W1297C

Planting and Managing Strawberries for Residential Production in Tennessee

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Strawberries are one of the most versatile home fruit crops because they can be grown in a range of planting areas from containers to in-ground plantings. They are a rapidly producing crop with fruit usually harvested a little over a year (or less for some types) after planting. With moderate care requirements and good production potential, strawberries are a crop that can be incorporated into many gardens.

<table>
<tr><td>Month</td><td>Jan</td><td>Feb</td><td>Mar</td><td>Apr</td><td>May</td><td>June</td><td>July</td><td>Aug</td><td>Sept</td><td>Oct</td><td>Nov</td><td>Dec</td></tr>
<tr><td>Plant mgt</td><td></td><td colspan="2">Prepare beds and fertilize (1st year)</td><td colspan="2"></td><td colspan="2">Renovation (2nd year after year)</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Nutrient mgt</td><td></td><td colspan="2">Fertilize 2nd year after and after</td><td colspan="2">Fertilize (1st yr)</td><td colspan="2">Fertilize after Renovation</td><td colspan="2">Third fertilization (1st yr)</td><td colspan="2">Soil test to check soil pH/ nutrient levels</td></tr>
<tr><td>Water mgt</td><td></td><td></td><td></td><td colspan="7">Irrigate as needed to provide 1-1.5” week</td><td></td><td></td></tr>
<tr><td>Temp mgt</td><td></td><td colspan="2">Remove mulch as weather allows</td><td colspan="2">Cover with row cover if late frosts are forcast</td><td></td><td></td><td></td><td></td><td></td><td></td><td>Add Mulch</td></tr>
<tr><td>Pest mgt</td><td></td><td></td><td></td><td colspan="6">Scout for insect pests and add netting to protect fruit from wildlife</td><td></td><td></td><td></td></tr>
<tr><td>Growth stage- short day</td><td colspan="2" rowspan="2">Dormant</td><td colspan="2">Flowering induced as temps warm</td><td>Fruit expansion and harvest</td><td colspan="2">Runner growth in long days</td><td colspan="2">Flower initiation with short days</td><td colspan="2" rowspan="2">Going into dormancy</td></tr>
<tr><td>Growth stage- day neutral</td><td colspan="8">Flowering and fruiting at multiple points during growing season with more production in cooler parts of season.</td></tr>
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Selecting Strawberries for Residential Production in Tennessee

Strawberries (*Fragaria x ananassa*) for the garden are found in two main types. The most familiar are often called June bearing with one fruiting period in May and/or June in Tennessee. Botanically, this type is also called short-day because their flowers were initiated the previous fall as days became shorter. The concentrated harvest period and generally higher overall yield and number of cultivars to choose from make June bearing the most popular type. The second type, often called day neutral, has multiple smaller harvest periods throughout the summer. These multiple harvests can be appealing, but the yield is often lower than June bearing.

Cultivars of both types can be found at local nurseries or garden centers, but the best selection is generally found from larger producers where gardeners are able to do online or mail orders. Disease resistance, productivity as well as taste quality and timing within the season are key selection criteria. More information can be found on a range of cultivars in the UT Extension publication W-895C Selecting Strawberries for Residential Production in Tennessee.

Preparing for Residential Strawberry Production – Selecting Growing Systems

Strawberries require full sun and prefer soil pH between 6.0 and 6.5. Sandy or loamy soils are often best, but clay soils may be used if combined with high organic matter and good drainage, which is essential for strawberries grown in all soil types. Strawberries are susceptible to Verticillium wilt, a soil-borne disease common in tomatoes, potatoes and peppers. Therefore, select a site that hasn't been recently used for those crops. Also avoid planting strawberries where sod has recently been removed because of the potential for any remaining grubs to damage the young plants. Select a site without weed issues, or use solarization, tillage or herbicides to control weeds before planting. In addition to sod and weed control, selecting a site for strawberries the year prior to planting enables soil testing and amending to be done in the fall before planting.

Another critical aspect for preparation is deciding whether you want to plant new strawberries annually or maintain them as a perennial crop for several years. Strawberries are unique among fruiting crops because they are herbaceous (not woody) and perennial. Strawberries have a compressed stem called a crown and modified stems called runners (botanically they are stolons) that spread and form new daughter plants naturally. This self-propagation tendency can be used in the garden to generate planting areas that bear fruit for many years. This method, called matted row, is the most common in the garden. Runners are allowed to grow and produce daughter plants beside current mother plants. From the second year of growing onward, some older plants are removed each summer (called renovation) to regenerate the bed and enable longer term production. The term matted row refers to the daughter plants growing among mother plants. Thinning out the older plant population during renovation allows room for younger plants, reduces disease and pest issues, and increases yield potential. In warm, humid areas like Tennessee, one of the main limitations of matted row growing is the build-up of disease. Therefore, selecting cultivars resistant to common diseases as well as using good cultural practices to prevent disease is crucial for the longevity and productivity of matted row growing areas.

Annual production is the method used almost exclusively for commercial growers. Strawberries are grown as an annual crop planted on plastic covered raised beds (often called plasticulture) in the late summer or fall. They are overwintered and harvested during the next spring and early summer before being removed. Cultivars that don't perform well in matted row due to heavy disease pressure over time can be grown in the annual system. Reference W-895C Selecting Strawberries for Residential Production for more information on cultivar selection.



Figure 1. *This is a dormant bare root strawberry plant showing the crown and roots right before planting.*



Figure 2. *This is an example of a strawberry plug with an actively growing plant with shoots and roots.*

Strawberry Planting and Establishment

Plants can be purchased as bare root dormant plants or as actively growing plugs. It is more common to plant plugs in the annual system in the late summer/early fall while matted row beds are usually planted with bare root dormant plants in the spring. Whether using the matted row or annual growing system, several cultivars can be grown to extend the harvest season. Purchase only disease-free plants of well-adapted cultivars from reputable sellers (see potential supplier list in the cited resources at the end of the publication).



In matted row production, plants are often set out three or four weeks before average last frost date. Spacing is usually 18 to 24 inches apart in rows with 2 to 3 feet between rows. Strawberry beds for matted row are often designed to be 8 feet wide to provide space for two 2-foot plant rows and two 2-foot aisles. When renovation is performed, the old rows are tilled, and the young plants in the old aisles become the new rows.

Plant strawberries so the soil level is in the center of the crown. Roots should be spread out with the soil gently tamped down around them to ensure there is good root-to-soil contact to support water uptake. In the first summer, remove flowers to support plant establishment. The flowers are removed to help the strawberries become firmly established for winter dormancy and to encourage runner production. If you are using the matted row system, allow runners. The first harvest of matted row strawberries will be a little more than a year after planting in the next spring/early summer.

In annual growing, plants are generally planted as plugs or rooted tip cuttings in the late summer or early fall. Plants are installed so the soil level is at the media level of the plug or cutting. Plastic beds could be used, or strawberries could be grown using the annual method in raised beds or containers in smaller space garden areas. For annual planting, strawberry plants are often placed on raised beds in double rows that are a foot apart with a foot between plants. Because runners will not be allowed to produce new plants, closer spacing is possible. Drip irrigation is also usually needed in the annual or hill system to support good plant health and growth as raised beds dry out faster. With annual plantings, extra care is often needed to protect plants from spring frost damage as bloom time will be earlier than in matted row.

Strawberry Site Management – Nutrient and Water Management

Prior to planting, follow soil test recommendations for fertilizer needed to supply needed nutrients. In the first summer after planting, two applications of nitrogen are recommended about a month after planting and again in mid-August. In subsequent years, the ideal time to apply fertilizer to strawberry plantings is after harvest at renovation and again in late August or early September. Nitrogen should not be applied before or during harvest as it can reduce fruit quality and increase disease risk. Apply fertilizer when the leaves are dry and promptly brush off fertilizer and prevent it from burning the leaves.

Table 2. Fertilizer needed for an 8'x30' matted row strawberry bed (~250 square feet)

Timing		Nitrogen*	Phosphorus*	Potassium
Planting year	Prior to planting	0.2 lb	0.3 lb if low 0.6 lb if med 0.9 lb if high	0.3 lb if low 0.6 lb if med 0.9 lb if high
	1 month after planting	0.2 lb	None	None
	August	0.2 lb	None	None
Subsequent years	March	0.2 lb	None	None
	At renovation in June	0.4 lb	0.3 lb if low 0.6 lb if med 0.9 lb if high	0.3 lb if low 0.6 lb if med 0.9 lb if high

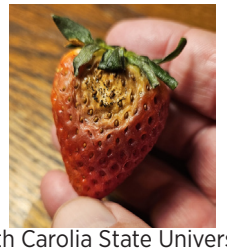
Recommendations for matted row production are adapted from the Mid-Atlantic Berry Guide

Irrigation is suggested for good productivity in strawberries in Tennessee regardless of the type of growing method. Strawberries do not have a deep root system, so even moisture is needed for good productivity. Overhead watering increases the risk of fungal diseases. Drip irrigation is the best option to reduce leaf wetting that increases disease risk.

Strawberry Plant Management – Care and Renovation

Mulches are a good method to moderate soil moisture and reduce soil splash to keep berries clean. Two to 4 inches of pine needle or wheat straw mulch works well as a soil covering. The use of plastic mulches is limited in matted row production due to daughter plant establishment. Straw or pine needle mulches are also often applied as a plant covering in early winter after the plants have been exposed to several freezes and are fully dormant. This timing protects plants from winter injury. When growth begins in early spring, most of the mulch should be removed to allow sunlight to reach the leaves. Mulch pulled off the plants can be placed in walkways to help suppress weed growth and keep fruit on the row edges off the soil. Leaves should not be used for mulch because they smother plants. Mulches may provide shelter for rodents, but the benefits of mulching generally outweigh potential problems.

In the matted row system, renovation is the annual process of removing the parent plants and renewing the strawberry bed to support production and health. This process usually occurs shortly after harvest and is combined with weeding and summer fertilization. The first step is to mow or clip off the leaves and broadcast or brush in the recommended fertilizer. Next, cultivation (roto-tilling or turning under by hand) is performed in strips to narrow the rows or create new walkways in the beds. Typically, new walkways 18 to 24 inches wide are tilled to create new 12-to-18-inch rows of young plants. This cultivation will also remove many weeds and incorporate the just broadcast fertilizer. It is important to water well after renovation and manage weeds throughout the summer.

Common issues for home garden strawberries	
Anthracnose is one of the most important diseases we see in home garden strawberries. While the damage on the fruit is severe, it can also infect the leaves. Selecting cultivars with some resistance to Anthracnose is preferred as well as ordering certified disease-free plants. While there are fungicides options to reduce the impact, gardeners should be prepared to replace the planting if Anthracnose becomes a serious issue.	 Madeline Dowling, Clemson University, Bugwood.org
Botrytis, or gray mold, is a common issue on strawberries affecting plants, blooms and fruit. While there are control materials labeled for Botrytis, the best control is addressing the environmental influences and trying to prevent long periods of high humidity and low air movement around the plants.	 Whitney Cranshaw, Colorado State University, Bugwood.org
Spider mites can be a serious pest of strawberries and are more prevalent if growing in high tunnels or greenhouses. It is best to scout closely to find infestations before webbing occurs (seen in image on right), which often indicates significant populations. Insecticidal soaps and oils can be used to address mite issues but may require repeated applications.	 Whitney Cranshaw, Colorado State University, Bugwood.org
Slugs can be a pest of strawberries. The image on the right shows feeding damage. They can be difficult to treat and control. One of the best techniques is to remove the mulch cover and moisture to reduce their habitat and shelter.	 Ontario Ministry of Agriculture and Food
Neopestalotiopsis is an emerging and damaging fungal disease that can impact the fruit, the crown, the root and the leaves. It was first seen in eastern US fields around 2018 and often results from infections already present in plants from suppliers. Leaf spots and crown infections are often observed that can look like other diseases. Fruit rots can look like Anthracnose but have small black spores. Purchasing disease-free plants is important and current research is focused on resistant cultivars and management practices.	 Bill Cline, North Carolia State University Extension

Strawberry Pest and Disease Management and Harvest

There are several leaf diseases that impact strawberries. Buying disease resistant cultivars and disease-free plants is a crucial first step towards prevention. Good air flow through the planting also reduces leaf disease risk and fruit rots, such as botrytis. One of the most severe is Anthracnose, which affects leaves, stems and fruit. In fact, Anthracnose is often the disease that reduces yield to the point that matted row plantings are discontinued. Birds are one of the most prominent pests attacking strawberries in home gardens, so netting may be required. For small home plantings, placing red painted rocks amongst the plants before the first fruit helps to discourage birds.

In the home garden, strawberries should be allowed to become fully ripe before harvesting. This is because sugar content is highest and flavor is at its peak during this time. To prevent bruising, berries should be picked carefully by the stems. Berries will not keep long on the plant, so daily harvest will likely be needed during the most productive times in the season. Strawberries can be stored in the refrigerator for a few days.

References and Online Resources

UT Extension publication W-895C Selecting Strawberries for Residential Production in Tennessee: **tiny.utk.edu/W895C**

Strawberry Growers Information: **strawberries.ces.ncsu.edu/strawberries-plasticulture-considerations-varieties/**

Integrated Pest Management Guide: **smallfruits.org/files/2019/06/StrawberryIPMGuide.pdf**

Book: The Mid-Atlantic Berry Guide for Commercial Growers, published by Pennsylvania State University Extension

Potential Suppliers: **docs.google.com/spreadsheets/d/1-CrNOZh_R770bJJ9jQkkBadA9KLhkmyResRWJ5NJVEU/edit?usp=drive_link**



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