



Strawberries

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Plants, selecting and preparing a site, planting and care of strawberries are covered in this NebGuide.

Strawberries are a popular, dependable fruit for home production. Growing your own strawberries can easily be done with a rudimentary understanding of the plant, but attention to detail is necessary as described in this NebGuide.

By following the recommended basic cultural practices, home gardeners can produce a good yield of fruit. Each healthy June bearing or Day neutral strawberry plant can be expected to yield at least one quart of berries. Everbearers produce sporadically throughout the growing season, but generally total yield is less than that of June bearing or Day-neutral strawberries.

The nutritional value of strawberries also makes it an excellent choice for home fruit growers. One cup of raw, capped strawberries contains 55 calories, one gram of protein, one gram of fat, 13 grams of carbohydrates and significant amounts of ascorbic acid, niacin and fiber. Strawberries are rated an excellent source of vitamin C, supplying more than the recommended daily requirement.

Plants

Strawberries can be purchased as plants, but more commonly mail-order plants are shipped as dormant crowns. To be sure that your plants are true-to-type, vigorous and virus-free, purchase them from a reputable nursery or mail order business. Registered virus-free plants can

yield significantly more fruit than ordinary stock plants.

It is not advisable to transplant strawberries out of an old bed because disease problems may be introduced. Tissue-cultured plants are now available either locally or from mail order companies. Order the plants several months before needed to ensure the delivery of the cultivars requested. Although more expensive than field-grown plants, they generally produce more fruit under optimum field conditions.

Three types of strawberries are grown in Nebraska: Junebearers, Everbearers and Day neutrals. June-bearing strawberries produce a single crop during late May and June, while everbearers produce in June as well as in late summer. June-bearing strawberries come into full production the year after planting, and generally out-yield everbearers. High temperatures and moisture stress, along with mismanagement of the planting, greatly reduce the yield and quality of the fall crop of everbearers.

Fewer people grow Day neutral types. Day neutral cultivars will, if properly managed, produce fruit throughout the entire growing season, although it requires skill to accomplish. Everbearers do better in western Nebraska due to the cooler night temperatures. For most growers June-bearing cultivars produce the largest fruit and greatest yield and are the best choice for beginner strawberry growers.

There is a great deal of variability in adaptability, disease resistance, season, and fruit quality of the different strawberry cultivars. Evaluate family needs and select a cultivar to plant from Table 1.

Table 1. Recommend Strawberry Cultivars for Nebraska.

	Berry Cultivar	Berry Size	Flavor	Disease Resistance
Early Season	Earliglow	Small-Medium	Good	Red Stele, Verticillium, Leaf Scorch
	Itasca	Large	Good	Red Stele, Leaf Spot, Leaf Scorch
	AC Wendy	Large	Excellent	Red Stele, Powdery Mildew
Mid-Season	Honeye	Very Large	Good	Red Stele, Verticillium, Leaf Spot
	Flavorfest	Very Large	Very Good	Red Stele, Anthracnose, Leaf Scorch, Crown Rot
	Surecrop	Large	Good	Red Stele, Verticillium, Leaf Spot, Leaf Scorch
	Allstar	Very Large	Very Good	Red Stele, Verticillium, Leaf Spot, Leaf Scorch
	Cavendish	Very Large	Very Good	Red Stele, Verticillium, Leaf Spot, Leaf Scorch
Late Season	Jewel	Large	Very Good	Red Stele, Verticillium, Leaf Spot, Leaf Scorch
Day Neutral & Everbearer (E)	Albion	Very Large	Very Good	Red Stele, Verticillium, Leaf Spot, Leaf Scorch
	Evie 2	Large	Good	Leaf Scorch, Leaf Spot
	Seascape	Large	Very Good	Red Stele, Verticillium, Leaf Spot, Leaf Scorch
	Tristar	Medium	Very Good	Red Stele, Verticillium, Leaf Spot, Leaf Scorch
	Tribute	Medium-Large	Very Good	Red Stele, Verticillium, Leaf Spot, Leaf Scorch

Site Selection and Preparation

A carefully selected and prepared site can help the grower of strawberries maximize the yield and quality of fruit produced. When it is possible to choose a site, consider the following factors in making your decision.

Soil conditions. Strawberries perform best on sandy loam soil but will produce adequately on heavier soils if adequate drainage can be provided. Strawberries do not tolerate standing water conditions, or “wet feet”.

Select a slightly sloped site to ensure good surface water drainage. The ideal soil pH is slightly acidic between 6.0 and 6.5. Chlorosis of the plants often occurs at pH levels above 7.5 because of high pH—induced nutrient deficiencies.

The soil should have adequate organic matter, preferably between 1 and 3%. It is advisable to begin a soil building program by incorporating organic matter the season before planting. A green manure crop can be grown and tilled in, or organic matter such as well-rotted manure or compost can be added at a rate of 50 to 75 pounds per 1,000 square feet. Soil fertility levels, soil pH and organic matter content can be determined by a soil test. Contact your local Extension Office for information on conducting a soil test. If the soil test indicates a need, thoroughly incorporate 10 to 15 pounds of a complete fertilizer such as 10-10-10 or 12-12-12 per 1,000 square feet. This recommendation is for a new planting site. Apply lime only if the soil test indicates the pH level is below 5.7.

Crop rotation. Avoid planting strawberries in a site that previously has been planted with tomatoes, potatoes, peppers or eggplant, or back into a site in which strawberries have been grown in the last two years. These plants are attacked by many of the same soilborne diseases as strawberries, and it is likely that the site already has a population of the disease organisms. Under such conditions disease problems can develop quickly, especially root diseases.

Weed-free area. Select an area that has few weed problems and take measures to eliminate the existing perennial weeds by using nonselective herbicides such as glyphosate the season before planting strawberries. Because of the perennial nature of strawberry plants, there are few herbicides that selectively can control perennial weeds in a planting without injuring the strawberries. Rototill or completely plow under areas that have been in grass sod the fall before planting strawberries.

Air drainage. Because strawberries begin blooming in early spring and are subject to frost injury, select a site that has good air movement. Avoid low lying areas in which cold air settles, creating frost pockets; the likelihood of frost injury is greater there. A slope facing south warms up faster in the spring, stimulates earlier flowering, and increases the danger of frost injury. A north-facing slope that delays blooming until after the seasonal danger of frost has passed may be to your advantage.

Irrigation. Irrigation is necessary during most seasons to produce good fruit size and yields of strawberries, so select a site that has a good water source. A thorough

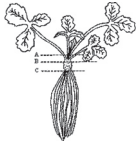


Fig. 1. Strawberry planting depths. Plant the crown so that line B is at the soil level. A plant set at line A is too deep; one set at line C is too shallow.

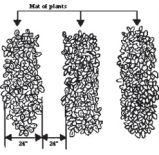


Fig. 2. Matted row system.

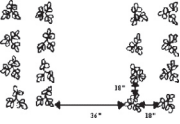


Fig. 3. Hill system.

watering that provides about one inch per week will be necessary during warm conditions and when plants are actively growing. Sprinkler irrigation may aid in prevention of injury from late frosts if applied in a timely manner.

Planting

Early spring environmental conditions favor the establishment of new strawberry plants, so plant as early as possible. This is generally during early to mid-April in the eastern part of the state, and two weeks later in western Nebraska. Avoid working the field when the soil is too wet, because it will destroy the soil structure and cause compaction. Plan to prepare the soil for planting in fall when soil is dry, to minimize the need for soil work in the spring aside from planting.

If weather conditions do not allow immediate planting when the plants arrive, open the shipping package and examine the plants or crown to be sure the roots have not dried out. Apply additional water to the packing material around the roots if necessary, and store the plants in a refrigerator at 35–40°F. When preparing strawberry plants for planting, never allow the roots to dry out. Cover the roots with moist peat or cloth, and keep the plants shaded at all times.

Before planting, remove all but two or three well-developed leaves per plant. Clip off any flower clusters that are visible to save the labor of removing them later in the field. Spread out the roots when planting and place the plant at a depth so that only the base of the crown is covered by the soil (*Figure 1*). If the crown is too high, the roots will be exposed and quickly will dry out. If the crown is too deep, it easily can be covered with soil and smothered. Gently firm the soil around the plant to prevent injury to the crown or tearing of the roots, and to avoid soil compaction. Plants should be watered immediately after planting.

A water-soluble fertilizer can be applied to individual plants as they are placed in the ground, or soon after if the soil fertility (phosphorous and/or potassium) is low or soil temperatures are in the low 50s. Prepare the solution using two tablespoons of a high phosphorus fertilizer, such as 18-46-0 or 16-32-0, to one gallon of water. Then add 1 1/4 cups of fertilizer solution around each plant. The plants must be irrigated if rainfall does not occur within two to three days after planting.

There are two main systems for training strawberry plantings, and the decision as to what system to use will determine the spacing between rows, and between plants within the rows.

The matted row system, suited for June-bearing cultivars, is most commonly used by home gardeners, and is a proven productive system. Set the plants 18 to 24 inches apart within the row and space the rows 36 to 48 inches apart. The plants are allowed to fill an 18- to 24-inch wide mat (*Figure 2*).

The hill system for strawberry planting requires more intensive labor and should be used with everbearing and day-neutral cultivars. It also is suitable for June-bearing types. Individual plants are set 18 inches apart within the row. Rows are spaced 18 inches apart with every third row left unplanted to serve as a walkway (*Figure 3*). All runners are removed as they develop, making the original plant the only one allowed to grow.

Matted Row System

Maintain the width of the matted row at 24 inches. To ensure the best yields and reduce disease severity with the matted row system, selectively prune out some of the runners to maintain a spacing of six inches between runner plants. Allowing too many plants to develop results in small berries and higher incidence of fruit rot. Remove any runners formed after Aug. 15. They generally do not have sufficient time to become established and initiate flower buds; also, the yield from these plants is small. Removing these competing plants may increase the yield of the remaining strawberries. Remove all plants growing into the row to maintain an 18- to 24-inch space between the matted rows to make access to the plants easier and to improve air circulation through the garden.

Hill System

Continue to prune off runners all season as they develop on everbearing and day-neutral cultivars trained to the hill system.

First Season Care

The goal during the first summer of growth after the spring planting of strawberries is to establish healthy plants as early in the season as possible. This is achieved by providing adequate moisture throughout the season, by fertilizing during high requirement periods as outlined below, and by properly controlling weeds, diseases, and insects.

In mid-June, after the mother plant becomes established, it sends out runners. At this time, apply one to two pounds of nitrogen fertilizer per 100 feet of row to encourage runner development. This same application rate is repeated in early August at the time flower buds are initiated for the next spring's fruit. Ammonium sulfate can be used as the nitrogen fertilizer to aid in reducing pH if the pH is 7.0 or above.

Frequent and shallow cultivation between the rows and hand pulling of weeds is necessary because strawberry plants do not compete well with weeds. Mulching the plants with two inches of hay, straw, ground corn cobs or coarse sawdust two or three weeks after planting will greatly reduce the number of weeds.

If mulches are used, add an additional 1/4 cup nitrogen fertilizer per bushel (or about 2 cubic feet) of organic matter. Chemical weed control using a suitable herbicide may be helpful in large home plantings.

Remove flower clusters on June-bearing cultivars as they appear during the entire first season, and until July 1st on everbearing and Day-neutral cultivars. If berries are allowed to develop during the first year the subsequent plants are weaker, and runner production and yield the following year are reduced. However, everbearing cultivars can be allowed to produce the first crop in the fall.

Care of Established Plants

Winter Protection. Strawberry plantings must be mulched for winter protection to produce consistently in Nebraska. Mulching prevents or reduces winter damage to the strawberry crown and flower buds. Unprotected strawberry cultivars are injured at 15°F. Plant vigor, moisture conservation, weed control and improved fruit quality are benefits from the mulching that continues through the summer.

Mulch. Apply a loose mulch to a depth of four inches in late November or early December after the soil has frozen or the average daytime temperature has dropped to around 20°F. Do not apply the mulch too early in the fall because it can increase crown rot. Early mulching also can prevent the plants from completely going dormant,

making them more subject to winter injury. Straw mulch is preferred over hay, but any loose mulch, that does not compact may be suitable. Remove the mulch in the spring after the new growth begins. While one can delay blooming by maintaining the mulch layer, too late a removal reduces yield.

Floating Row Covers. These can be an effective winter mulch and consist of light-weight plastic or spun bonded fabrics laid over the tops of the plants. Unlike straw mulches, light penetrates the mulch layer, increasing the number of blossoms formed and the yield. One disadvantage to floating row covers is that they accelerate flower development. Be prepared to protect blossoms from late frost. Remove the mulch to allow for pollination but re-cover the plants at night when frost is predicted. Remove only enough mulch to expose the leaves. Place this excess mulch in the walkways between the plant rows. Partial removal of the mulch allows for plant development but delays blooming by keeping the soil cooler and slowing plant growth.

Spring Frost Control. Early blooming strawberries are subject to frost injury each spring, but there are several ways growers can reduce the amount of injury that occurs. Site selection as previously described influences frost occurrence. In the home garden, protecting blooming plants with canvas, blankets or paper may be the best alternative when cold temperatures are expected. Secure the covering so it does not blow off during the night. Strawberry flowers are most vulnerable to frost injury immediately before and during opening. At this stage they can be damaged by temperatures of 28°F or lower. Flowers still in tight clusters can tolerate temperatures down to about 22°F. Frost injury to a strawberry flower can be identified by examining the center portion of the flower. If this center portion, which is normally yellow, has turned black, the flower has been injured by frost and fruit will not develop from it. Flowers that develop later in the season and are not injured by frost should develop fruit normally, but the total yield of the planting may be reduced.

Fertilization. Do not fertilize June-bearing strawberries in the spring before they produce fruit. High levels of nitrogen stimulate excess vegetative growth causing tall foliage that can interfere with bee activity and reduce pollination, as well as increase fruit rots. The exception to this recommendation is for plants growing on sandy soil. They may require an early spring application of nitrogen because of nutrient losses from leaching. If this is a problem, apply 1/4 to 1/2 pound of nitrogen per 100 feet of row in early spring before growth begins. In all other cases, avoid applying fertilizer until renovation time immediately following harvest. Everbearers should be fertilized during the spring

Renovation

if the previous year was wet or the plants are light green in color. Apply three to four pounds of a fertilizer product such as 10-10-10 per 100 feet of row immediately following each harvest.

Irrigation. Strawberries must be irrigated to produce quality fruit with high yields during most seasons in Nebraska. The plants generally require 1 1/2 to two inches of water or more per week, depending on soil type, climatic conditions such as temperatures and wind, and the plant's stage of development. The crucial water- requiring times are at planting, during runner production, in late summer when flower buds are forming, and during fruit development. Because the strawberry fruit is 90 percent water, any moisture stress during fruit development will reduce yield. If signs of water deficits such as wilting occur, apply water as soon as possible. Apply enough water to wet the soil to a depth of six to eight inches, the zone in which most of the plant's roots occur.

Harvesting. Harvest strawberries when the berry is fully ripe. White areas on the berry indicate immaturity. Allowing the berry to reach full color on the plant increases the sugar content and the size of the berry. Pick the berries with the stem and cap (sepals) attached to allow the fruit to keep for a longer period. Berries that have their caps removed or are injured become inedible and lose their vitamin C content within 48 to 72 hours. Note: Strawberries do not continue to ripen after harvest. The first harvest can occur approximately 30 days after first bloom. Check the planting every other day for ripe fruit. Place fruit in shallow containers to minimize injury and refrigerate promptly. Strawberries are a highly perishable fruit and should be stored at 32 to 40°F. Bird feeding may be a problem in some plantings. Protective netting is available from garden centers and must be put in place before the birds begin feeding on the fruit. Prop the netting several inches above the foliage and secure it around the edges to prevent the birds from being able to reach the fruit.

Strawberry plantings can produce for several years, but yields decrease with each year of harvest. Diseases, weeds, and weak plants limit the lifespan of a single planting, so do not expect a bed to maintain its quality for more than three fruiting seasons. By following the recommended renovation or renewal procedures, you can maximize the life and productivity of your planting.

For a planting in a matted row system, narrow the rows immediately after harvest to a width of 10 to 15 inches, using a rototiller. Mow off old leaves one inch above the crown and remove the leaf debris. This may help reduce foliar disease problems on newly developing foliage, but mainly helps you see the plants. Thin out remaining plants to three plants per square foot or seven to 11 inches apart by removing old mother plants and weak new runner plants. Apply six to eight pounds of a complete fertilizer such as 10-10-10 or 12-12-12, or three pounds of ammonium sulfate per 100 feet of row.

If weather and time permit, thin out weak plants in late September. By mid-October there should be only five to seven plants per square foot to get top yields the following spring. Thinning out the plants only after harvest usually is not sufficient to maintain the plant density required to optimize yields and quality. To renovate everbearing cultivars in the hill system, set new plants into a new site each year. Homegrown plants obtained by digging new runner plants can be used if disease has not been a problem. A few hills of strawberries can be allowed to produce runners during the season to provide a stock for transplanting each spring. If these runners lack vigor, purchase new virus-free stock.

Conclusion

With attention to detail and by following the advice in this NebGuide, the home gardener can enjoy these delicious and health-giving fruits for many years.

This publication is a revision of Strawberries, 1989, NebGuide G897, by Donald H. Steinegger and Donald E. Janssen.

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