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THE STRAWBERRY

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Soils and Slopes. Strawberries thrive on a wide range of soils. All soils, however, must have good air and water drainage, and must be thoroughly prepared for the plants to insure success in raising the strawberry. If an early berry with good color is wanted, the strawberries should be planted on a warm sandy loam soil, sloping toward the south, southeast, or southwest. The soil should be fairly deep and well supplied with humus or vegetable matter, so it will not dry out in the summer. North slopes ripen their berries later in the season, but they insure a longer cropping season and less liability to early spring frosts than the southern slopes. If late berries for the last of the season are wanted, cool clay loams on a north exposure will sometimes give as good financial returns as the earlier southern slopes.

Soil Preparation and Fertilizers. Soil for strawberries cannot well be too rich, although it should not have nitrogen out of proportion to the other fertilizer elements. Well-composted stable manure makes the best dressing for the strawberry patch. Great care should be taken that the manure is free from weed seeds, since weeds from this source have choked out many a strawberry bed. The manure should be put on in the fall, preferably, when it should be turned under with the plow, and then worked well into the soil by deep disking. As this is the only deep cultivation the strawberry bed will have, it is best to work up the soil, if possible, to the depth of eight or ten inches. The strawberry should follow some other cultivated crop, because when planted on a field that has been in hay, it is apt to be bothered with grubs and other insect pests. In the spring the soil should be disked thoroughly, smoothed over, and dragged before being planted, if planting is to be done at that season. For fall planting, the seed bed should have no less thorough attention.

When stable manure is not available, commercial fertilizers may often be applied with good results, though it is undoubtedly true that much money is wasted each year by the use of fertilizers which either are not needed at all, or are not the best for the soil conditions. The time of application has a great deal to do with results.

The only way a grower can be reasonably certain as to the needs of his strawberry bed, is to try out a few fertilizers singly and in combination. To do this, he should select a portion of his patch for the experiments where the soil and berry vines are as uniform as possible, and then apply fertilizers of different kinds to rows of equal length, taking pains to leave several unfertilized rows in different places to serve as checks. A careful record of each row should be made and stakes set to mark the rows.

One plot should receive nitrogen, another plot phosphoric acid, and another potash; while other plots should receive combinations of these fertilizers, such as nitrogen and phosphoric acid, nitrogen and potash,

phosphoric acid and potash, and phosphoric acid, potash, and nitrogen combined.

The common nitrogen fertilizers are nitrate of soda, testing 14% to 15% of nitrogen; sulphate of ammonia, testing 20% to 21%; dried blood, testing 11% to 14%; and tankage, testing 5% to 10%.

The phosphoric acid fertilizers are superphosphate, testing 12% to 15% of phosphoric acid; bone (ground raw), containing phosphoric acid 17% to 20%, and nitrogen 3% to 5%; and bone (steamed and ground), testing 22% to 29% of phosphoric acid, and 1.5% to 2.5% of nitrogen. Thomas slag tests from 15% to 19% phosphoric acid, and South Carolina rock, from 26% to 28% phosphoric acid. Florida phosphate rock contains from 18% to 28% or even 30% phosphoric acid.

The common potash fertilizers are muriate of potash, testing 45% to 55% potash; sulphate of potash, testing 45% to 55% potash; wood ashes, unleached, 4% to 9% potash.

As a nitrogen fertilizer, nitrate of soda will be found to be very satisfactory at a strength of from 100 to 200 pounds to the acre. The other forms of nitrogen fertilizer can be used, but the nitrate of soda is more quick in its action, and is absorbed more thoroughly by the roots. A dressing of from 300 to 400 pounds of superphosphate would be sufficient; while from 100 to 150 pounds of muriate of potash to the acre would make a good test.

If the foliage is dark green, little or no nitrogen is needed. Too much nitrogen means few berries, poor in color, and soft in texture.

The grower should obtain more detailed information concerning the composition, testing, and application of fertilizers from bulletins and books on the subject.

The time of application also has an important bearing on the crop. Nitrate of soda does more good if put on early in the season, before the vigorous spring rains have ceased. The middle of March should find the nitrate in the soil. Care must be taken not to apply this strong fertilizer close enough to the crown of the plant to burn it.

Where the plants receive considerable rainfall, or can be irrigated during the season, it will be well to apply potash and phosphoric acid fertilizers after fruiting, so that the crowns and buds of the plants may be well developed for next year's crop. Often heavy fertilizing and copious watering will bring a second crop late in the season. This is true especially of the "Oregon." Where the summers are quite dry and there is no irrigation, it will be better to apply the fertilizers early in the spring.

Number of Crops. Most commercial growers plan to get at least two crops off the strawberry beds, or, in other words, the plants remain in the ground for three growing seasons, and then are plowed up, unless they are vigorous and free from insect pests or diseases, when they may be left for some time longer.

Varieties. The first question that confronts the grower in planting his strawberries is that of varieties. In Oregon this is a simple matter

because, from investigations at the Oregon Experiment Station, we have found that only about half a dozen varieties do well in this state. A great many others have been tried, of course, but most of the varieties that have done especially well in the eastern part of the United States have failed to show promise when transplanted to Oregon. Of the six different varieties which are most highly recommended by the Experiment Station, it is interesting to note that four of them originated in Oregon; namely, the Magoon, Clark Seedling, Gold Dollar, and Oregon.

For home use and for markets not far distant the following varieties are recommended: Gold Dollar, Marshall, Magoon, and Oregon. The Gold Dollar is a bright red and very attractive berry, of good quality, and is the earliest of the four varieties mentioned. The Marshall is fairly successful in some sections of Oregon, though it has not proved to be so widely adaptable to our conditions as the Magoon. The Magoon is undoubtedly the most popular mid-season berry in the state. It is large, attractive in appearance, and very prolific. It is especially good for home use, but will not stand shipping any considerable distance. The Oregon is quite popular in many sections of the state but is not so prolific as the Magoon, and no better in quality.

For shipping long distances, or for commercial canning purposes, only two varieties of strawberries can be recommended: the Clark's Seedling and the Wilson. The Wilson seems to succeed best on the newer and stronger soils in Oregon, but in many parts of the state has not proved successful in later years. By far the best shipping and canning berry, is the Clark's Seedling. It is an attractive berry, and brings good prices on the market, but unfortunately it is a shy bearer, and for this reason it is not the money maker it should be. Plant breeding work, the purpose of which is to produce a more prolific shipping berry than the Clark's Seedling, is now being carried on at the State Experiment Station with undoubted promise.

Another variety which has given considerable promise as a canning berry in some localities is the Eittersburg No. 121. This strawberry is small but very prolific, stands up well in the can, and has fine color after cooking. It can be recommended for trial, but the trial should be on a small scale until the adaptability of the variety to the locality can be determined.

During the past year or two much attention, especially in the eastern part of the United States, has been directed to the so-called Ever-bearing varieties. If strawberry growers in Oregon care to try out such ever-bearing varieties as Superb, Progressive, and Americus, they are advised to do so on a small scale at first until they see how the berries adapt themselves to their soil conditions, and how well they are accepted in their markets.

Most of our common varieties, however, especially the Oregon, can be made to bear second crops late in the season. After the first crop has been removed, the vines should be mowed and the crowns allowed

to rest for a time. Then the plants should be well fertilized with commercial fertilizers and irrigation water applied.

In the coast counties of this state fine second crops are often grown without either fertilizing or irrigating. Growers of this section should make more of this opportunity nature has given them and develop a fine trade in the late-grown strawberry.

Some varieties of strawberries have imperfect flowers, the stamens not being present. When such varieties are planted they need perfect flowers planted along with them, for purposes of pollination.

Good Plants. For good results in berry growing it is absolutely necessary to start the berry patch with well-grown plants, free from disease and insect troubles of all sorts. Such plants should have white roots, indicating that they are in their first year of growth. It is an easy matter to propagate strawberry plants by allowing the runners to strike root in the patch. Such young plants, when well grown, show less loss from planting than do those obtained from nurseries, and one is sure of the variety he is planting. When plants are bought from a nursery they should be examined carefully upon arrival, to see that the roots and crowns are in good condition. If the roots are brown or badly dried or infested with insects, they should be rejected. If the plants are satisfactory, the bunches should be cut open, and the plants spread out in a shallow trench, where the roots can be covered carefully to keep them from drying out. This is called "heeling in" the plants.

Planting Systems. The hill system of planting seems to be most popular in this state. The plants are set in rows from three to three-and-one-half feet apart, and eighteen inches to two-and-one-half feet in the row, depending upon whether the grower wishes to cultivate both ways or not. Practically all the runners are clipped off the vines until after the fruiting season is over. This system is best for districts where irrigation is not practiced, and where the growers must depend upon careful cultivation for conservation of the water supply. Where irrigation is practiced, either the hill or the hedge-row system is the most frequently employed. In the latter the plants are set out from eighteen to twenty inches apart in the row, and, subsequently, runners are allowed to fill in these openings in the rows, so that by early summer the row is entirely filled with plants. The matted-row system, which is so common in the East, is seldom used here, because sufficient cultivation cannot be given between the plants and, consequently, the berries are too small. When soils are porous, allowing a good lateral spread of irrigation water, the matted-row system is successful under irrigation.

Setting Plants. In Western Oregon this can be done either in the fall or in the spring, but in Eastern Oregon the spring is the better time, especially on heavy lands that are apt to heave up with frost. When carefully covered with a mulch, fall-set plants may stand the winter fairly well in some parts of Eastern Oregon. Before setting the plants, mark off the ground with either a garden line or a marker. Cut off

about one-third of the lower end of the roots of each plant and remove most of the leaves, taking care not to injure the crown. The plants should be kept in water until ready for dropping ahead of the planter, and should not be dropped too far in advance. When placed in the soil the plants should rest at the same level that they were in the nursery. If planted too deep the crowns will rot in wet weather, and if planted too shallow the roots will dry out. When the setting is done by one man, either the ordinary garden dibber or the trowel will be found to be a convenient tool. More rapid work can be done by two men, one having a spade with which he opens the ground for the plants and the other setting the plants in the opening and packing the ground well around the roots. If the ground is very dry the plants should be watered well after being set.

Cultivation. The strawberry has a shallow spreading root system; therefore, cultivation through the summer should be shallow but frequent. Hoeing and cultivation about the plants should be kept up thoroughly until the time of blossoming, when little should be done to the soil from that time on until the fruit is removed. When runners grow out between the rows they may be cut off easily by attaching a disk wheel to each wing of the cultivator. The cultivator may be followed by such fining tools as the clod masher and the plank drag.

The blossoms should be carefully picked off during the spring after the plants are set. Sometimes with very vigorous plants it may be permissible to allow a small crop to set during the first summer.

Irrigation. The rill system of irrigation is by far the most common, although the Skinner system, which irrigates by means of sprays, does very well where enough special attention can be given the water so that the sprinklers may be moved as often as necessary. The Skinner system is used on small tracts of land, for the most part, where water under pressure is available and where frequent but light watering is needed. It is a costly system to install.

When watering the berry patch by the rill or ditch system, the water should be run the whole length of the rill as soon as possible, allowing the water to wet the ground thoroughly, but not so rapidly as to wash away the plant food. Watering should be done as often as the ground becomes dry—more during the fruiting season than at any other time of the year—and usually once or twice after fruiting. Care must be taken that the ground near the flume does not become water-logged. As soon as the ground has sufficiently dried so that a horse can go upon it, it should be lightly cultivated to conserve moisture.

Harvesting. Strawberries should be picked once a day, at least, during the height of the berry season. They should be picked in the morning, in the cool of the day, after the dew has evaporated, but should never be harvested shortly after a rain. Six-box carriers are used by the pickers, so that the berries will not remain out long in the sun. As soon as the carrier is filled, it is taken to the packing shed, or tent. One packer

ought to handle the berries from three pickers. The pickers should be cautioned to pick very carefully, without crushing, and to leave the stems on the fruit. Each picker should be required to keep his own row, and each should be given a tag which can be punched to show the number of boxes he has picked.

Berry boxes are made of spruce or cypress, and should contain one measured pint. With a good box machine two girls can make from six to eight thousand boxes a day. Crates vary in size, containing from sixteen to thirty-two boxes, although the twenty-four box size is by far the most popular.

Costs. On account of differences in the cost of cultivation, the price of strawberry plants, shipping, and marketing the crop, etc., only an approximation at best can be made in this field. Plowing and preparation of the soil will cost about \$5.00 an acre; plants run from \$3.00 to \$4.00 a thousand, and from eight to fourteen thousand plants will be needed for each acre, according to the distance at which they are planted. Setting will cost about \$5.00 an acre, and cultivation \$10.00. Picking will cost 24c a crate of 24 pint boxes, as a rule, while the crate boxes will cost about 15c each. In addition to the above, the overhead charges should never be forgotten. By overhead is meant such charges as money invested in the place, taxes, insurance, depreciation in tools, wagons, etc.

Marketing. Yields of strawberries vary widely, according to the variety and to the ground upon which they are grown. The Magoon strawberry is our best cropper, while, unfortunately, the Clark's Seedling is one of the lightest. Yields of from 100 to 150 crates may be considered about the average for the Clark's Seedling, while the Magoon, when well grown, will go considerably above this. The greatest need of the strawberry industry at the present time seems to be a berry which will combine the qualities of the Clark's Seedling with the heavy bearing of the Magoon.

Berries that are to be shipped some distance should be picked when they are very firm. Only such varieties as Wilson and Clark's Seedling should be shipped long distances. When shipped in small lots, berries are sent by express. When shipped in large lots, they are usually sent out by carloads, in which case they are tiered, braced, and iced, much as apples are. For home use or for local market, the berries stay on the vines until they are well colored, but for market purposes they should be firmer than for home consumption.

Prices. Prices obtained for strawberries vary widely, according to the earliness of variety, earliness of the soil, wetness of the season, supply and demand, distance from a cannery, shipping facilities, etc. Seventy-five cents to \$1.50 a crate is the price paid for the bulk of the crop, though many of the early berries run considerably above that figure. Growers should get in the neighborhood of \$80.00 a ton at the canneries when the cannery is run on a cooperative basis. At privately owned canneries, the prices obtained may be less.

Mulching. Where winters are cold and there is freezing and thawing, causing the soil to heave out the plants, the plants should be mulched with clean wheat or oat straw, bean or pea vines, or something of that sort. The mulch should be applied from three to eight inches deep, depending upon the severity of the winters in the locality. The mulch should be placed upon the plants after they are dormant, usually after the ground has frozen sufficiently so it will hold up a team and wagon.

Insect Pests and Plant Diseases. There are five insect pests which sometimes become more or less serious in the state. These are the red spider, strawberry leaf roller, crown miner, root weevil, and root borer. The first two of these may be controlled by cutting off the leaves of the plants after the fruiting season. When the leaves are thoroughly dried, a light dressing of straw should be scattered over the field, and, when there is a good breeze, a fire should be set to the straw. This will cause the leaves to be burned very quickly, without hurting the crowns of the plants. About the only remedy for the other three insects is to pull up and destroy the infested plants and rotate the crop.

The strawberry leaf spot may become severe enough to be serious in some seasons. If the leaves show many spots which are grayish colored in the center with a purplish margin they should be mowed and burned after fruiting. In severe cases spraying with Bordeaux 4-4-50 twice in the spring before the young fruits are half grown and once about September first is recommended.