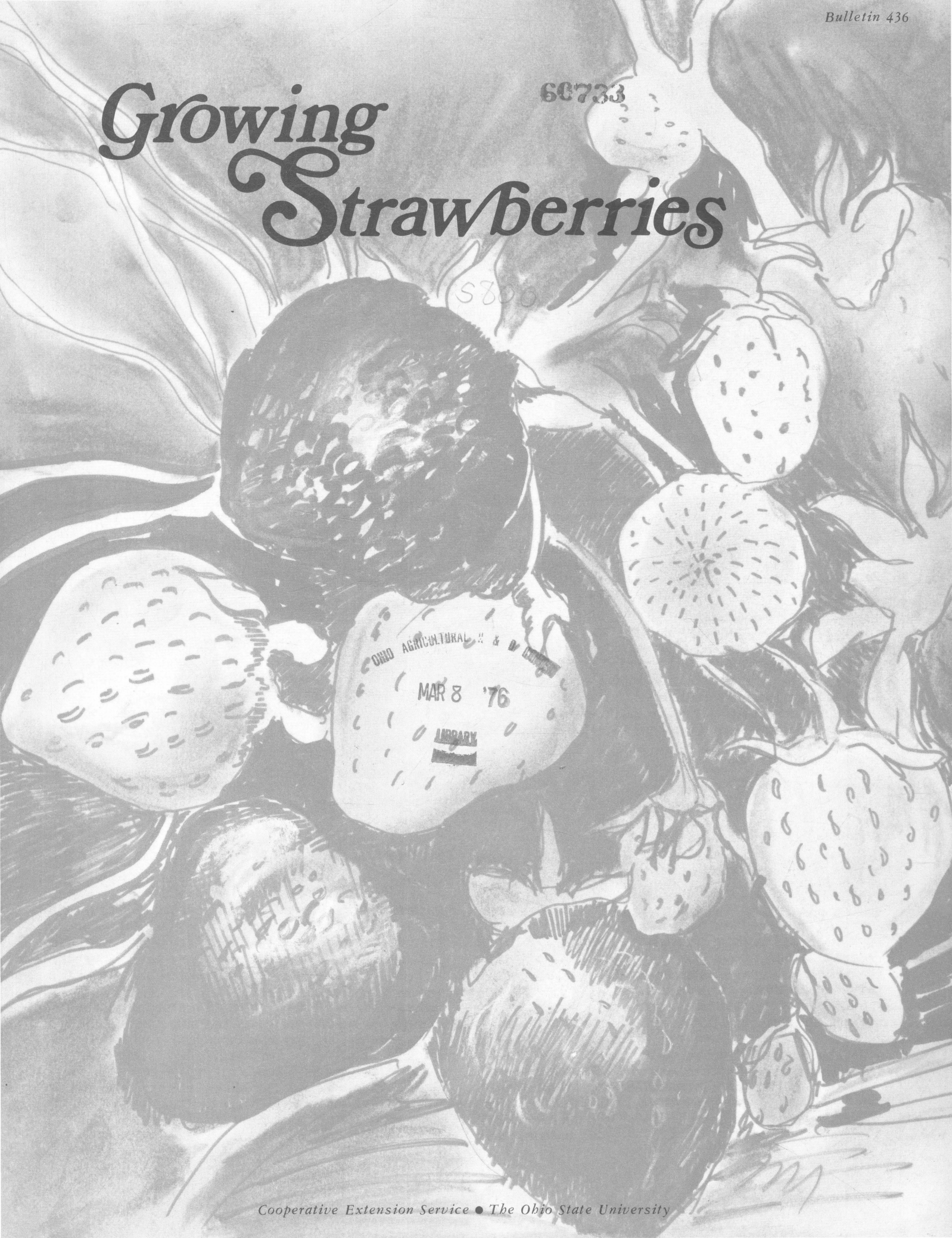
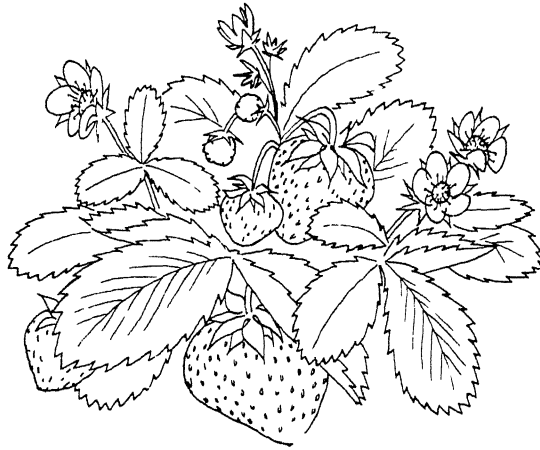


Growing Strawberries

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Acknowledgement

Material in this bulletin which deals with disease and insect control was prepared in cooperation with Dr. Blair F. Janson, Extension Plant Pathologist, and Dr. Roger N. Williams, Extension Entomologist, The Ohio State University.

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3/75—10M (Reprinted)

Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U. S. Department of Agriculture. Roy M. Kottman, Director of the Cooperative Extension Service, The Ohio State University.

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Growing Strawberries

Strawberry production is well suited to Ohio growing conditions. It is an important commercial and home garden crop in nearly all parts of the state. Strawberry production is widely used by both fruit and vegetable growers as a diversifying crop. The berries come into full production the season after planting. They begin ripening in May and continue through July, depending on the geographical area.

The strawberry is one of the few fruit crops that one can be nearly assured of a harvest every year, providing the blossoms are protected from frost. Unlike many other fruit crops, strawberries do not require the grower to follow an extensive or complicated pest control program.

Success in growing strawberries, like any other horticultural crop, depends on careful attention to cultural details. Small, well-cared-for plantings are generally more profitable than larger plantings which receive less care. A grower may expect nearly a full quart of berries from each plant used to establish a fruiting row, if he follows good cultural practices. Well-established and cared for plantings can be productive up to three years.

Strawberries, in addition to being an attractive, delightful, and versatile dessert fruit, are highly nutritious. One cup of fresh berries supplies more than the recommended minimum daily vitamin C requirement, as established by the Food and Nutrition Board of the National Research Council. Too, surplus berries from the home garden can be frozen for out of season use.

Selecting Site and Soil

Strawberries grow and produce satisfactorily in a wide range of soil types, from sandy to heavy loams. They are not particularly sensitive to soil reaction (pH); however, they produce best on sandy-loam soils with a pH of 5.8 to 6.5. If soil reaction is unknown, the county Extension Agent can assist the grower in having the soil tested. Best yields are obtained when strawberries are grown on fertile soil well supplied with organic matter.

The most important factors to consider in site selection are soil drainage and freedom from frost. Good production cannot be expected without good soil drainage during the entire year. The strawberry cannot tolerate standing water. Since strawberries bloom very early in spring, the planting should not be located in a frost pocket. Where air drainage is limited, the crop may be lost to late spring frosts, which can kill the flowers.

Strawberries require cultivation, so avoid planting on

steep slopes. Plantings on steep slopes are likely to wash, with some plants being buried and others washed out of the soil. If sloping sites must be used, run rows across the slope or on the contour.

Avoid areas which have been used recently to grow tomatoes, potatoes or sod. Such sites likely contain disease and insect pests, which may attack the strawberry. Likewise, sites that are heavily infested with quackgrass, Johnson grass, and thistles should be avoided or treated prior to planting to destroy these chronic weeds. Contact the local county Extension office for recommended control procedures.

Ideally, the site should be selected the year before it is to be planted. Early site selection allows proper preparation of the soil, including weed control, fertility adjustments, and elimination of other potential problems. Selection of a suitable site is the first step toward success with strawberries.

Cultivar Selection

Selection of the best possible cultivar* is vital to the success of any strawberry enterprise, whether it is a large commercial planting or a small home-garden planting. No cultural practice can overcome the handicap imposed by poor selection of cultivars.

The performance of any strawberry cultivar is markedly influenced by the local soil and climate under which it is grown. A cultivar which may be highly satisfactory in one area of the country may well be of little value in another. Cultivars, therefore, should be selected on the basis of local climatic conditions. Most growers would be wise to test cultivars, even recommended ones, on a limited scale before making extensive plantings. In this way, the grower can determine cultivar performance under his own growing and marketing conditions before using newer cultivars to replace older, proven ones.

Commercially available strawberry cultivars are self-fruitful (do not require cross pollination) and will produce full crops when planted alone. Most growers plant several cultivars in order to extend the picking season over a 3 to 4 week period.

June Bearing Cultivars

The June bearing strawberry is the most popular for both home garden and commercial production. Plants bear one crop each year in late spring. In Ohio, this normally occurs in late May and June. The first crop is produced the year after planting.

Included in this group is a special class of cultivars which is resistant to the fungus disease, red stele, discussed under "Disease and Insect Problems." Recommended cultivars of this group will produce good crops

* **CULTIVAR** is the term now used in place of "variety" which was common in horticultural literature for many years. Cultivar, to be used to designate horticultural varieties throughout the world, was adopted by the International Code of Nomenclature for Cultivated Plants in 1961. The term is being widely used in Europe and is now beginning to be used generally in the United States. Throughout this bulletin the term, cultivar, replaces the former term, variety.

of berries on sites infected with the disease. On such sites, nonresistant cultivars are not recommended. Some resistant cultivars have sufficient merit to warrant planting, even though red stele is not a problem.

Everbearing Cultivars

Everbearing cultivars will produce one crop of berries during the normal June season and then, if properly handled, will produce a second crop during late summer and early fall. The fall crop normally ends with the first killing frost. Successful culture of everbearing cultivars depends on the use of one of the mulch-spaced-plant systems of growing described under the section "Making the Planting." There are no red stele resistant cultivars of this type.



One of recommended cultivars in Ohio.

Recommended June-Bearing Red Stele Resistant Cultivars

Cultivar	Season	Yield	Size	Quality	Remarks
Guardian	Midseason	High	Very Large	Good	Resistant to Verticillium, Berry tends to be rough.
Midway	Midseason	High	Large	Good	Superior Cultivar—good Freezer.
Redchief	Midseason	Medium	Large	Good	Resistant to Verticillium.
Surecrop	Midseason	Medium	Medium	Good	Resistant to Verticillium.

Recommended Everbearing Non-Red Stele Resistant Cultivars

Cultivar	Season	Yield	Size	Quality	Remarks
Ozark Beauty		Medium	Medium	Good	Excellent, if well grown.
Superfection		High	Medium	Tart	Longtime favorite.

Recommended June-Bearing Non-Red Stele Resistant Cultivars

Cultivar	Season	Yield	Size	Quality	Remarks
Cyclone	Early	High	Large	Good	Tends to be soft.
Pocahontas	Early-Mid-Season	High	Large	Tart	Firm, good for Freezing.
Raritan	Mid-Season	High	Large	Good	Very attractive, Shiny.
Robinson	Late	Medium	Extra-Large	Fair	Longtime Standard.
Marlate	Very Late	High	Large	Excellent	Promising new Cultivar.
Vesper	Very Late	High	Large	Good	Standard for Season.

Other Cultivars

From time to time new strawberry cultivars become available in the nursery catalogues. These new sorts were named because they were found to be superior to cultivars normally grown in the area where they were named. They may or may not be under Ohio conditions. Except on a limited trial basis, growers should avoid these new sorts until their merit under Ohio conditions

can be determined. The performance potential of most new sorts can be ascertained through the local county agent.

Growers should shift to superior new cultivars as soon as their merits have been clearly established. Shifting cultivars simply to try something new can be a costly and disappointing procedure.

Source and Care of Plants

Selecting a good source of planting stock to establish the strawberry planting is most important. The disadvantage of poor stock can never be overcome. Planting stock is a keystone of the enterprise.

It is important to buy from a reputable nursery to be sure of getting good plants, true to name. To secure plants of the desired cultivars, place order as early as possible and indicate the desired delivery date.

The best type of plant to buy is "virus-free". Virus-free plants are known to yield 50 to 75 percent more than plants from ordinary planting stock. They are also more vigorous.

There is no apparent visual difference between virus-free and ordinary planting stock. The only way to be certain the plants are virus-free is to purchase **registered** plants. These have been grown under state supervision, and the word registered, on the bundle label, indicates that the plants are substantially virus-free, the best that can be obtained.

Virus-free plants of many, but not all, cultivars are available. Growers should use them whenever possible.

Another class of plants, called **certified**, is also grown under state supervision. Certification indicates that the plants are free of most noxious diseases and insects;

however, they may carry virus. These plants are the best available of some cultivars.

Dormant strawberry plants are best for spring planting. Plants dug early and held dormant in storage, if properly stored, are as good as freshly dug plants. In some cases, stored plants are superior to freshly dug ones.

When plants arrive, check the bundles and, if necessary, moisten the roots. Plants which cannot be set immediately may be held in storage for several weeks, or until planting conditions are satisfactory. Plants should be held at 30 to 32 degrees F. in plastic bags in which they are shipped. Be sure the bags in which the plants are stored are closed by folding only—not tightly closed.

Site Preparation

Preparation of the strawberry site should begin the year before planting. The proposed site should be used to grow a cultivated crop during the season prior to planting. Chronic weeds can be controlled and soil fertility levels adjusted during this period. Adjust fertility level, using soil test results as a guide. If it is necessary to plant an area that has been in sod, plow down the sod the fall prior to planting. Weed problems in plantings set into newly plowed sod can be overwhelming.

Ideally, the site should be worked and fitted in late summer. Seeding the area to ordinary rye in early September helps to control erosion. Usually, 2 to 3 pounds per 1,000 square feet or 1 to 1½ bushels per acre will give the desired results. If animal manures are available, they may be applied in the fall. A suitable application is 1 to 1½ tons of strawy manure per acre, or 50 to 75 pounds per 100 square feet.

Prepare the site for planting as early as possible in the spring, during late March or early April. It is important to plow before the rye gets too tall. Work the soil until it is near seedbed condition. Apply fertilizer and work in as the soil is prepared. Rates of fertilizer

If storage facilities are not available and planting cannot be done within a few days, carefully unpack plants and heel them in. To heel-in plants, select a sheltered and well-drained area and dig a shallow trench deep enough to accommodate the root system. Open the bundles and place a single layer of plants against one side of the trench so the crowns are partially above the soil line. Cover the roots with soil, moist peat moss, or sawdust and firm carefully. Plants so handled can be held for several weeks, if they are not allowed to dry out. Do not leave plants heeled-in any longer than is absolutely necessary.

It is wiser and cheaper, in the long run, to purchase nursery stock than to secure planting stock from your own or your neighbor's plantings. The better the planting stock, the better the yields you can expect.

application should be adjusted on the basis of the history and previous knowledge of the site, or by the results of soil test. On most sites, 500 pounds of a 5-10-10 analysis fertilizer per acre, or 1 pound per 100 square feet will be beneficial. For convenience, you may mix and spread the recommended soil insecticides with this fertilizer.

Do not work the soil when it is wet, or it may become puddled. Adverse effects of puddling will be noticeable during the entire growing season.

Where sites for strawberry production are limited, soil fumigation may be an important practice in site preparation. The practice of fumigation is used primarily to control soil borne diseases, insects, nematodes, and weeds. Fumigation requires special application equipment and skills. It is a costly procedure. Unless there is a proven need for it, fumigation may not be beneficial.

When soil fumigation is considered necessary, additional information and assistance can be obtained through the local county agent.

Making the Planting

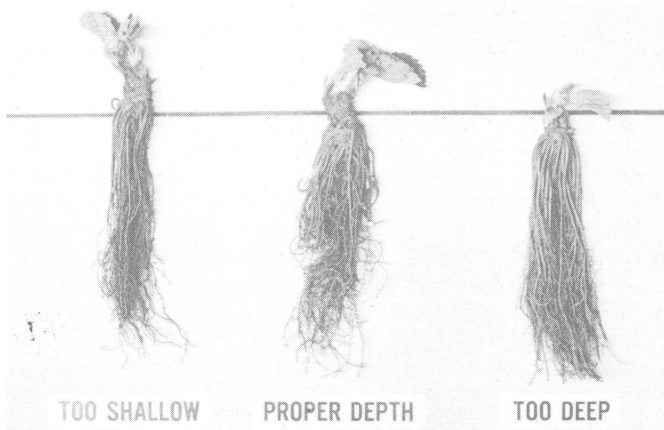
The training system to be followed in the strawberry planting determines the distance between rows and between plants in the row. The majority of Ohio growers use the **matted row**. With this system, no effort is made to limit the number of runner plants, but these runner plants are kept within a row 18 to 24 inches wide. Plants of most cultivars are usually set 18 inches apart in rows 48 inches apart. If this system is followed, 7,260 plants will be needed per acre.

The other system is called the **spaced row**. In such plantings, the number and location of runner plants is predetermined. For details of this system, see the section on "Growing Everbearing Strawberries." The spaced row

system requires much more labor than the matted row. It also requires setting more plants per unit area.

Early spring planting is best. Set plants as soon as soil can be prepared. Normally, this can be done during late March and early April. Do not attempt to plant until the soil is dry enough to work. If plants can be maintained in a dormant condition and irrigation is available, planting can be delayed.

Prior to planting, remove all but two or three of the most vigorous leaves and prune away about one-third of the root system. Place the plants in the soil so the root system is spread out. Cover the roots until the crown (where the leaves arise) is just above the surface of the



Mechanical transplanters are desirable in large plantings.

soil. If the crown is covered with soil, or the roots are exposed, plants will do poorly and may die.

Planting may be done either with a transplanter or by hand. In large plantings, a mechanical transplanter is recommended. Most vegetable transplanters can be adjusted to work satisfactorily. Transplanters that water individual plants are preferred. When transplanters are used, one man should follow immediately behind the machine to reset improperly planted or missing plants.

Hand planting may be done by a two-man team. One

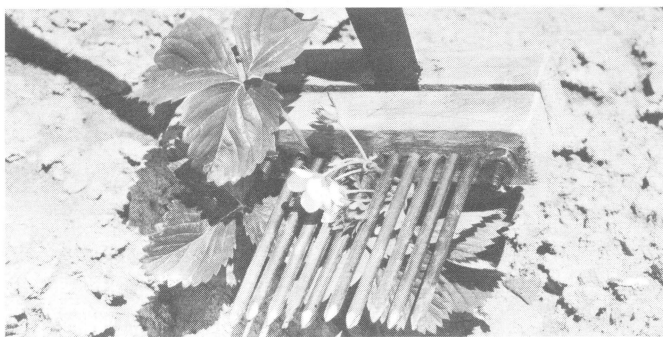
man forces a spade or long-handled shovel about 6 inches into the soil and pushes it forward to open the hole. The other man inserts the plant to the proper depth and holds it against the side of the hole while the spade is removed. The man with the spade then closes the hole by inserting the spade in front of the hole and closing it by pushing forward on the handle. Then he firms the soil about the roots with his foot. After setting, if the soil is dry, each plant should be given at least a cup of water. Regardless of the method of planting, every effort should be made to prevent the plants from drying out.

Care the First Season

Flower stalks should be removed as they appear. Some growers use a specially designed comb to facilitate flower removal. If allowed to develop, flowers and berries will reduce plant growth and the next year's crop.

Carefully cultivate and hand hoe the planting throughout the season to control weed growth. Frequent, shallow cultivation in one direction only is best. Infrequent, deep cultivation can damage strawberry plants. In addition, cultivation helps keep runner plants within the allotted row area and permits easier rooting of runner plants. Do not allow the rows to get wider than 18 to 24 inches. Chemicals may be used to aid in weed control during this period. For current chemical weed control recommendations, use Ohio Extension Bulletin 506.

Runner plants produced after August 15 are relatively



Specially designed comb for removing flowers from first season plants.

unproductive and should be removed, unless the desired matted row has not been obtained.

Fertilizer applications are seldom needed during the growing season. However, if the plants appear light green and do not grow off well, sidedress with nitrogen fertilizer about a month after planting. Apply 100 to 125 pounds of ammonium nitrate, 33.5N or equivalent, per acre. This can be applied with conventional sidedressing equipment. On small plantings, apply 1½ to 2 pounds of ammonium nitrate per 100 feet of row. When applying this fertilizer, select a dry day and brush all fertilizer off the leaves to protect them against fertilizer burn.

A similar application may be broadcast over the planting about August 1, if the plants have light green leaves. Avoid leaving fertilizer on the leaves of berry plants. Fertilizer applications in the spring of the fruiting years are apt to cause soft berries and reduce yields. Too much nitrogen may cause excessive growth and reduce yields, so care should be exercised in rates of application.

Determine fertilizer requirements for individual strawberry fields each July by submitting leaf samples to the Ohio Plant Analysis Laboratory. This service is available through the local county Extension office. As a result of precise chemical analysis of the leaf sample submitted, you will receive a report as to the status of the mineral nutrient elements that affect growth and production along with recommendations for any needed fertilizer applications.

Irrigation and pest control practices should be applied as needed.

Winter Care

The strawberry planting should be mulched for winter protection. Mulch protects plants from severe cold and against heaving, due to alternate freezing and thawing of the soil.

The best mulching materials are clean, seed-free wheat or rye straw. Tree leaves and oat straw tend to pack and smother the plants. Coarser materials offer little protection. Sawdust may be used, but straw is preferred. Expose the straw to weather by placing it near the planting early in the fall. Most of the grain and weed seeds will germinate prior to the mulch application, thus reducing a serious spring weed problem.

Apply mulch 3 to 4 inches deep over the plant rows. This requires 3 to 4 tons of straw per acre or about a bale per 30 to 40 feet of row. Apply mulch only after the

planting has experienced several sharp freezes—in the lower 20's. In Ohio, such freezes usually occur between Thanksgiving and Christmas. It is easier to apply mulch when the ground is frozen. If applied before growth stops, it may cause crowns to rot. If mulching is delayed, the crowns could be damaged by low temperatures.

Mice will sometimes damage strawberry plants under the mulch. If mouse problems develop, check with local Extension personnel for control methods.

In the spring when growth starts (new leaves start to develop), fork the mulch off the plants, placing it between the rows. So placed, the mulch controls weed growth, conserves moisture, and helps to keep the berries clean. It is best to remove only enough mulch from the rows to let the plants develop.

Frost Control

Strawberry flowers that are open, or in an advanced stage where petals are exposed, are easily killed by late spring frosts. Frost injury usually shows up first on the pistils or center portion of the flower. Often the petals and stamens are not injured. Close examination of blossoms 2 to 3 days after a frost or freeze will indicate the extent of possible injury. A dark, blackened center in the flower indicates a berry lost to severe frost damage.

Sprinkler irrigation will protect blossoms from frost injury. As water turns to ice on a blossom or leaf, the latent heat of fusion released provides a form of heating to prevent frost losses.

Sprinkler nozzle sizes and spacings capable of providing at least 0.10-inch of water per acre per hour are essential. Begin sprinkling as soon as the temperature at plant level drops to 34 degrees F. Sprinkling must be continued until the temperature the next day rises above the freezing point and all ice is melted from the plants.

Accurate and reliable thermometers placed at plant level are essential. Temperatures should be checked frequently before and during the period a frost is predicted. Temperature alarms are helpful.

Irrigation equipment, including pumps, valves, pipes and sprinkler heads, should be maintained in excellent operating condition. Frequent inspection and testing during late spring when frosts can be expected will help insure efficient operation of the system when needed.

Detailed specifications on nozzle sizes and spacing, equipment maintenance, and water requirements for frost control with irrigation are available from agricultural engineering specialists. Further information is available through county Extension agents.

Where irrigation for frost control is not available, winter mulch may be used to protect flowers from frost. If frost is predicted, mulch can be forked evenly back over the rows. The mulch acts as an insulation barrier to trap radiant heat from the soil around the plants. It can be left in place for several days, if necessary.



Sprinkler irrigation protects blossoms against frost injury. Continue sprinkling until temperature rises above freezing and all ice melts from plants.

Pollination

Commercially available strawberry cultivars are all perfect flowered and self-fruitful. Pollen transfer can be accomplished in a number of ways, but as with many fruit crops, insects play the major role. In small plantings, there are normally enough local bees to effect good pollination. Frequently however, there are not enough insects present to effectively pollinate all the flowers in large plantings.

The strawberry fruit consists of receptacle tissue which supports a number of achenes or seeds, each of which has its individual pistil. Complete pollination requires that each of these pistils be pollinated. If the pistils are not pollinated, or if, in some way, they are damaged, a misshapen berry of less than normal size will develop. Lack of pollination results in reduced yield and unattractive, unmarketable berries.

To insure adequate pollination, bee colonies should be moved into the strawberry fields at bloom time. The number of colonies required per acre can vary from one to two or three, but one strong colony probably will be enough. Avoid use of insecticides in the planting during bloom.



Insure adequate pollination by moving bee colonies into fields at bloom time.

Harvesting

Pick berries when they are fully colored; those with white areas are not ripe. Pick the berries with the caps and stems attached. To do this, snap the stem, using the thumb nail. Avoid bruising the berries. Keep harvested berries out of the sun and place them under refrigeration as soon as possible. Generally, the first harvest will take place about 30 days after first bloom. One of the many advantages of growing strawberries in the home garden is that they may be eaten at the peak of their quality.

When possible, avoid picking the fruit when plants are wet. Harvest as often as necessary, normally every other day. The harvest season of a given variety extends over 5 to 7 pickings. Generally in commercial plantings, berries are placed directly in quart containers in which they are sold. Harvesting is made easier by the use of either 4 or 6-quart carriers.



Proper harvesting involves snapping the stem with the thumb nail, leaving caps and stems attached.



The Pick-Your-Own marketing method saves the operator both harvesting and farm-to-market handling costs.

Pick-Your-Own Marketing Method

A number of producers in Ohio are harvesting thousands of pounds of strawberries through the "pick-your-own" system, thus eliminating large picking crews. By planning for production, parking, customers, pricing, and public relations, a strawberry production enterprise can become a successful "pick-your-own" operation.

A most important aspect of the "pick-your-own" operation is to establish highly productive, weed-free rows about 18 inches apart. Proper spacing accommodates traffic between the rows. Another is choice of proper cultivars. To extend the harvest season, early, mid-season, and late cultivars should be planted.

To handle a large number of pickers with varying degrees of picking experience and maintain a minimum of damage to the planting, the grower must acquaint customers with operating procedures. Signs and picking supervisors can expedite the picking and check out process.

In most operations the containers are furnished to the pickers. Containers furnished are quart cups, if the fruit is sold by volume, or small cardboard flats, if the fruit is sold by the pound. (1 quart of strawberries weighs about 1½ pounds). Prices are often charged on a graduated scale, with the price being cheaper as more units are purchased.

Locate the check out point so that all outgoing traffic will pass by it. Often, growers mount check out stations on wagon frames, making them highly mobile.

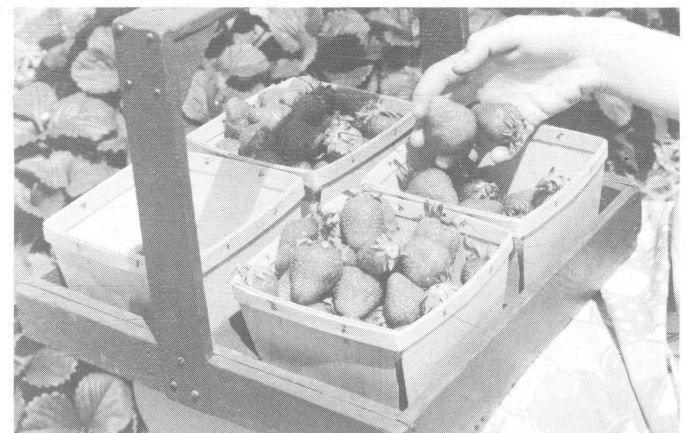
Renewing the Planting

Strawberries may be fruited more than one year. Yield and size of berries usually, but not always, are progressively smaller the second and third years. It is unwise to attempt more than three crops from a single planting. Only good plantings should be maintained and renewed. Weak, weedy or diseased planting should be destroyed right after harvest.

Renewal of a planting should be done shortly after harvest. Start by mowing off the tops as close to the ground as possible without damaging the crowns. Then with a plow, rotary type tiller, or spade, narrow the

row width to a strip of plants 8 to 10 inches wide. This can be done by destroying plants on both sides of the row or one side only. The latter is preferred. As the row is narrowed, the mulch and other organic material should be incorporated into the soil. Fertilize this row as indicated for summer fertilization of the newly set planting.

Handle the renewed planting in the same manner as a first-year planting. Generally, a planting should not be renewed for more than two seasons.



Four to six quart carriers are helpful in moving berries from fields.

As soon after the last harvest as possible, plow and sow the site to a cover crop such as soybeans. That fall plow and seed the site to rye. Then use the site for some other cultivated crop one season before replanting to strawberries.

Chemical Weed Control

Chemical weed control does not eliminate the weed problem. If properly used, chemicals can make weed control easier without reducing either plant growth, yield or berry quality. Their most effective use is during the growing season as the fruiting row is being formed. Although the use of chemicals should be considered in large plantings, it is doubtful whether their use in small plantings is justified.

Before any herbicide is applied within a strawberry planting, the grower should be sure that such use is recommended on the label by the manufacturer. Further, the herbicide should be used only with the limitations stated on the label. Use of other than recommended or approved herbicides may result in injury to the plants and undesirable residues in the fruit.

The application of herbicides requires careful at-

tention, if good results are to be gained. Improper use, even of approved herbicides, may result in damage to the crop or lack of weed control. Successful chemical weed control depends upon safely applying the correct amount of the proper herbicide at the proper stage of growth of both the weed and crop plant. Since many variables can affect the results obtained, growers are advised to learn to use chemical weed control measures in a portion of their plantings before making extensive application.

The herbicides recommended for use in strawberry plantings are most effective as a means of preventing rather than overcoming weed problems. They are best applied at low pressures, 40 to 50 pounds per square-inch in 50 to 100 gallons of water per acre of berries. The weed spray should be applied uniformly to the row and between row area alike. A special tractor mounted herbicide sprayer, which provides agitation within the spray tank, is preferred for application.

Herbicides available and approved for use in strawberry plantings may change from year to year. Growers should consult the latest Ohio Cooperative Extension Service recommendations.

Irrigation

Strawberries can be grown on a limited basis without irrigation. There are, however, many seasons in which full production cannot be realized unless the plantings can be irrigated. During these seasons, supplemental water is needed to assure the formation of a desirable fruiting row and to maintain berry size. Irrigation can also protect the crop from frost.

When available, enough water should be applied during the growing season to supplement rainfall and to

assure the planting receives an average of 1-inch of water per week. Irrigation should be used when a water shortage is apparent, even before the plants exhibit drought symptoms. Portable sprinkler irrigation is preferred, although overhead systems may be used where they already exist. In order to protect the crop from frost, it is important to have sufficient irrigation to cover the entire planting at one time. Trickle irrigation systems are not entirely satisfactory since they cannot be used for frost control.

Disease and Insect Problems

Strawberries are relatively free from disease and insect problems. Normally, they produce satisfactory crops in home gardens without spraying. Full production of high-quality berries, however, requires that the grower follow a careful pest control program.

Many problems can be avoided through the selection of sites free of disease and insect problems, suitable planting stock, and by following good cultural practices. As with other fruit crops, good pest control practices are based upon preventing problems rather than overcoming them.

Growers should be particularly aware of the following strawberry disease and insect problems, which are most frequently troublesome in Ohio.

Red Stele is a fungus disease which can cause serious losses throughout Ohio. It lives in the soil and attacks the root system in the spring of the fruiting year. Red

Stele is found most often in low, wet areas. Some infected plants suddenly wilt and die, while others become stunted and produce small, worthless, seedy berries. The new roots of these plants will have no laterals. If they are cut, the center or stele of the root will appear reddish-brown, while the stele of the healthy plant is creamy white. Usually, only part of the planting will be infected.

There is no known method of controlling the disease, once it has been introduced into a planting. The production of regular strawberry cultivars on infected sites is not practical. Through the use of red stele resistant cultivars, however, good crops of high-quality berries may be produced on such sites.

Verticillium Wilt is another soil-inhabiting pathogen that may cause trouble during the first growing season. It is frequently associated with sites that have been used for growing potatoes and similar crops. Symptoms of the disease appear during the growing season, generally

Controlling Pests

To assist growers in controlling pests in fruit crops, including the strawberry planting, the Ohio Cooperative Extension Service publishes current control recommendations each year.

Recommendations are given for the control of such pests as weeds, insects, diseases, mites, and rodents.

Obtain and use the following publications for assistance in controlling these pests:

Bulletin 506: "Commercial Fruit Spray Recommendations for Ohio"

Leaflet 1: "Disease and Insect Control Spray Schedule for the Control of Pests in Backyard Fruits"

These publications are available through local COOPERATIVE EXTENSION SERVICE OFFICES.

USE CURRENT YEAR'S RECOMMENDATIONS ONLY

in new plantings. Parent plants and their attached runners will appear wilted, turn brown, and die.

Varietal susceptibility to the pathogen varies. Earldawn is one of the most susceptible, while Catskill, Robinson, and Surecrop are among the more resistant varieties. Selection of sites and varieties is important in minimizing problems with this disease. Conventional means of control are ineffective against the pathogen, although soil fumigation has been effective.

Fruit Rot organisms can cause serious reductions in yield. The pathogens may attack and destroy flowers as well as fruit. The problem can be minimized by the adoption of a regular spray program at the time of first bloom.

Other fungus diseases that may appear on the leaves are **leaf spot**, **leaf blight**, and **leaf scorch**. Generally these diseases are present in most plantings but are seldom troublesome enough to cause concern. If they become severe, the application of the recommended fungicide will reduce the problem.

White Grubs which attack the roots and crowns of newly set strawberry plants can be a major problem. It is because of these pests that use of sites following sod should be avoided. To avoid the risk of grub damage, incorporate a soil insecticide prior to planting. The insecticide should be applied uniformly over the site and not just to the row areas. It may be sprayed on, applied as granules, or mixed and spread with the fertilizer. Following application, disc the site carefully to assure uniform incorporation. One such insecticide application should give control for three or more years.

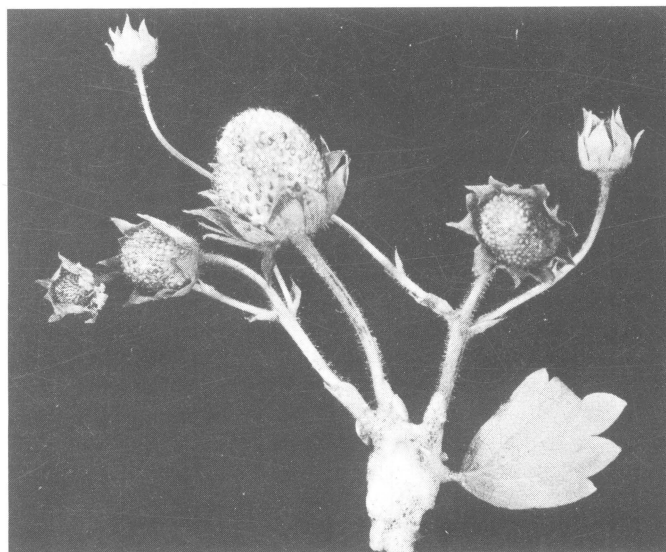
Spittlebugs can be troublesome in the spring of the fruiting season. They appear as small green insects covered by white, frothy masses $\frac{1}{2}$ -inch or more in



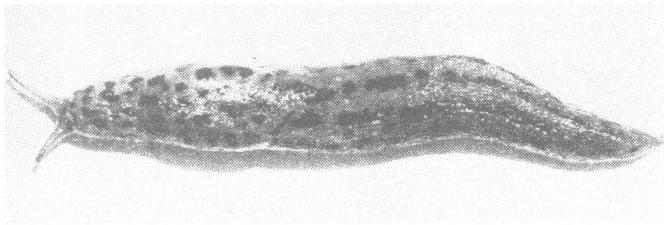
White grubs attack roots and crowns of newly set strawberry plants.

diameter on leaves and fruiting stem. They not only reduce yields and quality of berries produced but also interfere with harvest.

Mites are small pests which generally can not be seen with the naked eye; but they can cause crop loss. Red mites, which feed on the underside of the leaves, cause the planting to take on a coppery appearance. Cyclaman mites are active inside the crown. Emergence from the crown of deformed, discolored leaves is clear evidence of a mite problem. Growers should check plantings frequently for signs of mite damage and be prepared to spray when mite problems are first noted.



Spittlebugs reduce yield and quality of berries and interfere with harvesting.



Slugs damage strawberries by eating holes in the ripening fruit.

Slugs can be most troublesome, particularly during very rainy seasons. These pests, which grow to several inches in length, are not seen frequently in the planting, since they are active mostly at night, seeking out sheltered places during daylight hours. They damage

the crop by eating out holes in the ripening berries. Shiny, slimy trails throughout the planting are clear evidence of the presence of these pests.

Other insect and disease problems may be encountered occasionally. Should such problems occur, current pesticide recommendations should be consulted.

Up-to-date spray recommendations are published each year for the control of the various pest problems. These are available on request from the local county Extension office. Only current recommendations should be followed. In following these recommendations, it is essential not only to apply the right materials at the right time but also the proper gallonage. Most growers will find it helpful to maintain a supply of pesticides and miticides so they can handle anticipated spray applications and emergency mite sprays.

Growing Everbearing Strawberries

Everbearing strawberries are grown primarily for the fall crop. They will produce satisfactorily, if they are grown under the spaced-plant system of culture. Successful production of this type of berry has a heavy labor requirement; therefore, such plantings should be of limited size. They will not do well when grown in matted rows. Also, June bearing cultivars can be grown according to this system. However, plant cost and labor requirements make the system impractical for June bearing kinds.

The site for everbearing cultivars should be prepared and the plants set with the same considerations as indicated for June bearing cultivars. Set plants according to one of the three schemes shown in diagram.

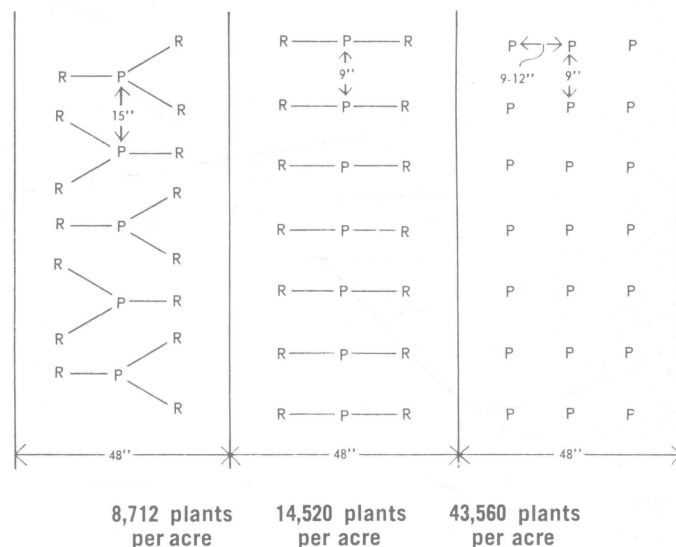
Such plantings should be maintained under either a sawdust or a black plastic mulch. The sawdust mulch system has been most widely followed. If this system is used, care for the planting as if it were a regular planting until early June when the runners appear, then stop cultivation. During this early period, take special care to remove all blossoms. Fertilize each plant with 2 tablespoons of 16 percent nitrogen carrier or equivalent when runners first appear.

Then cover the entire area of the planting with 1-inch of either hardwood or softwood sawdust. It may be fresh or weathered. Do not apply excessive amounts. Sawdust will not make the soil acid. Further weed control must be done by hand, since hoeing and cultivation will mix the sawdust with the soil, thus destroying the mulch benefits.

After applying the mulch, start training the runner plants, locating them in the desired positions. Force them gently but firmly through the sawdust, so their roots are in contact with the soil. The distance between runner plants will vary from season to season but will be about 9 to 10 inches apart.

After the desired number of runner plants has been established, remove all others as they develop throughout the remainder of the season.

Removal of flowers should continue until the first to the middle of July. The exact date for discontinuing blossom removal depends on the vigor of the planting. The more vigorous the planting, the earlier blossom removal can be stopped. Harvesting will begin about 30

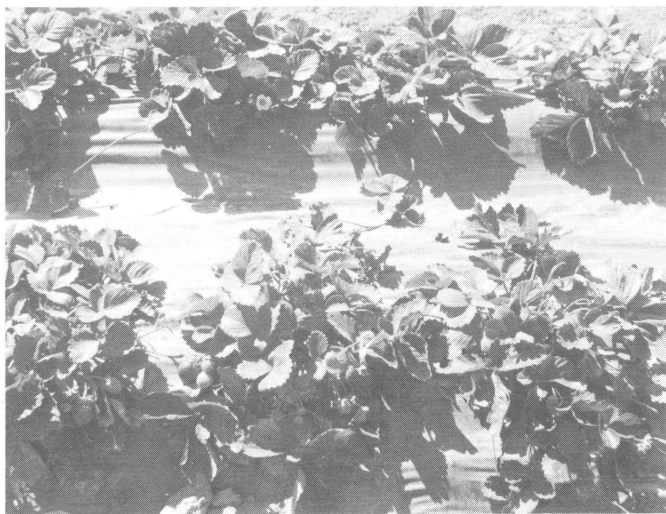


Planting arrangements used in the production of everbearing strawberries. Distances between parent plants (P) can be varied. Distances between runner plants (R) will depend on vigor of plants. Yields can be expected to increase as number of parent plants per unit area increases. There are many other possible arrangements.

days after the first blossoms appear. The first berries will ripen in August, and harvesting should continue twice a week until frost.

Sawdust mulch provides adequate winter protection for the plants. If mulch has been lost during the growing season, a thin renewal layer may be needed prior to winter. Apply only enough additional sawdust to make a total depth of 1-inch. The best time to do this is after the harvest season is over.

The following year, the planting may be allowed to produce a spring crop. After the crop is completed, remove the bloom until mid-July to assure a fall crop. For the second season, all runners should be removed, except those needed to replace lost plants. No more than two



Black plastic mulch minimizes weed problems, keeps berries clean, and conserves moisture.

fruiting seasons should be expected from a planting of overbearing strawberries.

Black plastic offers a number of advantages over sawdust as a mulch for strawberries. Its use minimizes the problem of weed control and that of dirty berries. Only slight variation in cultural practice is needed, if black plastic is used. When proper equipment is available, the mulch may be spread over the row area and the plants set through the mulch at the desired locations. If such equipment is not available, plants may be set, the mulch rolled out over the row area, and the plants pulled up through slits cut in the plastic. Regardless of the method followed, the edges of the mulch must be covered with soil to prevent wind whipping.

Where needed, runner plants may be established by cutting a slit in the desired location in the plastic and forcing the plant firmly into the soil. Blossom and runner removal are the same under both mulch systems.

Trickle type irrigation lines installed under the plastic mulch can prove helpful during droughty periods to maintain desirable soil moisture levels. Care must be used not to over water.

Grower Services

The Ohio Cooperative Extension Service maintains three special service laboratories to assist Ohio growers and to supplement its special publications and planned educational programs.

Complete details of these services, which are available on a nominal fee basis, may be obtained from each local County Extension Service office. It is important that samples supplied to the laboratories be collected, prepared, and mailed with the required information in order that these services will be of greatest value to growers.

The services available are briefly described here:

The Plant Analysis Laboratory is located at The Ohio Agricultural Research and Development Center, Wooster. Specified plant parts can be analyzed for content of 13 nutrient elements: nitrogen, phosphorus, potassium, sodium, calcium, magnesium, manganese, iron, boron, copper, molybdenum, zinc, and aluminum. Leaf or petiole samples from fruit crops should be collected and mailed to the laboratory between July 20 and August 10.

Results of the analysis are returned to the grower along with recommendations as to specific alterations in

the fertilizer program that may be needed, according to the analysis results.

The Soil Testing Laboratory, located on The Ohio State University campus, makes chemical analyses of soil samples. The laboratory is equipped to analyze samples for organic matter, pH, phosphorus, potassium, magnesium, manganese and boron. A competent authority in each specialty field prescribes individual fertilizer and cultural programs, based on the soil test results. Samples may be taken and mailed to the laboratory any time of year.

The Plant Disease Clinic, 1735 Neil Avenue, Columbus, Ohio 43210 is also on The Ohio State University campus. The clinic was established to assist growers in diagnosing plant disease problems.

In the laboratory, special diagnostic techniques are used to determine the cause of an apparent disorder. The grower submitting the sample is thereupon supplied with the diagnosis, together with recommendations for control of the disorder.

Strawberries and the 4-H Program

Growing strawberries can be an excellent 4-H horticultural project for young people interested in learning more about plant science.

Currently, two strawberry projects “Growing Everbearing Strawberries” and “Producing and Marketing June Bearing Strawberries” are available to Ohio 4-H club members. A Leader’s Guide to the projects is available to 4-H club advisers to assist in directing project activity.

By growing strawberries, 4-H club members can learn to grow one of America’s favorite fruits. Principles and practices learned in growing strawberries can be applied to growing other productive plants around the home. In addition to providing delightful fruit for a number of tasty desserts, strawberries can also be a profitable crop for those interested in some extra income from project activity.

Why not contact your local county 4-H agent today and learn more about growing strawberries the 4-H way?



Strawberries can be grown successfully throughout Ohio. The crop is profitable to the commercial grower and rewarding to the home gardener. Berries are good for eating fresh; making pies, jellies, and jams; and for freezing.