Department of Horticultural Science

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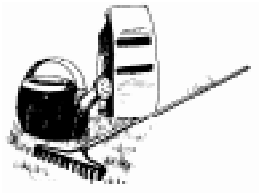

STRAWBERRIES IN THE HOME GARDEN

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Introduction

Strawberries can be grown anywhere in North Carolina. They are the first fruit to ripen in the spring, and no other small fruit produces berries as soon after planting as strawberries. In proportion to the size of the plant, strawberries are very productive. If 25 plants are set in the garden, these original plants and the resulting runner plants would produce a total of 25 quarts. Nutritionists rate strawberries as an excellent source of Vitamin C; ten large berries provide 60 milligrams of Vitamin C or 133% of the Recommended Daily Allowance. A single cupful of berries has only 55 calories, comparable to a thin slice of bread or half a cup of whole milk. Strawberries are low in sodium and contain measurable quantities of ellagic acid, which has inhibiting effects on chemically induced cancer in laboratory studies.

Origin

The modern garden strawberry, *Fragaria ananassa* (Fra-gah-ree-a an-a-nas-a), is derived from 2 native American strawberries, the Virginia "scarlet" strawberry, (*F. virginiana*), and the Chilean strawberry, (*F. chiloensis*), which is found on the Pacific Coast from Alaska to Chile. Early explorers to the New World collected both of these wild strawberries, and chance crosses between the two species in gardens in England and Europe in the middle eighteenth century resulted in a hybrid strawberry, *F. ananassa*, first called the "Pineapple" strawberry by Dutch horticulturists. The new hybrids combined the size and firmness of the Chilean strawberry and the high productivity, flavor and disease resistance of the Virginian strawberry that is native also to North Carolina.

Wild strawberry species are more diminutive than the modern garden strawberry, and they are not cultivated in the United States, but in countries such as France it is not unusual to see "fraises des bois", or wild strawberries, in open air markets, bakeries and restaurants. The Alpine strawberry, *F. vesca sempervirens*, a sub-species of *F. vesca* that originated in the mountains of Italy, is cultivated in Europe and America for its "gourmet" fruits. The Alpines make attractive edging plants, having masses of small white flowers that bear fruits continuously or in flushes, depending on growing region.

Growth Cycle

Growth in our common garden strawberries is affected greatly by temperature and length of the daylight period. In new plantings, runner production occurs during the long days and warm temperatures of summer (Figure 1). Then, in the short, cool days of fall, runnering stops and flower buds form

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within the plant crown. The strawberry crown is at soil level; this swollen growing region gives rise to leaves, runners, and roots (Figure 2). The flower clusters that develop inside the upper portion of the strawberry crown in the fall emerge in early spring. Berries begin to ripen 4 to 5 weeks after the first flowers open and continue to ripen for about 3 weeks. Toward the end of the harvest period, when days are long and warm, plants again grow runners which produce new plants.

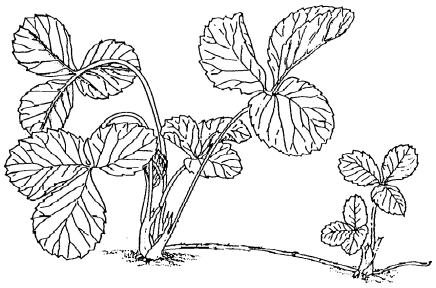

Figure 1. New strawberry plants set in the spring will send out runners during the long days and warm temperatures of summer. These runners, or "daughter" plants fill in the spaces between the original "mother" plants until a mat or matted row is formed.

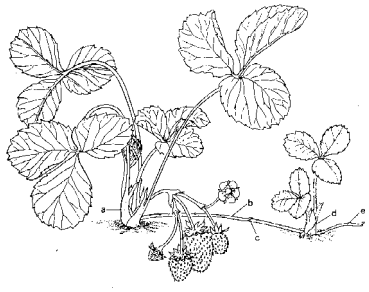

Figure 2. The strawberry crown is basically a compressed stem that given rise to leaves runners, roots, flowers and fruit.

Environmental Preferences

Light: Full sun; a southern slope will encourage earlier blossoming and earlier fruit, but this may not be desirable in locations where late spring frosts often nip the flower buds, unless protection can be given in such emergencies.

Soil Type: Strawberries can be grown in most garden soils. However, they are very shallow rooted and grow best in sandy loam soils which drain well and are well supplied with plenty of humus and a pH factor between 5.5 and 6.0.

Soil Preparation: Clay soils drain poorly and are harder to manage, but can be improved by adding organic matter. Leaves, chopped straw, peat moss, rotted sawdust, grass clippings, etc., can be used to improve soil texture. Manure applied at 2 to 3 bu/100 ft2 is a good source of organic matter. Apply the organic matter in the fall. Dig, rototill or plow it into the soil then, so that the material will be well decomposed by planting time in the early spring. In the year previous to planting, destroy all perennial weeds. Do not permit weeds to go to seed. Wherever possible, plant strawberries in soil which has not grown strawberries, potatoes, tomatoes, peppers or eggplants in the past 2 or 3 years.

Temperatures: For transplanting in the spring the temperature should be 40-50 °F; a spring frost generally will not harm new strawberry plants. Open blossoms are injured by temperatures of 31 °F or below. Frostbitten blossoms are distinguished by their darkened centers (Figure 3). Considerable blossom protection from frost can be obtained by covering plants with 2-3 inches of straw, old cloth, paper or row covers. Plastic sheets give little or no protection. Keeping plants continuously wetted will also give protection, since the change of water to ice on the plants releases heat. Low winter temperatures are not normally a problem in Eastern and Piedmont North Carolina. In Western N.C. and the Foothills, cover strawberry plants in early winter with straw (wheat, oat, rye, pine) after several hard frosts but before temperatures reach much below 20 °F. One bale will cover 100 ft2. Do not use leaves of grass clippings because they will smother the strawberry plants. Remove the straw in the spring "as soon" as there are signs of new leaf growth under the straw (usually in March).

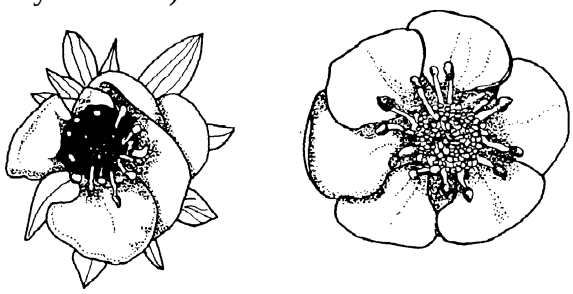

Figure 3. The strawberry blossom on the left is frost injured. The strawberry blossom on the right has not been frost injured.

Moisture: Strawberry plants have a shallow root system and cannot stand severe drought (see Irrigation).

Plants

Use healthy plants: Start with disease-free certified plants from a reliable nursery. Popular North Carolina varieties like 'Apollo', 'Atlas', 'Earlibelle' and 'Titan' can only be obtained from North Carolina certified strawberry nurseries. Strawberry varieties developed for other regions of the country are generally poorly adapted here. There are a few exceptions, including 'Earliglow' and 'Tennessee Beauty'; these can be purchased from a reliable out-of-state nursery. Avoid nurseries that contract with other nurseries to grow the strawberry plants listed in their retail catalog.

Avoid Everbearers: The main type of strawberry recommended in North Carolina is called a Junebearer. 'Apollo', 'Atlas', 'Titan', 'Earlibelle', 'Earliglow' and 'Tennessee Beauty' are all Junebearers. The name Junebearers is somewhat confusing since these varieties bear most of their crop in May! Junebearers produce a single crop in the spring. The so-called Everbearing strawberry is one that produces a crop in spring and another in late summer and until frost in the fall. All of the everbearing strawberries advertised in nursery catalogs originated in the northern states; they succeed best in those areas and are very poorly adapted to the mid-South. A few of the newest Dayneutral strawberries such as 'Tristar' and 'Tribute' can be grown in the higher elevations of Western North Carolina for a spring and fall crop of berries. The distinctions between Everbearing and Dayneutral strawberry varieties have little practical meaning for our purposes - both types will produce two crops a year (spring and fall).

Choosing Varieties: Strawberry varieties best adapted to the matted row system in North Carolina are listed in Table 2. Personal preference will, of course, dictate the choice of strawberry varieties to a great extent. More adventuresome gardeners may wish to experiment with newer strawberry varieties from other areas, but keep in mind that it is very rare that a variety bred for the Middle Atlantic, New England and Canada will be suitable for North Carolina. 'Earliglow' is an unusual strawberry because of its wide adaption through the northern U.S., Virginia and Piedmont and Western North Carolina. 'Earliglow' has the best dessert quality of all matted row varieties listed in Table 2; it is also resistant to red stele. No chemical controls are recommended for the homeowner for the control of this root disease, and planting a red stele resistant variety is the safest and most effective means of dealing with this problem.

Table 2. Strawberries for North Carolina

Variety	Area*	Quality Season	Size	Yield	Fresh	Processing	Remarks
Atlas	CP,P	Early to mid	Large	High	Good	Poor	Pale flesh
Apollo	All	Mid to late	Large	High	Good	Good	Needs pollination
Titan	CP,P	Early to mid	Very large	Medium	Excellent	Very good	Hollow center
Tennessee Beauty	M	Late	Small	Medium to high	Fair	Fair	Standard variety
Earlibelle	CP,P	Early	Medium	Medium good	Very	Excellent berry	Firm
Earliglow	P,M	Very early	Small	Medium	Excellent	Excellent	Best quality
Sweet Charlie	CP,P	Very early	Large	Medium	Excellent	Fair	Sweet
Tribute	P,M	Ever-bearing	Large	Medium to high	Good	Good	Deep red

*CP--coastal plain, P--piedmont, M--mountains.

Culture

Before planting: Have a soil test made several months in advance. Soil should be turned and pulverized at least 2 to 3 weeks prior to planting. Mix the recommended fertilizer and lime at this time. If nematodes are a likely problem, consult your county extension office for recommendations. Soil should be worked into a fine mellow condition for planting.

Planting: Set plants any time from November to March in the east and during March or April in the Piedmont and Western North Carolina. Place the plants in the soil so the roots are spread out. Cover the roots until the crown (where the leaves arise) is just above the soil surface (Figure 4). Water newly set plants and press soil firmly around roots.

Training system and spacing: Matted row system is easiest to follow. Table 1 provides suggested in-row spacings for each variety. High vigor varieties are best set 2 to 2½ ft apart, and moderate to low vigor varieties are set 1½ to 2 ft apart in the row. The rows are usually spaced 3 to 4 ft apart. Most of the runners from mother plants are permitted to grow during first season, with only fruit buds being removed to strengthen plants (Figure 1).

Double-row hill system -- set plants 12 inches apart in double rows. Leave 2½ to 3½ ft between rows. Cut off all runners as they form. Large individual hills will produce abundant crops of excellent quality fruit. Hill training is ideal for most everbearing varieties (Fig. 5).

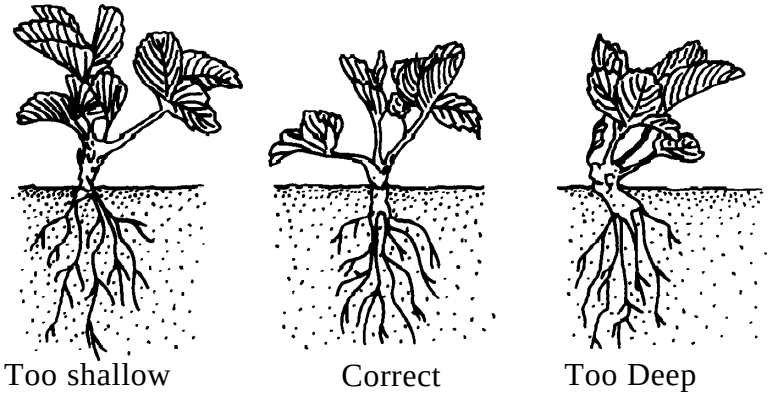

Figure 4. Correct planting depth for strawberry plants.

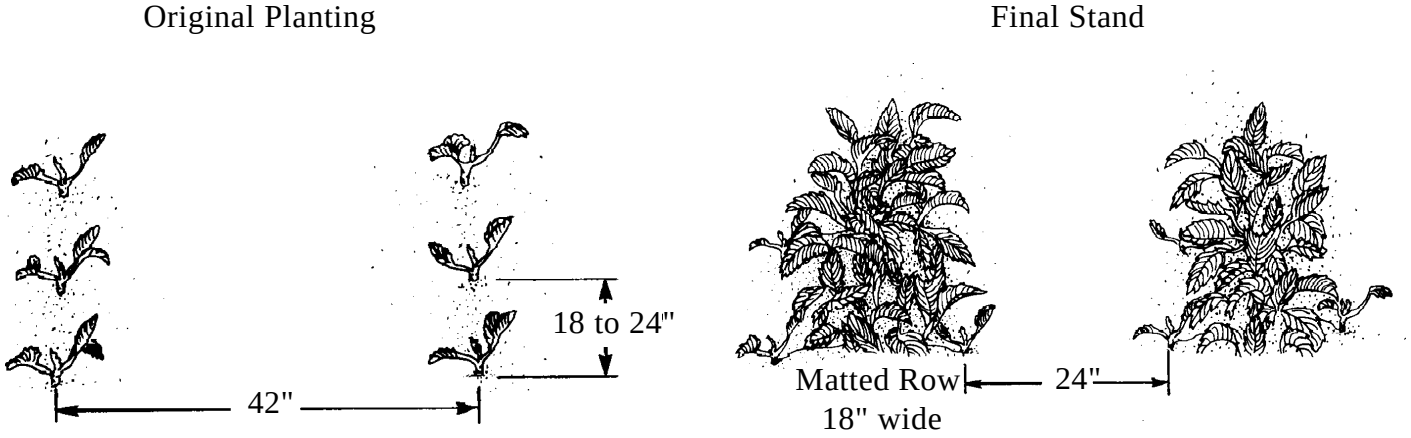

Figure 5. Matted-row system for planting strawberries. Spacing is 1 to 2 feet within the rows and 3 to 4 feet between the rows. Runners are allowed to set in all directions. Cultivation helps to straighten the runners into rows and to limit row width.

Fertilization: Before planting -- follow recommendations of soil test. If no test is made, broadcast about 4 pounds of 10-10-10 fertilizer for each 100 ft of row, 2 to 3 weeks before planting. First season fertilizer -- if new plants appear light green and don't grow well, sidedress with nitrogen about one month after planting. Apply 1½ pounds ammonium nitrate per 100 ft of row. A topdress application of ammonium nitrate at 1½ pounds per 100 ft of row should be made from August 15 to September 15. When broadcasting fertilizer over top of plants be sure foliage is dry and **brush all fertilizer off leaves to protect from fertilizer burn.** Special -- very light coastal soils need additional nitrogen again in late January or February. The rate suggested at this time is ¾ pounds ammonium nitrate (33% N) or the equivalent amount of nitrogen from complete fertilizer (10-10-10, 14-14-14). Renovation -- prior to mowing foliage at renovation, broadcast 3 to 4 pounds of a complete fertilizer (10-10-10) or about 1½ pounds ammonium nitrate per 100 ft of row. Older beds -- old beds should receive 1½ to 2 pounds ammonium nitrate per 100 ft of row sometime between August 15 and Sept. 15.

Mulching: Eastern Carolina and Central Piedmont -- apply pine needles or grain straw in February. Scatter lightly over plants and in middles between rows. Western Carolina and Western Piedmont -- in December, broadcast sufficient pine needles or grain straw in the middles and around the plants to protect crown. Use a light application on top of the plants at the higher elevations after the ground has frozen.

Irrigation: If drought comes during any of the following "critical" times, irrigate enough to wet the soil 6 to 8 inches deep once a week:

1. When plants are set and during dry periods following setting;
2. Just before harvest and during harvest when berry size appears to be suffering;
3. After renovation, as needed, to encourage new runner plant;
4. In late August, September, and early October when fruit buds are forming for the next season's crop;
5. Irrigation, if used properly, can help prevent frost injury to blossoms in spring (check with your county extension office for recommendation).

Weed Control: Methods of controlling weeds are as follows:

1. Machine cultivation plus hoeing and hand pulling;
2. Mulching with suitable material;
3. Chemical herbicides (check with your county extension office for recommendations). Herbicides should not be applied when plants are blooming, when runner plants are taking root, and during late summer and early fall when fruit buds are being formed.

Harvest: Strawberry harvest begins in the latter part of April in Eastern North Carolina, early May in the Piedmont, and late May in the Mountains. You should pick strawberries every other day or three times a week. The best time to pick is in early morning, when berries are still cool. Not all berries ripen at the same time; pick only those that are fully red.

Renovation or renewing the planting: Matted row strawberry plantings may bear fruit for more than one season, and may be kept for two or possibly 3 to 4 fruiting seasons if properly renovated. The main purpose of renovation is to keep plants from becoming too crowded in beds. Do not attempt to renew strawberry beds infested with weeds, diseases, or insects; it is better to set a new planting. To renew a planting follow these three steps:

1. Mow off the leaves, rake away from plants and dispose of them (take your rotary lawn mower and mow over top of bed setting blade about 4").
2. Cut back rows with a cultivator, rototiller or hoe to a strip 12-18 inches wide.
3. Thin the plants leaving only the most healthy and vigorous. Plants should be about six inches apart in all directions.

Insect and disease problems: Although strawberries can have their share of insect and disease problems, most homeowners ignore them unless they become serious. Following these six precautions should minimize pest problems.

1. Use only certified virus free plants for setting.
2. Choose well-drained soil; follow rotation recommendations and have nematode assay made.
3. During harvest remove berries damaged by diseases and insects as this reduces the amount of fruit rot.
4. Properly renovate beds to remove older diseased foliage and keep them from getting too crowded.
5. Don't keep a planting in production too long; start a new planting every year or two to replace old plantings after their second or third crop.
6. Do not allow insects and diseases to build up.

Follow recommendations in Fruit Disease Information Note (FDIN 005), Strawberry Diseases and thier Control, to achieve control of diseases. http://www.ces.ncsu.edu/depts/pp/notes/Fruit/fruit_contents.html