

STRAWBERRIES FOR THE HOME GARDEN

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April 2001

HG-515

Strawberries are one of the easiest and most popular small fruits in the home garden. Green foliage, white flowers and bright red fruit make strawberries a colorful addition to a garden. Attractive and flavorful, the strawberry is also nutritious. A cup of strawberries will supply more than the recommended human daily requirement of vitamin C. A bed of strawberries 4 feet by 8 feet will produce enough berries for an average-sized family.

PLANTING SITE SELECTION

Select a sunny, well-drained location. Strawberries require at least eight hours of full sun each day of the growing season to produce at their maximum capability. Strawberries grow best in loamy or sandy soils. Heavy clay soils cause reduced plant growth and vigor and a higher incidence of disease. However, clayey soils will work if they are well drained.

Strawberry blossoms are susceptible to late spring frosts, which can kill early flowers. Since early blossoms produce the largest berries, this can be a serious problem. Locating strawberry beds on elevated areas of the garden with gentle slopes will allow heavy cold air to drain away from the bed, helping to reduce frost damage. A northern exposure may help delay bloom in the spring if late frosts are a problem. Earlier production can be achieved by selecting a southern exposure that warms earlier in the spring. Plants may have to be covered with a straw mulch or blanket at night to protect them if frost becomes a problem. Locations next to a house are often warmer due to heat generated from the home.

Remember to locate a strawberry bed in an area that does not interfere with the annual working of the garden as strawberries are a perennial plant (one that comes back year after year). Also, avoid planting strawberries after peppers, tomatoes, potatoes, eggplant, or okra, all of which are susceptible to Verticillium wilt. Sites should also be free of perennial weeds.



SOIL PREPARATION

Before selecting a planting site, it is recommended that you have your soil tested at a certified lab. Soil testing information is available from your local USU Extension Office. Strawberries prefer

well-drained, sandy loam soils high in organic matter and fertility and a pH of 7.5 or less. Plants established on more alkaline soils (pH of 7.5 or greater) tend to exhibit signs of iron deficiency (interveinal chlorosis of younger leaves). In severe cases, pale leaves become white, turn brown around the edges, and then die. Strawberry plants are also highly sensitive to salt. High total salt levels greater than 1.8 ECe (dS/m) will cause stunting, marginal leaf scorch, and severe yield reduction. Avoid planting in salty soils or apply enough water to ensure that salts are leached below the root zone.

The soil should be prepared well in advance of planting. Incorporate organic matter (2-3 inches of garden compost) in the bed to a depth of at least 12 inches. Organic matter will help improve nutrient availability as well as the structure and water-holding capacity of the soil.

Soil drainage can be improved by planting on raised beds (36 inches wide and 6-8 inches high). Raised beds will also warm sooner in the spring than flat ground. However, planting on flat ground may be preferred where salts are a problem, making it necessary to flood the beds occasionally to move salts down through the soil profile.

FERTILIZATION

Before planting, incorporate a balanced fertilizer such as 10-10-10 into the planting bed at the rate of 1 lb per 100 sq feet, or as directed by the soil test recommendations. Additional nitrogen may be necessary once new growth begins in the spring and again 3-4 months later at a rate of ½ lb/100 sq ft of ammonium sulfate (21-0-0) per application. Scatter the fertilizer evenly across the bed and work it into the soil. Wash fertilizer off plant leaves to prevent leaf burn. Irrigate the bed after application. Fertilization is important the first year to encourage good growth.

During the second and following growing seasons, plants should be fertilized after harvest in the spring. Use a balanced fertilizer such as (10-10-10) applied at a rate of 1-1/2 lb/100 sq ft. Applying nitrogen fertilizers before harvest can result in soft, tasteless berries that easily rot. Plants can also become too leafy, more susceptible to disease, and tend to shed blossoms. Additional fertilizer probably will not be necessary if plants remain dark green. Applying too much nitrogen in the fall to established beds can make plants more susceptible to winter kill problems.

Iron chlorosis problems can be corrected with an application of either iron sulfate or an iron chelate. Foliar applications should be made in the spring before flowering or between flowering periods for everbearing and day-neutral types. Foliar applications during flowering can damage flowers. For longer lasting results, use soil applications of iron chelates. Follow the label directions for best results.

STRAWBERRY TYPES AND CULTIVARS

There are basically three types of strawberries: June-bearers, everbearers, and day-neutrals. They differ primarily in their response to day length, which affects both berry and runner production. Suggested varieties are listed below. There are other cultivars which may also do well in your area. Check with the local USU Extension Office and plant nurseries.

June-bearers

June-bearers develop flowers in the early spring from buds initiated the previous fall under short-day conditions (less than 10 hours of light per day). It is essential during the fall (September-November) that the plants have a full, well developed leaf canopy to produce sufficient energy for flowers to bud. June-bearers tend to out produce other types of strawberries, and are the most preferred for making jams and jellies as they set large crops of berries that ripen at the same time. However, June-bearing strawberries can be lost due to late frosts in the spring and are susceptible to injury from low winter time

temperatures. A row cover may be used for early frost protection of the plants as long as you remove it during the day for bee pollination. Mulching the plants during the winter months can prevent winter damage to the plants and the buds.

Cultivars

'Hood' - a medium to large berry with excellent flavor. Yields are somewhat lower than other varieties but worth trying as a result of its flavor.

'Honeoye' - large, conic, crimson red fruit; good yields; excellent flavor; good for desserts, preserves, and canning, with good disease resistance.

'Guardian' - large, conic, glossy, light red fruit; good yields; excellent flavor; good for desserts, preserves, and canning; resistant to Verticillium wilt and five races of red stele. Does very well in Utah.

'Robinson' - large, conic, blunt-ended berries; good producer; fair flavor; fair to good quality for desserts, canning, and freezing; resistant to Verticillium wilt, but susceptible to red stele; good in warm weather.

'Surecrop' - medium to large wedge-shaped berries; secondary berries tend to be more conic; excellent, slightly tart flavor; excellent for desserts and freezing; resistant to Verticillium wilt, red stele, and drought.

'Sequoia' - very large, somewhat soft flesh; very productive for several weeks; outstanding flavor.

'Tioga' - medium to large, wedge-shaped berries; very good flavor; good dessert and freezing quality; no resistance to red stele; good in warm weather.

Everbearers

Everbearers initiate flower buds under long-day conditions (more than 12 hours of sunlight). They will generally produce two main crops (spring and fall), but yield less than a single spring crop from a June-bearer. Everbearers, however, that lose a spring crop to frost will still produce a fall crop. Everbearers produce fewer runners and tend to form multiple crowns.

Cultivars

'Fort Laramie' - large, bright red fruit; very aromatic; good dessert, freezing, and preserving qualities.

'Ogallala' - large, plump fruit; excellent for preserves; very hardy; good drought and disease resistance.

'Ozark Beauty' - large, firm, wedge-shaped, long-necked berries; excellent flavor; excellent for desserts, canning, freezing, and preserves; susceptible to Verticillium wilt and red stele.

Day-neutrals

Day-neutral strawberries have the unique ability to flower and fruit under any day-length conditions. They will produce fruit from spring through fall with several peaks throughout the season. Temperatures above 70°F, however, will inhibit flower bud formation. Day-neutrals produce fruit and runners simultaneously, although runner production is generally less than that of June-bearers. Day-neutral runners often flower before initiating roots, which makes them excellent container plants.

Cultivars

'Selva' - large bright red fruit; excellent flavor; heavy yields.

'Tribute' - medium-large, short, cone- to wedge-shaped, bright red berries; pleasant flavor; good dessert and processing qualities; resistant to red stele.

'Tristar' - medium size, symmetrical, short, conic, deep red fruit; good dessert and freezing qualities; resistant to Verticillium wilt and red stele.

PLANTING

Plants should be ordered early in the winter before spring planting to ensure the availability of appropriate cultivars. Buy only certified virus-free plants that have been inspected for pests and bred for disease resistance. Beds should be prepared well in advance of your scheduled planting date.

Planting in the spring (after danger of hard frost) ensures greater plant survival because the weather is cool. Plants should be dormant and healthy upon arrival. Crowns should be solid with

light-colored roots. If new plants arrive early, plants can be stored at 29-30°F and 85-90 percent relative humidity (wrapped in moist packing materials). This should prevent the growth of mold. Plants can also be “heeled-in” in the garden for temporary storage. To heel-in the plants, place them in a shallow trench, cover the roots with soil, peat moss, or saw dust, then water them.

Do not allow the plant roots to dry out during planting operations. Roots can be placed in water for up to ½ hour before planting. Keeping plants in the shade will also reduce stress.

Prune off any dead, diseased or broken leaves and roots from the plants. Spread the roots evenly in the planting hole. The crown (where leaves are attached) should be level with the surface of the soil (see figure 1). If planted too shallow, the roots will dry out. When planted too deep, the plants will rot. Firm the soil over the roots and around the base of the crown so no air pockets occur and water plants immediately.

TRAINING

There are three main systems commonly used in the home garden to grow strawberries. They are: matted row, spaced bed or a hill system. Choice of training system is generally dependent upon the type of strawberry and personal preference. In any of the systems mentioned above, if plastic is used, holes will need to be cut for the daughter plants to root into the bed.

In a matted row system, plants are generally spaced 18-24 inches apart in rows with 36- to 42-inch centers. Runners are allowed to develop to fill the empty spaces between plants until the rows are 12-18 inches wide. The middles between rows are kept free of plants. Four to six runners per plant are allowed to develop. The runners are arranged along the row and spaced 8-10 inches apart. Runners are placed in the desired location and gently pressed into the soil (½ inch deep) where daughter plants form. Runners can also be held in place by placing a carpenter's staple over the runner near the base of the daughter plant. Do not sever the daughter plant from the mother plant. After sufficient runner plants

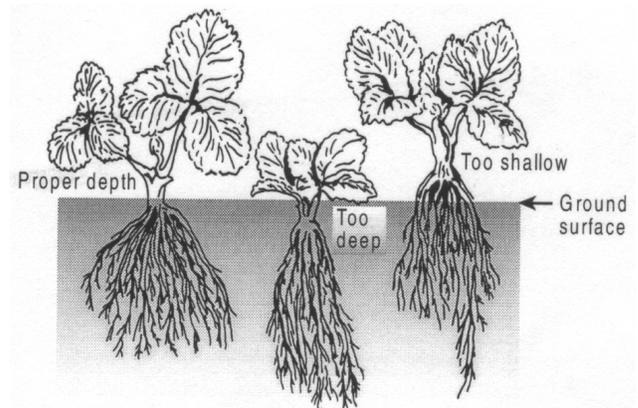


Figure 1. Proper depth for planting strawberries.

have formed, pinch off any new runners that develop. During the following growing season, all new runners should be removed.

The matted row system is generally used for June-bearers. During the first growing season, blossoms and fruit are allowed to form and runners are thinned so that there is about six inches between plants. The biggest problem with the matted row system is that too many plants can form, which can result in smaller berries and poor yields.

The hill system is generally used for both everbearing and day-neutral types of strawberries. Plants are spaced 12-15 inches apart in the row. The runners are removed as they form and the plants remain distinct units. Rows are generally spaced 2 feet apart. During the first growing season, the flowers are generally removed in the spring but can be allowed to set berries in the fall. Hill-trained strawberries generally produce larger berries than the matted row system.

SPACE-SAVING PLANTING METHODS

A “strawberry pyramid” or “strawberry barrel” can solve the problem of lack of space for a strawberry bed. These novel growing structures do require extra care to prevent the plants from drying out, and extra protection against winter injury since the plants are not as well insulated by soil. Everbearing strawberries are best adapted to the novel uses.

A terraced bed such as a “strawberry pyramid” may be constructed using retaining walls of wood, corrugated aluminum or other rigid materials. Each level of the terrace should be 8-12 inches wide and 6-8 inches deep with plants spaced 12 inches apart.

A “strawberry barrel” can be a decorative addition to a patio, terrace or deck. The barrel—generally a 50- to 55-gallon size—can be mounted on casters so it can be rotated in full sunshine. A water delivery system is necessary to give each plant an optimum supply of moisture and the barrel also needs to have good drainage.

A good soil mixture for a pyramid or barrel consists of one part sand, one part peatmoss and two parts garden soil. The peatmoss could be replaced with compost or well-rooted manure. About ½ cup of complete fertilizer should be mixed into each bushel of the growing media. Commercial potting soil mixes can also be used.

MANAGEMENT

Mulches are often used in strawberry production to reduce soil moisture evaporation, reduce weed growth, prevent mud from splashing on berries, reduce fruit rots, protect plants from freezing, and to control soil temperatures. Choice of mulch depends on the type of strawberry you're growing and growing season characteristics.

Clean straw (free of weed seed) is best but shavings, sawdust, leaves or pine needles may be used. Do not use lawn clippings, which tend to mat and attract pests such as snails, slugs, and sowbugs. If using a straw mulch to protect plants from freezing in the winter, a 3-inch straw mulch should be applied in early winter. In the spring, uncover the plants but leave the mulch to cover the soil between the plants. Runners can be easily manipulated to root down through the mulch.

White plastic (non-translucent) mulches can be used and are best used with everbearing and day-neutral



varieties that form fewer runners and are planted closer together. Unless the plastic is removed or covered by another type of mulch, the soil may get too warm during the summer and reduce yields of some strawberry varieties.

Black plastic or black woven plastic fabric (weed barriers) can be used in colder areas of the state to help warm the soil for earlier harvest and to keep plants from freezing. Woven fabrics are preferred, as they allow the soil to “breathe” and water to penetrate. Drip irrigation can be used under either plastic or fabric for optimum irrigation efficiency.

When using plastic or fabrics, a hill system planted with everbearing and day-neutral cultivars is preferable because runners are discouraged.

Strawberries grown in warmer areas of the state may require some shade in the afternoon during the summer. This will reduce heat and water stress to both plants and fruit. Erect a shade cloth over the bed, or plant on the east side of a fence or wall.

Due to the shallow root system of the strawberry plant, irrigation should be relatively frequent. Irrigation water containing excessive salts can cause salt burn on the leaves if it is allowed to accumulate in the soil. This can be a problem when drip irrigation is used. Flooding the bed occasionally will help move salts down through the soil profile below feeder roots. Whatever irrigation technique is used, enough water should be applied with each irrigation to wet the soil to a depth of at least 12 inches.

Strawberries require bees for pollination. No insecticides should be applied during bloom because they can kill bees. Catfacing or irregularly shaped fruit is often the result of poor pollination from either low bee populations or damage from cold weather.

RENOVATION OF BEDS

After harvest in late spring/early summer, June-bearing strawberry beds should be renovated to keep plants healthy and productive. The main objectives of renovation are to replace old leaves with new foliage, improve sunlight penetration, fertilize for berry enlargement, control weeds, and to topdress with soil over crowns for improved root production.

Renovation of strawberry beds can be accomplished with a rotary lawn mower set at the highest setting, removing old foliage just above the crowns. Be careful not to damage crowns. Do not renovate after July 15, as there may not be enough time for new leaf production. Older, less productive plants can be replaced with new runners. Row width should be maintained at 12-18 inches, with an optimum plant density of 3-4 plants/sq ft. Fertilize and apply mulch if needed. Most strawberry plantings will last several years with proper renovation. When yields decline, start over with a new planting.

HARVEST AND STORAGE

Pick berries in the morning when it's cool to prolong shelf life. The surface of the berry should be dry to prevent fruit rot. As berries will not continue to ripen after harvest, pick them when fully ripe (dark red). Be sure to remove any overripe, diseased, or insect-damaged fruit to keep plants producing. The time from bloom to harvest will vary from 18-45 days depending on variety, temperature, and exposure to sunlight.

Berries should be harvested every other day to maintain quality. Most June-bearers will yield berries for 10-15 days depending on the variety. Harvest by cupping the berry between your fingers and snapping both the berry and hull cleanly off the plant. Keep berries out of the sun, and refrigerate (2-6 days) unwashed until needed. Berries can be hulled and cleaned when ready to eat, freeze, or process.

INTEGRATED PEST MANAGEMENT (IPM)

Integrated pest management is the management of pest populations below levels that cause economic damage by using a compatible balance of biological, cultural, chemical, genetic, or other control methods. Control may be aimed at one or more pests depending upon the scope and complexity of the management system. IPM takes into account interactions among pests, environment, and commodity. IPM differs from traditional control approaches where each pest was considered and controlled individually and where emphasis may have been placed on a single measure.

The IPM concept comes from the realization that any disruption of a pest will tend to affect other pests and beneficials in the crop complex. Integrated pest management attempts to develop and use techniques to manage pests, not to eradicate them. If you have questions about IPM, contact your local USU Extension Office located under the County Government Section of your telephone directory.

REFERENCES

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Other Related Fact Sheets available on the World Wide Web at: <http://extension.usu.edu> or your local USU Extension Office.

HG 509	Selecting and Using Inorganic Fertilizers
HG 510	Selecting and Using Organic Fertilizers
AG SO01	Control of Iron Chlorosis in Ornamental and Crop Plants
AG SO03	Salinity and Plant Tolerance
Compost 02	Using Compost in Utah Gardens
HG H01	Preparing Garden Soil

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Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Robert L. Gilliland, Vice-President and Director, Cooperative Extension Service, Utah State University, Logan, Utah. (EP/04-01/DF)

STRAWBERRY PEST CONTROL GUIDE

Pest	Damage	Control/Pesticide
Birds	Eat fruit, holes in fruit	Scarecrows, cover with netting
Leafroller	Feed on foliage. Pieces of foliage eaten.	Carbaryl (Sevin) <i>Bacillus Thuringensis</i> (Bt)
Mites	Tiny light colored insects that suck juices out of the leaves of the plants. Leaves appear speckled, dirty and gritty. Some webbing.	Predatory mite, Kelthane
Strawberry Root Weevil	Larvae feed on roots. Foliage notched around the edges of the leaves.	Beneficial nematodes, Malathion
Slugs and Snails	Feed on plants at night.	Metaldehyde Bait, traps
Spittlebugs	Secrete a white froth and suck juices from leaves.	Carbaryl (Sevin)
White Grubs	Feed on roots.	Diazinon granules

Diseases	Damage	Control/Pesticide
Botrytis Gray Mold	Mold on fruit.	Space plants out for air circulation, keep fruit off the ground, apply the fungicide Captan.
Black Root Rot, Crown Rot	Poorly developed rotting root systems.	Crop rotations; Balanced fertilizer program.
Nematodes	Stunted plants.	Solarization with clean plastic, crop rotation.
Powdery Mildew	Leaves curl up and turn purplish or red. White powder on leaves.	Remove old leaves, Sulfur fungicides.
Red Stele	Inner cores of infested roots are red.	Plant in well-drained soil, resistant cultivars.
Verticillium Wilt	Outer leaves dry up.	Resistant cultivars, rotate to new site.
Viruses	Reduced plant vigor, small leaves, yellow cupped leaves.	Virus free plants, remove sick plants. Control insect vectors.