

AGRICULTURAL EXPERIMENT STATION

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GROWING STRAWBERRIES IN MISSOURI

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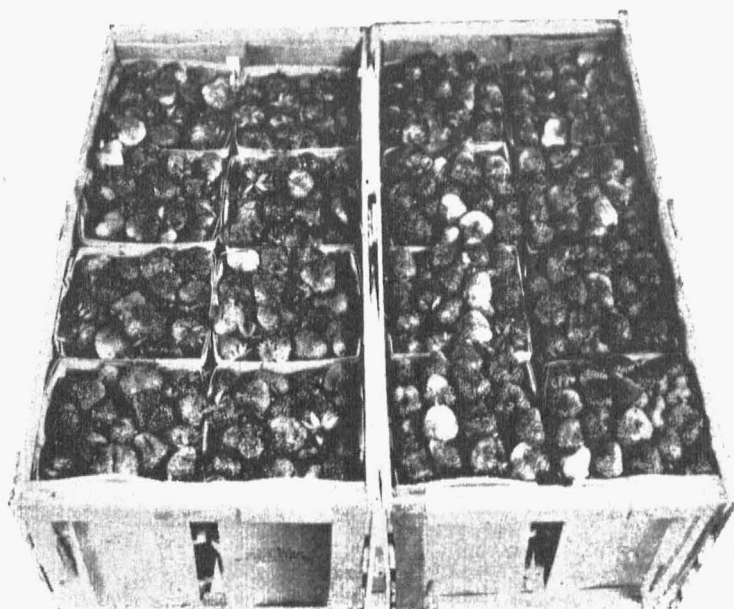


Fig. 1.—Aroma strawberries, grown in Missouri, ready for inspection and shipment.

In Missouri, the strawberry succeeds under a great diversity of soil and climatic conditions. It is an early, profitable, cash crop, thereby filling a need in the producer's business. Being a short-season crop it fits well into most rotation systems. The plants produce a full crop of fruit the year following planting and may continue to fruit profitably for one or more years under good culture. The

grower may go into the enterprise or out of it quickly. Also, the expenses for plants, tools for culture, and equipment for harvesting and handling are small in comparison with those of other crops.

VARIETIES

There is no one best variety of strawberries that can be recommended to the exclusion of all others. Most of the newer varieties have been developed for specific uses or conditions and are usually very limited in adaptability. The wise grower will observe for a few years an unknown kind of fruit in his community or set only a few plants before making an extensive planting. Also, commercial growers should not change varieties until most of the growers are willing to change since successful marketing depends largely upon being able to ship solid car or truck lots of a single variety.

A desirable strawberry variety is productive, a good plant maker and resistant to damage from drought and disease. Varieties for home use should have a high flavor, and good dessert quality. For commercial purposes satisfactory handling and shipping qualities, good size, attractive appearance, and firmness after processing are needed. Listed and described in this circular are the varieties most widely planted in the state at the present time. The Aroma and Blakemore are now the leading commercial varieties of the Ozark sections and of Missouri. There are many other good kinds, but from this list varieties can be selected which have proven their adaptability to Missouri conditions.

Blakemore.—This is the variety most widely planted at present. It is very vigorous, drought resistant, and an excellent plant maker. Good yields can be produced on soils not well adapted to the production of other varieties. It is one of the earliest sorts. The fruit is quite firm, with an attractive color, and is very desirable for freezing. Its chief defects are its rather low dessert quality, and a tendency to set too many plants and to produce small fruits toward the end of the season. Most strains have a tendency to produce a few plants with yellow leaves. Extreme care is needed in setting a new field to avoid these yellow plants for they are unproductive. In spite of its defects the Blakemore is one of the most productive and dependable varieties for both home and commercial uses in all sections of the state.

Aroma.—This is still one of the best varieties for handling and long distance shipping. Its large size, attractive appearance, and good carrying quality have made it a favorite market berry. Well grown Aroma strawberries command a premium on the terminal markets. Where conditions are favorable for its production, it is one of the most profitable kinds to grow. This is particularly true for the commer-

cial growing districts of Southwest Missouri. Its late ripening is an advantage since there is less competition from other shipping districts.

Restricted in its adaptation to soil and climate, this variety can be recommended for commercial planting only on the better strawberry soil types in the Ozark region. Even there, new land is preferred. Under favorable conditions it will develop a good row, and produce a satisfactory quantity of fancy fruit. It is difficult to secure a good row on land that has been depleted in organic matter through cultivation. The variety is unsuitable for frozen storage.

Premier.—This extra early, hardy variety is well adapted for growing in northern Missouri. The fruit is attractive and of good quality. It ranks among the best for home use. It is a fair plant maker and very productive on fertile land. The fruit is too soft for long distance shipping but is firm enough for local markets. It is an excellent berry for preserving and makes a fairly good frozen product.

Senator Dunlap.—This old midseason variety is still a favorite in the home garden. The plants are vigorous and very drought resistant. They continue to bear well even in beds that have stood for several years. The fruit is of good size and well flavored but too soft for commercial handling. Where the fruit is intended only for home use this variety is recommended.

Other Varieties.—Other varieties that are grown to some extent for commercial use in Missouri are Belmar and Klondike. The Belmar is a popular market berry in the St. Louis area, where it is grown because of its attractiveness and fine appearance. The Klondike is planted to some extent in the southeastern section of Missouri.

Most of the varieties introduced during recent years have been fruited at the Monett horticulture experiment field. Practically all of them, in one or more respects, are inferior to the recommended kinds. The most promising of the new varieties for southwestern Missouri are Tennessee Shipper and Tennessee Supreme. They are suggested for trial planting. The Fairpeak and Midland varieties produce firm fruit of high quality but need to be tested more extensively. The Midland has made a good showing at the Mountain Grove station.

EVERBEARING STRAWBERRY VARIETIES

The perpetual or everbearing types are grown like other varieties. For satisfactory production they require a fairly fertile soil of good texture with an adequate and well distributed moisture supply. Where irrigation is used, these varieties are much more likely to succeed. The everbearers may be preferred by some home producers, while the standard sorts are best for commercial purposes and most home uses.

Early spring planting is suggested. Blossom buds that begin to form soon after growth starts should be picked off until midsummer. Blossoms developing later, if allowed to grow, may produce fruit during the late summer and fall until frosts occur.

As the so-called everbearers, or fall bearing strawberries do not produce a large number of runner plants, they may be planted in rows from 30 to 36 inches apart with the plants spaced in the row from 15 to 20 inches apart. It is important that the soil about the plants be given timely and thorough cultivation especially following rains.

A mulch consisting of wheat straw or similar material sufficient to conserve moisture and keep down weeds and grass should be placed around the plants shortly before the fruit begins to ripen. The mulch is also needed to keep the berries clean or free from soil particles. Winter mulch materials are applied just before the first hard freeze, as for other varieties. The mulch is removed sufficiently early in the spring to permit early plant growth.

Several different varieties are used successfully. Some of these are Rockhill (Wayzata), Gem, Gemzata, Mastodon, Progressive, and Green Mountain. For Missouri conditions Rockhill (Wayzata) generally succeeds best. Some producers, however, may want several varieties to procure as nearly as possible continuous fruiting.

SOILS, LOCATIONS AND SITES

Soils.—Most varieties do better on light sandy, gravelly or stony soils than on clay, heavy or wet soils. New land is often preferred on account of the increased yields and because there are fewer weeds to fight and less cultivation required. For best results, a well-drained fairly light, moisture-holding, medium fertile soil is generally desired.

Locations.—The commercial strawberry field that is conveniently located near a town or city has important advantages. Pickers are more easily obtained and both transportation and marketing are simplified.

Sites.—Favorable sites afford good air and water drainage to somewhat lower levels. Low areas or "frost pockets" more or less surrounded by heavy timber or hills that slow up good air movement should be avoided, if possible. In selecting the site for the field, however, it is not necessary to establish the planting on the highest or steepest land. Land of medium elevation and gently rolling may prove very satisfactory. *Proper air drainage may be important in preventing frost injury at blossoming time.*

WHITE GRUB AND WEED CONTROL

Before planting strawberries on sod land, and particularly land which has grown lespedeza, a crop requiring clean cultivation for at

least two years should be grown. This is for the purpose of destroying the white grub which may live over in the soil for two years. Cultivation helps to destroy the seeds of weeds, grasses, and clovers and prevent their reseeding. Furthermore, such tillage permits the use of manure, commercial fertilizers, and cover crops to build up the organic matter and mineral content of the soil. Old land may be made as productive as new ground, if the fertility and organic matter are maintained. Most growers agree that, if the weed and grass problem can be solved, old ground may be made satisfactory for the growing of strawberries. Too much emphasis cannot be placed upon clean, thorough, and timely cultivation of crops preceding strawberries.

Newly cleared ground is generally free of white grubs and the land may be set to strawberries when the clearing and soil preparation are finished.

SOIL AND WATER CONSERVATION

Conservation of soil and moisture will make money for the strawberry grower. On new land where erosion is controlled, the soil fertility may be kept at a level high enough for profitable berry production for many years. Even immediate results of conservation are worthwhile since this crop is easily damaged by a shortage of moisture. Any practice which will aid in moisture conservation is likely to show a profit.

Planting and cultivation on the contour is the one soil conservation measure most likely to give the greatest immediate results. The rows are run practically on the level or given a slight grade, which permits the excess water to flow slowly from the field. Running the rows down the slope allows the water to concentrate in the middles and increases its destructive action. Strawberries are advisedly planted on graded contours where the slope or drop is greater than 2 feet for every 100 feet. Contour planting may be used alone or in connection with terrace systems. The rows should be run parallel with the terrace ridge or with the graded contour lines. It is neither practical nor desirable to have every row on the exact grade. Where terraces are not used the master contours can be laid out at intervals of 100 to 150 feet. It is a good practice to plant a strip of some close growing crop such as grass, small grain or lespedeza between the contours and where point rows should occur. Cross cultivation can be followed with contour plantings as well as when the field is set on the square plan. Care must be exercised in setting to get the plants aligned for the cross cultivation. Cultivation after the plants begin to set runners should be with the contour.

It is next to impossible to lay out graded contours with the un-

aided eye. The county agent and the local vocational agriculture instructor or his students will be glad to loan a grower a farm level and assist with running the contour grades.

The contour furrows act as miniature dams which check the downward flow of water, giving it a chance to soak into the ground. When rainfall is so heavy that even contouring can not handle the surplus water, diversion terraces may prove valuable. They prevent both erosion and flooding.

PLANTING A NEW FIELD EVERY YEAR

Planting new berry fields every year should reduce damage from insects and diseases. Such a system, conscientiously followed, should also tend to stabilize production, increase yields, improve quality and increase returns. On the other hand, it may be said that planting every year will run up costs of production. If the expense of renewing the field after harvest is considered, production costs will be raised little or none. Moreover, the larger yields, higher quality of berries and less likelihood of damage by pests from fields fruiting only once should largely offset the expense of planting every year.

During very dry summers, however, early spring plantings or fall plantings may not develop as good a row for production the following year as old fields or patches properly renewed and cultivated after harvest. This was especially true for Southwest Missouri during the dry summer of 1946.

SEASON OF PLANTING

Early Spring Planting.—As a general rule, strawberry plants should be set as early in the spring as the weather permits and the ground can be worked. In fact, it is almost impossible to set them too early under Missouri conditions. Hard freezes after the plants are set will do no harm. For South Missouri, the plants should be ordered early so that they may arrive during late February or the first part of March. In the central and northern sections of the state, the plants should be available for planting during the latter part of March or first of April. Temporarily, the plants may be held for a few days in a cool cellar, or much longer if heeled-in outside. Plantings made later than the first of April in Southwest Missouri frequently fail to make a good row. Early planting, therefore, is strongly recommended.

Late Fall Planting.—Commercial growers in southwestern Missouri have found late fall setting to be profitable. Their experience has been confirmed by experimental work done on the University of Missouri's horticulture experiment field near Monett. In general, it

has not been profitable to set strawberries in any section of the state during late summer and early fall.

November set plants generally produce a better row and give increased yields since they get off to an earlier start in the spring. Based upon experimental work for Southwest Missouri conditions, about the middle of November appears to be the best date for fall planting. To prevent winter injury, a mulch must be applied before the first hard freeze. Only enough straw to cover the plants is needed. The mulch is removed and cultivation is started in early spring as soon as the soil can be worked. The grower also generally has more time and better weather for preparing the ground and setting the plants in the fall than in the spring.

It should be noted, however, that November planting is suggested only for conditions comparable to those of Southwest Missouri. Late fall settings in Central Missouri (Columbia) repeatedly failed to show a profit. Furthermore, late fall plantings do not produce a crop the next year.

SELECTING PLANTING STOCK

Medium large, sturdy, vigorous, one-year-old plants generally give best results. The one-year-old plants, usually called new plants, give quicker and stronger growth than older ones and a larger percentage of them grow. The large plants usually stand transplanting better, start forming runners or new plants more quickly, and are more resistant to diseases and insects than small and less thrifty ones.

Where producers select their plants from fields and beds, it is important that the thrifty one-year-old plants be distinguished from plants two or more years old. The older plants generally have two or more crowns or growing points. They are also darker in color than crowns of one year plants. If plants are procured, however, from patches that have fruited one year only, the problem is made easier and there is much less likelihood of getting worthless seedlings that often spring up in old plantings.

CARE OF PLANTS ON ARRIVAL

As soon as the plants are received, examine the roots to see if they are moist. If they are not, moisten them at once and keep them so in a cool place away from the sun until transplanted. The roots should never be exposed to the drying action of the wind and sun. When planting, the roots of the plants may be kept in a bucket or tub partly filled with water or they may be covered with damp packing material or wrapped in damp gunny sacks.

In case the strawberry plants cannot be planted immediately upon arrival, they should be heeled-in as soon as possible. This is done by

digging a shallow trench. The ties of the bundles are cut and the roots of the plants are spread out in the trench to allow moist soil to come in contact with them. When the plants are spread out in the trench, the varieties may be marked by driving stakes between the different lots. A covering of soil is finally placed over the roots and sprinkled down with water. Later care is needed to prevent damage by rodents and drying-out.

PRUNING BEFORE SETTING

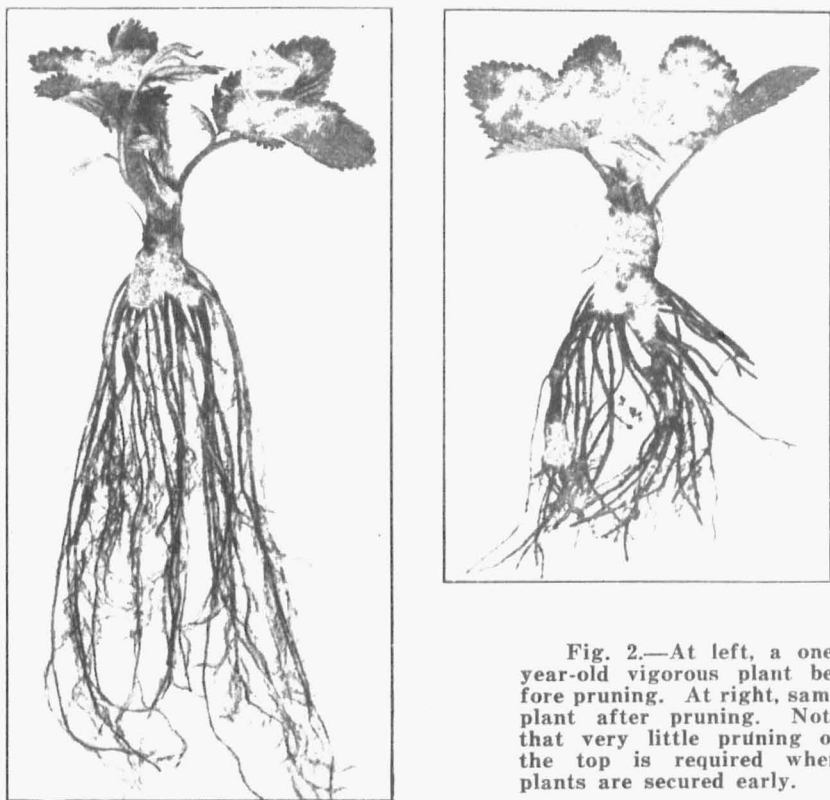


Fig. 2.—At left, a one-year-old vigorous plant before pruning. At right, same plant after pruning. Note that very little pruning of the top is required when plants are secured early.

If the tops of the plants are large, pruning may be helpful in securing a good stand. Part of the leaves are removed to reduce transpiration before the roots become established in the soil. The amount of pruning will depend upon the season of the year, the size of the plants, and the condition of the weather and soil at planting time.

Early in the spring when the leaves are small and few in number, little or no pruning is required. When the plants are older and the time of planting later, all but one or two of the smallest leaves in the

center should be removed by cutting the leaf-stems near the crown of the plant.

The roots are usually cut back from one-fourth to one-fifth of their length, leaving them about 4 or 5 inches long. The removal of a portion of the root system may permit better spreading of the roots and prevent doubling over and twisting.

SPACING OR PLANTING DISTANCES

The average spacing and planting distances of commercial growers using horse or power machinery for cultivation are from 3 to 3½ feet apart in the row and 4 feet apart between the rows. For hand cultivation the plants may be set 18 to 24 inches apart in the row, with the rows spaced 3 feet apart. On small areas for home production distances may be reduced considerably. Spacing 18 to 24 inches in rows 2½ to 3 feet apart may prove satisfactory with good thinning.

NUMBER OF PLANTS NEEDED

The number of plants required for an acre may be obtained by multiplying the number of feet between the plants in the row by the number of feet between the rows. This will give the number of square feet occupied by one plant. Then divide the number of square feet in an acre, which is 43,560, by this sum. The quotient will be the number of plants needed for one acre. In order to have enough plants to replace those which die or do not thrive after being transplanted for a period of about three weeks, some growers order about one-tenth more plants than are required to set the field. With the plants set 3½ by 4 feet, 3111 would be required for one acre. About one-tenth more for loss and replacements gives 3400, the number usually needed for one acre, planted 3½ x 4 feet.

HOW TO SET STRAWBERRIES

It is important that strawberry plants be transplanted to the proper depth. An opening in the prepared soil should be made just deep and wide enough to accommodate the roots when spread slightly and to allow the crown of the plant to be level with the ground when the soil has been thoroughly firmed about the roots. If the crown of the plant is covered with soil, the plant will usually die or make a slow growth. If the crown extends too far above the surface of the ground, the plant may dry out and die or become unprofitable.

When the soil has been well prepared, the land may be laid off in rows by means of a plow equipped with a rather long, narrow shovel. The furrows may be crossed with a marker to indicate the planting distance in the row. The ground is sometimes checked with furrows running in transverse directions and the plants are placed at the point

where the furrows cross. Other methods also are employed in checking and marking off the land for planting.

The most important points to remember in transplanting strawberries are to thoroughly firm and compact the soil around the roots of the plants and, when the work is finished, to have the crown or growing point of the plant just level with the top of the soil.



Fig. 3.—Planting depth for strawberries. A, too shallow; B, just right; C, too deep.

TRAINING AND SPACING RUNNER PLANTS

The early runner plants should be saved and developed as rapidly as possible. This is true because the plants formed in July and August produce more fruit the following year than those formed later. It is also very important that the plants be carefully spaced and encouraged to root rapidly in order that they may grow the maximum number of leaves and healthy, vigorous crowns for the next year's crop. Rooting can usually be facilitated by pressing gently the young plants into the mellow soil and pulling a thin layer over the runners.

From four to six plants per square foot are usually sufficient for good yields but, where early, strong runner plants can be developed, three or four plants per square foot may even give better returns. In general, it is not profitable to go to great trouble and expense in spacing the plants. In hoeing and plowing, however, the grower should space the early runner plants about 6 to 9 inches apart to be assured of the most profitable yields of high quality berries. The width of the spaced row may vary from about 12 to 24 inches.

CULTIVATION

On old ground, particularly, the plants may require cultivation at intervals of ten days or two weeks from the time they are set until vegetation is killed by frost in the fall. The number of plowings and hoeings will depend a great deal upon the amount of rainfall and the prevalence of grass and weeds. It is not necessary, however, to cultivate more often than is required to keep down grass and weeds.

Shallow cultivation also generally gives better results than deep plowing or stirring of the soil. In fact, deep cultivation in late summer and early fall may do more harm than good by destroying plant roots. It is important, however, that the field be kept free from grass and weeds at all times.

BLOSSOM REMOVAL AFTER PLANTING

Fruit production is a great drain on the plant. For this reason, all blossom stems should be pinched off during the first year following transplanting, in order to produce many strong, vigorous plants. If the plants are allowed to set fruit, the yield of the current year and the next year is likely to be small and unprofitable. The blossoms may be pinched off when plowing and hoeing.

PREPARING LAND IN ADVANCE FOR STRAWBERRIES

By plowing under barnyard manure and such leguminous crops as cowpeas, soybeans, vetch, clover, or alfalfa, both humus and nitrogen are added to the soil. Non-leguminous crops like wheat, rye, and barley may also be plowed under for the purpose of building up the water-holding capacity and humus content of the soil. In most cases, it is perhaps more important to loosen and aerate the soil and increase its water-holding capacity than it is to add fertility in the form of nitrogen. Strawberries require large quantities of soil moisture in maturing a crop but only a moderate amount of nitrogen.

With all these soil improving crops, much greater yields may be produced for plowing under by applying a high analysis complete fertilizer during seeding operations at the rate of 500 to 700 pounds to the acre. Proper seed inoculation for the legumes is also very helpful in securing good stands. Such green manure crops will greatly increase the volume of organic matter to be disked or plowed into the soil.

Use of Commercial Fertilizers.—Where the soil fertility has been kept up by the rotation of crops, the growing and plowing under of leguminous or non-leguminous crops and barnyard manure, it is usually unnecessary to use commercial fertilizers following planting. Fertilizers and manure are generally of more value to strawberries if they are used properly in growing crops preceding strawberries. Their use in the strawberry field may actually be a detriment rather than a benefit to the crop. Where the soil will grow good crops of potatoes, corn or wheat, usually a profitable crop of strawberries can be produced without fertilization.

Depleted or poor soils should be fertilized before planting strawberries. Superphosphate or a complete fertilizer like 4-16-4 or 4-12-4,



Fig. 4.—Strawberry rows produced under drought conditions on land containing a good supply of humus.

or a similar combination, at the rate of 350 to 400 pounds per acre may be drilled or cultivated into the topsoil. The fertilizer may also be cultivated into the soil between the rows. Where only one application is made, August or early September is likely to give the best results.

Caution.—Where a commercial fertilizer is used at planting time or around the plants when the fields are renewed it is important in order to prevent injury by burning that the fertilizer be well mixed with soil before being worked closely around the crowns or roots of the plants. Nitrate of soda or ammonium sulphate may also seriously burn the leaves and stems of the strawberry if applied directly to them. This will be particularly true when the foliage is wet.

Working Out Fields or Patches After Harvest.—Both producers and agricultural experiment station workers have never been happy or satisfied with the old methods of renewing or renovating strawberry fields and patches soon after harvest. This has been true because the methods used did not generally give the desired results.

Now; it is known through extended observation and experiments that the old practice of destroying the plants on each side of the old matted row and thinning by cultivation in the row may reduce yields the following year 40 per cent or more. Such lowering of yields is due chiefly to the reduction of the number of old plants, and the failure of late forming new plants to develop fruit buds.

A stand of plants in a row approximately 24 inches wide with about eight to ten plants per square foot is generally needed for good yields. If the plants are allowed to become much thicker, yields per plant are likely to be lessened. If matted rows are cut down to a width of 10 inches soon after harvest or in July, the grower may expect a reduction in yield the following year.

In the renewal of fields and patches immediately after harvest, therefore, the object or purpose should be to retain enough old plants for a satisfactory row as described above. Where there are not enough old plants to provide for this, good cultivation and fertilization may hasten the production of new runner plants and if these are formed and established no later than August or early September in South Missouri they may prove to be fairly productive the following spring. It is important that the early production of runner plants be encouraged.

Removal of Leaves and Mulch.—The strawberry field should usually be mowed and raked immediately after the harvesting period. These operations will rid the patch of injured leaves, and assist in the control of fungus diseases and insect pests. A mowing machine with the cutter bar raised slightly in front may be used effectively for this purpose. After mowing, the leaves and mulch may be raked into windrows and removed from the field. This practice alone tends to increase yields.

Reducing Width of Rows.—The next operation, after removing leaves and mulch, may be to narrow-down the old matted row to about 24 inches. This may be accomplished in a number of ways. One of the most common is secured by running twice between the rows with a one or two-horse cultivator. In this way the old strawberry row may be reduced to the desired width. Where horse or power cultivation is not employed the work may be done with hoes, spades or other implements. The plants may also be allowed to cover the whole area. With or without rows, it is important that good cultivation of the plants and proper thinning if needed should be continued until frost.

MULCHING IS IMPORTANT

No variety of strawberry is immune to winter injury, although the damage may vary materially with the different sorts. The injury may cut the yield of the plants the following spring anywhere from about 10 per cent to as much as 100 per cent. Production is frequently reduced from one-third to one-half and the cause is often attributed to an attack of diseases and to the effects of drought, one or both.

Crowns and Roots Injured Early.—The plant crowns and roots

may be injured early. Consequently, if temperatures drop to near zero or below during the latter part of November or in early December before the mulch is applied, great reductions in the strawberry yield may occur in the following year. This will be especially true if warm weather lasts until very late in the fall and is followed by a sudden drop in temperature. In such cases the damage is likely to be much greater than in years when cold weather comes on gradually. Under normal weather conditions the plants gradually become hardened and develop resistance to cold.

Time to Mulch.—To avoid injury by cold it will generally be found advisable to mulch the strawberry plants during the early part of December or the last half of November. In most cases it will be well to have the mulch on before the first hard freeze and not after. If the plants are growing rapidly as a result of good fall growing conditions, mulching should be postponed as long as possible. This is true because early mulching is likely to injure growing plants.

Study Weather Bureau Forecasts.—In most instances it will be advisable to place in the strawberry fields or on the borders early in November at least a part or all of the mulching material needed. Then watch the forecasts of the U. S. Weather Bureau, particularly during late November and early December. When temperatures of 15° F. to 20° F. or lower are predicted by the Weather Bureau, it is highly important that at least a part of the mulch be spread over



Fig. 5.—A strawberry field mulched for winter with wheat straw. University of Missouri, Agricultural Experiment Station.

the strawberry rows. An observance of such precautions may frequently prevent reductions in the crop the following year.

Mulching Material.—The most common mulching material consists of wheat straw, oat and rye straw, slough grass, leaves and strawy manure. Leaves alone are not as satisfactory as the other materials, because they lie closely together and pack down in such a way that they may tend to smother out the plants if heavy applications are made.

Wheat and rye straw and slough grass are generally considered the best materials. Coarse strawy manure, oat straw, shredded corn fodder, and various kinds of hay or roughage may be used to advantage. The thoughtful grower will plan for an adequate supply of mulch material before setting his strawberry field. He will make arrangements with neighbors who grow small grains or better still plan to produce it on his own farm. Small grain production fits well into the cropping plans of most well balanced farms. Their many uses for feed, fall pasture and nurse crops are well known. Summer grass crops like sudan, millet and hay sorghums may serve as mulches.

The mulch should be as free as possible from seeds. A growth of weeds or wheat will reduce yields during a dry spring, make picking more difficult and lower the quality of the fruit. Renewal after harvest is also more difficult.

The mulch material can usually be freed from seed by placing it in low piles around the edges of the strawberry field a month or so before it is to be used. The extra handling will sift out most of the seeds and chaff. Fall rains will wet such low piles and germinate most of the seed. The moist straw is easier to handle and stays in place better.

A mulch of from 2 to 4 tons per acre is usually sufficient and it should cover the plants from 2 to 3 inches in depth. The mulch is to prevent cold injury to crowns and roots, conserve moisture, keep the soil cool and damp during the season when the fruit is ripening, prevent heaving out the plants in winter, facilitate harvesting operations, and keep the fruit clean at picking time.

Removal of Mulch.—The mulch above the strawberry plants should be removed sufficiently to uncover and expose the plants to sunlight and air, as soon as growth starts in early spring or shortly before. The mulch may be raked lightly between and around the plants and toward the middles between the rows. An ordinary hay-fork is generally considered a satisfactory implement for this operation.

Uncovering the plants early in the spring as growth starts pre-

vents delayed growth and the development of leaves and stems tender to frost if mulch removal is delayed. Also, the mulch around the plants tends to keep the berries at harvest time free from sand and earth. It helps to conserve moisture, keeps down weeds and grass, and if mud or dust is present the soil covering may facilitate picking and handling operations in both wet and dry weather.

For home plantings especially, the mulch may be used to delay the blossoming period.

HARVESTING

The pickers are generally supplied with a six or eight quart basket carrier. The carrier facilitates the prompt removal of the berries to the packing shed after picking, which is very important.

How to Pick.—The berries should be picked with an attached stem about one-fourth inch long. This may be done by pinching the stem between the thumb and finger. Crushing or bruising the berries should be prohibited and this can usually be prevented by instructing the pickers against the practice of holding several berries in the hand. The pickers when assigned to definite rows should be held responsible for them.

Keeping Harvesting Records.—Many methods of keeping the harvesting record are employed, and perhaps no one is best under all conditions. Tickets for punching as the quart baskets are received at the packing shed are popular with some growers; while coupons and metal checks are used successfully in other instances. It may be necessary for each producer to work out the system of checking the harvesting record best adapted to his conditions.

Grading and Packing.—Careful grading and packing will generally pay big dividends. As the berries come from the field, they should be sorted over in the packing shed. With some pickers very little sorting will be required, as much may be done in the field by placing the marketable berries in certain boxes and the culls and soft berries in others reserved for this purpose. Pan grading is generally recommended for the Aroma, because the berries, if picked at the right time and properly, are firm and will not be damaged in the operation. For softer varieties, which are likely to be injured, pan grading may not be advisable, although for local markets it will frequently pay.

Rules for Picking.—The following rules for picking and handling strawberries are in force in one of the western fruit exchanges, and should be of vital interest to Missouri growers:

1. Berries must not be picked while there is moisture on plants.
2. Berries should be pink all over, or three-fourths red.

3. Berries should be picked riper in cool weather than in warm.
4. A picker must not be allowed to hold more than one or two berries in his hand at the same time.
5. Filled carriers must not be allowed to stand in the sun.
6. Berries must be picked with a stem a quarter of an inch long and not longer or shorter.
7. Sort out all green, over-ripe, misshapen, and small berries.
8. No culls in boxes. Put in nothing but fair sized berries.
9. Use clean crates and keep them from being soiled.
10. Haul without injury and cover to keep out the dust.

When to Pick.—In order that the berries may be pre-cooled properly and reach the market in good condition, the picking should be done when the fruit is cool and dry and in just the right condition of maturity. When the weather is warm, it may be necessary to pick over the field every day. Early in the season and during cool weather picking every other day may be all that is required. The morning hours are usually best for picking, because the berries are cool, firm, and subjected to less injury by the hot sun. The fruit ships with less likelihood of damage if picked when cool and firm, and the pickers can do more and better work during the cooler part of the day. The only objection to picking during the morning hours is that the berries may be wet with dew. Since the berries go down faster when picked wet, they should be picked dry if possible.

Shipping.—To make sales profitable, standard varieties must be grown, adequate shipping facilities must be maintained and an efficient marketing organization is essential. The acreage near the shipping point should be sufficient to load at least one car daily. This will require from 75 to 100 acres which should be located within a radius of not more than three or four miles from the shipping point. Most commercial districts load 420 crates into a standard refrigerator car, each crate containing 24 full quarts. These are usually placed in the car four crates high, seven crates wide, and fifteen crates long, and properly braced. Crates generally weigh about 40 pounds each.

Shipping Point Inspection.—The inspection of fruit at shipping point is one of the most valuable services to the fruit grower. Under the supervisions of both the Federal and State authorities grades, standards and packs are more rigidly maintained. The certificate of inspection received by the producer enables him to deal in a more business-like way with buyers. The buyers also know that they cannot reject or refuse Federal and State inspected fruit without proper procedure and check-up. The inspection certificate is legal evidence that fruit of a certain grade left the shipping points in condition

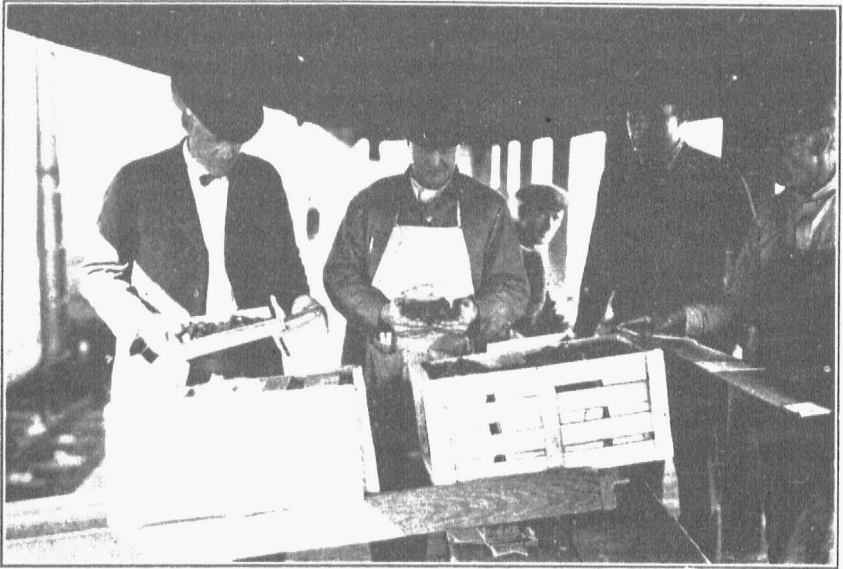


Fig. 6.—Inspecting strawberries at the car door, Federal and State Inspection Service, Monett, Missouri.

suitable for its arrival at destination in marketable condition. It adds force, life, and confidence to contracts regarding grade, marketable condition and carriers' responsibility. The certificate has unquestioned value in the proper adjustment of claims and controversies between shipper, buyer, and carrier.

INSECT AND DISEASE CONTROL

In many parts of the state strawberries may be grown successfully without a great deal of trouble from an attack of insect pests and fungus diseases. This will be particularly true where young, healthy, vigorous plants are used for the setting of the fields and where fields are not fruited more than two years in succession. Too much emphasis cannot be placed upon the importance of securing plants from fields free from infestation by the strawberry crown borer. Equal importance should be placed on the ridding of white grubs from sod ground by growing row crops such as corn for two years or more before planting strawberries.

The strawberry leaf spot, a fungus disease which seriously affects some varieties, and the strawberry leaf roller and crown-borer insects, may affect the plants badly enough to justify spraying with bordeaux to destroy the fungus and with arsenate of lead to kill the chewing insects. Where spraying is necessary, the first application

should be made shortly after growth is started in the spring, using 6-8-100 bordeaux and 3 pounds of arsenate of lead. The second application should be made when the berries are about one-third grown. Two sprays will usually be sufficient. Where diseases and insects are especially serious, however, a third application after the crop is harvested may be helpful.

If a strawberry field or patch is planted every year and the plants allowed to fruit only the year following planting, rarely, if ever, will attack of diseases and insects be a problem. Furthermore, the planting of a new field or patch in early spring or late fall in southern Missouri is not likely to be more expensive than the proper renewal of fruited areas after harvest.

MARKETING PROBLEMS

All are agreed that the first essential in solving marketing problems is the production of good berries of varieties that are in demand and will stand up well. Furthermore, if the fruit is to reach the consumer in the best possible condition, it must be picked, graded, packed, and transported to market properly.

Adherence to standard strawberry grades and the suggestions of the local Associations are of paramount importance to all commercial producers. To improve the sale of fruit, one of the most important points may be that of selling only the best grades and placing the less desirable grades in consumption through by-products. With growers generally adopting this plan, it is believed that even during big crop years and keen competition from other fruits, in normal times strawberries will bring producers at least fair returns.