

Better

Sweet Peas

By - George J. Bell

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Sweet Peas**

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By **GEORGE J. BALL**

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George J. Ball.

BETTER SWEET PEAS

by

GEORGE J. BALL



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FOREWORD.

Most of us little realize how largely we and our business are the products of past generations, the cumulative result of a long line of patient ancestry. We, in turn, owe it to future generations to make the best of this heritage and hand it on. The grower who attempts to guard a "secret," as he calls it, is an unnatural product, indeed, a sort of vacuum, that nature in her profound wisdom will not tolerate. He is not paying his debt to the past, present or future, an old world type of the narrower past. It is more than a hollow truism to say business is built on service as well as public good will. Every improved plant or system is a direct betterment that affects us all, and this spirit of improvement in every phase of human endeavor never ceases. It has long been the writer's philosophy that the world in the broadest sense is growing better in every way. If this booklet will in any way assist some one in producing better sweet peas, he will feel that something has been added to this universal betterment.

George J. Ball.

PREPARING SOIL.

UNLIKE the production of our other staple crops, sweet pea growing is a comparatively modern industry that has reached the stage in which standardized systems are becoming recognized. We shall attempt to discuss briefly the important phases of this business, realizing that the value of these remarks can only be of a suggestive nature because of varying local conditions. We naturally look on the question of soil as a basic one in all plant growing operations. Many authorities are most precise in describing the exact type of soil a certain plant requires. Traveling over this broad land of ours, we observe all our staple greenhouse crops flourishing in every conceivable kind of soil. Down in St. Louis can be noted magnificent growth, especially in carnations, in a light, porous-looking material that we, accustomed to a heavy black loam, might easily consider a poor soil.

In Ronks, Pa., is a successful sweet pea grower who has a heavy clay with which to work. In all our experience with peas we have never seen such strong growth and flowers as the adobe-like soil of some parts of California produces without fertilizer or manure of any kind. The soil there is of unusual depth and undoubtedly is capable of storing plenty of moisture; this, with cool nights and bright days, produces such growth.

In the sandy soils of Florida crops are produced of such staples as we grow in our stiff prairie loam. The most productive growth of peas we have ever noted in a greenhouse is produced annually without changing soil which consists largely of peat, so loose and full of humus that one's hand is easily worked to the bottom of the bed; this upsets the theory that this strong-rooting plant produces its best development in a heavier soil. We believe the results in this particular

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case are due to the moisture-retaining nature of this material, together with the perfect aëration such a soil affords.

We cite these circumstances to show that it is not so much the type of soil that determines the crop as it is the management of that soil that counts in growing sweet peas. The soil is, after all, but a medium through which the plant is sustained. Nevertheless, crops do thrive in some soils and not in others, regardless of their mechanical condition. Soil taken from low land is usually in more prosperous condition than that from uplands, from which much of its value has been leached. We have seen a sandy soil produce wonderful peas, but it was underlaid with water. We might fall back on the safe and frequently offered suggestion, "Any soil that will produce a good growth of farm or garden crops will do as well for sweet peas."

Because of the humus it contains and probably partly because it has been protected from the wearing elements, a piece of old sod makes valuable soil for greenhouse crops. When such material is composted with cow manure at the rate of 3 or 4 to 1, depending on how clear the manure is, we are laying a good foundation for a crop of peas. To this should be added a 100-pound bag of raw bone meal for every two loads of soil. The raw bone will furnish the needed phosphate supply, while well decayed cow manure is a form of natural fertilizer that cannot be equaled.

Why a cow, living largely on grass, should produce a more valuable form of fertilizer than a grain-fed horse is not clear. The latter probably loses its value quickly through heating. If proper care is taken of horse manure, there would seem to be no reason why it should not be as valuable as that from any other animal. If a year can be allowed for the above materials to decay, they should be in ideal condition, but in these days of upset labor conditions, we are fortunate, indeed, to have them together in time for planting. We suggest this compost only for late planting. Our method of handling the soil for early or midsummer planting will be discussed under that heading.

Before proceeding further, let us briefly discuss the importance of keeping our soil open and sweet by means of drain

tile. In the past we laid down one or two lines of tile under each 5-foot ground bed. Our greenhouses are located on something of a hillside, having a slope of perhaps two or three per cent, and we have found that this location provides all the drainage we need and that our tiling is really a disadvantage in that it carries off the heavy waterings too readily, without giving them a chance to saturate the soil. Sweet peas under full growth, especially as spring approaches, require much water, and where the drainage is too free this is sometimes difficult to provide. On a level piece of ground or where surface water does not freely run off, the soil may become water-logged, smothering the roots of the plants as it were, the tops indicating this by turning yellow. Or the plants may be vigorous enough to stand the surplus moisture; the result is a soft, heavy growth that will not hold a bud. In such a location a line of 3-inch or 4-inch tile should be laid about every ten feet, or closer. If trenching to an outlet for these lines of tile is impracticable or too costly, a shallow well can be dug to material that will drain, and generally this is easily done. While tiling is not a panacea for bud-dropping, it enables the grower better to control the moisture in his soil and harden the growth. The "secret," if we may call it that, of controlling bud-dropping is getting the growth hardened, making the subject of drainage, where needed, an important one for the sweet pea grower. During periods of heavy spring rains we have seen peas come into the market literally rotten. The grower declared they left the greenhouses two hours earlier in apparently perfect condition. His flowers were water-logged, and his site needed drainage.

Soil should be toned up occasionally by becoming fairly dry. This encourages the formation of white, or feeding, roots by increasing the air supply, and these feeding roots are the life of the plant. The question might be asked, "What about plants that live in water?" In the earth's beginning, we are told, all plant life began in the water, some gradually getting a foothold on land through the ebb and flow of the tide and the survival of the strongest. Our aquatics, according to this theory, are left-overs of another age. Plants under natural

conditions thrive on plenty of water. What luxurious growth follows a wet season outdoors! But when we are growing sweet peas in the greenhouse during the dark days of winter we are setting up a highly artificial situation, indeed, and good drainage, we might say, is of prime importance. Even with the lengthened days of spring, with its more open conditions, a poorly drained site will fill a house with condensation that sometimes rots peas grown on raised benches. It will at least produce a grade of soft flowers that tends to give the sweet pea a black eye.

The bed generally used by sweet pea growers is, for want of a better term, referred to as a "ground" or "solid" bed. There is nothing arbitrary about the width or depth of this bed. The standard 4-footer is used by many sweet pea specialists, with 12-inch sides, leaving eighteen to twenty inches for a walk. This walk is made use of during the summer months for a system of subirrigation, by flooding it until the lower soil of the beds is entirely saturated. This is the most efficient way of applying water during the summer months and is easily done where the beds are but four feet wide.

The past few years we have converted the center beds of our houses into one, giving us beds fifteen to twenty-five feet wide, leaving the two side beds, where head room is restricted, for mums or calendulas, followed with peas. We find this arrangement decidedly simplifies the routine operations connected with handling the crops. The soil can be turned over with horsepower; we are planning the use of a gasoline-driven plow for this purpose. We plant our peas in lengthwise rows in these beds, usually three and sometimes four together, leaving a 24-inch or 30-inch space for walks. To prevent packing and injuring the soil, we lay 12-inch pecky cypress boards for walks, leaving them always dry and clean. In the case of catch crops that do not require much handling, such as pompon mums, these wide beds are planted up solidly, adding substantially to the growing space of the house. We are frequently asked how the watering of these beds is managed. During the summer this is all done overhead in the form of a spray,

and there is no form of watering that mums, in particular, enjoy so much. Even during midwinter we do much of our watering of young peas in this way. This method of watering also takes care of red spider, a pest with which we are rarely troubled.

In connection with growing peas in such beds, it is sometimes suggested to trench two or three feet deep. Our experience has not favored this. We seem to get little or no additional growth over adjoining beds that were not trenched. In our 12-inch ground beds we spade under a coat of manure before filling; this gives us about eighteen inches of loose soil. The finest peas we ever produced were from one of these beds without loosening the lower soil. In fact, most growers prepare their beds in this way. We might go further; in six inches of good soil on a raised bed an excellent grade of peas can be grown during midwinter, on stems six to twelve inches long, and this is radically different from a 3-foot trenching. The question naturally arises as to which is the best. There is one sure and infallible way of answering this, and that is by looking into the system most of the successful specialists have settled upon, and we find this to be the ground bed with a 12-inch siding and with little attempt made to loosen the soil below. If too much encouragement is given the roots to ramble in midwinter, it becomes increasingly difficult to harden the growth to a point where buds will hold. This would not apply in a locality favored with plenty of midwinter sun.

The raised bed of six inches of soil has its successful advocates. The soil being under complete control, the growth can be hardened as wanted. During an especially dark winter, the raised bench undoubtedly has the best of it. Such a bench should not be planted before August 1, as it is hardly possible to carry the peas through the hot summer if planted earlier. On the other hand, it does not pay to plant a raised bench late, after mums. These late plantings do not get into much of a crop until late February and a few warm spells after that shorten them up fast, while the ground bed planted at the same time is getting into its finest crop. Where raised benches are used, they should be carried warm enough to run them out

by St. Valentine's day. After that, the space is valuable for a great variety of crops.

The use of 12-inch siding for ground beds assures drainage to a certain extent. Where this question of drainage does not have to be considered, growers sometimes disregard the siding, leveling off the site and planting as one would a garden. However, we prefer the siding, not only for the drainage, but for the extra depth of twelve inches it adds to the well prepared soil.

PLANTING FOR EARLY CROP.

SWEET peas planted for an early, or winter-blooming, crop require a high, light, airy house, and from ten to fifteen feet of head room must be assured. In this early crop we have a proposition that is sometimes referred to as a gamble, for though we may hold a full house, so to speak, yet with an abnormally hot spell in September we sometimes lose. Last season we started a house June 24, in fresh soil, fairly heavy shade and plenty of side ventilation. It held up well through several hot spells in September, but an abnormally hot one the first days of October weakened what otherwise promised to be a splendid crop. Because of the highly artificial conditions under which this crop starts off, particular attention must be paid to the soil moisture; in fact, we believe the real problem to be the provision of sufficient and uniform moisture at the roots. This is the season of most rapid evaporation, especially under glass, and when the roots of this plant, that prospers only in a cool temperature, are allowed to become dry in a temperature of 90 or 100 there will be trouble. These roots are not far from the surface. All we can expect to do with our plants at this season is to keep them alive until relieved by cooler weather. A light, loose soil that dries out quickly, especially an old soil made light by heavy manuring, will not do. Fresh, fairly heavy loam should be used.

In preparing the beds for this crop we prefer to work our manure and fertilizer, and also the sod, into the bottom of it, unless a well decomposed compost is available. If not, use only well decomposed manure, adding bone or acid phosphate at the rate of one pound to five square feet. We prefer to have the top three or four inches of soil without manure for this early crop. The young plants do not need it and their roots are

better off without contact with manure at this time. Do not fill the bed level full and expect it to settle. It is difficult to water thoroughly an overfilled bed. We have frequently noted beds of peas that seemed stunted or hardened to a point where they were worthless, caused by filling the bed to a point that made it practically impossible properly to water it to the bottom.

With our bed heavily soaked to the bottom and allowed to stand a few days, we are ready for sowing. This can be done in this latitude any time from June 15 to August 15. The earlier the planting, the greater the hazard, as we have stated. If sown early in July, they get into good crop late in September, but the flowers have little value until cooler weather sets in. This early sowing gets into a considerable crop by October, while those sown in August will produce rather sparingly during that month. In our market peas are actively called for with the coming of cool fall weather.

With beds four to five feet wide the standard practice is to plant a double row across the bed every twenty-four or thirty inches, the double rows being four to six inches apart. With this spacing the rows should grow together by November or December. During the winter months, practically all the picking is from the terminal growths, lack of sunshine preventing any appreciable development of flowers on the sides. In planting our wide beds, we run our rows or beds on east and west lines. We find this decidedly better than to run the rows across these beds; that is, north and south. Theoretically, there should be no difference in the flowering of a row in either direction. Rows running north and south receive a certain amount of sun on both sides part of the time, but because of the weakness of the winter sun, neither side receives enough to be of appreciable value. On the other hand, the south side of rows running east and west receives, part-way down, all the available sun and it is enough to develop a considerable crop later on the south side. All work connected with handling the vines and crop is simplified in these long rows. For this early-planted crop some growers space single rows five feet apart, filling the intervening space with any quickly developed small crop, such as

lettuce or radishes; violets are also used, and pompon mums that have been grown in the field can be used. In this arrangement, a narrow walk is left on the north side of each row of peas. This close arrangement calls for careful attention to supports for both crops. This single row plan can only be recommended where a heavy growth of vines is assured. Even where this is the case, we should recommend the more generally used double row system.

We use three rows, spacing them twelve inches apart; this gives us a bed twenty-four inches wide with a 3-foot walk. This can be figured out as more liberal spacing than a standard 5-foot bed with its double row across the bed every twenty-four inches. Whatever plan your local conditions seem to call for is the one to adopt. For the large grower who plants an entire house with peas these are points to consider carefully. The retail grower whose planting is limited will probably favor the plan that permits catch crops.

Years ago we used to soak our seed twenty-four to forty-eight hours and chip through the outer coating of the unswelled ones. We still do that with costly or scarce varieties, but to pay 50 cents per hour for this slow, tedious work when seed costs but \$6 to \$8 per pound is out of order. During the first few years of the early-flowering Spencers nearly all varieties were discouragingly unfixed, so much so that some growers gave up sweet peas on that account. This encouraged the production of greenhouse-grown seed. With the high temperature and sunshine that prevail under glass during May and June, sweet pea seed develops freely on strong young plants, but not on weakened old vines. In the greenhouse, seed does not become so full and plump as it does under outdoor conditions, but there is no reason why its vitality should not be as great. Under glass, seed sometimes ripens hard, making it necessary to soak or chip it before sowing. Of late years California seed growers have developed roguing to a fine point, so that this greenhouse industry has become a lost occupation. Greenhouse-grown seed cannot be profitably produced for less than \$35 to \$40 per pound and is usually not so well rogued as California-grown seed at one-fifth this cost.

The early sowing of peas should be made directly in the beds where they are to be grown. Later we sow in pots to save time, but during the heat of summer, handling in pots or as seedlings seems to weaken the plants. For this reason we advise sowing direct. Open a furrow about two inches deep and spread the seed to average about one inch apart. Unless the soil is too wet, tread the covering firmly, smooth it over with a rake and leave it undisturbed until the seedlings come up, which will be within a week; that is, if the soil was properly watered before sowing. Excessively high wind or heat may make some surface watering necessary before the seedlings come through, but white-seeded varieties must assuredly be sown in well moistened soil and not touched with water until well through the ground, or they will rot. This is caused by the thin outer coating of the varieties which have white and cream-colored seeds; they do not ripen so hard as others. It has been found that starting the seeds in a sterilized material overcomes this tendency to decay, but if the above directions are followed, little trouble will be had. Should extremely drying conditions set in, the rows can be covered with boards, which will hold the moisture uniformly.

Green fly is the most serious enemy against which the young plants have to be guarded during the hot months. Last summer we had a planting of outdoor peas adjoining an early planted pea house. It seems almost impossible to keep aphid down on outdoor peas when the vines begin to dry up and equally difficult to keep them from spreading. Before half the indoor stock was through the ground we found as many as six to eight aphid on individual plants, and after the plants were eight to ten inches out of the ground a ruinously large number showed traces of the fatal mosaic disease, distinguished by a mottling or striping of the leaves, which later extends to the flower. This will be more fully discussed in the chapter on diseases. Vigorous spraying with some form of commercial nicotine is the only remedy and it should be made strong enough to be uncomfortable to apply. We use it at the rate of two to three ounces to one gallon of water. Before the nicotine is applied the bed should be well watered, for if the plants are

dry, they will burn. Red spider should also be watched for. They will literally "eat 'em alive" in a high temperature and with dry surface soil. Don't trifle with salt water for this pest, but thoroughly syringe, keeping the atmosphere and surface soil moist.

The young plants are, moreover, much refreshed on hot days by free overhead spraying. We maintain a partial shade during the heated period, gradually removing it with the coming of cooler weather. The best shade material is whiting mixed with water and sprayed under the glass. This is easily removed with the hose when no longer needed.

As already emphasized, care and judgment are necessary in watering young peas at this time. We approach this subject with a certain diffidence, for our success along these lines has not been uniform. If we recall correctly, the late William Scott was responsible for the statement that a man who knows how to handle a hose is, like a poet, born, not made. What makes watering an uncertain subject to discuss is the fact of varying conditions as to soil and drainage.

It is our conviction that most failures with this early crop are due to keeping the soil too dry, especially if it is old soil made open with heavy manuring. Under strong sun and high temperature, we are obliged to water carefully every day, not of necessity heavily, while the roots are not down deep. A state of moisture that might safely be maintained for days when the roots are down deep, might be fatally dry for young plants with their roots but a few inches below the surface. The lower soil should be wet and kept so.

Only an experienced grower knows the quantity of water necessary to soak up the lower soil of a ground bed, especially when the drainage is free. The soil should be dug into and examined to the depth of the bed; it should be moist enough to ball up easily in the hand. This lower moisture will tend to draw the roots down. To get the water down, we dig the end of a running hose into the bed at intervals. As the plants increase in size, the amount of water they can use should also increase. However, as cooler weather sets in, evaporation decreases and when we get into October it is time to go easy

with water, or the plants will enter the dark months of November and December too soft.

We know of some successful growers who lay the young vines on the ground when they are about a foot long, to facilitate breaks from the base. Double rows are used, the growth being laid opposite ways. After the breaks are well along, say six to eight inches, the laid-down tops are all clipped evenly. Whether this is done or not, these breaks will promptly appear. If the house is light and root action normal, they will develop into the real plants. If the growth is promptly supported on strings, which we generally advise, these blind original growths should be thinned out to prevent overcrowding and later, when the air is cut down and growth is heavy, to prevent decay from setting in. The supporting strings should be plentiful, so that bunching up of growth will not be necessary. We have seen plants twelve to fifteen feet high and full of flowers suddenly wilt down, and have found the trouble near the ground, where a number of growths were bunched together, rot setting in and cutting through all of them.

For supporting the vines, No. 16 or 18 galvanized wire is stretched over the rows. To this overhead wire is connected 3-ply or 4-ply cotton twine. Strings of the 4-ply can be used several years by cutting them off carefully at the bottom and pulling the old vines from them. Sections of them are gathered together and looped out of the way until wanted the next season. Each string must be securely tied at the top wire and, for each crop, again at the bottom. We know a number of growers who have used this plan for years, so there must be advantages in it. We prefer using 3-ply twine, which gives us substantially more yardage, and discarding and replacing it for every crop. Besides these uprights, horizontal strings must be carried alongside the rows or beds ten or twelve inches apart. As the vines develop, a constant tucking in or straightening up of the growths is necessary to obtain straight-stemmed flowers. In fact, proper and timely supporting is an important phase of sweet pea growing. To lay the vines out carefully on the side of the row, and when the breaks are six to eight inches long, to cut away the weak original growth is entirely

different from allowing them to grow together in a tangled mass before supporting. It is the nature of peas to climb, and why it is that they do not make the same growth when allowed to go unsupported, we do not know, except to say that it is unnatural and any form of life in that state does not prosper. Circumstances on one occasion obliged us to leave the supporting of a bed of peas half finished for several weeks. It was a striking example of the influence of support on growth. The delayed vines were fully twelve inches behind those promptly supported.

In late September the early pea grower's anxious days are over; cooler weather from this time on brings with it the detail of ventilation. The closing of ventilators brings with it the mildew problem. This should be anticipated by thoroughly dusting the vines late in September with sulphur. This cannot be done with flowers or partly opened buds on the vines. The combination of sun and sulphur will burn them, as it does the spores of mildew, but it can be applied safely before the buds open and most of it will remain on all winter, for when in crop the vines should not be syringed, except occasionally about the base or particularly near steam pipes to prevent spider getting a start up the vines.

Our modern Spencer sweet pea seems to develop a larger and fuller flower and, of course, more rapidly in a night temperature of 55 than the regulation 50 or 52 degrees, but the vines will weaken more quickly and the stems become shorter under the higher temperature. All things considered and with an average amount of sunshine, we believe the higher temperature will be more profitable than the lower one; 55 degrees is really not high. We can usually depend on plenty of sunshine in October, but in November our darker weather comes and during December we occasionally run along a week without a ray of sun, and it hurts. After three or four consecutive days without sun, the temperature, both day and night, should be lowered a degree or two daily, with as much air as possible, to prevent the growth's running up too fast and soft. If this brand of hard-luck weather is maintained for eight to ten days, all partly developed buds will drop. The temperature should

drop with them at least 5 degrees and as much air as possible should be maintained, to harden the growth again. The normal temperature should be gradually restored as the weather clears.

For vines in full crop, 60 to 65 degrees on cloudy days and from that up to 70 or 75 degrees, with sunshine, are temperatures that move the plants nicely.

Usually these protracted dark spells are followed by brilliant weather. Not more than three or four days should be lost getting back to normal temperature. Usually ten days or two weeks are required to restore a crop of flowers. During periods of heavy firing, we like to do a certain amount of surface watering and syringing where steam pipes come in close contact with the plants and on the south edges of beds, where the sun hits them directly, but as for real watering, this should not be necessary the last half of November and all of December. The surface soil should be loose and fine, to prevent its cracking. The danger of stunting the growth, such as we face with small plants in August, is past. Our early-sown crop should now be six to eight feet high and with an elaborate root system that easily cares for itself in a ground bed during these dark months.

Bud-dropping depends on two circumstances, lack of sun and soft growth: the former cannot be controlled, the latter can. Peas planted early in July usually become so well hardened by excessive heat that bud-dropping, ordinarily, need not be feared, but it is difficult to carry them safely through this long hot period. Also, we shall find, the more we succeed in hardening the growth, the shorter will be our flower stems; at every turn we meet the law of compensation. The early crop is usually and far more safely planted in August and early September, and during November and December this planting is often soft and real watering is unnecessary, though an unusual amount of sunshine or open weather during this period may put the soil in condition to stand a heavy soaking the week before Christmas, to increase the crop for the following week. Following a heavy watering at this time, plenty of air and steam should be used, to clear the atmosphere of the evaporated moisture that follows, and the surface soil should be worked over again as soon as it is dry enough to handle.

The value of using the ventilators, with some steam, to create a live atmosphere should be kept in mind in connection with bud-dropping. A close, heavy atmosphere during cloudy, soft weather is certain to get the growth in bad shape. The late, or summer-blooming, variety will drop its buds out in the open during the month of June under the influence of cloudy, wet weather. The failure of these late, or summer-blooming, varieties to flower under glass during the winter is due to the strong, soft growth that characterizes all of this class. Nothing but the strong sun of late April will harden this growth to a point where the buds will set and hold.

Among early-flowering peas we have two distinct types of growth: one gets into flower early and produces a comparatively weak, or restricted, growth, and because of this weaker growth, buds do not drop so easily. The flower stems are shorter, of course, than on varieties with the stronger growth and there are not so many flowers on a stem, but they bloom profusely. We mention this in passing to show that it is the heavy, soft, unrestricted growth that sheds its buds. To prevent this, ventilate as freely as possible at all times and carry the soil through November and December consistently dry.

In connection with this subject of bud-dropping we will offer a brief comment on "a new method of sweet pea culture," so called, which it is claimed will overcome bud-dropping.

Briefly, it consists of topping the main or first growth. The resulting side growths, we are told, will limit the height of the vines, lengthen the season of bloom and produce twice as many blooms. The flowers, we are told, will keep much longer, stems will grow longer and the vines will flower earlier. In addition to all these claims, which are incidental, this new method, it is claimed, will prevent bud-dropping; no further merits are claimed.

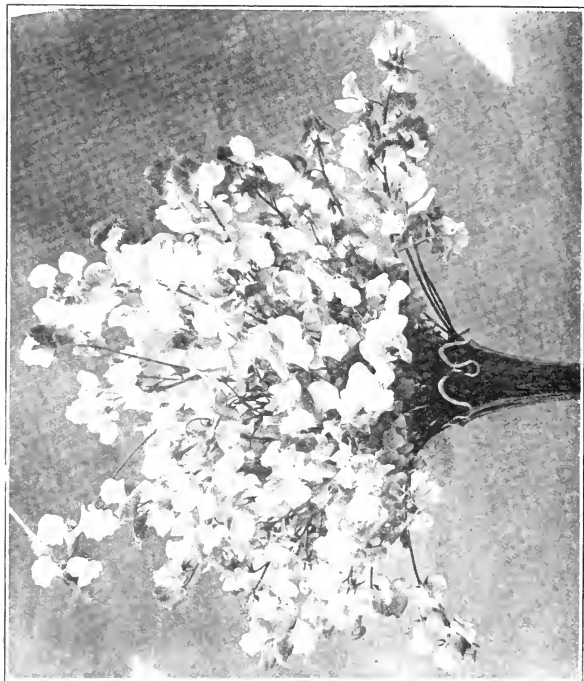
We have explained in detail how these base breaks normally appear and become the future plant when conditions are right. When these breaks do not develop without topping, it is an indication that normal vigor is lacking, either through enfeebled roots or lack of full exposure to light. We do not question this writer's sincerity; he is merely short on experience.

He also makes an egregious error when telling us that the two sexes of the sweet pea are four to five days apart in developing and that if it were otherwise, inbreeding would result. The facts are that the two sexes develop together and the flowers are self-fertilized. This brings up the question of inbreeding as affecting sweet peas, of which we shall have a few words to say later.

Ordinarily sweet peas do not cross, as this authority would have us believe. The reproductive organs are enveloped in the keel. When the flower is disturbed, as by bees or the wind, self-fertilization takes place, the pistil of the flower being surrounded by the stamens, making it practically impossible for outside pollen to become effective. For many years we have grown, under glass, seeds of numerous small lots, such lots growing side by side and never crossing.

As we emerge from midwinter and the sun becomes stronger our early-sown crop rapidly declines. Good plants in 2-inch pots that are started in the middle of November or even the first days of November and grown cool, should be ready to replace beds sown as early as June. Those started in July or August should¹ produce heavily up to St. Valentine's day or later. It rarely pays to try holding these for Easter. A few warm days in March entirely finish them. With the vines hardened, as they are at this time, there is little or no danger of overwatering. Plenty of water will certainly prolong their life. There is naturally an abundance of plant food in ordinary soil. The problem is its dissolution, and to promote this nothing is so valuable as a free use of water. It has always seemed to us that undue importance is placed on the feeding of growing plants, particularly during the winter months. We have experimented repeatedly with bone, acid phosphate, blood and bone, and sheep manure as top-dressing, with no noticeable results, always leaving check spaces to determine this. Possibly we did not apply enough water to dissolve these materials. We think it is likely they require more time to dissolve than we realize and that the following crop is the real beneficiary. This, of course, does not include quick-acting forms of nitrogen, that color up flowers and strengthen plants.

We generally depend on the material incorporated with the soil before planting, and in the case of early planted peas, heavy watering after the growth becomes hardened in January and February.



Vase of Columbia.

PLANTING AFTER MUMS.

THE finest flowers of sweet peas we have ever grown were from sowings made in September, following an aster crop. This crop escapes most of the excessive heat and comes into winter strong, and under the influence of plenty of air and a night temperature of about 45 degrees up to January, makes a kind of growth that produces exhibition flowers. Not many are in time for St. Valentine's day, but by Easter the plants should be in full crop, and if they have been well cared for, they will be producing freely as late as Mothers' day. This crop escapes all the bud-dropping worries of November and December, but it has not been particularly popular with us because of the difficulty of successfully growing asters under glass and of finding any other preceding crop that can be cleared early in September. With a crop that can be harvested at this time, this September sowing is, indeed, to be recommended.

The combination of mums and peas is, we believe, the safest and, on the average, the most profitable way of handling peas. The mums give the grower a lump sum with which to begin the winter, and the peas obtain a start under the most favorable conditions possible. The young stock for this planting can be started in pots from three to six weeks before the beds are ready for planting.

Preparing this young stock involves considerable good management. The mistake is often made of starting this stock too early, getting it potbound and thus beginning with a handicap. We figure on a bench of mums being cut out by October 15. Possibly conditions over which we may have no control will delay this until October 20; after this it is easy to be delayed another week by other work that is pressing

and unlooked-for, or an excessively warm spell of weather early in October might push our young stock a week out of schedule. We might easily conclude that it is better not to take this chance, with the extra work involved, and sow direct when the beds are cleared, but this means the loss of two or three weeks in getting the plants into crop in the spring, and when peas are a specialty this is an important item.

We try to sow our seeds in pots about three weeks before the beds are ready for planting. Soak the seeds twenty-four hours before you are ready to sow them and use only the swelled ones: ninety-five per cent of nearly all California-grown seeds will swell in that time. Such as do not respond to this treatment can either be chipped or the hard coating broken through by rubbing over a file. If there are but few, it is better to discard them, for generally the germ is not developed. Three seeds are plenty for a 2-inch pot and four seedlings nicely fill a 3-inch pot. Beyond this size, they are clumsy to handle.

An outdoor frame is an ideal place to start these young plants, and if they can be planted before November 1, artificial heat is hardly needed in our latitude. A light freeze seems really to tone them up, but if this does happen, it would be better not to let the sun thaw them out, though we have noted stray seedlings outdoors in fine shape after a hard freeze. However, under the protection of a sash they do not harden to that extent. If pots or time are not available, the seeds can be sown in an open bed of light, fine soil or in flats of well sifted soil, about three weeks before their permanent quarters are ready. They transplant easily when small, but they do not like to be torn up after the second or third set of leaves develops.

Even though these young plants are in the frame but two or three weeks, they should be thoroughly sprayed for green fly, for, with the frames uncovered, as they should be as much as possible, aphids can easily work into the plants from what outdoor vegetation there may be in the vicinity. Even though you have reason to think your plants are free of this pest, play safe and spray them thoroughly.

Keeping this young stock uniformly moist is another detail to watch carefully. If the plants are exposed to the sun and air, as they should be, the moisture in a 2-inch or 3-inch pot does not last long. They should, of course, be plunged to the rim in soil, cinders or whatever happens to be in the frame. If allowed to become excessively dry a few times, they seem to become hardened and never really make good.

For growing young stock to follow early mums or to plant any time in October, it is not really necessary to use a frame. The south side of any kind of protection from the north or west wind is an admirable place, provided the plants may be covered, with whatever material is at hand, against an actual freeze. But to grow young stock to follow midseason or late mums requires, if a frame be used, that the frame be heated. A 1-inch steam pipe on the south side will take good care of a tight frame when the outdoor temperature falls as low as 15 degrees. If this pipe cannot be connected conveniently at the return end with the general heating system, it can be partly closed with a valve and let blow. It is only used to keep out frost, and for this purpose it may not be used more than three or four times during the month of November, and in the first days of December we get this frame cleared. For the midseason and late mums more time can be safely allowed for developing the young stock, the lower temperature of October and November bringing them along slowly. October 10 to 15 is a safe time to start seeds for all these beds, except such as are occupied as late as Christmas, and for these the seed can be sown November 15.

The grower of late peas need not consider east and west lines in planting, as he would for the early crop, as most of the flowers are from the terminal or upper growth. The vines ordinarily do not exceed six to eight feet in height and can be planted decidedly closer. In our wide beds we follow the same plan that we use for the early crop, except that in place of two or three rows ten or twelve inches apart, we plant four rows eight or ten inches apart, cutting down the 30-inch walk allowed for the early planting to twenty-four inches, with 5-foot beds.

Some growers plant a double row on both sides of the bed, using the center for a walk, and this is a good plan. However, for the late planting of such a bed, we prefer to carry our rows across, spacing them twelve to fourteen inches apart. This method of planting, of course, fills the entire bed with growth and, we find, produces more flowers, especially early in the season, when they are most valuable. The single row system, with three or four feet between the rows, will produce a heavy crop on the south side of the row, but not until late, when the stems are short and the flowers sometimes not particularly profitable.

To develop a strong growth that responds vigorously to the increased sunshine of January and February, a night temperature not exceeding 45 degrees should be maintained, with as much fresh air provided as possible. Because of the short days and the usual cloudiness of November and December, a higher temperature would run the growth up soft and thin, and there is no profit in peas from such growth. We find a temperature much below 45 degrees is not an advantage; rather, it seems to check the plants. This has been frequently noted in the cool ends of a house.

As promptly as buds form in the terminals, which depends on the prevalence of sunshine, the temperature should be increased to 52 or even 54 degrees. Such colors as orange, scarlet or cerise will retain an objectionable light-colored edge in the flower petals in a lower temperature. A temperature of 55 degrees produces a better colored and more fully developed flower, brings on the crop faster and, of course, shortens the life of the vines, compared with a temperature of 50 degrees, that has the advantage of producing a firmer flower, which will stand shipping better. These might be considered the two points between which the grower can choose according to requirement.

As in the case of the early planted peas, young stock, until it becomes well established, requires careful watering. If the soil is light and porous from heavy, coarse manuring, frequent heavy waterings are necessary to establish the plant well. This is indicated by the free breaking into fresh growth.

At this stage the roots are deep enough in the lower soil to care for the plants safely. If the soil is kept too dry before this point is reached, the plants seem to become hardened, or stunted. We frequently note this on the south edge of a bed, where it is difficult to maintain that necessary uniform moisture. When the drainage is free, sweet peas use a surprising amount of water. Early sown plants that are ten or twelve feet high are in midwinter like trees outdoors in midsummer, with their roots so deep in the soil that they can grow freely for several months without one's watering through the surface soil. But with young plants it is quite different, indeed.

During the winter months, fumigating once a month or every six weeks will keep aphid down, but, with the higher temperature of spring, aphid will get a ruinous footing if not watched. Before shutting down steam, on which we depend, the houses are treated to a heavy fumigating and this generally carries us through.

Peas that were planted after early mums should begin to flower freely by March 1 and produce stems twelve to fifteen inches long, if conditions have favored them. This heavy growth will drop some buds at this time, even with a normal amount of sunshine. Should several days of cloudy weather be followed by clearing skies, this soft growth will wilt, doing no particular harm. The wilting can be counteracted to some extent by spraying overhead and keeping the air cool. The routine work of picking, watering and keeping the vines properly supported will keep the grower busy from now until after Mothers' day. What is left of these late planted peas by Memorial day depends on how late they were planted and the number of excessively warm periods during May.

Our latest planting of peas is made after St. Valentine's day, in side benches that have usually been previously occupied by calendulas. The young stock for this late planting should be started about the middle of December. If grown cool, say around 40 degrees, they develop slowly at this season and become correspondingly strong. Satisfactory returns can be had from this late planting if strong young pot plants are used. There is no time to produce the heavy growth we get

from the after-mum planting, and the flowers will not be so long-stemmed, but the vines should produce heavily throughout May, when the demand for sweet peas is sometimes active on account of the exhaustion of the earlier planting.

With the strong sun of May, a light shade is beneficial; in fact, almost necessary. We like a thin mixture of whiting on the roof for this purpose. A rain will clean it off, but this is usually followed by a few days of dark weather, when it is desirable to have it off. During midsummer, or when the houses are empty, we spray this material on the inside of the roof, removing it easily with the hose when it is no longer wanted.

CATCH CROPS WITH PEAS.

SWEET peas that were planted the middle of July and successfully carried through the heat of summer should have the life flowered out of them by February 1. Having good pot plants of young peas with which to replant, the question of catch crops does not concern us, but for the average grower it may be more desirable and certainly safer to grow a crop of mums with at least part of his space, and mums are the most popular crop grown in connection with sweet peas.

In the case of the pompons it might be of interest to say we have two systems of handling them. The early propagated stock is planted in the field as soon as all danger of frost is over, pinched back once and grown into good plants by the end of June, when the pea beds are cleared to receive them. The other and better method is to plant cuttings in permanent quarters direct from sand. This, of course, can only be done with cuttings put in the sand late. We find this method produces decidedly the better results, besides saving the work of handling the field plants. The cuttings directly planted receive no check at any stage, such as the earlier propagated stock receives. After planting a bed with cuttings, it is advisable to pot up a few extra to replace those that may not take hold.

The improved calendula has been for us an important as well as profitable catch crop. We grow it in side beds, where the head room does not permit planting peas until after St. Valentine's day. The seed is sown August 1. The seedlings are potted in 3-inch pots and grown outdoors, protected somewhat from the strong sun until they are well established. To insure a uniform bed of plants, a few more than are actually needed should be potted, so that the weak ones may be dis-

carded. We space the calendulas twelve by fourteen inches. We water heavily only when necessary.

With us they are subject to a form of rust similar to the one attacking snapdragons, and this seems to be encouraged by heat and excessive moisture. Instead of potting our seedlings, we formerly planted them directly in the beds in August, under a shade to prevent burning out, and kept them well syringed. By the new method we have kept free from this rust. After cool weather sets in and firing begins, all danger of this is past, and affected plants, unless it has a serious hold, grow out of it.

Green flies make themselves entirely at home among calendulas, keeping to the under side of the foliage, so that the unsuspecting grower does not discover them until his plants are covered with them.

This improved calendula makes an upright growth that permits easy disbudding, and this must be regularly looked after. Taking out the center or first bud is of no particular advantage, though it might as well be done if they are opening too early.

Calendulas have but little value if produced under a high temperature. These plants thrive in a night temperature of 45 to 50 degrees and in a solid bed of well enriched old soil. By February 1 to 15 the first crop of flowers should be well cut away, each plant producing eight to ten flowers, that bring from \$1 to \$1.50 per dozen wholesale.

Stevia serrata is another crop that fits into the rotation plan. Undoubtedly a fine grade of this flower is produced by carrying it along in pots all summer. A decidedly easier way of handling it, and one that produces quite good results, is to plant young stock in the field. Keep it pinched closely all summer, September 1 being the date for the last topping. A breath of frost will cut it down, and so it must be sheltered early in September in our locality. Besides all available greenhouse space, we use our heated frames for this, adding to the sides until they are eighteen inches high. The stevia is planted in boxes, made of 6-inch pecky cypress, four or five feet long,

six inches deep and six inches wide, and is protected in the frames until an early mum bed is cleared.

Besides these important staples, a great variety of plants will suggest themselves to the grower. In low houses, where the air is close to the beds, asters can be grown to perfection between pea crops, but modern high houses become entirely too hot for them. Violets and pansies will flourish in a house planted with late peas, but more liberal spacing of peas must be resorted to than we advise; this suggestion might fit a retail grower, who could follow up early mums with a combination of peas with violets and pansies. This arrangement would be profitable until about St. Valentine's day. After this date the peas will overshadow all small crops.

Radishes and lettuce between rows of late planted peas are important crops with some growers. To follow early planted peas that have exhausted themselves by the middle of February or the first part of March, tomatoes and cucumbers are important staple crops and are, comparatively speaking, easily handled because of the rapidly opening season. The young stock for this crop must be started early and grown on in a warm house.

In considering these side lines, the grower must also be guided by his market for them. In our own case the most advantageous crop to follow early peas is another crop of these same peas started in 2-inch pots six weeks before they are wanted.

Though somewhat speculative, Dutch or French bulbs suggest another line. Planted in flats, they can be brought in and started in shade between the vines and can be shifted about where wanted. They are quickly cleared, providing a rapid turnover. The last few years Darwin tulips for Easter have been receiving special consideration. Any enterprising native bulb man can furnish an unlimited amount of information along these lines.

In a house with a gutter six or seven feet high and used for early planted peas, the north bed offers a problem, because of insufficient head room. By November this bed is entirely shaded, and in such a bed no small flowering crop will flourish.

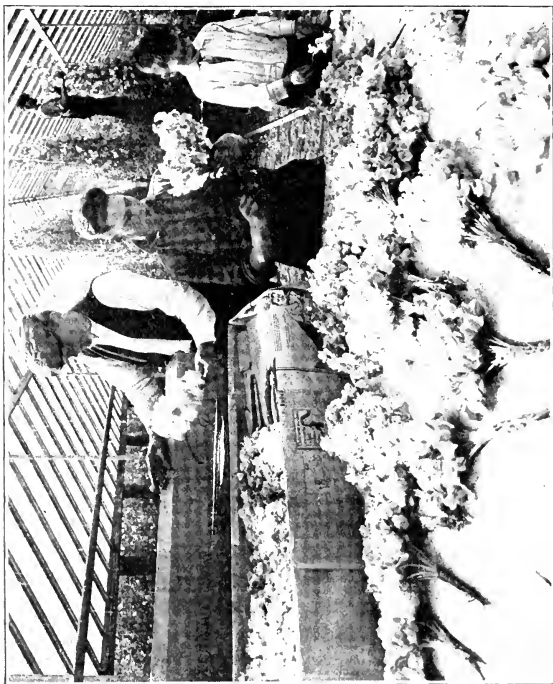
Asparagus, either *plumosus* or *Sprengeri*, will fit into such a situation, and while these crops are not highly profitable, they can be used to advantage. A crop of early mums can be taken from such a bed, but after that it is under a total eclipse until the peas are removed.

Where early peas are finished by March 1, snapdragons can still be planted to good advantage. In fact, nothing is easier than to fill a bed profitably at the end of February or the first part of March, or even the middle of March, and these are about the dates when peas, started in July or August and grown in a temperature of not less than 50 degrees, will be exhausted. However, if the vines are in a fairly vigorous condition by the first of March and this month is cool and cloudy, as it sometimes is, it might pay to hold them for an early Easter, but we have frequently lost out in attempting this. A few warm spells at the end of March exhaust these old vines fast—besides, short peas are at a discount during March. This month represents the end of the winter's real social activities, and spring is not yet under way. Besides, peas planted after mums are in the highest state of perfection at this time.

Annual larkspur is an easily handled and valuable addition to the list of annuals for early spring forcing. As in the case of most annuals, they should be started a month or six weeks before they are to be used, for during midwinter annuals grow slowly. Among others in this class, the following are valuable: *Gypsophila elegans*, which should be sown where it is to flower; annual lupines, which are quite popular; ten weeks' stocks, *clarkia*, *salpiglossis*, *centaurea*, or cornflower, which should be sown early; candytuft and African marigolds.

The improved dahlia-flowered zinnia is another plant for spring and early summer flowering. Seed can be sown about a month before the seedlings are planted in permanent quarters. They should be planted under glass about twelve by fourteen inches apart. An extra supply of plants should be carried along, for the seedlings are susceptible to a form of black rot. About June 1 they should be partly shaded. We believe

the improved zinnia has an important future. We have seen splendid flowers grown under glass until well into the summer. Where but one crop of early planted peas is depended on, the zinnia fits in well as a catch crop, using bench space to advantage from March until July.



Bunching and Packing Sweet Peas for Shipment.

MARKETING SWEET PEAS.

IT IS inconsistency, indeed, to expend a lot of costly material and careful attention in growing good peas and finish by marketing them in an indifferent way. To begin with picking, this can be done any time after a few hours' sun has opened them. As to the stage of openness, all depends upon the demand and the season. During the winter they can be allowed to develop more fully than during the spring, and with the coming of warm weather they must be picked close and clean daily. Sometimes when the weather is quite warm we try to get over them twice daily, for they open rapidly in warm weather and if the blooms are allowed to remain on the vines too long they will collapse sometimes before the commission man can get them off his hands. By picking close we refer to the state in which there are two fairly open flowers and a bud; two open flowers and two buds is very close. One open flower and one bud is never taken. Unless attention is paid to this, losses are certain during the occasional "hot times" we experience in spring.

When flowers are scarce they sell put up in any old way, but when stock accumulates the best bunched flowers sell more readily and, it logically follows, will return a better average price. Any commission man will bear out the statement, frequently made, that poor peas well bunched will sell better than good peas poorly put together. The demand of the Chicago market in this phase of the sweet pea business differs radically from that of any other market as regards the style of bunching. Many of our peas are used for corsage work, and unless the bunches, which consist of twenty-five sprays, are flattened and the flowers faced as shown in the illustration on the next page, our market will not handle them to any advantage.



These bunches, with a bit of trimming by the retailer, are ready for milady. We believe other markets would respond to this style of bunching and that peas would become a more popular and profitable item with the retailer if this style of bunching were given a fair trial. The mass effect of a well-arranged bunch of sweet peas places every other corsage flower in the background.

With a little practice, this style of bunch is easily made. The stems are held firmly between the thumb and forefinger of the left hand while the long-stemmed flowers are worked into the back of the bunch and the short ones into the front, being gradually rounded out to the desired fan shape. To maintain this shape, the stems must be held firmly in place, especially while one is tying them. For tying we use No. 40 thread or any light material. Do not use cotton twine. Rubber bands are sometimes employed, but their use requires that the stems be more rounded together in bunching than we are accustomed to do.

This style of bunching enables the grower to work in some crooked-stemmed and short stock to an advantage not possible in the ordinary round bunch, in which such a stem cannot be concealed. In shipping, these flat bunches naturally carry to advantage.

When we have a heavy crop to care for, we put this bunching on a piece-work basis, paying \$1.25 per hundred bunches for it. An experienced buncher easily makes fifty to sixty bunches hourly. Sometimes the bunching is done at the vines in the process of picking, but we prefer, especially with a heavy crop, to make them two separate operations.

Cut flowers of any kind should be stored in a dry, cool, well ventilated place, and sweet peas are no exception. During the winter we prefer our storage room to maintain a temperature of 50 to 55 degrees; if it is much lower the flowers are inclined to close up and lose what little fragrance they possess at this season. Fresh air seems to play an important part in the fragrance of sweet peas. With open ventilators and the strong sun of spring, we get the real sweet pea odor, but

we do not get this in full until the open-air flowers of June are with us.

During excessively warm spells in May and June, when flowers are quite soft, they should not be left in water until shipped the following morning. After they have been standing in water from three to four hours, we spread them out on dry paper, which will absorb the surplus moisture, until ready to ship. If growers would pick their flowers more closely and keep them from excessive moisture when they are soft, we should not hear the occasional complaints of sweet peas being fragile. The sweet pea is of such delicately exquisite beauty that the law of compensation will not permit it to be of an everlasting nature. For those desiring something with lasting quality, straw and paper flowers are recommended.

Corrugated shipping boxes carry peas nicely. We prefer them to be not more than ten inches deep, fourteen inches wide and forty inches long; such a box will hold 2,000 fairly long peas, in four layers, with paper between the layers to absorb surplus moisture.

DISEASES.

THE subject of diseases which attack sweet peas should ordinarily be treated by a pathologist or school man. It is a field in which there is much to be done, and one of which we have, comparatively speaking, little working knowledge. However, the practical grower is in a position to make valuable deductions, as much depends on constant observations. We shall digress far enough to cite the aster blight as an instance of the importance of unchecked growth as a factor in resisting disease. It is almost impossible to grow the aster profitably in some sections. We send diseased specimens to the state institutions, but generally receive no practical or helpful information, for, through lack of funds to carry on this work, little can be accomplished there, and this situation will continue until the greenhouse men in a more united way get behind their state experiment stations. What we growers need to understand are the underlying principles that control disease and health, and that the more nearly we surround our plants with natural growing conditions, the freer they will be of disease.

Speaking of asters, we usually start the seed the first part of March in a warm, moist greenhouse, in flats containing two or three inches of soil. It is easy, in the rush of other work, to permit the plants to become too dry in this shallow soil, so that they wilt, and are checked or weakened. After they are overcrowded we transplant, and before they are transplanted to the field they are allowed to become overcrowded again, thus being given another setback in this final transplanting. They grow along beautifully, but the germ of the trouble has got into them, and when the weather turns dry and hot the plants go in the way we all know. This may not be

the general procedure, but it approximates it. On the other hand, our neighbor's wife buys a packet of seed at the corner grocery, sows it in her open garden and in the fall is rewarded with a wealth of perfect flowers. We have cut through the main stems of some of these garden plants and found them perfectly clean, while ours, even such as held up long enough to produce a full crop, were black from stem-rot.

We shall cite another experience: Several years ago we planted a bed of asters indoors. Half of it was planted with early-sown transplanted seedlings; in the remaining half the seed was sown direct. With the coming of hot weather, red spider got a foothold on the transplanted half, and, in spite of the most vigorous daily syringing, these plants were ruined by this pest, while the plants from seed sown direct, even to the adjoining row, were free from spider.

We can go yet farther and recall a like experience with snapdragons: On one occasion we planted part of a bed with plants from the field and the remainder with young seedlings. This was in summer; by October the field stock was literally smothered with rust, while the seedlings were entirely free. Our common sense in this matter was so dormant that we sprayed the affected plants with a commercial fungicide.

The principles that govern all forms of life are the same; it is a case of survival of the strongest, not the unlike. The warfare between disease and life is incessantly going on, and the stronger and more naturally we grow our plants, the more favorable their chances of overcoming disease and, to an extent, insect enemies. A check in any form to a growing plant counts against its ability to resist disease. A modern, light, steam-heated, well ventilated greenhouse is a great improvement over antiquated, dark structures in growing plants that are able to resist disease.

Another point that many of us do not fully appreciate is the value of free ventilation. One of the costliest items of a modern greenhouse is the ventilating system, and no part of the cost is more fully justified. It is easy to reason that the more perfect our ventilation, the more nearly we approach natural conditions and the more our plants are strengthened

against fungous diseases. The case of the modern rose grower is somewhat different. His plants are grown under highly artificial conditions of uniformly high temperature, making it necessary to guard against sudden drafts of air that chill the plants, lowering resistance and making them a prey to the ever-present spores of mildew.

An instance of the value of free ventilation we have frequently noticed concerns the little insect known to mum growers as the leaf-tyer. By drawing leaves together with a fine web, it does considerable damage to foliage. We have never noticed this to an appreciable extent in a well ventilated house, but we have seen it ruinously bad in what are commonly referred to as "dead air pockets," such as a lean-to or additions where air does not circulate.

Fresh air is not a panacea for all of a greenhouse man's troubles, to be sure, but we feel free to say there are many growers who do not fully appreciate its importance.

The most serious trouble with which sweet peas are affected, in our experience, is what is known as the mosaic disease. This is characterized by a white or light yellow mottling or striping of the leaf, which extends to the flower. The growth becomes stunted, and an infected plant never recovers. Occasionally such a plant will make an apparently clean growth, which has misled some authorities to believe it capable of outgrowing the trouble. With us this trouble almost invariably follows an attack of aphid on young plants. After the plants are up twelve or fourteen inches they seem immune. The first year the winter-blooming Spencers were released, we planted a newly built house with them, deferring the glazing until September. Ordinary precautions were taken against green fly, but by late September the fatal mosaic disease put in its appearance, and it was soon plainly evident the entire house was affected. For plants in the open, as they were, we had not sprayed often enough. The loss of valuable seed and time was not all. We wrote for information to several experiment stations, where it was diagnosed as a form of root-rot. Thorough sterilization with steam or formaldehyde was recommended, and this was carried out to the letter, for we

were scared. However, a check plot was left. All beds did equally well in the succeeding crop.

Since this experience we have been exceedingly thorough in spraying our young peas with a strong solution of nicotine at least twice a week during summer months, and we have had but little trouble since. During the summer months all doors and openings near the ground, in houses containing early-planted stock, should be kept closed, for green fly will travel and find its way through small openings. Ordinary side ventilators seem too high for them. Occasionally this trouble is noticed in California seed fields, where the cause is laid to the wind's whipping the vines about, the germs of the disease possibly entering the plant through bruises.

The next most serious pest we have heard of as affecting peas is a form of aphid at the roots. We have had no experience with this, but we learn from others that it is a serious matter. The affected plants gradually lose their vigor and appear to be dying out. Careful examination of the roots discloses, in the cases we have noted, a reddish-brown louse. We have heard of its being white sometimes. Watering these affected plants with what you would consider a weak solution for spraying will kill this pest without injuring the plants. It would probably be well to experiment with the strength of the solution before using it. The trouble seems to be brought in with fresh soil, and about all we can suggest now is to change the source of soil supply or to sterilize, if drenching with nicotine does not seem permanently to clean out these root parasites. We have heard of but few cases of this form of trouble, but when a grower finds patches of plants standing still or going backward, it might be well to examine the roots for this trouble.

When we start peas in midsummer under glass it is under highly artificial and unnatural conditions, producing weakened plants that become unable to fight off various fungous diseases that attack the roots. This constitutes the most serious difficulty in starting early peas in hot weather. The vigorous white roots turn black and rot off; new ones form, but no really healthy ones come until cool weather sets in, when this

trouble disappears or, more correctly speaking, the plant's resistance increases to a point that enables it to fight off the disease. Sometimes the plants pick up and develop normally. They may be disturbed to an extent that makes full recovery impossible and often enough they die out entirely. Authorities on sweet pea diseases inform us that this is rhizoctonia root-rot and, like most forms of fungus, its development is favored by high temperature and excessive moisture.

We have definitely established the fact that we have comparatively little trouble with it in fresh soil. We even find the same soil fairly free the second season. While excessive moisture may encourage the fungus, we find it best to maintain a fairly moist soil, syringing overhead two or three times on hot days. This, with a heavy shade during August, gradually reduced in September, seems to provide an atmosphere that gives the plants a fighting chance.

In entirely fresh soil we frequently notice a form of damping off that is confined to seedlings; it attacks the stems above ground, usually confining itself in any one place to three or four inches of a row. While this trouble is not serious, we prefer to scoop the soil from these affected spots to prevent its spread. A strong light will sometimes reveal an amazing amount of night traffic over the surface of beds, rendering easy transportation facilities to the world of germs.

With the coming of cool fall nights and the dropping of ventilators, we soften our growth and invite mildew. This should be anticipated before flowers open by thoroughly dusting the vines with sulphur. This material, combined with sunshine, will burn open flowers. An application of sulphur should remain on the vines, as it ordinarily is not necessary to syringe blooming peas. Mildew should not be regarded lightly, as the value of foliage in sustaining a plant is destroyed when covered by it.

With the coming of spring the foliage about the base of our plants sometimes becomes affected with brown spots about one-fourth of an inch in diameter. We consider excessive moisture largely responsible. As in other similar disturbances, practically no harm is done. When plants are soft from ex-

cessively dark weather and are suddenly exposed to strong sunshine, they are inclined to wilt and the edges of the soft foliage to burn, but after a few days the plants regain their equilibrium.

On heavy young growth the flower stems will sometimes appear to wilt near the top, the bud dropping over. We have always felt this was due to the same cause, strong sunshine on soft growth.

We have seen peas oversupplied with water to a point where the flowers completely collapsed after reaching the market, though apparently in perfect condition a few hours earlier; they were simply a rotten mass. This is generally occasioned by lack of drainage and heavy spring rains, though we have seen the same condition of excess moisture, with the same results, in plants on raised beds. The latter was also due to lack of drainage, probably with poor ventilation. A poorly drained site is not only bad because of the excess moisture it holds at the roots in the case of a ground bed, but the atmosphere of the house will, during most of the winter and spring, be heavily saturated with moisture, and this is not in the interest of good, hard peas that will hold up for shipping, to say nothing of its effect on the spread of fungous diseases. During the pressure of spring work we are sometimes tempted to give up firing too soon. Letting the temperature drop to 45 degrees or lower will do no particular harm during this rapidly developing season, but the flowers are softened by the atmosphere of the house becoming saturated with moisture. When the hands become moistened in handling the vines or in picking, we should know steam is needed to dry the plants. During these spring months, if artificial heat is given up, some ventilation must assuredly be left on to care for this heavy evaporation. With the coming of warmer weather the situation changes, for wide-open ventilators and a high temperature remove the moisture rapidly, and it must be liberally replaced to keep down red spider; besides, sweet peas do not prosper in a hot, dry atmosphere.

BREEDING AND VARIETIES.

THE most pronounced fact in all creation is evolution. It is sometimes referred to as a theory, but to any logical mind it is indeed an open fact. Consider the improvement of many domesticated plants within an average lifetime. Under the intensive influence of the breeder, the evolution in size and coloring of the modern sweet pea has been unequalled by any cultivated plant. It is often asked along what lines further development is to be looked for. We should say, fixing and enlarging on the duplex type. Judging by what may be seen in California, this type, in a fixed condition, is not in the distant future.

All development so far made has been in the late-flowering kinds, but once this characteristic becomes a permanent part of any variety, it will be a comparatively easy matter to cross it into the early-flowering class. However, this will require time, judging by the elusive nature this characteristic has displayed in the past.

On the trial grounds of the W. Atlee Burpee Co. and C. C. Morse & Co. there were flowered last season plots that were acres in extent, of varieties that were fully ninety-five per cent clear duplex. In this class we might mention **Radiance**, deep pink on a cream ground; **Kenneth**, a brilliant soft rose; **Ring Dove**, a particularly fine cream pink. The last two, we understand, are **Dobbie** products. An extra large deep cream was also noted. Last year this appeared a finished product, but a few breaks this season remind us what a long-drawn-out and costly process this work is. We are told **Mr. Cuthbertson** has been at work on this particular lot for years. In being shown over these costly trials, we cannot but admire the enthusiasm that sustains these Californians in this work.

Aside from the duplex type, the most interesting original development in sweet peas is the new late-flowering Morse variety known as Youth, a delicately youthful shade of light pink on a white ground, quite unlike anything in this color class; but this is the least of its attractions, for it possesses an orange-blossom odor clearly distinctive from any variety it may be compared with. This suggests also an interesting possibility of the sweet pea.

To return to the early-flowering varieties, not a season passes in which we are not given new shades in all colors or improvement in size or growth. In Mrs. Kerr we make a step forward in all these points. In the new variety, Grenadier, we have a rich scarlet, finely waved and extra strong in growth. The near future will give us Bright and Early, a dazzling orange scarlet that is exceptionally bright. Chevalier, an extra large deep rose with very strong growth and stem, is the most attractive of the current season's trials with us. We mention these varieties in passing to show that real progress is being made. However, we have room for a light clear blue, lighter than Blue Bird and stronger than Mrs. Harding. This want will soon be filled. True Blue is the desired shade, but this variety lacks vigorous growth.

From the standpoint of the cut flower grower, the most popular shade of pink is the late-flowering Hawlmark Pink. This variety lacks vigorous growth and on that account has never been particularly popular with cut flower growers. It is a highly attractive rose, with a softening touch of salmon, a color that will sell anywhere at any time. Our California friends have been at work for years to breed this color into the early-flowering type, which has been easily done, but it persists in breaking up. However, several of the large growers seem to be running it down. We believe this will be offered, trued up, within two or three years. This color in the early-flowering varieties will go a long way, indeed, toward the further popularizing of the early sweet pea.

Anywhere from five to ten years are required from an original cross to work up a new variety for popular approval. Improvements are often secured by selection, but these breaks

are the results of former crosses. It is this continual crossing in an effort to improve that causes all varieties to produce more or less rogues, as we term them. The more violently different the parents used in crossing, the more this factor is complicated. For the cut flower grower, these rogue colors are all salable, but they must be sorted and bunched separately, and this requires extra time. For the seed grower, they add greatly to his costs, for the fields must be gone through regularly by carefully trained men, throughout the blooming season. This tendency to vary is true of any plant regularly reproduced by seed. It is not true to such an extent in the case of wheat or corn, which have a long line of unbroken ancestors. These are improved by selection.

To get new colors or shades in sweet peas, we must cross, and take the consequences. This is where the law of heredity, discovered by Mendel over fifty years ago, becomes an important factor. Briefly stated, this, as relating to color characteristics, is as follows: In crossing a pink and a white, the resulting first generation will be all of the pink, or dark shade. These are known as dominants and give us nothing new. Seed from these plants, sown the following year, will show the variations from the cross in the proportion of three pink or dark shades to every white or light one. This is the second generation. Now for its practical application. The white or light shades should reproduce themselves exactly, while of the dark shades, one of every three should do the same, the other two breaking up in the same proportion as did the second generation, three dark ones to one light. Theoretically these are the proportions, but the factor of chance in seed might unbalance these. Volumes are devoted to this subject, the principles being carried out with every conceivable characteristic of plants and animals. To follow out this law in breeding sweet peas is apparently an easy matter, but determining the dominants and the recessives or light-colored ones in the second generation gives rise to uncertainties, unless one has made an exhaustive study of this far-reaching principle.

When a particularly desirable characteristic appears in any of their second generation seedlings, most successful breeders

disregard Mendelism. Should the variety break up in the next generation, it is easily discarded and forgotten. However, some successful breeders claim to use this law in working with sweet peas, while others equally successful do not.

The work of crossing sweet peas is simple. Practically all flowers contain both male and female organs of reproduction, and must be emasculated, or the pollen removed. A bud about half-developed is selected, and with a needle the keel is slit open, exposing both these organs. The pollen heads, which are removed with the same needle, must, of course, be unripe, and for this reason a half-developed bud is selected. To prevent the chance of stray pollen upsetting our plans, we prefer to cover these emasculated buds, and for this a piece of tissue paper about six inches square is used. The female organs of these emasculated buds will develop to a receptive condition in two or three days, depending on the amount of heat and sun. This applies to greenhouse conditions.

For crossing, the day should be a clear one, to insure the pollen's being dry. The pollen in buds about three-fourths developed will be found to be in the right state. While the mechanical work connected with making these crosses is a comparatively simple matter, knowing what colors or characteristics to combine to secure what we have in mind calls for experience, combined with what we might call intuition. A beginner makes his crosses at random and gets nowhere except by chance.

A certain ideal of improvement must be kept in mind and parents selected possessing these points. This is easily suggested, but to carry it out successfully requires that indefinable something we have referred to as "intuition" and is not handed on through cold type.

Some years ago we made a number of crosses, using Zvolanek's Rose and Rose Queen as parents. The former possesses fine color, but is short in stem, while Rose Queen is long in stem, but weak in color. Of all these crosses, the best one is a distinct improvement on Rose Queen in that it has a stronger color, while retaining the long stem, and the tendency to produce four flowers on a stem. With parents possessing

such strong points, and of similar color, the results can hardly fail to be successful, if enough crosses are made.

A variety known locally as Mrs. Burke, possessing a desirable shade of blue and of strong growth, but almost a grandiflora in form, was crossed with True Blue, which has large flowers and the desired color, but is decidedly lacking in vigorous growth. This has given us the shade of blue we are after, with good growth, but not more than twenty-five per cent of them were true Spencers. Seed is saved separately from the best of these true Spencers, in an effort to run down the desired Spencer type.

Hawlmarmk Pink, of the late-flowering class, has been used as the male parent on the rose pink resulting from the Zvolanek's Rose and Rose Queen cross. The first generation of this cross gives us all of the late-flowering type. In the next generation we find about half of the late and half of the early kind. Among these earlies, we find every shade of rose, from the strongest to the lightest, including some true Hawlmarmk Pink. Just what the third generation will do with our true Hawlmarmks remains for another season to determine. They are intermediate between the dark and light shades and just where they belong according to Mendelism is not clear to us. We believe they will prove to be dominants, with one chance in three of securing a true Hawlmarmk.

Last season we made a number of crosses between selected individuals of our improved Rose Queen, as we call it. The first generation of this lot of crosses is encouraging, for we appear to have a stronger growth and no rogues. We shall try this close breeding theory with our true Hawlmarmks in an effort to fix this desirable shade in the early-flowering class.

We give these experiences, in passing, to suggest lines of procedure for beginners, realizing fully our lack of extended successful experience in this, the most fascinating phase of plant study.

No two plants are exactly alike, particularly as to their latent or hereditary tendencies. This makes the improvement of plants by selection an important line of procedure and full of possibilities, particularly for the greenhouse man.

Conditions under glass are entirely different from what the field man has to contend with. They are as nearly ideal as it is possible to make them for the full development of characteristics that the harsher outdoor conditions develop only partially or not at all. The sweet pea *Columbia* is an example of our contention. This was an easy selection from an ordinary strain of pink and white. Stock seed was worked up and sent to California, where it required two seasons for the growers to note any difference between this and the regular pink and white strains. Under glass the strong, heavy growth of this variety will produce fully one-third more blooms than the ordinary strain. The showing made by our improved *calendula* in California was a distinct disappointment to us. But little difference as grown in the field between this and ordinary strains was noticeable. But what a marked difference can be seen under the protective influence of greenhouse conditions!

We cite these experiences to show what opportunities the greenhouse man has in the field of individual plant selection.

There is no wizardry connected with the crossing or selecting of plants. A real interest in plant biology plus patience to watch and wait for results are the required qualifications. The grower who does not recognize valuable points in a plant or flower is not a practical plantsman. However, recognizing and selecting is only the beginning.

Of all the colors in sweet peas, the various shades of clear rose pink represented by such varieties as *Zvolanek's Rose*, *Rose Queen* and *Hercules* are the most actively in demand for cut flower purposes. All shades of what is popularly known as pink, with the possible exception of the cream suffusions, are safe market colors. Up to a few years ago, the bicolored *Blanche Ferry* type, represented by the variety *Columbia*, headed the popular color list. With the great improvement in the rose pink class, the *Blanche Ferry* pink has gradually taken second place. However, the pink and-white combination continues to be popular, particularly for midwinter blooming.

We should probably place lavender next in commercial importance. Its use is far from being confined to sober occasions.

When used in combination with rose pink, it will be found to be an exceedingly attractive combination for any occasion.

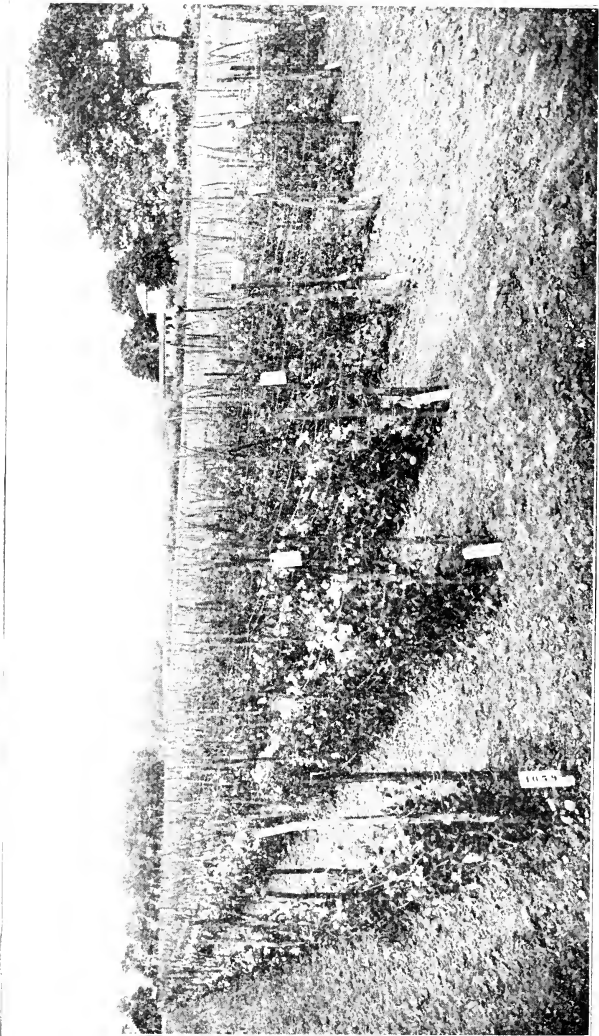
The various shades of blue will easily come next in this order, in so far as concerns the middle states. Our eastern and western states seem better supplied with violets, which somewhat tempers the demand for blue sweet peas. However, reports from all parts of the country plainly indicate the sweet pea is relegating the violet to a place among the flowers that have seen better days.

We place whites rather far down this list, for there are only certain occasions calling for their active use. For Easter or for Mothers' day the supply sometimes runs short, but ordinarily the demand is easily met until June, with its many brides, arrives. To meet the demand in that month in this locality, we are obliged to depend on our outdoor crop of late or summer-blooming Spencers, which will be treated in another chapter.

The colors so far discussed are what we might call the staple ones, particularly valuable for planting early to bloom in midwinter. Varieties outside these standard colors should be used cautiously for this early planting.

The various shades of orange, scarlet and apricot, and the so-called novelty colors, are becoming increasingly important for late or after-chrysanthemum planting, as these colors do not develop well until under the influence of the lengthened days of early spring.

The development of the sweet pea is going on so steadily and surely that a list of the best varieties at this time will be partly obsolete in a season or two. Hence, we shall refrain from suggesting such a list. However, we will easily predict that the following varieties will be found in any impartially prepared list of five years hence, or 1928: Columbia, Harmony, Mrs. Kerr, Rose Queen, Zvolanek's Rose, Chevalier, Glitters, Snowstorm, Aurora, Blue Bird and Grenadier.



Where Brush Is Plentiful It May Be Used to Support Peas Outdoors.

SUMMER-FLOWERING PEAS.

EXCEPTING the orchid itself, no modern flower can surpass the sweet pea for exquisite beauty, richness of coloring and sweetness of fragrance. During March, April and May, winter peas under glass attain their highest state of excellence and at that time the demand seems unlimited. After early June, greenhouse peas live largely on their reputation.

Brides and graduates create a considerable demand for sweet peas until the last day of June. To meet this demand as well as the less insistent one of July, the writer has for some years been growing an outdoor crop of what is generally known as late or summer-flowering sweet peas. These are a decidedly worth-while crop if properly handled, notwithstanding the fact that the heat of July cuts them short.

There are two causes for most of the failures in handling this outdoor crop with profit under our climatic conditions. One is green fly, or aphid, and the other is getting them started too late. Both these are manageable.

To begin with the first step, the seed is sown in the greenhouse early in February, in well sifted soil and in a temperature of about 50 degrees. About a month later the seedlings are potted, four in a 4-inch pot or three in a 3-inch pot, and grown along in as cool a house as we have. We prefer this plan to sowing in pots direct because considerable space is saved during the month the young stock is growing in the seed bed. If a greenhouse is not available, seed can be sown about March 1 in a mild hotbed. Too much heat from this source would quickly ruin the young stock. After the seedlings are well out of the ground, the detail of ventilation would, with a hotbed, require considerable

attention, as much air as possible being necessary at all times. These frame seedlings can be potted as is greenhouse stock. It might be nearly April 1 before this could be done, in which case little would be gained over planting this young stock directly from the seed bed to the field. We have seen good results from the coldframe method, the difference between this and the earlier greenhouse-started stock being a week or ten days getting into flower.

Another method of starting summer peas, where other facilities are lacking, is to sow late in the fall in the open where they are to flower. The success of this method depends entirely on hitting the proper time for sowing. In our latitude this is usually about the middle of November. The point to keep in mind is that they must be sown late enough to prevent more than the germination of the seed. Should four or five days of open weather follow this germination, the seed might develop to a point at which it would freeze out later. This system could be easily recommended were it not for the uncertainty of getting the seed in at the right time. Farther south, where the winters are not so harsh, this should work out well.

Whatever method of starting the young stock is used, it should be borne in mind that sweet peas will stand up under a certain amount of freezing when well hardened.

Plenty of strawy manure between the rows is a considerable help in growing outdoor peas. It should be spread between the rows as soon as the young stock is out. In the case of fall sowing, the rows should be well covered with it. For young stock planted out in the spring, this coarse manure is quickly forked on the rows, should the temperature suddenly drop below freezing. It will not seriously harm the plants to have it on two or three days if needed.

The early, greenhouse-started plants have, of course, a decided advantage over those grown by any other plan we have mentioned. After these greenhouse plants are well started in pots, we like to pinch out the top to hasten the breaks that come normally from the base of well grown plants. These form the future plants. Growing peas on what

is known as the cordon system consists in removing all but one or two of these breaks, keeping them carefully supported, spacing and feeding liberally, and keeping all the laterals pinched out of these one or two growths. The plant's energy is highly concentrated and we get exhibition stock, but not the kind that pays the market grower.

A fall-plowed, well manured and limed piece of land should be selected. Good drainage is also of prime importance. We must be able to plant in this soil as early as the frost is drawn out of it. In fact, we sometimes plant before the lower soil is thawed out. By the middle of April we have strong, bushy plants that have filled the 3-inch or 4-inch pots with white roots. After well hardening them, we take a chance, soon after April 1, with a few of them in the field, always being prepared to protect them with coarse manure. Not later than April 20 or 25, we have them all out. Deep rooting before warm weather drives up the growth is the secret, if we may be pardoned the expression, of fine, long-stemmed outdoor peas.

Before the young stock is transferred to the field, it should be thoroughly fumigated or sprayed, for it is a certain handicap to start young stock in the field with a trace of green fly. With the coming of warm weather, this pest will spread over the field in a ruinous way. This makes it important to start the plants in the field absolutely clean. Outdoors aphid seems to grow stronger than under glass, making a stronger nicotine solution necessary.

We space our rows three feet apart. We have used the double row system, with 3-foot spacing between rows, and we prefer it, should the season be exceptionally warm, cutting short the growth. With a normal season in this climate and given plenty of water and a good soil, a single row fills out nicely with our pot plants spaced eight to ten inches. Where climatic conditions are more favorable, these strong pot plants should stand at least twelve inches apart. In our latitude the heat of late June and July cuts the development of our plants by half, making it wasteful to plant farther apart. Ordinarily they have little chance to develop much

lateral growth. Most of the flowers come from the terminals, or original breaks; therefore the close planting. If we get the plants up to a height of five feet, we consider them doing well. Farther north we have seen them covered with flowers at a height of eight feet. Deep, well prepared soil and plenty of water avail nothing when an excessively warm spell of weather descends upon us, leaving the weather the limiting factor.

We easily assume the reader's appreciation of the value of aerating the soil by free cultivation and giving the plants every opportunity for development by keeping out weeds; so we shall pass on to the consideration of supports.

This had best be done as promptly after the plants are out as is convenient, for the rush of other work later may delay it. At intervals of twenty-five feet in the row, 6-foot lengths of 2x2 are driven into the ground on each side of the row. To these is stapled horizontally No. 18 galvanized wire about six inches apart. These wires must keep pace with the growth, for if the plants get too far beyond them and the tops fall over, the result will be what might be referred to as a mess, which will be almost impossible to straighten up. The wires must be tightly stretched from well braced supports at each end of the row and the uprights sustaining the wires should be slightly spread apart at the top and secured by a cross-piece. This spreading provides more room for development near the top, where it is needed. Heavy string in place of the wire is unsatisfactory, exposure to the weather causing it to expand and loosen.

Our first outdoor peas were supported with brush, until one of our sweeping prairie wind storms convinced us that a more substantial system would have to be devised. Had we stretched a wire over the row and tied the brush to it, we might have been better impressed with this plan. For a limited planting or where brush is plentiful, this system might be commended.

The horizontal wire support calls for a considerable amount of this material. Some growers use a wire at the top and bottom only, connecting with strings, as we do indoors. The

prospect of a heavy growth will make it advisable to put up this wire and string combination on both sides of the row, though we have seen well supported rows with a single line of the wire and string combination. Should the growth become unmanageably large, it can be supported with lengths of cotton twine, run horizontally alongside the row about twelve inches apart. Any form of twine will expand outdoors, and to take care of this, in case of the upright strings, 1x1 material can be wedged between the wires vertically. Modifications of these systems will suggest themselves according to material available. Popular usage is a most certain index of the value of any supporting plan. According to this criterion, wire stretched over top and bottom of row and connected with strings spaced three or four inches apart would seem the best. Three-ply cotton twine is used, as it will easily last the season through, the yardage being substantially greater than in 4-ply.

In England, where outdoor peas are popular because of the favorable climate, the use of brush for supporting them is almost universal. This material is plentiful there. Quite the reverse is true on our western prairies.

Under any form of support, it is necessary to keep the vines tucked in regularly, or crooked stems will result.

Make your supporting plans before the busy planting season is at hand, for this is an important phase of outdoor pea growing.

Early in June a few flowers will develop with us, and by the middle of the month the weather is usually settled and warm enough to develop flowers that are difficult to distinguish from good indoor stock. At least twice during June we thoroughly spray the plants for green fly. Flowers should be picked closely before spraying, for nicotine spots them badly.

Outdoor peas, growing under natural conditions, are not so subject to fungous disease as are indoor ones. In fact, we find them quite free except for the mosaic disease, caused, with us, by green fly on the young stock. We notice this more or less wherever outdoor peas are grown. In California, the

wind or weather is held responsible for its spread. An affected plant is gradually overcome by the trouble, never freeing itself from it. Except through the agency of insects, it does not seem to spread under glass as much as it does outdoors, giving plausibility to the contention that it is spread by the wind.

If the ground is allowed to become too dry before watering is begun, the plants are inclined to harden, and if hot weather follows, no amount of water seems to revive them. The heavy mulch of coarse manure we suggested earlier helps to retain what moisture there is and to keep the ground cooler. Even with an ordinary rainfall, in this section, this is not enough to keep the growth soft and the stems long. We prefer to do our watering by means of ditches along the side of each row, or one on each side for double rows. These ditches are fed from a header across the higher end of the rows. If the ground slopes too much, it may be necessary to dam up the flow occasionally to insure the settling of enough water. Our soil is a heavy loam with a depth of ten or twelve inches. It is underlaid with heavy clay. In a light or sandy soil, an overhead watering system would probably work better. An overhead spraying late in the afternoon of warm days will be found beneficial, for the same reason that a good rainfall freshens the plants.

The ability of the plants to absorb moisture through clean foliage seems greater than we generally realize. Therefore the value of healthy foliage, free of mildew. Flowers should be picked as early in the morning as the dew dries from them. During the excessively warm weather they will be soft and must be picked close. By "close" we mean where there are two flowers on a stem and one is fully open and the other half open. A partly open flower will be found to develop in water, while those fully open will not travel far.

Another hot weather precaution is not to keep the flowers in water overnight. Three or four hours will freshen them nicely, after which they should be laid out on paper in cool, dry storage. In packing for market, avoid overcrowding. A corrugated paper box, eight inches deep, caring for three

layers with newspaper between each, will be found satisfactory for local shipping.

Most of the orange, crimson, scarlet and apricot shades bleach to a worthless condition in a strong open sun and consequently must be shaded. Nothing better can be found for this than what is popularly known as cheesecloth, or any similar light material, stretched over a framework of light lumber, supplemented with wire. This should not be placed in position until the flowers are opening, for up to then the plants are benefited by full exposure. After the shade is in position, a few days of cloudy, wet weather will soften the growth, dropping a few buds. Under this shade the flowers will be as clean and well finished as indoor stock. All colors will be somewhat benefited by this protection from the hot sun of June and particularly of July.

The winter or early-flowering varieties have been recommended for outdoor growing because of their earliness. They will flower freely two weeks earlier than the late type, or during late May if started early. In our latitude this is at a time when weather conditions are too unsettled to produce salable flowers. During the month of May they would have the overwhelming competition of indoor-grown flowers, usually of excellent quality at this time. For vigorous growth and length of stem, they are entirely outclassed by the late-flowering kinds. We even have a range of color in the late ones that has not as yet been worked into the early kind. The earlies have been especially recommended for the southern states, because they get into bloom before hot weather sets in. Any uncertainty on this point can be definitely settled by trying both types.

To the grower unfamiliar with varieties, an extended list is a perplexing proposition and a rather difficult one for the seedsmen to get away from. Certain kinds seem to behave better in one locality than in another, though much of this experience—or shall we say lack of it?—can be discounted. A grower tries a certain kind and, for one of many reasons, fails; so he promptly condemns it. Or the experience may be vice versa, and an insistent demand is created for a certain

kind, though there may be better ones, and if a grower's seedsman does not list his particular favorite—well, there are others. So it is that we have the extended list. Some varieties duplicate others, while some are clearly inferior or are unsuitable colors for our purpose. We have in mind, among others, the original Countess Spencer. Hercules is so much stronger and longer-stemmed—and is identical in color or practically so—that one would think seedsmen would have dropped the Countess with the coming of Hercules. But in 1923, Countess Spencer continues to be included in every important sweet pea list. This variety is the original one of our Spencer sweet peas and was introduced in 1901. When one considers the many magnificent variations that have come and gone, one realizes the work that has been done with the sweet pea. It is indeed to the credit of Countess Spencer to be continued on the list and it illustrates most strikingly the impetus of a reputation. Take the case of Mrs. Skach among the earlies; the supremacy enjoyed in its day gave it such an impetus that it continues to be called for though it is entirely outclassed.

The cut flower grower, especially when large markets are depended upon, should be careful in selecting varieties or colors. It should be borne in mind that clear, attractive self colors only are wanted in quantity. The amateur delights in novelty colors or art shades, but for personal adornment or general cut flower purposes, milady selects clear, definite colors.

As in the case of the early kind under glass, the various shades of pink easily dominate the list, particularly the rose and clear pink, such as Hercules and Elfrida Pearson. When there is a cream suffusion, as in Margaret Atlee, the variety is inclined to be in the novelty class and is not in strong demand. On the other hand, the touch of salmon in Hawlmark Pink gives us a particularly good selling color.

The next most important color for the outdoor crop is white, because of the special demand created by brides and graduates during the month of June. The black-seeded white, Constance Hinton, is used exclusively for this purpose. It finishes practically pure white, and the flowers are firmer and

hold up better than those of the white-seeded varieties. In addition to this point, the black seeds are easier to germinate.

The various shades of lavender easily come next in commercial importance. Austin Frederick and Hawlmark Lavender are fine types of this color.

The blue of the shade of Delphinium Belladonna is a first-class commercial color. The variety Mrs. Tom Jones represents this well. The dark blue is not much wanted. The deep scarlet cerise, Royal Scot, is a splendid color, though not wanted in large lots. This variety does not burn in the open sun and is therefore of particular value. A clear purple, such as Royal Purple, is also wanted in a limited way. This also applies to orange, crimson, clear scarlet and maroon.

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