GROWING AND TESTING STRAWBERRIES

SUMMARIZED BY
F. H. HALL
FROM BULLETIN BY
O. M. TAYLOR

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GROWING AND TESTING STRAWBERRIES

F. H. HALL

CULTURE.

Strawberries do well on widely different soils; but most varieties do better on lighter, sandy loams than on the colder, more compact clay soils. A quick soil, a sandy loam well stocked with plant food, and a southern slope favor early crops; and suitable varieties on such soils bring the profits which often come from good prices early in the season. Again at the end of the season prices may advance, when late varieties, grown on heavier clay soils with a northern exposure, may reward their grower. Berries grown on such soils usually ship better than those from lighter soils. Plants on higher lands are in less danger from frost than those on the low lands. Whatever the soil, it should be well drained and retentive of moisture.

Since weeds make the strawberry grower much trouble, it would be better to set the plants on land that has grown a hoed crop; and to apply the manure to this crop. On most soils deep plowing is preferable, to give room for deep rooting; and fall plowing followed by spring plowing and thorough working makes

*This is a comprehensive review of Bulletin No. 336 of this Station, on Newer Varieties of Strawberries, with Cultural Directions, by O. M. Taylor. This review contains all the essential facts given in the complete bulletin relating to culture and to the varietal comparisons. Detailed descriptions of the varieties tested are omitted. A copy of the complete bulletin will be sent, on application, to those interested in the descriptions.
the soil fine and mellow, a point to which too little attention is usually given. Clover sod, fall-plowed, helps strawberries wonderfully; but a grass sod, especially if plowed in the spring, generally harbors grubs that eat the plant roots.

**Fertilizing.** Almost any amount of well-rotted manure, thoroughly worked into the soil. If coarse, it should be applied long before the plants are set, and cover-crops or clover sod should be turned under early. These crops are most valuable for their humus, which, thoroughly worked into the soil, makes of this a sponge to hold moisture.

Additional plant food may be added in commercial fertilizers; but no rule can be given for their application except to test each element on the soil, by itself and in combination with the other elements, and see to what the soil responds. If nitrogen be needed, use from two hundred to three hundred pounds to the acre of nitrate of soda, or three hundred to six hundred pounds of dried blood. It is sometimes advantageous to apply nitrate of soda on fruiting beds just before blossoming, broadcasting directly over the plant rows; but too much nitrogen may produce leaves and plants, rather than fruit. Potash may be applied in one ton of good wood ashes or in two to three hundred pounds of muriate of potash; and phosphoric acid in six to seven hundred pounds of acid phosphate. As with form of fertilizer, so with method of application, the owner of the bed should be the best judge. For new beds the material may be applied broadcast in the spring before setting the plants, harrowing it in, or may be scattered along the plant rows after setting, cultivating until well mixed with the soil. On old beds apply fertilizer or rotted manure along the rows after they have been cleaned out after fruiting.

**Selecting varieties.** No variety should be planted on a large scale unless known to be adapted to the soil and to the market; as varieties excellent under one set of conditions may be worthless under others. Test
out new varieties by growing only a few plants at first. Especially, be cautious in setting "fall-bearing" varieties.

Sex of plants.

Sexual status of the variety should be known, since some kinds of strawberries bear imperfect, pistillate, or female flowers which will not set fruit unless they receive pollen from perfect, male, or staminate flowers borne on other varieties. These last will set fruit from their own pollen.

![Figure 1: Imperfect, or Pistillate, Flower.](image1)

![Figure 2: Perfect Flower.](image2)

At least one row of a perfect-flowered variety should be set beside every three rows of an imperfect-flowered kind. Imperfect fertilization is often indicated when nubbins, berries with hard, greenish, undeveloped tips, are found plentiful on any variety.

Spring planting of strawberry sets is best; as fall-set plants run danger of drought after setting and require one additional winter's protection more than spring-set plants. Potted plants set in the fall may give a small crop of fruit the next season; but the process is expensive. These plants are grown by causing the first runners to "strike" in small pots plunged in the soil beside the rows. Spring setting usually insures good growing weather for the young plants. It may be begun as soon as soil and plants are in good condition and extend well through May.
The best plants possible should be secured.

Selection of plants. Vigorous, healthy plants from well-cared-for young beds that have not fruited are preferable; "pedigreed" plants are excellent if the term means what it should — that the plants come from an improved strain fixed by several years of careful selection and continued propagation. Not all so-called "pedigreed" plants on the market have this fixedness of character which promises permanent improvement. When selected and dug, the plants should be freed from all dead leaves and runners and all but one or two green leaves. The roots should not be allowed to dry, and when ready to set should be cut back one-third.

Distance of planting. Plants are frequently set too close, so that at fruiting time they are so much crowded that each cannot secure moisture enough to mature its load of fruit. On heavy, rich, moisture-retaining soils plants may be set closer than on lighter soils, unless the richer soil stimulates runner and plant production enough to cause crowding. It is evident, therefore, that the behavior of the variety on the particular soil must be known before the best distance for setting can be determined.

In the narrow matted row used in most commercial plantings, in which plant growth is restricted to a foot in width, the plants may be set from eighteen to thirty inches apart in the row, depending on the character of the variety as a plant maker, in rows three to four feet apart. The wide matted row allows two feet for plant growth, so the plants are set somewhat closer together and the rows farther apart. In the hill system, all runners are removed, the fruit being taken only from the original plant, so that both plants and rows are set closer than in the other systems. This gives fruit of large size and good appearance, but requires much labor.

Setting the plants. Previous to setting it is simplest to mark the ground both ways, though some prefer to mark across the rows and set by a stretched line. Keep the roots of the plants moist by setting them in
a pail or basket with damp moss or fine hay in the bottom. The holes may be opened with a trowel, flat dibber or narrow, bright spade. With the latter, a wedge-shaped opening is made by setting the spade in the ground and pressing the handle forward. The roots are then spread fan-wise and inserted in this opening, the dirt being pressed firmly upon them by the hand and foot. The roots should be so placed that the crowns are not covered by the soil nor the upper parts of any root exposed to the air. If too deep the crowns may rot, if too shallow or if the soil is not pressed close about them the roots may dry out.

**Summer treatment.** Cultivation should begin as soon as the plants are set and be continued throughout the summer and fall, whenever necessary, to keep the ground free from weeds which rob the soil of both moisture and plant food, to retain a mellow soil condition, to assist in breaking down plant food, to conserve moisture and to maintain a steady, normal growth. If the distance apart of plants is sufficient, the cultivation should be both ways until the runners begin to make plants. The tillage or hoeing should never be deep enough to disturb the shallow root system, especially in hot, dry weather.

Fruitage lessens plant growth. Flower-clusters should therefore be removed as soon as they appear, to secure stronger plants from which the runners will develop later. The first runners that start should not be cut off but be encouraged to root as soon as possible by “bedding in” or placing in a position where they will “strike” readily and will not be disturbed by the cultivator. They, however, should not become crowded, and it may be necessary to thin out some of the later ones before the season of growth ends.

In the fall, some growers stop cultivation early, sowing among the plants oats or barley which die down after the first frosts. This gives a slight protection as a cover-crop or mulch over winter and helps somewhat to keep the ground from baking in the spring and to keep the berries clean. This practice is probably not as desirable as the method suggested under “winter treatment” owing to the large amount of water removed by the oats or barley
which in a dry fall must result in decreased vigor of the strawberry plants, and also because of insufficient winter protection.

**Winter treatment.** Repeated freezing and thawing weaken the plants and tend to reduce the yield. Winter protection of some form should be given. The most desirable covering is one which is free from weed seeds, spreads evenly, is not blown off by heavy winds and does not smother the plants. The objects to be secured are: to protect against the bad effects of freezing and thawing; to keep the soil more moist the following spring; to prevent the ground from baking; to retard the time of blooming, thus diminishing danger from late spring frosts; to keep the berries clean; to improve conditions at picking time. Various materials may be used for mulching, that most easily obtained at minimum prices ordinarily being selected, such as coarse, strawy, horse manure, marsh hay, clean wheat or oat straw, swale grass, leaves for covering small beds, or even corn stalks if nothing else is available. Oat straw smothers plants more quickly than does wheat straw and stable manure frequently introduces grass and weed seeds. The covering should be applied to the entire surface of the ground, as soon as it is sufficiently frozen to bear a wagon. A heavy mulch is unnecessary and undesirable, for if too thick the plants may be smothered. A light coating an inch or two deep that covers the plants out of sight is preferable to one of greater depth.

The mulch should remain over the plants as long as possible in the spring. As warm weather approaches it may be necessary to shake up the covering to prevent the plants from smothering; if need be, remove part of the material, where too thick, to the space between the rows. The vines will grow up through the mulch left on the ground. No further treatment is generally necessary, except to hand-pull the larger weeds after a soaking rain. In extreme conditions it may be necessary to remove the mulch and give thorough cultivation, replacing it before the berries ripen.
Renewing old beds. Usually it is better to set new beds each year than to continue the old ones. The advisability of removing more than one crop of fruit depends largely on the condition of the bed. If the plants are numerous, vigorous and healthy, and the ground not too weedy, they may be left for a second crop. Two and even three profitable crops may sometimes be harvested before making a change. The berries ripen slightly earlier but average somewhat smaller on the older beds, and the plants are more liable to trouble from insects and diseases. The cost of cleaning out and caring for an old bed is usually greater than for setting a new one. Under some conditions a quick-growing crop maturing before winter may be grown upon the same soil if the strawberry vines be plowed under as soon as the crop has been harvested, or it may be advantageous to sow the ground to a clover cover-crop to be plowed under the following spring.

If the bed be retained for a second crop it will be necessary to clean out, fertilize and cultivate the rows. Some growers go over the bed with a mowing machine and as soon as the leaves are sufficiently dry burn over the entire field during a wind blowing in the direction of the rows. This must be carefully done or injury may result to the crowns of the plants. Such treatment tends to lessen insect and fungus troubles. The majority of growers who retain their beds narrow down the old rows with plow, disc-harrow or cultivator to a width of from six to twelve inches, depending on the stand of plants, and cultivate thoroughly to loosen the ground which has become hard and compact from the tread of the pickers. The weeds and surplus plants should be cut out from the rows remaining and a heavy application of plant food, preferably in the form of well-rotted stable manure, should be broadcast lengthwise of the rows and directly over the plants. If this work is done after the first rain following fruitage, the plants will quickly start into new growth.
Insects and diseases.

Strawberry troubles are not so numerous nor so destructive as those of other small-fruits. Sod ground should be avoided to lessen injury from white grubs. Leaf-blight, the most common fungus disease, is overcome by good air and soil drainage, with selection of resistant varieties; if conditions make a bad outbreak probable it may be well to spray thoroughly with 3-3-50 bordeaux mixture as growth begins in spring and again just before blossoming time. On old beds spray just as soon as the rows have been cleaned out after fruiting.

The best preventive for both insects and fungi, in addition to the remedies suggested, is a quick rotation of crops.

Warning. It must be kept in mind that the suggestions given above are not full specific directions. Details vary widely in different places and must be worked out by each grower to meet his own conditions.

NOTES ON VARIETIES

Of strawberries secured by the Station for testing, a number of the newer varieties and a few seedlings fruited in 1909 and again in 1910. The plants were spring-set, eighteen inches apart in rows three feet apart, on heavily manured, well drained, rather heavy clay loam. Clean culture was given during the summer, the first runners were encouraged to root as quickly as possible, and the blossom clusters were kept picked off the first season up to the middle of July. As soon as the ground was frozen, the plants of all varieties were mulched with coarse stable manure through which the plants grew the following spring.

The seasons of 1909 and 1910 were not only dissimilar in climatic conditions, but the widest variations also existed during the same season in different parts of the State. Strawberries probably were more affected than any other fruits by these variations; because the plants, owing partly to their small extent of root area, are most susceptible to unfavorable weather.
Water supply for his plants is of the greatest importance to the strawberry grower. In 100 pounds of the ripe fruit there may be from 87 to 94 pounds of water, and the amount of water used by the plant, especially during the ripening season, must be large owing to the rapid transpiration from the extensive leaf-surface; if not available the lack is quickly indicated in a decreased yield. The table which follows shows clearly that at Geneva at least, there must have been, during the years 1909 and 1910 a great lack of moisture during the strawberry season from June 15th to July 15th, as the average monthly rainfall for that time was only 1.42 inches as compared with a similar average of 4.8 inches for the same month of the preceding five years.

**Rainfall at Geneva During Strawberry Ripening, 1904–1910.**

<table>
<thead>
<tr>
<th>Date</th>
<th>1904</th>
<th>1905</th>
<th>1906</th>
<th>1907</th>
<th>1908</th>
<th>1909</th>
<th>1910</th>
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<tr>
<td>June 15 to July 15</td>
<td>Inches</td>
<td>Inches</td>
<td>Inches</td>
<td>Inches</td>
<td>Inches</td>
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<td></td>
<td>5.37</td>
<td>8.43</td>
<td>4.81</td>
<td>2.87</td>
<td>2.52</td>
<td>1.50</td>
<td>1.34</td>
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On account of the small amount of rainfall at **Productiveness**. fruiting time the yield of all varieties was much less than in previous years. Of the fifty varieties tested, seven were very productive and seven were unproductive. The following varieties include only the extremes in productiveness:

**Very Productive**
- Battenburg
- Clifton
- Early Ozark
- Iowa
- Paul Jones
- Rockhill No. 10
- Swedenberg

**Unproductive**
- Americus
- Glastonbury
- Goree
- Irena
- Red Bird
- Rockhill No. 7
- Rockhill No. 9
Plants of nearly all varieties were unusually healthy. Mildew and leaf-blight develop slowly, if at all, under unfavorable conditions and the prolonged period of dry weather retarded the rapid spread of these diseases. Forty-three varieties showed no indication of fungus trouble while only seven appeared susceptible to such attacks.

Productiveness and resistance to disease are closely associated with vigor, yet the most vigorous plants are not always the most productive. Of seven varieties, Clifton, Dixon, Early Ozark, Kevitt Wonder, Manhattan, Matthew Crawford and Rockhill No. 6, all characterized by a comparatively low-growing habit, the first and third were among the most productive varieties under test. Two of the most vigorous varieties, Bessie and Nonsuch, were very productive, while Highland, ranking with them in vigor, proved considerably less productive.

There are wide differences in the ability of varieties to reproduce themselves through the development of new plants from runners. With some kinds the plants are produced in such large numbers that a most serious condition of overcrowding results unless the original plants be given more room or those considered unnecessary be cut out. Some kinds, however, produce few runners and the distance of planting should be closer to avoid loss from unoccupied ground. Last season a single plant at the Station developed forty-seven plants, while an equally vigorous one of another variety produced but one plant. Thirteen varieties produced plants in great numbers, while eighteen kinds developed but few runners.

In the planting of perfect-flowering varieties, those in which the stamens, as well as the pistils, are present, no thought need be given to pollinating varieties, but the imperfect-flowering
kinds, those with no stamens in the blossoms, must have plants of perfect-flowering varieties growing nearby to provide for fertilization of their blossoms. The following varieties were imperfect-flowering:

**Varieties Having Imperfect Flowers.**

<table>
<thead>
<tr>
<th>Highland</th>
<th>Paul Jones</th>
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<tbody>
<tr>
<td>July</td>
<td>Red Bird</td>
</tr>
<tr>
<td>Kittie Rice</td>
<td>Salisbury</td>
</tr>
<tr>
<td>Labell</td>
<td>Sherman</td>
</tr>
<tr>
<td>Moyer</td>
<td>Wooster</td>
</tr>
<tr>
<td>Orphan</td>
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</table>

Blooming season.

In the colder sections of this State and in exposed locations some of the early blooming varieties may be severely injured by late spring frosts. Some protection may be secured by holding back the growing season somewhat by a covering of mulch as indicated under cultural directions. Occasionally it may be desirable, however, to select varieties that bloom later than others. Four varieties, Mascot, Parcell Early, Richl No. 10 and Superior were very early bloomers while Dixon, July, Orphan and Outlander were among the varieties which opened their blossoms latest in the season.

Season of ripening.

The market to be supplied has an important bearing on the selection of varieties with regard to time of ripening. In one location an early market is most profitable while in another place late varieties may be most in demand. Weather conditions materially change the date of ripening in different years and also lengthen or shorten the season during which profitable pickings may be made. There can be no marked line of division between some varieties as they blend one into another. The divisions must
therefore be arbitrary and the varieties may not follow the same order each season. The two extremes are listed as follows:

**SEASON EARLY**
- Early Ozark
- Highland
- Irena
- Mascot
- Monroe
- Parcell Early
- Red Bird
- Rockhill No. 9
- Swedenberg
- Wooster

**SEASON LATE**
- Americus
- Greenwood
- Heritage
- Labell
- Manhattan
- Matthew Crawford
- Nonsuch
- Orem
- Orphan
- Outlander
- Salisbury
- Silver Coin

**Size of fruit.** One of the requirements of varieties for commercial purposes is fairly good size. It is not sufficient that the fruit ship well and be of attractive color. A wide range exists among the different varieties in regard to size. Some kinds uniformly run small; others produce large fruit at first but rapidly drop in size as the season progresses; still others retain their size fairly well throughout the season. Fruit averaging above medium usually ships better than berries of largest size. At each picking the berries were rated and the following is a list of those varieties retaining good size fairly well throughout the season:

**FRUIT OF GOOD SIZE THROUGHOUT THE SEASON.**
- Battenburg
- Deacon
- Dicky
- Early Ozark
- Fendall
- First Quality
- Glastonbury
- Gray Dollar
- Monroe
- Myer

- Nonsuch
- Orem
- Orphan
- Outlander
- Parcell Early
- Paul Jones
- Rockhill No. 11
- Sherman
- Stull No. 1
- Wooster
The final selection of the best varieties to grow is one of the most important and most difficult of all the subjects connected with strawberry growing. Habits of both plant and fruit must receive careful scrutiny not only once but at different times during the season. Even then we know that some of these characters are not consistent in different environment, and the safest method to follow is to try the varieties under the conditions existing in the locality in which they are to be grown. The following list of varieties is therefore only suggestive. It includes the most promising of the kinds fruited in 1909 and 1910 under but one set of conditions. It is not expected that they will do equally well in all localities. They, however, appear to combine most fully, although not perfectly, the various requirements that go to make a desirable berry. It will be noted that the list includes those of highest quality. A variety may be productive, of good size and color, but if poor in quality, it is undesirable.

**Varieties Having Many Desirable Characters.**

- Battenburg
- Deacon
- Early Ozark
- First Quality
- Highland
- Kittie Rice
- Mascot
- Monroe
- Parcell Early
- Sherman
- Stall No. 1
- Superior