home garden. In addition, their dessert quality is such as to insure their continued popularity.

BUSH FRUIT PRODUCTION

Cumberland is the most widely grown black raspberry. It ripens its fruit in midseason and the well-flavored berries are large and handle well. The canes are vigorous, productive, and fairly hardy.

Plum Farmer is one of the hardiest black caps. The berries are large and firm. The season is early and so short that the crop may be harvested in two or three pickings.

Kansas is an early variety with large, firm berries. The tendency of the canes to winter-kill has reduced its popularity.

Red Raspberries—Varieties of this type are favored for dessert purposes by most consumers, and their bright, attractive color insures a ready market. Their culture extends across the northern states with few interruptions from New England to the Pacific coast. Their excellence in manufactured products in addition to their dessert qualities insures their place in the home garden. There are many varieties and preferences vary, but the following are most commonly grown:

Cuthbert is the standard of quality among red raspberries and it is the leading variety in most sections. It is only moderately hardy, however, and its susceptibility to diseases of the mosaic type is tending to limit its culture.

RASPBERRY CULTURE

It is still one of the very best varieties for the home garden. Its season is late.

Latham lacks the high quality of *Cuthbert*, but it is a good berry. It is a relatively new variety but its hardiness, vigor, and productivity are bringing it into high favor with growers. In many sections *Latham* is challenging *Cuthbert* for first place. The fruit ripens late. *Latham* is sometimes sold under the name *Redpath*.

Herbert is a hardy variety of Canadian origin, and it is the most satisfactory raspberry in some of the colder parts of the country. It is a midseason variety, vigorous and productive, with large, bright red fruit.

June is an early variety with large, firm, bright red fruit. It is very vigorous and productive, especially on the heavier soils.

King is one of the best early varieties in the Central West. The canes are hardy and vigorous and the bright red, firm, medium-sized berries ripen over a long season.

There are many other varieties of red raspberries which are worth consideration in the sections to which they are adapted but which cannot be considered here in detail. *Otah* and *Sunbeam* can be grown in the northern Great Plains area where common varieties fail because of the severe winters. *Surprise* is the

BUSH FRUIT PRODUCTION

leading variety in central and southern California. Marlboro is extensively grown in Colorado and is to be found here and there in the northeastern states. The everbearers are treated separately (see page 50).

Purple Raspberries—The “purple canes” are hybrids between red and black raspberries, and have certain characteristics of each parent. They are tremendous yielders, surpassing all other raspberries in this respect. The quality is good although the fruit is dull in color. Purple raspberries are somewhat easier to handle in the garden than red or black varieties, because they do not spread from the hills in which they are planted, and they are a popular home garden fruit in many states. They are splendidly adapted to canning and to the making of raspberry products.

Columbian is the leading variety of purple canes. The berries are very large and ripen late, but are too soft to ship well. The canes are moderately hardy, very vigorous, and very productive. *Columbian* is one of the best varieties of raspberries for canning and for manufactured products.

Royal (Royal Purple) is said to be hardier in some sections than *Columbian*. The berries are large and firm, and the season is long.

RASPBERRY CULTURE

Royal is a very late berry, ripening ten days or more after Cuthbert.

Other Raspberries—*Van Fleet* is a hybrid of recent introduction which may be grown farther south than most other raspberries. The bush is vigorous and moderately productive. It propagates by tip layering. The fruit is a dull, light red and ripens very late. It is probable that this new raspberry will find favor chiefly in the southern part of its range.

Yellow varieties appear occasionally among both red and black raspberries. Most of those now in cultivation, if not all of them, are red raspberries except in color. Golden Queen is almost a yellow Cuthbert and it is the best of the yellow raspberries. The quality of the fruit is high, but the plant is more tender than Cuthbert and needs better care. Golden Queen is worth planting in the home garden but has little or no commercial value.

SOILS AND THEIR PREPARATION

Raspberries are adapted to a wide range of soil types but extremes should be avoided. The fruit has a high water content and ripens at a time of year when rains are likely to be infrequent. A shortage of moisture near ripen-

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ing time may cause many of the berries to dry up before maturing and harvested berries are usually small and seedy. The soil should, therefore, be retentive of moisture.

Raspberries are sensitive also to an excess of moisture in the soil and the location of the plantation should be one in which the soil is not wet for a long period in spring. Good drainage in spring is just as essential as an adequate moisture supply in midsummer.

Ordinary garden soils which are well filled with humus are satisfactory for raspberries if the plane of fertility is not too high. On extremely fertile soils the canes tend to grow late and make a soft unripened growth which is likely to winterkill. On poor soils the canes are small and spindling and the crops light.

Within these wide limits, raspberries will thrive on almost any soil. The ideal is a sandy or light clay loam well filled with organic matter which not only furnishes plant food but acts also as a reservoir for moisture. Varieties differ somewhat in their soil adaptations. June usually does best on clay loams, while Cuthbert and Latham are very cosmopolitan in their soil requirements.

The plowing under of manure or green crops tends to improve the texture of both very heavy and very light soils, and it should

RASPBERRY CULTURE

be a part of the preparation of such soils for raspberry growing. Weeds and grass increase the difficulties of keeping the plantation clean and vigorous and an effort should be made to eradicate most of them before planting, for it is easier then than when the plants are in place.

Before the plants are set it is best to plow the land and pulverize it until a good seed bed is prepared. Thorough preparation saves cultivation later on, makes planting easier, and insures the plants a fair start. Raspberries occupy the land for several years and a little care in preparing the soil is an excellent investment.

CULTIVATION

The duration of the raspberry plantation will depend a great deal upon the degree to which the land is kept free from grass and weeds. If grass gets a good start it may soon be easier to establish a new raspberry patch than to clean up the old one. Weeds and grass rob the plants of moisture and plant food and their increase marks the decline of the crop.

Part of the root system of raspberry plants is near the surface and after the plantation is established cultivation next to the rows should be shallow. A one-horse cultivator with teeth

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shortened on the side next to the rows is used in large-scale operations. In the garden there is nothing better than a good iron rake if cultivation is not neglected until the ground gets hard and compact, and weeds are large.

The amount of cultivation needed will depend upon the nature and condition of the soil. Once each week up to the time of harvest is not too often and some good growers cultivate more frequently. As picking time approaches the surface soil should be kept fine and loose. The size and quality of the berries will depend very largely upon the amount of moisture available at ripening time.

During the harvesting season the pickers tread down and compact the soil at a time when the moisture supply is particularly important. It is a good plan to cultivate after each picking unless the berries hang so low as to become dusty.

After the harvest season cultivation should be continued to keep weeds from getting a start, but if they have been conquered during the early summer they will seldom be troublesome later. Frequent cultivation in the fall encourages late growth and may leave the plants in poor condition to withstand the winter. If there is no late cultivation, however, weeds may sprout and be ready for an early

RASPBERRY CULTURE

start in spring before the land can be cultivated.

Mulching—In the garden a mulching system is often more satisfactory than cultivation, and it is employed very successfully by some commercial growers as well. If sufficient straw, old hay, or other similar materials are used to prevent the growth of weeds, the moisture supply is maintained in an efficient way. On sandy or gravelly soils raspberries may thrive better under a good mulch system than under cultivation.

III

THE RED RASPBERRIES

PROPAGATION

RED RASPBERRIES propagate by means of suckers. Root-like underground stems bearing fibrous roots radiate from the crown of the parent plant. These creeping underground stems are nearly horizontal and from them suckers appear during the growing season at some distance from the crown. These suckers are readily transplanted. Suckers are produced by common varieties in such abundance that propagation is not a problem at all. They are the worst weeds in the plantation and large numbers must be removed each year to keep the rows within bounds and to prevent crowding of plants in the rows.

Occasionally it becomes desirable to increase the production of new plants, as with a new variety or a valuable supply of disease-free stock. The growth of suckers may be stimulated by cutting the underground stems or otherwise disturbing them. They are not

THE RED RASPBERRIES

far below the surface and deep cultivation close to the rows in early spring will usually start a forest of suckers. In the garden the same effect may be obtained by thrusting down a spade several times in a circle a few inches from the base of the parent plant. Cutting back the tips of the new canes in early summer is also effective.

Conversely, to minimize suckering, which usually is highly desirable, an undue disturbance of the root system should be avoided and the tops should not be cut back during the growing season.

Root cuttings such as those described on page 73 may also be used to propagate red raspberries when a maximum number of plants is desired.

BUYING NURSERY STOCK

Some nurserymen take great pains to keep their stock free from serious diseases. Others buy most of the stock which they sell from local growers who may have no interest whatever in selecting healthy plants.

There is an obvious advantage in buying stock from local plantations known to be free from diseases. When it is necessary to send to a distant nurseryman it is safest to buy

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stock officially certified to be disease-free, or practically so. Most of the leading raspberry-growing states now have an organized inspection service and plants which have been examined by authorized agents of the state are available to those who take the trouble to locate them.

Lists of nurserymen who have disease-free plants are compiled each year and may be secured from the Bureau of Plant Industry, United States Department of Agriculture, Washington, D. C., or from state experiment stations which work with small fruits, like those of Minnesota, Illinois, Ohio, Michigan, and New York.

TAKING UP DORMANT SUCKERS

Only the most vigorous and healthy suckers should be transplanted. Many of the younger plants far out between the rows will live and grow but it is easy to lose a year in getting a new plantation started and weak plants are an unnecessary handicap.

Care should be taken to secure a piece of the parent root with each plant. The sucker usually has developed a few fibrous roots of its own but not enough to give it the right start. When the sucker is pulled up it almost

THE RED RASPBERRIES

always is broken loose from the parent plant. If a spade is thrust down between the sucker and the row to cut the underground stem there is least danger of breaking off the sucker. Then the new plant may be lifted on the spade and the earth shaken off.

The tops of new plants are usually cut back to leave not more than a foot of cane which serves as a convenient handle in resetting. The plants are then tied in bundles to facilitate handling.

TRANSPLANTING GREEN PLANTS

Under favorable conditions it is possible to transplant young suckers in spring when they are about five or six inches high. It is then easier to select healthy plants than during the dormant season. Since virus diseases of the mosaic type have become so widespread this method of starting new plantations has gained steadily in favor.

To be most successful, green shoots should be transplanted in spring when the soil is moist and rains are frequent. When planted in a dry soil or when transplanting is followed by a drouth too many of the plants wither and die. Special care should be exercised to get a root-bearing piece of the parent plant, for

BUSH FRUIT PRODUCTION

the young plant is likely to have few or no roots of its own. This method is more likely to be successful on soils which are naturally moist than on sandy soils, but when intelligently done it is probably the most satisfactory way to start a new raspberry patch from an old one on the premises.

SELECTING DISEASE-FREE STOCK

Avoiding diseases has become the most important problem in raspberry growing. Since the raspberry is attacked by several incurable troubles it is important that the stock for planting should be disease-free. Suckers should be selected from plants which are known to be free of mosaic, leaf curl, and crown gall (see pages 45 and 46).

Mosaic and leaf curl are not easily detected unless the plants are in full leaf. In plantations where such diseases are known to have obtained a foothold, and that includes almost every plantation, sections which show no evidences of these troubles should be staked off or otherwise marked during the latter part of the growing season. This makes it possible to select disease-free stock when the time arrives for transplanting dormant suckers.

THE RED RASPBERRIES

SYSTEMS OF TRAINING

Two general systems of culture are used for red raspberries: solid rows, and the hill system. Solid rows are most often employed and vary in width from a single irregular row of plants to a hedge three or four feet wide at the bottom.

Hedge Rows—In establishing solid rows, plants are set about thirty inches to three feet apart in the rows and allowed to produce suckers freely until the rows are filled with plants and have reached the desired width. The cultivator is then used to keep the rows from spreading farther.

The distance between rows at planting time varies with the soil and with the width of row to be expected later on. On strong soils plants grow larger and should be given more room than on soils where growth will be less vigorous. In any case there should be room for the cultivator between the rows when the plantation has reached maturity. It should be remembered, too, that canes bend outward as the fruit develops and that a row one foot wide at the bottom may be three or four feet wide at the height of a man's waist.

Six feet between rows is a common planting

distance for the narrow hedge system. Under good growing conditions seven feet is undoubtedly much better. Growers often complain of insufficient room in which to work about the plants, but seldom that they have too much. In gardens especially rows are often set but four or five feet apart. That seems to be plenty of room at the start, but before long the rows begin to crowd. When the space between rows becomes too narrow for frequent and easy cultivation, the temptation is strong to neglect that most important operation. Too close planting ruins many raspberry patches and should be carefully guarded against.

The most desirable width of row is open to question. It varies somewhat with the fertility of the soil and the vigor of the variety, but in general narrow rows produce the best berries and they are much more easily pruned and harvested. When the row becomes so wide that the middle is not easily reached, many berries on the middle canes are overlooked and the rest are found with considerable difficulty. The same difficulty of reaching through the brambles to the middle of the row is experienced at pruning time. While it is probable that higher total yields may be secured from wider rows, ease in handling makes it advisable to keep the rows narrow.



FIG. 6 (*above*). A black raspberry plant properly pruned. The canes are cut back and each lateral shortened to leave a few buds only.

FIG. 7 (*below*). Red Raspberries. A crate and a field carrier filled with pint boxes. A convenient carrier may be made from a greenhouse "flat" and a piece of barrel hoop.

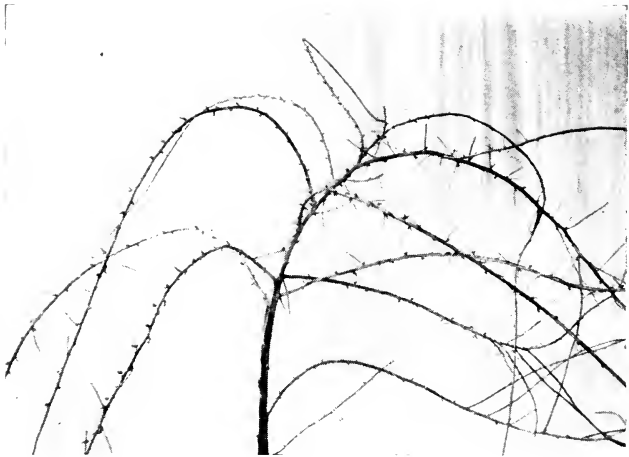


FIG. 8 (*above*). A single black raspberry cane before pruning. Without pruning, such canes produce small and seedy berries well out on the lateral branches, where they swing near the ground and often get dusty.

FIG. 9 (*below*). The same cane pruned. There is little or no reduction in yield from such pruning, and the berries are much larger and finer than those from canes pruned more lightly. Try it.

THE RED RASPBERRIES

Supports for the Hedge Row—Raspberry growers are more and more inclined to furnish some support to keep raspberry canes from bending over too far into the space between the rows. Some of the finest berries are borne on these bending canes, but they are difficult to harvest and often get dusty from cultivation or spattered with mud during a driving rain.

Usually a wire is run on either side of the row, as in figure 5, and supported on posts. For narrow rows a single line of posts may be set in the row with a wire fastened to either side. It is often convenient to fasten the wires to the posts in such a way that they may be removed and laid on the ground to facilitate pruning and harvesting. This is accomplished easiest by driving heavy nails into the top of the post on either side and merely laying the wires between them. For very narrow rows a single high wire is sufficient if the canes are tied to it with twine.

The Linear System—This is essentially a hedge row narrowed down to as near a single line of plants as can be maintained. It is employed by a few growers of fancy berries but is not in general use. The rows may be placed somewhat closer together but even then the yields are less than with wider rows. Hand

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work, however, is reduced to a minimum and such operations as pruning and harvesting are made a great deal easier. The linear system has certain advantages for the home garden, where high yields may be subordinated to the quality of the fruit and to greater ease in growing it.

Red raspberries grown on the linear system usually are given some support. A single wire is sometimes used, or two wires, one above the other, to which the canes are tied.

The Hill System—Red raspberries grown on the hill system usually are set about five feet apart each way. Five to seven canes are allowed to grow in each hill and all others are removed. This system is not widely used but its adherents claim that, while the yields per acre are rather low, the quality is high and the number of quarts grown per man is higher than with other systems because of the small amount of hand work required and the ease with which the canes are pruned and the crop harvested. For support, the canes are tied to a stake driven in beside the hill and standing about five feet above ground.

The hill system is not well adapted to the culture of such varieties as Cuthbert, which sucker freely, but has been used extensively with less vigorous varieties like Perfection,

THE RED RASPBERRIES

especially in the Hudson Valley section of New York.

TIME OF PLANTING

Plants are usually set in early spring, except on the Pacific coast, where they are set at any time during the rainy season. Fall planting is coming to be preferred by many growers, however, even in sections like New England where winters are severe, if a covering of snow can be depended upon for protection.

Plants set as early in the fall as dormant stock for transplanting can be obtained, are off to a flying start in spring and usually make a stronger growth the first year than spring-set plants. That is the great advantage of fall planting.

Plants set in spring should be given the earliest possible start. If they become well established before the drier weather of summer arrives they continue to grow vigorously and often will produce a sizeable crop the second year; but when they are planted late very few new canes will be produced the first season, especially if the summer is a dry one.

At whatever time the planting is done the stock should be as near dormant as possible when set. Shoots that have formed or even

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buds that have swollen are likely to be broken off, and their starting, in itself, seriously weakens the plants. The first shoots to start on new-set plants and the strongest canes to appear the first year are from leader buds near the base of the transplanted sucker. If they are broken off it takes much longer for the new plant to establish itself.

KEEPING PLANTS DORMANT

When plants arrive from the nursery before planting time they should be unpacked and kept cool and fairly moist until set. It is possible to open the boxes, set them in a cool cellar, and supply moisture as needed, but that requires attention and is likely not to be followed up closely enough. If the plants become dry the damage may be serious.

An ice house is a splendid place for nursery stock, where the bundles may be buried in cold, moist sawdust. The next best place is the ground itself. In "heeling in" plants a shallow trench is dug, preferably in a cool, shady spot, the bundles are broken apart and the plants placed in the trench with earth tramped solidly about their roots. At least plants will not dry out when treated in this way and if they are

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out of direct sunlight they usually remain dormant until they can be set.

SETTING PLANTS

Care must be taken to keep the roots from drying out while they are being set. Pails or tubs in which the roots may be kept in water are often placed at convenient points in the patch, or the bundles of plants are wrapped in wet burlap.

Raspberry plants are usually set in furrows or with a spade. Setting in furrows has the advantage of speed, and if care is taken to run the furrows straight, and to set the plants before the furrows dry, there are no serious objections to it. In following this method the furrows are opened but a short distance ahead of the planters to guard against drying out of the soil. Each plant is dropped into place and earth is pushed over it with the foot in sufficient quantity to hold it in place, and tramped solidly. As soon as the row is set the cultivator is run on either side of the row to finish filling the furrow, and the job is completed.

Setting with a spade is a more useful method in the garden where it may not be convenient to furrow out the land. The spade

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is thrust into the soil and pushed forward to make an opening into which the root is placed. The spade is then removed and the soil tramped firmly about the plant. For large-scale operations, three men make an efficient crew, setting two rows at a time. Two men with spades make the openings for the plants while the third, walking between the rows, places the plants. If the soil is dry particular care should be taken to press the soil firmly about the roots, for there is a tendency to leave a hollow space at the bottom of the opening. A three-man crew can set about three thousand plants in a day, if the land has been well prepared.

PRUNING AT PLANTING TIME

As soon as planting is finished the pieces of cane projecting above ground should be cut back to leave only enough to mark the rows for convenience in cultivation. Otherwise many of the topmost buds will produce fruiting shoots. The first task of the new plantation is to grow plants enough to fill in the rows and make a real crop possible. Any fruit borne the first year is distinctly at the expense of growth and later crops. In so far as possible growth the first year should be

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forced to come from below ground—from the leader buds on the canes near the roots and from the underground stems which are soon sent out in all directions if the top is kept from growing.

PRUNING RED RASPBERRIES

Raspberry canes grow in one year, branch and produce a crop in the next growing season, then die. While one set of canes is fruiting another set is growing to produce their crop in turn in the year following.

Cut Back—The first pruning which a red raspberry cane receives is in the spring of the fruiting year, when it is cut back at the tip. Any bud on the cane is capable of producing a fruiting branch under favorable conditons, as is shown by the action of buds low on the cane following severe winterkilling. Growth tends to come from the highest buds, however, and they usually produce the crop. Some have argued that the topmost buds, formed late in the preceding autumn, are weak and by cutting back the growth is turned into lower and stronger buds, which are better fitted to produce a crop.

Experimental evidence is lacking on the amount of cutting back which is best, and

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practice varies from no cutting back at all to severe pruning, which enables the canes to stand erect without support under the weight of a full crop. Most growers cut the canes back to a height of three to five feet, depending on their vigor.

Very severe cutting back reduces the yield and delays ripening. Gardeners sometimes take advantage of this method of delaying the harvest, and provide a supply of raspberries well past the normal season by pruning a part of the row severely.

Thin Out the Row—It usually is necessary at the time of the spring pruning to thin the canes, also. Each cane must be given room to branch and bear fruit. It should have several inches clear in each direction. Suckers which have appeared outside the rows and have escaped the cultivator should be removed. See illustrations Nos. 2 and 3.

Remove Old Canes—As soon as the canes have borne their crop, they may be removed or they may be left until pruning time in the following spring. Immediately following the harvest season the canes are more easily cut off, insects and diseases borne by them are removed, and the new canes are given more room to develop. In regions where heavy snows sometimes break the canes the old tops

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may be left over winter to lend their support to the weaker ones. More often they are left in through carelessness or because it is more convenient to do all the pruning in spring in one operation.

FERTILIZATION

The most important item in handling the soil on which raspberries are grown is to secure the maximum of drouth resistance and to avoid soils which are unduly wet in spring. This makes a good supply of organic matter the first consideration. If the soil is well filled with humus, little additional fertilization will be required.

A normal, healthy growth leads to maximum crop production. Overstimulation must be avoided for it may decrease the yield and expose the canes to winterkilling, but the most common fault, especially in small plantations, is insufficient growth.

The first step in remedying this condition should be to free the rows of grass and weeds. Then reduce the width of the rows to twelve or fifteen inches at the bottom and thin out the canes to eliminate undue crowding as detailed under "pruning." If growth still is inadequate, fertilization is in order.

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Well-rotted manure or compost must be given first place as a fertilizer for red raspberries (see page 15). When neither of these is available a good commercial fertilizer of 4-8-4 or 5-8-5 grade, or better, will be found best for general use. It should be applied to the rows in spring after pruning and worked into the soil with a narrow hoe. Fertilization late in the season is sometimes worth while on weak plants, but it must be undertaken with caution and should not be attempted by the inexperienced.

WINTERKILLING

The terminal growth of raspberries continues until brought to an end by cold weather. The new wood at the tips of the canes does not harden or "ripen" and is not resistant to cold. Back from the tips the older wood becomes progressively more resistant to the trying conditions met in winter. Drying out of the canes in winter seems to play a part as important as low temperatures in injuring plant tissues.

The tips winterkill regularly and sometimes the injury extends back to the snowline or to ground level, the amount depending upon the severity of the weather and the condition of

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the canes. Sometimes the strongest canes, which probably grew most in the fall, are damaged worst. Plants which are weakened by disease or starvation often are unable to withstand winters of no more than ordinary severity, while healthy vigorous canes will sometimes come through very cold winters in perfect condition. At times canes which apparently have come through a severe winter in good condition are badly damaged in March after killing temperatures presumably are past.

Winterkilling of plants is complicated by many factors which are so little understood as yet that the causes cannot be clarified. Experience however points to several things which tend to prevent it. A strong healthy growth is first to be desired. Over fertilization, wet land and other things that tend to promote a rapid growth as the time for killing frost approaches are to be avoided. Beyond that, little can be done at present in the way of cultural treatment.

WINTER PROTECTION

In some sections raspberry canes winterkill so severely that they are covered with earth for protection. This is not a difficult opera-

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tion and it will insure the crop against partial destruction by winter even in sections where severe killing is not the rule.

In laying down the canes and covering them with earth, care must be taken not to break or split them. Usually they are pushed over and held down with a fork while sufficient earth is thrown on the tips to hold the canes in place (see Figure 4). In sections where heavy snows are to be expected it is necessary to use enough earth to hold the canes down only. Otherwise they should be entirely covered to a depth of three or four inches.

If the canes are to be covered with earth it is best to lay them as flat to the ground as possible without too great breakage. This is facilitated by removing a spadeful of soil from beside the plant and pressing against the bases of the canes with the foot when they are being laid down.

After all danger of heavy frost is past in spring the canes are uncovered and lifted into position. Usually they are given some support. Caution must be used in uncovering the canes, for they are very tender after their winter in the ground and are more easily damaged by frost than canes that have not been given protection. They should not be uncovered too early. On the other hand, if the

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buds start growth before the plants are lifted, they may be damaged upon exposure to a hot sun.

When raspberry canes are to be covered during the winter the rows should be kept narrow, and old fruiting canes should be removed soon after harvest.

PESTS OF THE RED RASPBERRY

Among the many insects and diseases which find their way into raspberry plantations are several which are widespread and destructive. Their successful control depends upon the recognition of such an invader when it appears and the prompt adoption of control measures. When an unknown and evidently destructive pest is found it is advisable to send a specimen for identification to the state agricultural college. Once its identity is determined proper control measures may be undertaken.

“Yellows” or Mosaic and Leaf Curl—These two obscure diseases are the worst pests of the red raspberry. They are almost certain to appear in every plantation. They infect every part of the plant, which they dwarf and destroy, and new shoots from infected plants develop “yellows” without fail. Once a plant is attacked, no cure is known.

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Mosaic is the most common form. It appears as a yellowish mottling of the leaves, with darker green blisters between the veins. Plants infected with leaf curl, on the other hand, have dark green leaves which are tightly curled, the edges rolling inward toward the under surfaces.

Both mosaic and leaf curl belong to that mysterious group of mosaic diseases which is arousing the concern of plant pathologists everywhere. The organisms which cause them seem to be incredibly minute—at least they never have been seen. They are spread from plant to plant by certain aphids or plant lice.

The only practical control measure which has been suggested is the removal of infected plants as they appear. The roots, too, should be removed in so far as possible and new shoots from remaining roots should be destroyed until the last root is dead. The disease dies with the plant and when the old plant is gone, a new one may safely be set in its place.

Crown Gall is another incurable disease which sometimes appears. This disease occurs on many plants and appears as wartlike growths on the roots. Infected plants are weakened and rendered more susceptible to drouth and winter injury. Crown gall spreads

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through the soil from plant to plant and is able to live in the soil for some time after a diseased plant is removed.

Crown gall nearly always comes into the plantation on nursery stock. Plants with galls on their roots should be discarded and a determined effort should be made to keep the plantation healthy.

Cane Blight is still another common trouble which usually comes in on nursery stock. Infected canes may apparently endure the winter in fine condition but fail to start into growth in spring. The diseased canes are light in color with patches of fine dark stippling where the spore-bearing organs appear.

Blight may be spread by cultivation, on pruning tools, or by pickers. Affected canes should be cut and burned. Fortunately, good cultural methods, including the removal of old canes after the harvest season, will usually hold cane blight in check.

Cane Borers are found in many plantations. The adult insect is about three-quarters of an inch long with black body and yellow neck or prothorax. In summer the female deposits eggs in the canes about six inches from the growing tips. She then girdles each cane above and again below the egg. The tip wilts and finally breaks off, the wilted tip betraying

the presence of the borer. The egg soon hatches and the young borer works down the cane. It spends two seasons in the cane and usually keeps the berries from maturing.

The wilted tips may be gathered and burned to destroy the borers before they have a chance to do much damage. When old canes are removed as soon as they have borne their crop, the older borers are destroyed and the pest is held in check.

Raspberry Byturus—Small brownish insects about one-seventh of an inch long sometimes appear in the raspberry patch, where they eat holes in the buds and devour the flower parts within before the blossoms open. These are the adults of the raspberry byturus. The larva is the raspberry worm, a small, soft, tarnished white larva that feeds in the fleshy base or receptacle upon which the berry is borne. These worms sometimes adhere to the berries when they are picked.

A single cultivation in late fall when these insects are pupating will destroy many of them. When they become really troublesome it is advisable to spray with arsenate of lead, using about one and one-half ounces of the powdered form in one gallon of water. Apply it as soon as the adults appear and repeat in a few days, if necessary. If poultry can be

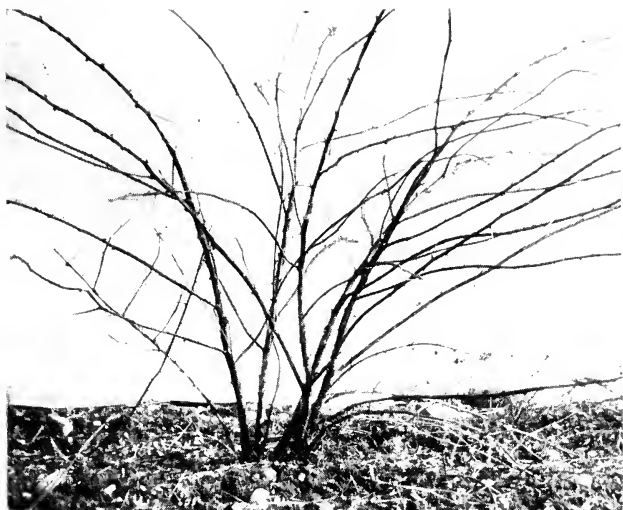


FIG. 10 (*above*). A purple raspberry plant before pruning. Unpruned, such plants produce an abundance of small seedy berries which are difficult to harvest and poor in quality.

FIG. 11 (*below*). The same bush pruned. Only the productive canes are left, and these are pruned back to concentrate the crop on the best bearing wood.

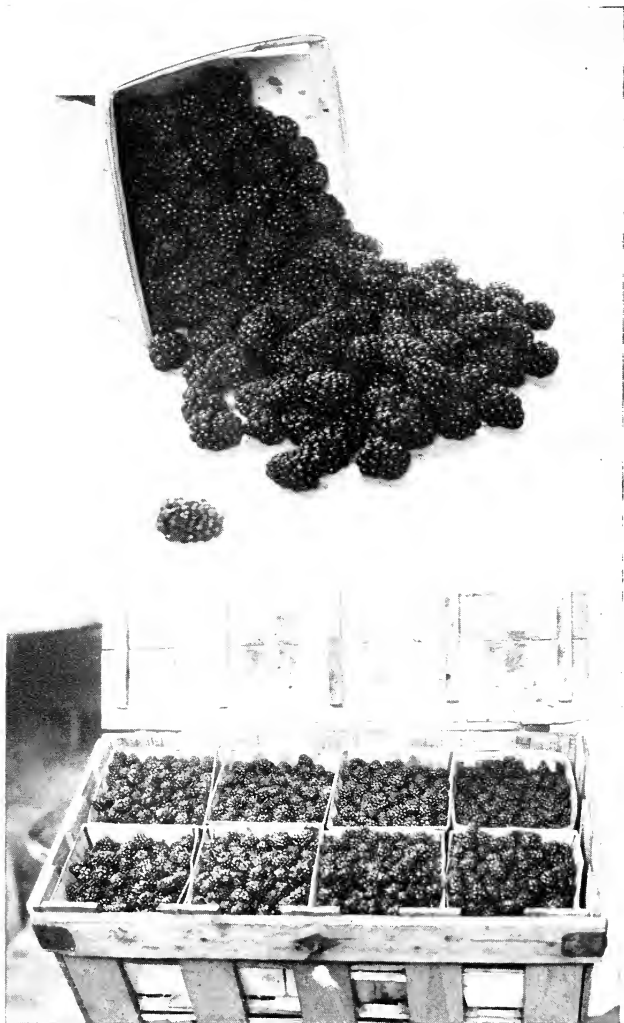


FIG. 12 (*above*). Blackberries. When fully ripened on the canes, blackberries must be classed among our most delicious fruits.

FIG. 13 (*below*). A crate of blackberries.

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run in the plantation in the fall they will prevent a carry-over of the infestation to the year following.

HARVESTING AND MARKETING

A yield of a quart to the yard of row is fair, although two or three times that amount is not unusual. Naturally the yield per linear foot of row varies tremendously, not only with the condition of the plants but with the width of the row as well.

Red raspberries are highly perishable; they must be picked often and handled carefully. When the weather is hot and favorable to ripening it is best to go over the patch every day to remove the fully ripened berries. For immediate home consumption the berries should be allowed to ripen fully before harvesting them. The full rich flavor of cane-ripened fruit has little in common with the insipid flatness of berries picked early and shipped from a distance. The moisture supply is so important at harvest time that it is advisable to follow each picking with the cultivator to loosen up the soil tramped down by the pickers, unless it is so dry that many berries would be covered with dust and rendered unfit for use.

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Small containers should be used in harvesting and handling red raspberries. Pint splint boxes are used ordinarily, for in quart boxes the weight of the fruit soon tends to crush the berries on the bottom. If the berries are set in a cool place soon after harvesting, they will keep much longer than if allowed to stand in the sun or in a warm place.

Almost every hamlet in the country offers a good market for surplus berries. The market in many sections never is adequately supplied and unquestionably the consumption of raspberries could be extended manyfold if only a larger supply were available. A small town will often absorb the output of a commercial plantation of some size. Even where a supply of shipped-in berries is maintained, berries deteriorate so rapidly that the local man can easily gain a reputation for a high quality product.

FALL BEARING OR "EVERBEARING" RASPBERRIES

The fall bearing raspberries commonly grown are red varieties, although some black caps also have this habit. The fall crop is borne on the tips of the current season's growth, and in the following year these same

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canes branch and produce a summer crop in the usual way.

Fall bearing raspberries are grown extensively in New Jersey and in surrounding states, and to a lesser extent in many other sections. The leading variety is Ranere (St. Regis). Apparently it is not injured by the mosaic diseases and for this and other reasons Ranere is gaining in favor with many raspberry growers. The summer crop ripens early and the bright red fruit is attractive. The berries are rather small, however, and the quality is not high. Other fall bearing varieties, which are not so satisfactory in most sections, are Erskine (Erskine Park) and La France.

Most of the fall crop ripens in August and September, when rains may be infrequent. If the moisture supply is short the crop is curtailed and the berries harvested are likely to be small, with prominent seeds. A moisture-retaining soil is therefore even more essential to success with everbearers than with other raspberries. Irrigation is of particular value in improving the fall crop, but when it is not to be had, good cultivation or mulching is a great help.

IV

THE BLACK RASPBERRIES

BLACK CAP RASPBERRIES are a popular garden fruit in many of the northern states. The dessert qualities of this fruit are appreciated by many and it lends itself admirably to the making of jams and other manufactured products.

SOILS AND FERTILIZERS

Black caps thrive on most garden soils. They winterkill on low, heavy, wet soils, and on drouthy land the berries are small and seedy, if indeed they do not dry up entirely before ripening.

Plenty of organic matter is the most important attribute of a good raspberry soil, and stable manure ranks high as a fertilizer. Complete fertilizers of a high grade are excellent for supplementary fertilization after the plantation is established (see page 41).

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PROPAGATION

The black raspberry usually is propagated by tip layering. As the new canes grow they bend over and in late summer the ends reach the ground. Some tips root well of their own accord but when many strong plants are desired it is best to open the ground with a spade or hoe and insert the tips to a distance of two or three inches to insure good roots. This may be done at any time in late summer, but it is best to wait until the ends of the canes of spreading varieties like Plum Farmer have reached the ground of their own accord, and produced long slender tips.

New plants are severed from the parent plants in the following spring and are taken up carefully on a spade to preserve as much of the root system as possible.

Experienced growers of black caps take plants for transplanting from young and vigorous parent plants, if at all possible. Black varieties are very susceptible to diseases of the mosaic type and plants from older bushes are likely to carry some infection. Plants from one- or two-year-old plantations are more vigorous than those from plants that are on the decline. Great care should be taken to get new plants which are healthy and vigorous.

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Many of the more experienced commercial growers of black raspberries hold a plantation for three or four years only, replanting so frequently to maintain the vigor of their plantations. This system could be followed to advantage in gardens in which black raspberries tend to "run out" in a few years. This decline in vigor may be due to poor cultural conditions, but is more likely to be due to one of the diseases of the mosaic type (see page 59).

PLANTING

Black raspberries are usually grown in rows rather than hills. They are planted three or four feet apart in rows which should be at least six feet apart. Seven usually is better in locations favorable to this fruit. It is a common fault to plant the rows so close together that after the plants are mature it is almost impossible to work between the rows. The planting distance, however, should be adjusted to the varieties, strength of the soil, and the system of culture to be employed. After the first experience these things may be taken into consideration.

Planting should be done as early in spring as the ground can be worked. The rooted tips send up new canes in spring and these new

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shoots get an early start. They are very tender and are easily broken off, a decided injury to the new plant. The plants may be set either in furrows or with a spade, as described for the red raspberry (see page 37).

PRUNING AT PLANTING TIME

After planting, the old canes should be cut back to within three or four inches of ground level. If they are left long, much of the growth of the first year may go into the production of branches on the old cane rather than into the growth of new canes. These branches may bear fruit, still further weakening the new plant. No fruit should be allowed on new plants the first year, and every effort should be made to secure a good growth of new canes from the root.

If the old cane is spotted with anthracnose it is best to remove it entirely and plant the root only. The row may be marked with stakes for convenience in cultivating before the new shoots appear. It is a poor policy to start a new plantation with an infection of anthracnose, and by exercising care a healthy plantation may be started from an old one that is infested. With mosaic or streak, how-

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ever, this plan is of no value, for diseases of that type infect the root as well as the top.

PRUNING BLACK RASPBERRIES

Because of their distinctive method of growth, black caps are pruned quite differently than red varieties. Black raspberries do not send up suckers at a distance from the parent plants and it is easier to keep the rows within bounds. Propagation in clean land is interfered with by the winds, which keep the tips blowing around and tend to prevent their rooting, so it is not difficult to keep new plants in check.

Tipping in Summer—As with all raspberries, the canes grow during their first season, produce fruit the next, then die. Black raspberry canes branch freely in their first year when they arch over toward the ground. This increases the bearing area of the canes, but many of the branches produced naturally are too far out on the cane to be kept off the ground easily.

To encourage earlier and stronger branching and to secure more stocky canes it is customary for black raspberry growers to pinch off the growing tips of the new canes when

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they reach a height of eighteen to thirty inches, depending on their vigor.

Removing Old Canes—When the harvest season is over the bearing canes have fulfilled their mission, and soon decline and die. In climates where heavy snows sometimes break raspberry canes in winter they are often allowed to stand until pruning time in the following spring. Otherwise it is best to cut them out and burn them soon after harvest. They are then removed from interference with the new growth, and many insect and disease pests are destroyed which otherwise would be transferred to the new canes.

Spring Pruning—In spring, while the plants are still dormant, weak canes should be removed and laterals on the others should be shortened. Half a dozen buds on each lateral probably are better than more. Every bud is a potential fruit bud, but if they are not reduced in number many will contribute nothing to the crop and so many berries may be set on the others that the size and quality of the fruit may be impaired. See illustrations Nos. 6, 10, and 11.

SOIL TREATMENT

Black raspberries respond promptly and abundantly to good care, and soon lose their

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vigor and productivity without it. When weeds and grass are allowed to come in, black caps propagate much more freely, for the tips root more readily than on cleanly cultivated ground, and the raspberry patch soon becomes an impenetrable jungle.

When cultivation is followed, it should be started in early spring before the weeds get a start and before the ground is packed hard by spring rains. A good dust mulch should be maintained until after harvest.

In the garden it is often more convenient to use a mulch system than to attempt cultivation. When used at all, a good mulch should be established early and maintained carefully. The mulch must be heavy enough to prevent the growth of weeds and the thickness required will vary with the condition of the land. Almost any vegetable waste will serve as a mulching material, but it should not contain ripened seeds which might make trouble.

Mice under mulches are sometimes troublesome. In winter they may girdle the canes by devouring the bark when hard pressed for food. The mulch should be examined in the fall and if the runways of mice are numerous, the mice should be poisoned or otherwise destroyed.

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PESTS OF THE BLACK RASPBERRY

Anthracnose—This fungous disease appears as light, oval spots on the canes. They interfere with the transfer of food materials in the plant and as they enlarge and coalesce they may prevent the ripening of the crop. In a wet spring young shoots may be killed.

The removal of fruiting canes soon after harvest probably aids in checking this disease. When it is serious, however, the plants should be thoroughly sprayed with lime sulphur solution, as follows:

- (1) In spring when plants are still dormant use liquid lime sulphur about $\frac{1}{2}$ pint to each gallon of water.
- (2) About June first, use liquid lime sulphur about $\frac{1}{2}$ pint to each three gallons of water.
- (3) Just before blossoming, use same material as in (2).

Mosaic—(See page 45). On the black raspberry this disease checks growth, kills the growing tips and finally results in the death of the plant. Clean nursery stock to start with and later roguing out of infested plants is the only remedy known.

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For other insects and diseases see pages 45 to 48.

HARVESTING

Yields vary tremendously with the condition of the plants and with the season. A quart to the yard of row is a dependable yield in the garden, and two or three times that amount may be harvested. In general, black caps outyield red varieties, being intermediate in that respect between red and purple sorts.

To attain their full flavor, black caps should be allowed to ripen well before being picked. The berries should be kept in a cool place after removal from the canes, and the less handling they receive the better. They should be picked into small receptacles to prevent the crushing of berries on the bottom. Pint baskets are better than quarts for this purpose.

V

THE PURPLE RASPBERRIES

STARTING THE PLANTATION

THE purple raspberries are propagated readily by tip layering, but do not propagate themselves freely. In habit of growth the common varieties are intermediate between the parent species, the upright red raspberries and the black raspberries which bend in late summer until the tips of the canes are brought into a favorable position to root and produce new plants. The common purple canes do not produce sucker plants and are too upright in habit of growth to bring the tips of the canes in contact with the ground. When covered with earth in late summer, however, the tips root readily (see page 53).

This is for the most part a decided advantage. With other raspberries new plants are the worst weeds in the plantation. Unless they are rigorously kept within bounds they soon

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form an impenetrable thicket, but the purple canes stay in the original hills while affording an easy means of propagation to the grower who wishes new plants.

TRAINING

Purple raspberries are usually planted about four feet apart in rows seven or eight feet apart, the distance varying with the fertility of the soil and the type of culture to be employed. For horse cultivation wider spaces are needed between rows than for hand cultivation or mulching.

The canes are upright and strong, and when pruned properly usually need no support. Sometimes, however, they are supported by wires after the fashion of red raspberries (see page 33), or the canes may be tied like black caps to stakes driven in beside the hills.

PLANTING

The new plants usually are transplanted in early spring. They should be set before the new shoots begin to grow for they are easily broken. Care should be taken in digging up plants to preserve as many as possible of the fibrous roots. After transplanting, the top

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should be cut back until only enough is left to mark the row (see page 55).

PRUNING

Purple raspberries are pruned much like black caps. The tips are pinched from the new canes in summer when they have reached the desired height. With the purple canes this height is about thirty to forty inches. This forces the production of strong branches low on the canes. Before growth starts in the spring following, these laterals are shortened to bring the crop nearer to the main cane and, by reducing the number of buds, to improve the size and quality of the fruit. Weak canes also should be removed at this time. See illustrations Nos. 10 and 11.

In summer after these canes have borne their crop they are cut out and burned as an aid in controlling pests, or they may be left until the following spring to furnish a measure of protection to the young canes from breakage by snow. Each plan has its adherents, and both are successful.

CULTURE AND FERTILIZATION

Purple canes are heavy producers when well grown and a strong healthy growth is highly

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desirable. The soil should be well filled with organic matter before the plants are set by plowing down manure or vegetable waste materials. The same thorough preparation of the soil should be given as for a garden crop.

In established plantations which are tilled, cultivation should begin in early spring and a dust mulch maintained until after the harvest season. After that, tillage should be such as to keep weeds and grass from gaining a foothold. In clean land one or two thorough cultivations after harvest should be enough.

When plants in established plantations fail to make a clean vigorous growth plant food in some form should be supplied. Well-rotted stable manure is best (see page 15). When it is not to be had, a high-grade commercial fertilizer should be used. Fertilizers should be applied early in the season only, and care should be taken not to add too much nitrogen. It may continue vigorous growth too late in the fall and lead to serious winter injury. The purple canes are less hardy than some of the other raspberries and special care should be taken to guard against a strong growth late in the season. It is equally important that a healthy growth should be secured, for weak canes, too, lack hardiness.

THE PURPLE RASPBERRIES

PESTS

The pests of purple raspberries are those of red and black varieties (see page 45). Mosaic is the most serious trouble, and Columbian has been ranked with the Cuthbert red raspberry in susceptibility to this disease. Care should be taken to secure disease-free stock for planting, and any diseased plants appearing in the plantation should be promptly dug out and destroyed.

HARVESTING

Purple canes usually outyield other types of raspberries, and they ripen late. The berries are soft and perishable, and should be handled with care. Small receptacles should be used in harvesting to prevent crushing of the bottom berries and they should be placed in a cool, well-ventilated place as soon as possible.

VI

THE BLACKBERRIES

THE blackberry is one of the newest and certainly the wildest of the native fruits of North America that have become established in cultivation. Heavily armed with vicious thorns and aggressively extending its holdings by sending up a forest of new plants on all sides, it vigorously advertises the fact that it has not yet become adjusted to its new surroundings.

Blackberries are abundant in the waste lands of most parts of the north temperate zone, and for uncounted centuries the fruit has been esteemed, but it is only in North America that their culture has become well established. This delectable fruit is almost a stranger to European gardens, aside from the surrounding hedge rows in which it flourishes.

In this country blackberry culture had advanced but little at the time of the Civil War. The first varieties to be grown successfully

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were the *Lawton*, found in New York, and the *Dorchester*, from the vicinity of Boston. Soon after the close of the Civil War the *Wilson* was introduced from New Jersey and the high quality of its fruit did much to popularize the new berry. *Kittatinny*, also found in New Jersey, was introduced at about the same time and its hardiness extended the culture of blackberries far into the Northern States.

Other varieties soon followed, among them *Snyder*. Hardy, productive, and disease resistant, Snyder soon established itself from coast to coast as the leading blackberry of the Northern States. It is now giving way to newer varieties which are higher in quality and more desirable, but it promises to remain a standard sort for some time yet in the colder parts of its range.

SOILS AND THEIR PREPARATION

The best soils for blackberry growing are largely determined by two requirements: drouth resistance and a high degree of immunity from winter injury. Blackberries ripen their fruits in late summer during the driest part of the year. Water constitutes the greatest part of the fruit and a shortage in soil moisture invariably reduces the size of the

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berries. Such berries lack flavor and are unduly seedy, having their full complement of seeds and lacking only the fully developed pulp around them. Drouthy soils must therefore be avoided.

Wet, undrained soils on the other hand induce winter injury. Growth on such soils is beyond control and to plant blackberries in such land is to court disaster. The blackberry plant is tenacious of life and will continue to live in most unfavorable situations, but for the purposes of the fruit grower extreme soil types must be avoided.

A strong, deep loam, moist but well drained, is to be desired. As suggested before, plenty of organic matter in the soil will go a long way toward correcting faults in the original texture of the soil, and it deserves special attention (see page 15).

It is difficult to build up a soil after the plants are set. It is therefore well to incorporate plenty of organic material with the soil before planting. It also saves much labor and disappointment later if the land is freed of pernicious grasses and weeds. It is almost, if not quite, impossible to rid a plantation of such aggressive pests as quack grass, and usually it is easiest and best to start a new

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plantation when such weeds become firmly established in the old one.

The soil should be deeply pulverized and worked into fine condition before planting. A good start the first year usually means a good crop by the third year and often saves a year in establishing the plantation.

VARIETIES

Many varieties of blackberries are now in cultivation. Some, like Snyder, are grown over large areas, while others are local in their adaptations. Unfortunately the most hardy varieties are not always the highest in quality or the most resistant to diseases, and the selection of the best variety for a given location is attended by some difficulties.

Sufficient hardiness to withstand at least most of the local winters is an absolute requirement. When this and other sectional adaptations have been met, quality of fruit may be considered. For such extreme sections as the region surrounding the Dakotas no varieties are available that can be depended upon to thrive without winter protection.

Among the hardiest varieties are Ancient Briton and Snyder. Somewhat less resistant but grown over most of the northern range of

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the blackberry are Blowers, Eldorado, Erie, and Mersereau. On the Pacific Coast several very vigorous varieties are found which are of little value east of the Rockies. Among them are Crandall, Oregon Evergreen and related varieties, Himalaya, and Mammoth. Dallas, Haupt, and McDonald are said to be better adapted than other varieties to the dry Southwest. The following notes are concerned with leading varieties only.

Ancient Briton—Will stand cold winters better than most other varieties. A vigorous grower and productive. The berries are medium in size but the quality is good. The fruit ripens in midseason.

Blowers—A vigorous, free growing variety but not always productive. The season is long. The fruit is good in quality but variable in size and shape.

Early Harvest—Widely grown in the South; not hardy in the North. Susceptible to orange rust. Fruit ripens very early and the quality is good.

Eldorado—One of the best varieties for the northern states. The plant is vigorous, productive, hardy, and rust resistant. The fruit is large and exceptionally high in quality. The season is early and long.

Erie—A vigorous plant that is usually

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hardy and productive. Fruits large but very acid until well ripened. Matures in mid-season.

Mersereau—A dependable variety widely grown in the northern states. The plant is vigorous, productive, and hardy, but susceptible to rust. The fruit ripens in late mid-season and is high in quality.

Snyder—This has been a standard variety for a long time. The bush is very hardy and productive, and is little troubled by disease. The fruit, however, is not so high in quality as that of some other blackberries and Snyder might well be replaced by better varieties in many sections.

UNUSUAL FORMS

White Blackberries—These albino blackberries occur frequently in nature and a number of named varieties have found their way into the trade. Iceberg is at present the most widely known "white" variety. The color of the fruit is amber rather than white. The quality of the fruit is good but the canes are not very hardy. Such varieties have no commercial importance but the gardener who is looking for something unusual might well add the white blackberry to his collection.

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Oregon Evergreen—This rampant blackberry now grows wild in the Pacific Northwest but it originally came from Europe, where it has been grown for more than a century. It flourishes in Oregon and Washington, where it is grown extensively. East of the Rocky Mountains the variety has little value. It winterkills easily and the fruit is almost worthless. Other names under which the berry is sold are Evergreen, Everbearing, Star, Cut Leaved, Atlantic Dewberry and Wonder. Black Diamond, grown somewhat in New Jersey, is said to be a seedling much like the parent.

Himalaya—This is one of the Burbank berries that have been sold rather widely. It is a standard sort in California, but east of the Rockies it has found little favor. Like the Oregon Evergreen it is semi-trailing and a very vigorous grower, the canes running like vines for ten or fifteen feet. It is difficult to handle, tender to cold, not highly productive, and the fruit is inferior in size and quality.

PROPAGATION AND PLANTING

Common varieties of blackberries propagate freely from suckers which grow from the roots, often at some distance from the older canes.

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New plantations usually are started by transplanting well-rooted suckers. Ordinarily suckers are produced in such great abundance that they are the worst weeds in the plantation and vigorous measures are necessary to suppress them.

Any disturbance of the root system tends to increase the production of suckers and in the rare cases when more new plants are wanted than appear naturally they may be encouraged by deep cultivation, which breaks the roots, or by cutting the roots with a spade a short distance from the older canes.

Root cuttings two or three inches long are often used by nurserymen in propagating blackberries, and the method is equally satisfactory for the gardener and fruit grower, especially in emergencies when a large number of new plants from a few old ones are desired. It is best to dig the roots in fall and cut them up. The pieces should be layered in moist sand and stored until spring in a cool place. Then they are planted two or three inches deep in good garden soil, where they are grown for one or two years before transplanting to the field.

If suckers are used, only vigorous, healthy plants should be selected for transplanting. Usually there are plenty of them. They should

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be lifted out of the ground with a spade, preserving as much as possible of the root system. The sooner they are reset the better, although plants which are fully dormant may be shipped or stored for a long time if they are kept from drying out and kept dormant until planted.

TIME OF PLANTING

Suckers may be transplanted either in the fall or in spring in most sections. In Middle Western regions where dry, cold winters are common, however, spring planting is to be preferred. In other sections fall-set plants usually winter well and get an early start in the following spring, which may save a year in establishing the plantation.

Plants should not be dug in the fall until dormant. After planting in regions where severe winters are to be expected, a light mulch or mounding with earth will give added protection.

Most planting in the northern states is done in spring, and much of it is done too late to be most effective. Late-set plants often are unable to become well established before the drier weather of midsummer comes on. They may, in consequence, be unable to make much growth until the autumn rains give them a

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start, and it will take a year longer to grow canes enough for the first real crop. When planting is done as soon as the soil can be worked in spring the plants become established early and have a long growing season the first year.

The first consideration is the development of full rows of fruiting canes. The blackberry plantation will fruit in the second summer, but if the first year's growth was poor and the rows have many gaps, it is sometimes best to cut off the fruiting canes in spring and allow all the strength of the root system to go to the production of new plants rather than a crop too small to be worth much. If some of the nursery plants failed to grow, sucker plants from vigorous growers may be transplanted into the blank spaces at the beginning of the second year.

SETTING THE PLANTS

Plants may be set and set well in a number of ways, and nearly every gardener or fruit grower has a favorite method of his own. Earth should be brought into close contact with the roots and thorough preparation of the soil will do much to make planting easy and rapid. Where only a few plants are to be

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set the rows may be marked off and the plants set with a spade. If the spade is thrust into the soil at an angle and pushed forward, an opening is made behind it for the plant. After the spade is withdrawn the soil should be tramped solid over the roots. This is the most important part of transplanting and it should be done thoroughly. There is no danger of injuring the root system but there is danger of leaving air spaces next to the roots, especially with this system of planting.

It usually is easier and quicker to furrow the land at the proper distance and set the plants in the furrow. Place each plant and draw a little earth over the roots with the foot, tramping it solid. The covering may be finished by running a plow along the row, and the land may be smoothed then with a cultivator.

PLANTING SYSTEMS AND DISTANCES

Blackberries are usually grown in solid rows—the so-called hedge row system of planting. With plants so thorny and difficult to work among, the rows should never be allowed to become wide, for pickers will not work their way in very far to harvest the berries in the middle of the row. The more narrow the rows

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the less hand labor is required and the easier the work is done. It requires a great deal of determination and some active work with the cultivator or hoe to keep the rows from growing wider every year, but the effort is worth while.

The rows should be planted at least eight feet apart if horses are to be employed in cultivation. When the rows are established this will leave six or seven feet between rows at the bottom, but the canes bend outward above and the space is little enough in which the horse can walk without coming into contact with the thorny canes.

The plants are usually set about three feet apart in the rows, although the distance varies from two to four feet or more with the preferences of the grower. In general, the closer planting distances enable the plants to fill in the rows more quickly and if growth conditions are not favorable, as with plants set late in spring, close planting is to be preferred. Ordinarily, however, three feet is about right.

A few commercial growers prefer the hill system, which permits cultivation in both directions and reduces hand labor to a minimum. The yields probably average somewhat below the hedge row system, but the berries

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are larger and finer. The hills are usually spaced seven or eight feet apart each way.

PRUNING

Careful pruning is a great aid in growing good blackberries easily. Without pruning, the patch soon becomes a wild tangle of thorny canes which is utterly unmanageable. Blackberry canes grow in one season, produce fruiting branches in the second season, then die and are ready for removal. The root system lives for many years but the canes are short-lived.

Summer Pruning—The first pruning which the cane receives is in its first or growing season, when the tip is pinched off at a height of two to three feet, varying with the vigor of the plants and the notions of the grower. This checks the elongation of the cane, forces the production of side shoots, and brings about the development of a fruiting area near the ground.

This pinching of the green and growing tips may be done with the hand. It should be done as the young cane reaches the proper height, to give the side shoots a long time to grow and mature and form fruit buds. If the young cane is allowed to grow to a height of four or five feet, then cut back to two or three

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feet, the branches which form as a result of the pruning usually are slender and weak. Too often they die in the spring of the fruiting year, if indeed they live through the winter. Since some canes reach the proper height before others it is not practicable to "tip" the whole plantation at one time.

Some growers prefer to let the canes grow as long as they will without tipping and to cut them back more or less severely in the spring of the fruiting year. Many good berries are produced in this way, but it is likely that the crop is reduced somewhat.

Spring Pruning—The next pruning which the cane should receive is in the following spring—the spring of the fruiting year. This pruning should be done after severe weather is past but before growth starts. Long canes should be headed in and laterals on branched canes should be shortened. The severity of this pruning varies with the fruiting habits of the variety and most effective pruning demands some observation of the parts of the cane which produce most of the fruit.

Some varieties, like Ward and Lawton, produce their fruit low on the cane or well in toward the bases of the laterals and may be headed in without reducing the crop. A few others, like Early King, Taylor and Wauchu-

sett, fruit heaviest at the tips and should be pruned lightly or the crop will be cut off.

On the more common varieties, like Eldorado, Snyder, Mersereau, and Ancient Briton, however, it seems that most of the buds are potential fruit buds. The most satisfactory crops on these varieties have been secured when the laterals were reduced one half in length, and when long unbranched canes were pruned with equal severity.

Another important operation which should be performed in the spring is the removal of surplus canes. The rows in established plantations soon begin to crowd badly and the canes should be thinned until each has room to branch and produce its crop without serious crowding.

Restrict the Spread of the Rows—The rows, too, must be rigorously kept within narrow limits, and all new canes appearing outside the rows should be summarily dealt with. When a row is allowed to spread it soon becomes unmanageable.

Removing Old Canes—After the crop is harvested the work of the fruiting canes is done. They will never bear again and may either be removed immediately or left until pruning time in the spring following. The old canes are easier to cut soon after the harvest

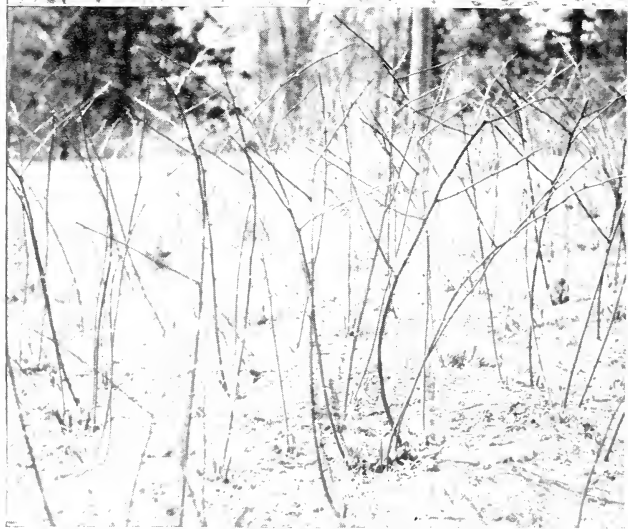


FIG. 14 (*above*). A blackberry "patch" before pruning. Without severe pruning a plantation of this kind is very difficult to harvest and the berries lack size and quality. Good blackberries are grown easiest in cultivated rows.

FIG. 15 (*below*). After pruning. The canes have been severely thinned out and those remaining have been cut back to allow the fruit to be picked with a minimum of discomfort.



FIG. 16 (*above*). Evergreen blackberries in Puyallup, Washington. These strong-growing forms are planted far apart and trained on trellises for convenience in handling.

FIG. 17 (*below*). Currants between grapes in the Hudson Valley. They are also planted under grape vines in the rows, and may be grown more successfully than most other crops between fruit trees, where the shade is not too dense.

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season, before they become dry and hard, and their removal at that time may help to eliminate some pests, but many growers leave them until spring. See illustrations Nos. 14 and 15.

CULTIVATION

The cultivator should be started ahead of the weeds in spring, and the soil should be kept loose and free of weeds through the summer. Cultivation usually is stopped a month or more before the ground freezes to discourage late growth and in a measure favor the hardening of new growth.

Blackberries ripen at a time of year when the soil is likely to be dry. A shortage of moisture reduces the crop and the berries harvested are small and seedy. Cultivation should be pursued with special care as harvest time approaches, and during the harvest season the cultivator should follow the pickers to loosen the tramped soil and conserve as much as possible of the soil moisture.

Blackberry roots are near the surface and deep cultivation may disturb them. Next to the rows, in particular, cultivation should be shallow. When roots are cut suckers are produced, for each severed piece of root acts as a root cutting to produce a new plant. Plenty

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of suckers are produced without this encouragement.

MULCHING

Blackberries may be grown successfully under a mulch and mulching is particularly applicable to small plots. Straw, waste hay, leaves, and similar materials may be used, but it is well to avoid mulching material carrying ripened seeds.

A good mulch conserves moisture, keeps down weeds, and decays on the under side to furnish a steady supply of plant food. It must be maintained, however, by annual applications, or weeds and sucker plants will soon come through it and put an end to the plantation. The mulch between the rows should be heavier than that next to the canes.

The best way to remove sucker plants is to pull them while they are still green. Often cutting them out only encourages more suckers.

FERTILIZERS

Stable manure is still the main reliance of the blackberry grower. The canes are strong growers and appreciate plenty of plant food. Manure is usually applied before the plants are set and later applications may be made if

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necessary and worked into the soil or used as a mulch. Manure also builds up the organic matter in the soil and makes it more retentive of moisture. Where manure is not available a balanced commercial fertilizer of 4-8-4 grade or better is effective. If the land is known to be deficient in nitrogen or phosphoric acid or potash, the material needed may be applied separately, but otherwise it is safest to use a complete fertilizer.

Garden soils which have been heavily manured for years are sometimes too fertile for best results. Too much nitrogen in particular is to be avoided, for it tends to encourage cane growth at the expense of the crop. Heavy applications of poultry manure are dangerous. More plants suffer from starvation than from overfeeding, however, and aside from highly fertile garden soils a growth too rank for good results is not common.

PESTS

The blackberry is remarkably free from insect pests. A leaf miner occasionally attacks the leaves in the eastern states and in Canada, but usually does little damage. Tree crickets sometimes lay eggs in the smaller canes, weakening them somewhat, but this damage usually

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is negligible. Cane borers of several kinds may be found on blackberries but seldom in destructive numbers. As a rule insects occasion little worry to the blackberry grower.

That is not true, however, of diseases, for the blackberry has a number of serious troubles of this class. Some of them are incurable. Only those most likely to be troublesome are mentioned here.

Crown gall, which attacks so many kinds of plants, is frequently found on the blackberry. It appears as wartlike growths where the cane meets the root, and sometimes it is found on the cane at some distance from the ground. It weakens the plants and apparently renders them more susceptible to winterkilling.

This disease is incurable and infected plants should be removed to check its spread. Sometimes diseased plants will live and bear fruit for several years, but such plants are not dependable and it is best to keep crown gall from spreading through the patch if it is noticed before many plants have contracted the disease. The bacteria responsible for crown gall may live for a time in the soil and land known to be infected should be planted to herbaceous plants for awhile.

Orange rust is a common and serious dis-

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ease in many sections. It attacks the leaves and colors them a bright orange on the lower surfaces. The leaves curl and the plant is stunted in growth. Infected plants usually have the trouble year after year and are rendered worthless. No practicable cure is known, and diseased plants should be removed and burned to prevent a spread of the infection. Modern varieties are less likely to be troubled than those of a few years back. The disease often attacks seedlings or rogues which have crept in with the nursery stock, while such varieties as Snyder and Eldorado are unharmed.

HARVESTING

When blackberry rows are kept narrow and pruning is attended to, the berries are not difficult to pick. If the rows are allowed to spread, however, until the centers are not easily reached, it becomes a somewhat trying job.

The most common mistake in harvesting blackberries is to pick them too soon. The blackberry has an unfortunate habit of turning black before it is fully ripened, and if picked immediately the acidity is most pronounced. Fruit growers who ship blackberries some distance to market must harvest the fruit

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while it is still firm enough to handle well, and the blackberry bought on the average market is not calculated to arouse the enthusiasm of anyone. Let it ripen fully, however, and the blackberry must be given a high rank among our finest cultivated fruits.

The gardener need not be so precipitate in harvesting the blackberry crop. The finest flavor which this delicious fruit can attain is reserved for him if he will only wait.

Wild blackberries are famous for their delicious flavor, and it is often said that the blackberry has degenerated under cultivation. But wild blackberries are not examined every day and picked as soon as they turn black. They have a chance to ripen.

After harvesting the berries should be kept in the shade. The sun fades the color to a dull unattractive red and the flavor may be seriously impaired. The blackberry is one of the easiest of all fruits to grow, but there are a few things which must be done with care if results are to be fully satisfactory.

VII

THE DEWBERRIES

DEWBERRIES are a little more than merely trailing or prostrate blackberries, although the two forms grade into each other and are sometimes distinguished with some difficulty by the layman. Dewberries, however, strike their roots more deeply into the soil than blackberries, they propagate in nature by tip layering, and the center blossom of the cluster opens first, while the blossom cluster of the blackberry is larger and blossoms from the margin toward the center.

Serious attempts to cultivate the dewberry date back scarcely half a century. Lucretia, the first variety to be introduced, is still the most popular sort, and it is plain that the amelioration of this new fruit has not gone far. Even so, the dewberry has much to offer to the lover of fruits. It is productive and within its range it is not difficult to grow, while the well-ripened berries must be ranked with our most delicious and refreshing fruits.

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SOILS AND FERTILIZERS FOR DEWBERRIES

Almost any ordinary garden soil will grow dewberries. Excessively fertile soils may lead to an over-vegetative condition and render the plants more than ordinarily susceptible to winter injury. The deep root system makes it possible for the dewberry to tap the lower reserves of soil moisture and it may be grown on sandy land with a moisture retaining subsoil if the plants are fertilized generously.

Good growth is essential to heavy production and soils which are not fertile require correspondingly heavy fertilization for best results. There is nothing which will quite replace stable manure on such soils, but when it is not available a good complete fertilizer may be used to advantage. The amount will vary with the natural fertility of the soil and should be increased until a clean vigorous growth is secured.

On very poor soils it is customary to make two applications of fertilizer in the course of the season. The first is applied in early spring and the second immediately after harvest to encourage a strong growth of new canes for the next crop. In some of the southern dewberry sections the whole plant is cut off near the ground as soon as the harvest season is

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over and the root system is forced to produce a vigorous new set of canes for the next crop.

Over-fertilization is possible, but it is not often met with in practice. The average plantation is more likely to produce far below its capacity because of a shortage in plant food. When the plants become over-vegetative, however, and winter injury is excessive, the fertilization program should be considered carefully as a contributing factor, and curtailment is in order if it seems likely that the main trouble is an excess of plant food rather than abnormal weather conditions.

CULTIVATION

Dewberries respond well to good culture. A normally vigorous growth of canes is much to be desired and careful cultivation is an important operation. The size and quality of the berries will vary with the moisture supply, and cultivation is particularly important as harvest time approaches.

When new canes are pushing out rapidly it is convenient to cultivate in one way only. The prostrate canes are then swung into the rows and left there. They are not dragged back and forth.

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PROPAGATION

Dewberries are propagated easily by tip layering, and that method usually is used. To insure abundant and vigorous roots it is best to cover the tips of young canes with soil in August or September, or to open the ground with a spade and insert the tip for a distance of two or three inches. The tips root promptly and the new plants may be transplanted before frost or in the spring following.

Root cuttings are also used. The larger roots are cut into three-inch pieces in the fall and stored in moist sand over winter. They are planted close together in spring and grown for a year before transplanting to a permanent place.

PLANTING

Dewberries usually are planted in early spring, although in the South they may be set in winter. When the plants are taken up, five or six inches of the old cane is left on the root for convenience in handling. This section of old cane is of no particular value to the new plant, and if it shows signs of disease it may be cut off entirely when the root is planted. Otherwise it serves to mark the row until the new shoots appear.

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Early planting is much to be desired, especially on light land. If the plant fails to become well established before the drier part of the summer, the first year's growth will be small and it may take an extra year to secure the first full crop. When planted early and pushed right along a fair crop may be secured the year after planting. Otherwise it often is best to cut off the bearing canes early in the second year and throw the whole energy of the plant into shoot and root growth.

Planting distances vary with the system of culture. In large fields where horse cultivation in both directions is desired, five by five feet is a common distance. In the garden, where cultivation is possible in one direction only, solid rows are more economical of space and three feet between plants and five or six feet between rows are about right.

SUPPORTS FOR DEWBERRIES

Dewberries usually are trained to a support of some kind. This takes many forms, only two of which can be mentioned here.

Staking is perhaps the most widely adaptable practice. When trained to stakes the plants usually are set three to five feet apart in rows which are five feet apart. A stake

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is driven solidly into the ground beside each plant, extending about five feet above ground, and the canes are gathered together and wound around the stake. The canes are tied at the top and once or twice lower down.

Cultivation is simplified when this system is used and the berries are exposed and easy to pick.

A form of wire trellis that often is convenient is made by stretching a wire on posts. It should be about three to four feet above the ground, with posts every thirty or forty feet. The canes are then tied to this wire. They may be allowed to run along the wire or they may be cut off above it.

PRUNING DEWBERRIES

Details of pruning will vary somewhat with the climate and the training of the plants, but the principles are fundamentally the same.

The dewberry cane, like the canes of other brambles, grows in one season, branches and bears fruit in the second summer, then dies and is cut out. When it is tied up in the spring of the fruiting year it usually is shortened to fit the support. Old canes may be taken out in the fall or may be left until the spring pruning season.

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In the South, where the growing season is long, it is customary to cut off all canes, young and old, close to the crowns, immediately after harvest. There still is time for the production before winter of strong new canes to bear the next crop.

PROTECTION OVER WINTER

Where snow can be depended upon to cover the canes throughout the winter, no protective measures are necessary. But in many of the northern and midwestern states the ground is too often bare when the weather is severe. In such situations some form of winter covering is worth while to prevent excessive killing of canes.

A common form of protection is to cover the canes with two or three inches of earth. This may be done with a plow or, in smaller plantations, with a shovel. Canes should be covered just before the first hard freezes. In spring it is well not to remove the earth too early, for canes so protected over winter are rather more tender than others when exposed to the sharp winds of early spring.

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HARVESTING

Dewberries are never at their best unless they are allowed to ripen fully on the canes. When dead ripe they must rank with our most delicious fruits. Ordinarily they are picked every other day, but in hot weather daily picking may be necessary to save the fruit. For shipment the berries must be picked while still firm and before they are fully ripe.

VARIETIES

Lucretia is the most widely grown dewberry. It is the leading variety in almost every part of the country, and usually it is the only variety grown. *Mayes* and *Gardenia*, however, are listed as leaders in Texas and California, respectively, while *Premo* is said to be grown to some extent in North Carolina.

VIII

THE CURRANTS

MOST of our cultivated fruits are assigned by botanists to the rose family, but currants and gooseberries belong to another group, the saxifrage family. Since good cultural methods are mainly concerned with providing optimum growing conditions for the plant, its characteristics and peculiarities dictate the best cultural treatment.

It is to be expected, then, that these fruits, not closely related to others, might require cultural adaptations somewhat different from those needed by the brambles, or strawberries, or apples. This is true, although the careful and observant gardener will have little difficulty in adapting his knowledge and skill to these fruits.

SOILS AND LOCATIONS FOR CURRANTS

Currants, like gooseberries, are distinctly northern fruits, and they thrive best in cool,

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moist places. Usually currants are not fully productive on warm soils and exposures, although the plants may appear normally vigorous. The currant grows southward to Virginia and it extends to the north far beyond the range of most fruits.

Clay loams and northern slopes are to be preferred, although fertile sandy loams which are not drouthy are satisfactory for the purposes of the gardener. Where lighter soils must be used they may be improved by filling them with organic matter.

When grown on a small scale, protection from the sun may be secured by planting currants on the north side of a fence or building. This means of sheltering the plants from the sun is of more importance southward than in the cooler climates. Likewise, lighter soils and warmer locations may be used in the north. Even in the northern states, however, currants are often grown in partial shade between fruit trees. They should not be planted too close to trees, for competition for food and moisture may then become acute, but on good loams some varieties of currants thrive when interplanted in orchards.

Two other factors in connection with the site should be noted: currants love moisture in summer but cannot withstand wet soils. Good



FIG. 18 (*above*). Currant bush before pruning. The older wood declines rapidly in productivity and as the bush grows dense it checks the growth of new shoots.

FIG. 19 (*below*). The bush pruned. The oldest canes are removed along with new shoots which are weak, and branches near the ground are cut away.



FIG. 20 (*above*). A three-year-old cultivated blueberry bush in a garden. The large, finely flavored fruit and its universal popularity make the blueberry a welcome addition to the list of garden fruits.

FIG. 21 (*below*). A blueberry bush covered with netting to keep birds away as harvest time approaches. Note the heavy mulch of pine shavings.

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drainage in spring is essential. Furthermore the currant is one of the first fruits to bloom in spring, and in low places the blossoms are likely to be damaged by late frosts. Frost pockets must be avoided.

PROPAGATION

The easiest way to propagate currants is by layering and it is quite satisfactory when only a few new plants are desired. Bend a young shoot to the ground at any time during the early part of the growing season and cover a portion of it with earth, having the end exposed. If the shoot was quite upright, it may be necessary to add a stone to keep it down.

Such shoots root quickly and are ready to transplant in the fall or early spring. If the layering is not delayed until late summer a strong root system usually is developed and the plants get an excellent start. If the branch is covered for a length of a foot or more, the buried portion may send up several shoots, each of which may be severed, along with a piece of root, and transplanted.

When many plants are desired, hardwood cuttings are employed. The cuttings may be made in the fall as soon as the leaves have dropped, and they are taken from current

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season's growth. It probably is best to wait until the leaves fall, insuring the maturity of the wood, but the work is sometimes hastened by removing the last leaves a week or ten days before taking the cuttings. The cuttings should be six inches to a foot in length.

Currant cuttings root readily and sometimes they are planted immediately. Under these conditions, however, mortality is likely to run high and many which live get a slow start.

It usually is better to tie the cuttings in bundles with the butts even and bury them in a well-drained spot, upside down, with an inch or two of soil over the butts. A callus then forms on the cut ends from which roots strike readily. As soon as the ground can be worked in spring the cuttings should be planted in a nursery row, five or six inches apart, with the soil packed tightly about them and with but one or two buds exposed.

There are many other successful methods of handling cuttings. They may be made during the winter and stored in a cool place in moist sand, or they may be rooted, as spring approaches, in a greenhouse, with bottom heat. In any case they are ready to grow earlier in spring than most fruit-bearing plants and should be set in the ground as soon as possible.

THE CURRANTS

PLANTING CURRANTS

Except in the colder parts of the Great Plains area, currants may be planted either in the fall or spring. Where winters are extremely trying to plants, spring planting is best, but in other sections fall planting has some advantages. Currants begin to grow so early in spring that fall-set plants get an early start and may become well established in a shorter time.

The currant becomes dormant earlier in autumn than most fruit plants and fall planting may be done earlier and easier than with most others. Dormant plants may be secured in the North in September. If transplanted at that time they become established before the ground freezes and can withstand any but the most trying winters.

The size of currant plants at maturity varies a great deal with the variety, soil, and climate, and planting distances should be adjusted accordingly. The currant is a gross feeder and crowding is not advisable. Distances between rows vary from six to eight feet and the distance between plants in the row should be four to six feet. Black currants and strong-growing varieties of red currants like Wilder require more room than red currants like Per-

BUSH FRUIT PRODUCTION

fection and Red Cross, which by nature form smaller bushes.

CULTIVATION AND MULCHING

The currant has a shallow root system and deep tillage is likely to do considerable damage. Plowing next to the plants is to be avoided, but frequent shallow cultivation is highly desirable. In small garden plots a good rake makes an excellent tool for rapid, thorough work, but it has little value if weeds are allowed to get a good start before cultivation is started.

Mulching has many advantages, especially in gardens where currants often are planted in corners and in out-of-the-way places where they cannot be cultivated easily. A good mulch conserves moisture, prevents the growth of weeds, decays on the under side to furnish a supply of plant food, and keeps the ground cool, a desirable condition with currants. Almost any vegetable rubbish about the premises may be used for the mulch. Such materials as straw, old hay, dried lawn clippings and leaves are excellent. The mulch should be replenished often to maintain a thickness of several inches.

One danger in mulching should be noted.

THE CURRANTS

A mulch affords an attractive nesting place for mice and in winter they may be driven by hunger to gnaw away the bark of the currant canes, girdling and killing them. As a precautionary measure the mulch should not be piled against the plant. It should be placed several inches away and the intervening space should be kept free of weeds and grass, or at least should be cleared as winter approaches.

Backward plants may be mulched with stable manure. It improves the growth of the plants and does not attract mice. Some care must be taken, however, not to over-fertilize plants already vigorous.

FERTILIZATION

Currants are voracious feeders and respond promptly to liberal fertilization. If a heavy application of stable manure can be worked into the soil before the plants are set, that is the best possible foundation for future attempts to bring out the best that is in the plants. Stable manure and poultry manure are excellent fertilizers for bearing bushes, but they must be used with discretion.

In all rational fertilization it is necessary to watch the growth of the plants and adjust annual applications to the apparent need for

BUSH FRUIT PRODUCTION

more plant food. If last year's treatment failed to produce the right response, then increase the amount this year; if last season's fertilization brought about an over-vegetative condition, then reduce the amount this year, making due allowance for weather conditions.

In the absence of manures, commercial fertilizers may be used to advantage where currants need additional plant food. The peculiar requirements of currants have never been thoroughly explored by research workers, and in the absence of better information it is best to use a standard, high grade, complete fertilizer. The proper amount can be determined only by making a trial application and watching plant growth as suggested in the paragraph above.

PRUNING

Currants are borne on wood that is one year old or older. New canes are vigorous and productive, but gradually decline in value as they grow older. Red and white currants bear most heavily on two-year-old and on three-year-old wood. Pruning should therefore aim to maintain a supply of wood that is not over three years old. Black currants bear well on one-year-old wood and may be pruned more closely.

THE CURRANTS

Last year's growth is smooth, straight, and light gray in color. The amount of this new growth at the ends of older canes is an index of their vigor.

Because of the currant borer, all currants should be grown in bush form rather than in the form of a tree with a distinct trunk. If borers destroy one cane in a bush there are others left, but if the single trunk is destroyed the little currant tree is lost.

In pruning a currant bush the weak growths should be removed first. Then thin out the canes, removing the older ones and those that made the least growth during the past season. Varieties with an upright habit of growth, like Prince Albert, should be pruned out in the center to open them up, while spreading varieties like Fay need to be pruned on the sides to keep them off the ground.

Prostrate branches of any variety should be removed, for any fruit which they may bear is likely to be dusty and of little value, while one such cluster, inadvertently picked, tends to spoil the whole basket.

HARVESTING

When currants are to be used for jelly they usually are picked a little green, at least be-

BUSH FRUIT PRODUCTION

fore the color has darkened. They may be left on the bushes with very little loss, however, for at least a month after they have reached this stage of ripening, which lengthens the season in which they are available for use.

CHIEF PESTS OF THE CURRANT

Imported Currant Worm—These are the green worms with yellowish ends that appear suddenly in spring and voraciously devour the leaves. A second brood appears in early summer and a third sometimes appears late in the season.

Currant worms are easily poisoned. The leaves should be dusted or sprayed with one of the common insect poisons as soon as the worms appear. Arsenate of lead powder at the rate of one ounce in three gallons of water is effective.

Around harvest time it is best to use powdered hellebore, either as a spray (one ounce to one gallon of water) or as a dust (one ounce to half a pound of flour or air-slaked lime). Hellebore loses its poisonous properties quickly upon exposure to the air and sprayed or dusted fruit may be eaten safely in a short time.

Imported Currant Borer—This insect

THE CURRANTS

burrows in the canes, eating out the pith. The canes are greatly weakened and fruit production declines. Borers are combatted best by cutting out and burning the weak canes each spring.

Currant Aphids—These tiny sucking insects cluster on the under sides of the leaves and cause them to curl, producing blister-like areas which often have a reddish tinge and are very conspicuous. They may be controlled by spraying the under sides of the leaves, or by dipping infested branches in a solution of 40 per cent nicotine sulphate, one to eight hundred parts of soapy water.

Anthracnose—This disease appears as small brownish spots scattered thickly over the upper surfaces of the leaves. Later the leaves turn yellow and finally drop, sometimes before the fruit is harvested. The plants are greatly weakened.

Anthracnose is combatted by spraying, in spring before the leaves start, with liquid lime sulphur one to ten, and during the growing season with 4-4-50 Bordeaux mixture. Spraying just before harvest time should be avoided, for Bordeaux will discolor the fruit.

White Pine Blister Rust—This disease, so destructive to the five-leaved pines, must spend a part of its life cycle on the currant or

BUSH FRUIT PRODUCTION

gooseberry. Pines cannot reinfect pines. That is the weak point in the life cycle of this scourge of the pines, and the only circumstance that prevents the rapid destruction of all our white pine forests, even as the chestnut was eradicated.

This disease gains entrance to the pine tree through the needles and small twigs. It grows in the inner bark and spreads until it reaches the trunk and girdles it. Spores are discharged in spring from the rust-colored blisters on the pines. They are light and may drift with the wind for hundreds of miles to infect currant and gooseberry leaves and produce the next stage of the fungus.

During the summer, blister rust spreads locally from currant to currant or gooseberry, but, beginning in midsummer, another kind of spore is produced which may infect pines. These spores have not been known to produce an infection on pine trees at a distance greater than 900 feet from the currant bush which was the source of infection. By removing currants from the vicinity of pine trees, then, this disease may be controlled.

Black currants are much more susceptible to this disease than others, and when infected they produce hundreds of times as many pine-infecting spores as most red or white varieties.

THE CURRANTS

They should, therefore, be planted in white pine territory with extreme caution, if at all.

VARIETIES OF CURRANTS

Red Varieties—The red currants are more popular for general use than the white or black varieties. Wilder and Perfection probably are the most extensively grown red currants, and both are good. Perfection seems to outyield Wilder in partial shade, as when interplanted in orchards, but in the open Wilder usually is most productive.

Other good red varieties adapted to a wide range of growing conditions are Cherry, Fay, Red Cross, and London Market.

White Varieties—The white varieties are mild in flavor and are popular with many home gardeners, although not extensively grown for market. White Imperial is the leading white variety and it is considered the standard of excellence in flavor among all currants.

Black Varieties—Black currants differ botanically from the others and are much more susceptible to White Pine Blister Rust. In some regions where the five-needle pines are of great importance, the growing of black currants has been forbidden by law. They have a peculiar, musky flavor and odor and have

BUSH FRUIT PRODUCTION

never become very popular in the United States. They are extensively grown in Europe, and find more favor in Canada than here. In general, it is likely that the culture of black currants will decline in America. Boskoop, Crandall, Prince of Wales, Naples, and Champion are standard varieties.

IX

THE GOOSEBERRIES

GOOSEBERRIES have never been very popular in the United States. In Europe they are much more generally and favorably known. Ripe gooseberries are prized there for eating out of hand and they are a staple article of commerce; here ripe gooseberries as a dessert fruit are almost unknown. We pick the fruit green and use it almost exclusively in jams and sauces, and even in these manufactured products the fruit is not known to many.

It is in home gardens that gooseberries have found greatest favor. They are easily grown and the fruit is most acceptable when once its excellence becomes known.

Gooseberries are closely related botanically to currants, and their culture is much the same. Most of the things that have been said about currant growing apply with equal force to the culture of the gooseberry. It ranges a little farther south than the currant but is

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distinctly a cool-climate fruit. It feels most at home in a cool, moist, fertile loam, but can be grown on lighter soils in the North. In low wet land, the gooseberry is often attacked and seriously injured by mildew, a disease which does little damage to the currant.

PROPAGATION OF GOOSEBERRIES

Gooseberries may be propagated from hardwood cuttings, as described for currants, but some vigorous varieties, like Downing, do not root well from cuttings and here layering usually is employed.

Like currants, gooseberries root well when branches are bent to the ground and covered with earth. That method is satisfactory when only a few plants are desired. For larger numbers of plants, mound layering is employed. Mature plants are cut back severely in autumn, which induces a vigorous growth of new shoots in the following spring. About the first of July these shoots are mounded with earth to leave only the tips exposed. English varieties are given two seasons in which to root, but American sorts root quickly and may be taken up in the fall, stored over winter, grown in nursery rows the following

THE GOOSEBERRIES

year, and then transplanted to a permanent place.

PRUNING

Gooseberry canes branch more freely than those of the currant and the bushes tend to become more dense. As with the currant, young wood is most productive. A vigorous thinning out each spring of canes more than two years old is therefore the principal part of pruning gooseberries. (See pruning the currant, page 102).

INSECTS AND DISEASES

The pests of the currant are also the pests of the gooseberry, although the degree of susceptibility varies. Mildew is the most serious disease infecting gooseberries, especially European varieties. It is most troublesome in the South.

Mildew appears first as spots having a cob-web-like appearance. They spread and coalesce to form larger areas and the growth of the plant is seriously interfered with. The most effective means of combatting this disease is by spraying with potassium sulfide, one ounce in two gallons of water. The first application is made when the buds have broken

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in spring, and this is followed by three or four more similar applications at intervals of ten days or two weeks.

Currant worms, currant borers, aphids, and anthracnose are found on gooseberries as well as on currants, and are combatted in the same ways. Gooseberries are less susceptible than currants to White Pine Blister Rust, but do serve as a means of bridging the gap from pine to pine.

VARIETIES

European varieties of gooseberries are larger and showier, but American sorts are more productive and higher in quality. Among American varieties, *Downing* is most widely grown. *Houghton*, *Pearl*, and *Josselyn* (*Red Jacket*) also are good. *Poorman* is a new variety with large berries and few thorns. It promises to replace some of the older varieties.

Among the European varieties *Industry* is probably the leader. *Chautauqua*, *Crown Bob*, and *May Duke* are other valuable varieties.

X

THE BLUEBERRIES

BLUEBERRIES, HUCKLEBERRIES AND BILBERRIES

THESE names with many others are used more or less interchangeably for a closely related group of native berries which are blue or black in color, and which range intermittently from Labrador to Alaska and south to the Gulf of Mexico. There are a number of species and several are often found growing together, especially in the northeastern states. They were a favorite food with the Indians, who ate them in summer and dried them for winter use. The white settlers soon came to appreciate blueberries and since early days they have been a staple article of commerce in regions where they were most abundant.

Several species to which the term "bilberry" may be properly applied are found most commonly west of the Mississippi, while blueber-

BUSH FRUIT PRODUCTION

ries and huckleberries are most plentiful eastward. There are several species of blueberries and a number of huckleberries. In some regions they are all called blueberries, and in others they are collectively known as huckleberries, but in a few places, like New England, where both groups are common, a proper distinction is made.

Huckleberries (genus *Gaylussacia*) have hard seeds which crackle in the teeth, while the seeds of true blueberries (genus *Vaccinium*) are soft and hardly to be noticed. The bushes themselves may be distinguished in a number of ways. One noticeable difference is the presence on huckleberry leaves of resinous dots or patches which look like flecks and spots of varnish. A few people prefer the flavor of huckleberries, but where both blueberries and huckleberries are plentiful the huckleberries usually are left behind by pickers.

The bushes of some species of blueberries grow taller than a man, while others rise but a few inches from the earth. Most of the work directed toward the improvement of the blueberry has been done with the "high bush" species, *Vaccinium corymbosum*. It is common from the northeastern states west to Minnesota and it ranges far into the South, especi-

THE BLUEBERRIES

ally in the mountains. While little cross-breeding and selection has been done with "low bush" blueberries, some attention has been given to them in the wild. In Washington County, Maine, for instance, great areas of blueberry barrens are burned over periodically to the great improvement of the crop, which supports an extensive blueberry canning industry.

DOMESTICATION OF THE BLUEBERRY

The first attempts to cultivate the blueberry were confined to transplanting selected wild plants into locations where they could be handled like other crop plants. Many of these attempts failed, largely because the peculiar soil requirements of the fruit were little understood.

In 1906 the United States Department of Agriculture began a series of experiments looking toward the improvement of the berries, by crossing and selecting superior sorts, and toward the development of successful cultural methods. Progress has been remarkable. The average size of the berries has been tremendously increased through the development of better varieties, and cultural requirements have been uncovered to such an extent that it

BUSH FRUIT PRODUCTION

may be said in truth that the blueberry has now taken a place among the cultivated fruits. This is the high bush blueberry, *Vaccinium corymbosum*. The plantation at Whitesbog, New Jersey, where most of the work was done, has become internationally famous and every gardener has at least heard of it.

BLUEBERRY SOILS

The blueberry requires an acid soil which is well aerated during the growing season yet abundantly supplied with moisture. This is a peculiar soil preference but one which must be met by many soils or the high bush blueberry would not be so widely distributed in nature.

The soil which has been found so satisfactory for the culture of blueberries in New Jersey has a three-inch topsoil consisting of a mixture of peat and coarse sand. The subsoil is sand underlain with hardpan, usually within three or four feet of the surface. The natural growth on such land in New Jersey is a mixture of pine, white cedar, and red maple, and it grows blueberries to perfection. Unfortunately most of the cultural directions now available have been developed for this

THE BLUEBERRIES

soil only; they may need considerable modification elsewhere.

This same blueberry is very common in portions of New England, where it thrives on moist, well-drained hillsides. Numerous small plantations have been set with improved varieties from Whitesbog, to test their possibilities in many places. Some of these have come under observation and their promising start gives rise to the feeling that perhaps the cultivated blueberry is not quite so exacting in its requirements as was indicated by the first experiments.

The large plantations in New Jersey are tilled during the summer. On some soils it is evident that a mulching system is as successful and perhaps more satisfactory. Various mulching materials are being used to good advantage, among them hardwood sawdust, pine planer shavings, and oak leaves. Annual applications of these materials seem to maintain the right soil conditions.

FERTILIZERS

The soil in which blueberries are grown must be kept acid. The land therefore should not be limed, and such lime-bearing materials as ashes are likely to prove harmful. After

BUSH FRUIT PRODUCTION

some experimental work on fertilizers for blueberries, the New Jersey Agricultural Experiment Station recommended the following mixture. The quantities are about right for one acre, and should be applied in June.

125 pounds nitrate of soda
200 pounds tankage
400 pounds rock phosphate
75 pounds sulphate of potash.

This is about $\frac{3}{4}$ lb. per plant.

GETTING PLANTS

Blueberries are now propagated from hardwood cuttings made in late winter. The cuttings do not root readily and most gardeners will find it best to buy plants. Some work has been done with green cuttings and this promises to develop an easier and a cheaper method of propagation.

A few nurserymen have capitalized the popular interest in blueberry growing by offering for sale plants taken from the woods and hillsides. To guard against disappointment, improved varieties should be insisted upon.

THE BLUEBERRIES

PLANTING BLUEBERRIES

Cultivated blueberries should be set at least four feet apart each way. Where cultivation is to be employed, four by eight or ten feet is about right.

Plants should be set in early spring or in late August. If they are to be shipped far, spring planting is preferred. Care must be taken to keep the plants from drying out before they are set.

At least two varieties should be planted together for cross pollination. Single varieties when isolated have set light crops. Since there are a number of good varieties it is as well to plant several of them.

PRUNING

Blueberries are borne on terminal growth formed late in the preceding season. It is important therefore to maintain a clean, strong growth, and pruning helps to do it.

The finest fruit is borne on young shoots. As these shoots grow older they decline in vigor and the berries fail to attain the size desired. When this condition is reached by blueberry bushes, the New Jersey Experiment Station advises the following treatment: keep

BUSH FRUIT PRODUCTION

the bush thinned out to favor the production of new shoots, and each year cut back about one-third of those remaining to stumps. This insures a constant supply of new and vigorous wood, and leaves no branches or canes more than three years old.

For the production of extra fancy berries some additional thinning of the fruit buds on lateral branches is desirable. The fruit buds are the large plump buds near the ends of the last season's growth, and they should be reduced to three or four by cutting back the shoot. Strong new shoots do not need such pruning. All pruning should be done during the dormant season.

VARIETIES

The improved varieties of blueberries now offered for sale are selections from a large number of the best wild sorts obtainable, or are the best varieties resulting from nearly fifty thousand crosses between selected wild varieties made under the direction of the United States Department of Agriculture.

It is likely that any wild blueberry, when brought into a favorable environment and given good culture, would respond with larger, finer fruit. Undoubtedly, however, these new

THE BLUEBERRIES

varieties are superior to any ordinary selection of wild plants. Certainly the fruit produced by these varieties under good culture is, in size and quality, beyond comparison with the ordinary wild blueberry.

Here are the leading varieties, arranged about in order of ripening: *Cabot*, *Adams*, *Pioneer*, *Rubel* and *Katherine*, *Dunfee*, *Grover* and *Harding*. One low bush hybrid, *Greenfield*, has been propagated.

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The object of this book is to present in a clear and concise manner to the amateur as well as the professional grower the simpler requirements of this regal flower. The author has made a specialty of roses for many years—as a commercial grower—as an expert in charge of one of the American Rose Society's test gardens—and as a judge at many exhibitions. He is well equipped to present such information. Writing from experience he commands the reader's attention.

In this volume no attempt has been made to give definite inviolable rules for the author well knows the sensitiveness of the rose to various soil and climatic conditions. Why certain types of plants give better results than others is clearly brought out in the chapter on "Plants and Planting," "Winter Protection" is another interesting chapter in which the writer describes how Hybrid Teas were successfully wintered in a section of the country where, according to the rose zone map, only Hybrid Perpetuals and Rugosas could be grown. For the amateur who is desirous of growing flowers fit for the exhibition table, many helpful suggestions will be found in the chapter on "Exhibition Blooms."

Scattered throughout the volume are many cautionary remarks which are of the greatest assistance to successful culture. No rose grower, either experienced or beginner, can afford to be without it.

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