



GROWING STRAWBERRIES IN YOUR HOME GARDEN

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Growing strawberries in your home garden can be an interesting and rewarding experience. By growing various cultivars (varieties) of strawberry, you can pick ripe fruit from late spring until frost. If you care for plants properly, you can obtain enough berries for your family from a relatively small area.

Strawberry plants have a short, compressed stem called a crown. The crown produces a whorl of leaves, fruiting structures (inflorescences), branch crowns, and runners. (Runners, also called “daughter” plants, can be used to propagate new strawberry plants.) The strawberry fruit is fleshy, with achenes (seeds) on the surface. The fruit is topped by a calyx—a green, leafy cap—which might remain on the plant when the fruit is picked.

Types of strawberries

June-bearers

- One crop per year (in June and July)
- Produce many runners

Everbearers

- Two crops per year (June–July and fall)
- Produce few runners

Day-neutrals

- Crop almost continuously (late May until frost)
- Produce few runners

You can choose from various cultivars (varieties) available for each type of strawberry.



Figure 1. Tillamook, a June-bearing strawberry, in the second fruiting season.

Strawberry types are June-bearers, everbearers, and day-neutrals. June-bearers produce only one crop a year, in June and July. Everbearers produce two crops—one from June through early July and another in the fall. Day-neutrals produce fruit almost continuously through the growing season except when it’s very hot; then, flowers do not form. All types are self-fruitful, so you need only one cultivar for pollination and fruit production.

The fruit of everbearers and day-neutrals typically is smaller, and total seasonal yields often are lower, than those of June-bearers. However, the advantage in growing these types along with June-bearers is that you can harvest fruit for most of the growing season. Day-neutrals are the better choice for fresh fruit throughout the season, as they have a longer fruiting period and better fruit quality. Unfortunately, retail nurseries often lump day-neutrals and everbearers together, calling both “everbearers.”

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For more information on strawberry cultivars adapted to Oregon growing conditions, see *Strawberry Cultivars for Oregon* (EC 1618).

Selecting a site

Strawberries require direct, full sunlight for best production. They bloom early in spring, so don't plant them in frost pockets—that is, low-lying areas into which cold air drains, or areas where cold air is trapped (for example, a site surrounded by tall trees).

Strawberry plantings can remain productive for 3 or 4 fruiting years. You can minimize many insect and disease problems by rotating the strawberry patch from one site to another each time you make a new planting. See “Planting systems,” page 3.

Avoid planting where tomatoes, peppers, potatoes, eggplants, strawberries, raspberries, or blackberries have grown in the past 3 years. These plants all can be hosts for fungi that cause diseases such as *Verticillium* wilt, and for insect pests that build up in soil unless you follow a rotation schedule of at least 3 years. Strawberries are subject to several virus diseases that are transmitted to the new runner plants, mainly by aphids.

Selecting a cultivar

Various types of strawberry differ in fruiting season and cultural requirements, and cultivars within a type differ in fruit quality and flavor, appearance, tolerance to pests, cold hardiness, plant longevity, and processed-fruit characteristics.

June-bearing cultivars, the most common, include ‘Hood’, ‘Totem’, ‘Benton’, and ‘Tillamook’. June-bearers produce many runners.

Everbearing strawberries produce few runners; cultivars include ‘Quinault’ and ‘Fort Laramie’. Day-neutrals produce fruit in cycles from early spring until frost; cultivars include ‘Tristar’, ‘Tribute’, and ‘Selva’. Day-neutrals generally produce fewer runners than June-bearers.

Capping or hulling a strawberry fruit means removing the green stem and leafy part attached to the berry. You can do this by hand (long fingernails help) or use a strawberry huller, available in most kitchen supply stores.

Note: Some cultivars are easier to cap than others or the cap stays on the plant when you pick the ripe fruit. If you make a lot of preserves or freeze a lot of berries, you may want to consider this when you select a cultivar.

It's important to choose a cultivar adapted to your needs and site. Whichever type and cultivar you choose, buy only certified, disease-free plants from a reputable nursery. Even though it's tempting, because it's easy and free, don't start your new planting with plants from your old patch or someone else's; this could introduce pest-infested soil and virus-infected plants to your new planting.

Establishing your planting

Preparing the soil

Strawberries will tolerate a wide range of soil types if you properly modify the soil. The soil should be well drained—strawberries can't tolerate standing water or “wet feet.” They grow best in a raised bed of well-drained loam soil, high in organic matter, that has a pH between 6 and 7.

Avoid planting in heavy clay soils. If the only soil available has poor drainage, you may be able to improve it by tiling and adding organic matter. Planting on ridges or raised beds also helps if soils drain poorly. A raised bed should be about 1 foot high; width depends on how many rows are on each bed (see “Planting systems,” page 3). Raised beds can be constructed with wood walls, but walls are not necessary if you can form a raised bed by hilling natural soil and incorporated organic material.

A good supply of organic matter in the soil improves aeration and drainage and increases

water-holding capacity. Apply organic matter the summer or fall before you plant; manure, applied at 2 to 3 cubic yards per 100 square feet, is a good source. You also can use decomposed (rotted) compost, leaves, or sawdust.

Use only materials that you believe are free from insects and weed seeds. Dig, plow, or till the material into the soil to ensure that it will be well decomposed by planting time. If you incorporate large amounts of nondecomposed material into the soil, add calcium nitrate (16 percent nitrogen) at 2 pounds per 100 square feet to aid in decomposition.

It's best to check the soil pH 6 months to a year before you plant. If the soil is too acidic (pH below 6), add lime as recommended by the soil analysis. (For more information about soil testing, see *Laboratories Serving Oregon: Soil, Water, Plant Tissue, and Feed Analysis*, EM 8677, and *Soil Sampling for Home Gardens and Small Acreages*, EC 628.

In the year before you plant, eliminate all perennial weeds from the planting site. Prevent weeds from going to seed!

Planting systems

The matted-row and the hill systems are the most common for strawberries. The hill system is preferred for everbearers and day-neutrals, because they don't produce as many runners as June-bearers. June-bearers usually are grown in a matted row, but you also can grow them in a hill system.

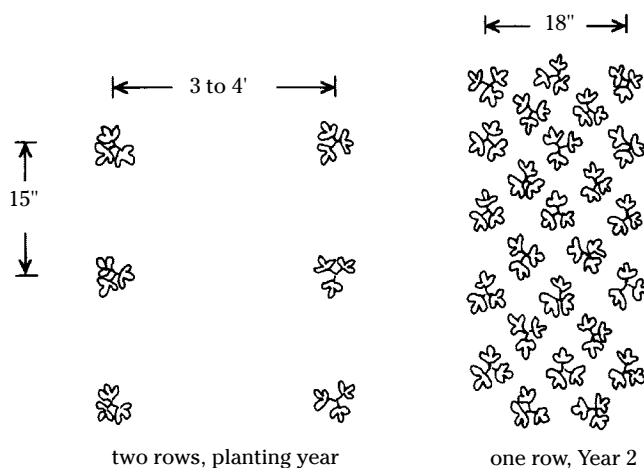


Figure 2. Proper spacing in the matted-row system.

In the matted-row system, set plants about 15 inches apart in the row (or on the raised bed), with 3 to 4 feet between rows (Figure 2). Allow the early runners—in the Willamette Valley, those formed from the “mother” plants before September 1—to develop and root. Sweep them into the row area before they root, maintaining a matted row width of 12 to 18 inches. Keep the remaining 1½ to 2½ feet between rows clear by sweeping early runners into the row and by cutting off late-forming runners that grow into the aisle or off the edge of the raised bed (Figure 3).

June-bearers develop flower buds in late summer for next year's crop. Thus, early-rooted runners are more productive than late-rooted ones, because they have more time to grow before the flower bud initiation period.

The hill system is ideal for cultivars that produce few runners, such as everbearers and many day-neutrals, but it also can be used for June-bearers. Set plants 12 to 15 inches apart in double- or triple-wide rows (on raised beds if necessary). Aisles should be 1½ to 2 feet wide (Figure 4, page 4). In the hill system, cut off all runners every 2 to 3 weeks. It's best to wait until runners have formed a daughter plant but have not yet rooted (Figure 5, page 4). Removing runners before this time often encourages the plant to produce even more runners.



Figure 3. Matted row of June-bearing strawberry in the first fruiting season.

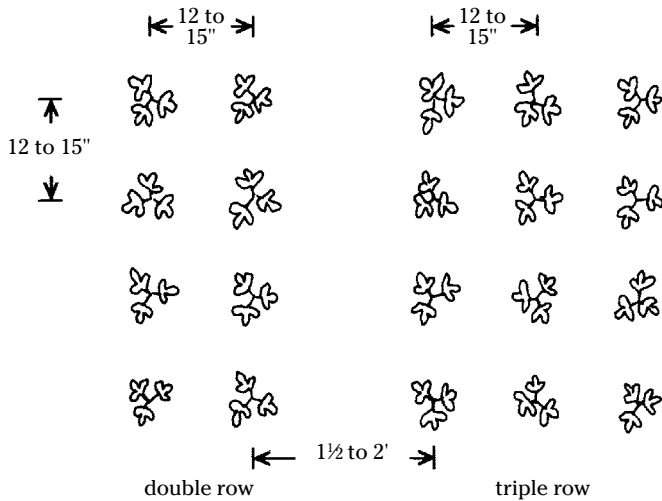


Figure 4. Proper spacing in the hill system.

What planting system should you choose?

- *In the matted row*, the runners produced are allowed to fill in a space 12 to 18 inches wide (Figure 2).
- *In the hill system*, you must remove all runners that are produced.
- *Grow everbearers and day-neutrals in a hill system*, as these types produce few runners and won't form a nice matted row. You can grow June-bearers in either system.

Matted row versus hill system

- *The matted row* requires less labor to maintain and is productive. However, if you let the row get too dense, diseases such as fruit rot may become more of a problem, and fruit will be smaller.
- *The hill system* can produce both high yields and large fruit, provided you diligently remove all runners that are produced before they root. The plants will branch and become very productive.



Figure 5. A hill system on raised bed. Runners should be removed at this stage, before rooting, to maintain the hill system.

Planting

Purchase certified disease-free plants from a nursery. Plant as early as you can work the soil in spring. If you buy plants but can't put them in immediately, "heel" them into moist soil or sawdust to prevent the roots from drying.

Planting depth is very important for strawberries! At planting, dig a hole for each plant large enough to accommodate the roots without bending them. Spread the root mass and set the plant at the same depth it was in the nursery container. For bare-root plants, the midpoint of the crown should be level with the soil surface; the topmost root should be just below the soil surface (Figure 6, page 5) and not exposed to air even after a good irrigation. If you set plants too low (Figure 6), the growing tip at the top of the crown may be smothered and rot. Cover roots with soil and press firmly to remove air pockets. Water the plants to settle the soil.

June-bearers produce very little fruit in the planting year. Everbearers and day-neutrals produce a "baby" crop in the planting year. Plants will be in full production the next year ("first fruiting season") and generally are productive for two to four fruiting seasons (1 to 5 full years in the ground). Start your new patch in the year of your existing patch's last fruiting season, so you won't skip a year of production.

Container growing

You can plant strawberries in barrels, planters, or hanging baskets, though fruit production in hanging baskets might be disappointing. These plantings require close care in watering, fertilizing, and other cultural steps.

Day-neutral types are best suited for container production. You will need to remove runners. Containers and soil mixtures should permit excellent drainage. A recommended soil mixture is one part sand, one part finely ground fir bark, and two parts garden or potting soil. Before planting, you can mix in about 8 cups of slow-release (sulfur-coated) fertilizer per cubic yard of the growing medium.

First season's care

Fertilizing

A good guide for fertilization is to observe plant growth. Leaves should be a healthy green; a pale green or yellow and poor runner growth may indicate nitrogen deficiency.

In the planting year, fertilize plants with a total of 2 ounces of nitrogen (N) for each 10 feet of row. Use a well-balanced fertilizer such as 16-16-16. To calculate how much product to apply during the year, divide the amount of N you need to apply (in this case, 2 ounces) by the percentage of N in the fertilizer (16%, or 0.16). Thus: $2 \div 0.16 = 12.5$ ounces of fertilizer per 10-foot row).

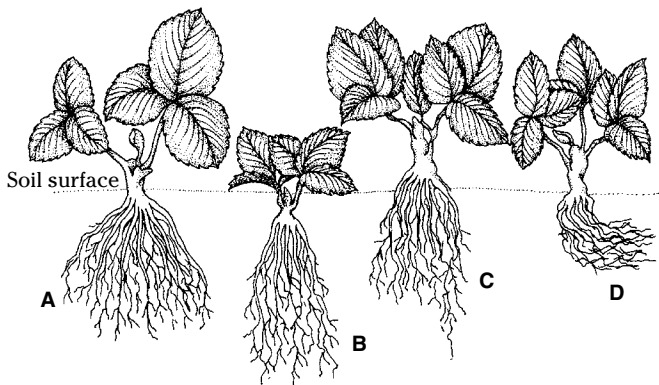


Figure 6. Proper planting depth (A) and improper depths (B, C, D). In B, the crown is too deep; in C, the crown is too high; and in D, the roots are bent and remain near the surface.

Checklist for establishing your planting and care in the first year

- Choose a good site.
- Eliminate all perennial weeds prior to planting and annual weeds as they appear.
- Choose a cultivar(s) suitable for your needs and site.
- Choose a planting system.
- Prepare the soil by adding organic matter and lime, if necessary, and by forming raised beds if desired.
- Apply fertilizer, if necessary.
- Till the soil.
- Purchase certified disease-free plants.
- Plant in the spring, setting plants to the correct depth.
- In the hill system or plants in containers, remove all runners as they form.
- In the matted row, train runners to the row (12–18 inches wide); remove all runners that form after September 1.
- Irrigate as required.

In new plantings, do not apply all the fertilizer at once. Instead, divide the total amount into thirds, and apply the first third 2 weeks after planting, the next third 1 month later, and the final third an additional month later. (This assumes you planted your strawberries in early spring.)

Broadcast the fertilizer—spread it evenly over the soil surface in the row in a band a little wider than the row width. To avoid burning plants, broadcast the fertilizer when strawberry foliage is dry, and avoid getting fertilizer directly on plants' crowns. After broadcasting, remove fertilizer from leaves and crowns by brushing or by sprinkler irrigation, and irrigate right away.

If you use manure, wait until late fall or early winter to apply it. Manure applied in early fall might cause strawberry plants to grow later in the season than they normally would, making them

more susceptible to winter injury. When you use manure, reduce the nitrogen fertilizer rate by one-half.

Irrigation

Strawberries have shallow roots. To get maximum growth and yield, never let plants be stressed by lack of water. Keep newly set strawberries well irrigated. The plants will need about 1 to 1.5 inches of water a week; supplement rain with irrigation as needed. If your soil is sandy, you will need to pay more attention to watering and fertilization. Often, plantings on sandy soil require more frequent and lighter applications of water and fertilizer.

Weed management

Weeds compete with the shallow-rooted strawberry plant for water and nutrients, and weeds often harbor insects and diseases. Hoe around the strawberries often enough to destroy weeds and keep soil loose. This promotes good growth and permits runner plants to root quickly when establishing the matted row.

You can use sawdust or bark mulch or black plastic in the row to keep down weeds, conserve moisture, and keep fruit clean. (Mulches may lead to an increase in slugs, however.) Mulch is particularly useful for hill-system plantings. Avoid covering the top of the crown or growing point of plants with sawdust or bark mulch.

While black plastic is very useful as a mulch in hill system plantings, clear plastic isn't as suitable, because weeds thrive underneath it. You can apply plastic most easily just before or just after planting. Before planting, place the plastic over the planting area or raised bed. Overlap the edges of plastic and hold them down with soil. Cut circles 6 inches wide in the plastic where you'll set the plants. Plant through these holes.

If you lay plastic just after you plant, feel for the plants under the plastic and carefully cut holes around them. The holes cut in the plastic do allow some weeds to grow around the plants, but the holes are necessary to ensure that plants get enough water and fertilizer.

Using drip irrigation under the plastic is ideal.

Although runner plants can't root through plastic, you still should cut off runners; otherwise, the "mother" plants get weak.

Care of established plantings

Winter and frost protection

In western Oregon, don't protect strawberry plants from winter cold. However, east of the Cascades, protection might be necessary.

In eastern Oregon, minimize cold damage by covering plants with 2 to 3 inches of loose straw after temperatures first drop below freezing. Remove straw once the risk of severely cold temperatures has passed. It's important to avoid placing straw on the plants too early or leaving it on too late in spring.

Strawberry flowers can be killed by frost during bloom; open flowers are damaged below 30°F. Frost-damaged flowers have black centers and produce either misshapen fruit or no fruit at all. If frost is forecast during bloom, protect a small strawberry planting by placing a sheet of spun-bound polyethylene row cover over the plants. Put the cover on in early evening and remove it in the morning once the risk of frost injury has passed.

Fertilizing

It's best to fertilize established June-bearing strawberries in late summer to promote growth. Fertilizing strawberries in spring is not recommended except in weak plantings. Spring fertilizing results in excessive runner formation and leaf growth—the latter can promote fruit rot—and doesn't promote more or larger berries. If you use manure, wait until late fall to apply it.

The best time to fertilize established June-bearing strawberries is at renovation (see page 7). Fertilize plants with a total of 2 ounces of nitrogen for each 10 feet of row. If you use a well-balanced fertilizer such as 16-16-16, apply 12.5 ounces of fertilizer product per 10-foot row. Broadcast the

fertilizer all at once, spreading it evenly over the entire row length and width. Irrigate right after fertilizing.

If you aren't mowing the plants (see "Renovation"), brush or wash the fertilizer off the leaves.

Give day-neutral or everbearing types the same amount of fertilizer, but divide it into thirds or fourths and apply in equal installments from spring through early August.

Irrigation

During the growing season, established strawberries need about 1 to 1.5 inches of water per week. On sites with sandy soils and on any site during very hot weather, plants may need more water. If rain isn't adequate, irrigate the plants.

Wet the soil 6 to 8 inches deep with each irrigation. Don't apply so much water that soil is saturated (excessively wet) for long periods. Standing water is harmful, even for a day or two.

After the first season, there are two critical times when good soil moisture is important. The first is from just after bloom through harvest, to

ensure the berries swell to maximum possible size. The other is from late August through early fall, when the plant resumes growth and forms flower buds for the following season's crop.

Weed management

Keep the planting free of weeds by cultivation or hand pulling. Check with your county office of the OSU Extension Service or a garden supply store for herbicides registered for use on strawberries in the home garden.

Renovation

June-bearers can be maintained for several fruiting seasons if properly managed and renovated after harvest (Figure 7). Renovation improves the next season's yield and may decrease fruit rot significantly, especially if leaves are removed from the planting. The planting should be vigorous and relatively free from weeds, insects, and diseases. Renovation is not recommended for day-neutrals or everbearers, because they are still fruiting in late summer.

- After harvest, mow foliage to about 2 inches above the top of the crowns. The best time to mow in western Oregon is from July 14 to August 1. Use hedge clippers or a rotary mower with the blade raised high. Remove and burn or bury all plant debris to reduce disease risk. Take care not to damage the crowns.
- Narrow the rows to about 10 inches wide by using a tiller, shovel, or hoe (go no deeper than 1 to 2 inches).
- In older plantings, thin out old and weak plants, leaving vigorous 1-year-old plants. (This is time consuming, however, and not absolutely necessary.) The best plant density is about five to six plants per square foot of row.
- Remove weeds and keep the planting free of weeds. Rake new runners into the row.
- Fertilize (see page 6).
- Irrigate as needed.



Figure 7. June-bearers about 2 weeks after renovation in mid-August.

Checklist for taking care of your mature planting

All types

- Protect the planting from frost if possible. Avoid planting in frost pockets, or use row covers.
- Control weeds.
- Irrigate as required.
- In the hill system, remove all runners that form.
- In the matted-row system, train runners to the row (12–18 inches wide); remove all runners that form after September 1.

June-bearers

- Pick fruit from June to July.
- Renovate the planting after harvest, or remove it if it's no longer productive.
- Fertilize in late summer.
- Irrigate if necessary.

Everbearers and day-neutrals

- Pick fruit in June and July and in the fall (for day-neutrals, pick throughout the season).
- Remove the planting if it's no longer productive.
- Fertilize; make three or four applications from spring through early August.
- Irrigate if necessary.

To renovate June-bearers in the hill system, mow off foliage 2 inches above the crown, remove and burn or bury all plant debris, and remove all runners through the fall.

Remove all plantings that are no longer productive or that lack vigor (generally, plantings that have had three fruiting seasons). Start a new planting in another location during the last year your existing planting is fruiting.

Harvest

Pick fruit every few days, depending on cultivar and weather. Warm temperatures and/or rain necessitate more frequent harvesting. Pick all ripe berries; fruit left on the plant becomes overripe, and disease and insect problems may develop.

Harvesting in the morning and picking fruit so that its green, leafy cap stays on usually give a longer shelf life. Avoid washing fruit until just before using it, to prevent softening and decay.

Expect yields of 1 to 2 pounds per plant or 15 to 20 pounds per 20-foot row. Yield varies greatly with cultivar and age of planting; the best yield is usually in the year after planting.

Pest and disease problems

The most serious disease problems of strawberry are Botrytis fruit rot, root rot, and Verticillium wilt. Insect problems include root weevil, aphid, spider mite, crown moth, and symphylan. Photos and suggested control measures for these pests are in Extension's online PNW pest management handbooks at <http://pnwpest.org/>

For more information

Strawberry Cultivars for Oregon, C. Finn and B.C. Strik, EC 1618

Laboratories Serving Oregon: Soil, Water, Plant Tissue, and Feed Analysis, J. Hart, EM 8677.

Pacific Northwest Insect Management Handbook and *Pacific Northwest Plant Disease Management Handbook*. Revised and reissued annually. <http://pnwpest.org/>

Soil Sampling for Home Gardens and Small Acreages, M. Rebotham and J. Hart, EC 628.