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# Low Tunnel Strawberry Guide for Home Gardeners on the Texas High Plains

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Strawberries (*Fragaria ananassa*) are a very popular small fruit for home gardeners. On the High Plains of Texas and in surrounding regions, strawberries can be difficult to grow, often leaving home gardeners feeling very frustrated. However, with proper growing techniques, transplant timing, and tender loving care, high yielding and quality strawberries can be achieved (see Figure 1).



Figure 1. Strawberries ready to be harvested on March 2, 2012 in high tunnels located at the Texas A & M AgriLife Research and Extension Center at Lubbock. Photo credit: Russ Wallace.

## GARDEN AND SOIL PREPARATION

Strawberries prefer a sunny location with good quality soil that is protected from high winds. Certain strawberry cultivars can be

very sensitive to high winds, blowing dust and plant damage can reduce berry number and development. Research has shown that when provided with wind protection, strawberry yields and quality increase significantly (Wallace, 2012). For more information on wind protection and low tunnels see section titled '*Constructing a low tunnel for strawberry home gardens.*

Strawberries grow best on well-drained soils. Adequate drainage can be improved by planting strawberries on beds raised 6 to 12 inches. Strawberries also prefer soils with a pH range of 6.5 – 7.0. However, soils on the Texas High Plains generally have soil pH from 7.5 – 8.3. Iron deficiency may cause leaf yellowing, and thus iron chelates may be sprayed to improve growth. Soil tests should be considered prior planting, and every few years to evaluate the soil.

Recent strawberry evaluations at the Texas A & M AgriLife Research & Extension Center at Lubbock have shown excellent yields even on soils with a pH of 8.1. Soil pH can be lowered temporarily using organic materials including compost, peat moss, pine needles, humic acid, or sulfur. Some fertilizers including forms of

urea, ammonium sulfate or ammonium nitrate can also help. Strawberries should be fertilized with at least 1.0 lb/100 sq. ft. of a balanced fertilizer (e.g. 13-13-13) at transplanting and periodically during strawberry growth.

Strawberries perform best when given uniform irrigation. Low humidity and windy conditions found on the Texas High Plains throughout late winter and spring can quickly deplete soil moisture resulting in poor growth and development. Use of drip irrigation or a soaker hose placed beneath black plastic mulch is recommended, and when regularly irrigated, this will reduce soil moisture evaporation. In addition, use of black plastic mulch can help raise soil temperatures during cooler temperatures improving crop growth.

## TRANSPLANTING STRAWBERRIES

Strawberries can be purchased as bare rooted plants or as rooted plugs. Most local nurseries sell rooted plugs which can be easily transplanted into the garden. If transplanting bare root plants, be sure to not let the roots dry out. Prune any dead or dying roots and spread the roots out to increase rooting. When using rooted plugs, transplant the entire plant, including the soil around the roots.

Using black plastic mulch to grow strawberries is encouraged, and will help increase strawberry growth, reduce soil moisture evaporation, and control weeds. Holes should be punched into the black plastic mulch at regular intervals, generally

with an in-row spacing of 12-inches. Strawberries can also be transplanted in multiple rows spaced 12-inches apart, though it is best to stagger the plants 6-inches in alternate rows to improve uniformity of plant growth and development.

When transplanting bare root plants or rooted plugs be sure and use the proper planting depth. All roots should be covered with soil, but do not cover the plant's growing point (also called the crown). When roots are left exposed, transplants may dry out and die. If planted too deep and the crown is buried, the plant may rot, or emerging stems and leaves may be damaged. Do not transplant any plants that are diseased as they may infect other plants. After placing the plant in the transplant hole, pack the soil firmly around the crown. At transplanting, it is a good idea to use a diluted fertilizer transplant solution to increase rooting and early growth, and prevent the plants from drying out.

In Texas, strawberries are best transplanted in the fall, generally between mid-September and late October. Unfortunately, most local nurseries sell strawberry plants in the spring. Trials at the Texas A & M AgriLife Research & Extension Center at Lubbock showed that when transplanted in the spring (March or April), that air temperatures quickly become too hot for strawberries, limiting growth and development (Wallace, 2012). As a result, it may be necessary to order strawberries from producers online, or discuss growing plants for fall transplanting with your local retail nursery.

## STRAWBERRY GROWTH

Plants will begin to grow by sending out new roots, shoots and leaves from the crown area, as well as runners (or stolons).

Runners are stems that have growing points the strawberry plants use to reproduce, generally forming a new plantlet which will root on exposed soil. During early growth, runners should be removed to allow the nutrients to be used for overall growth. If runners are not removed, they will try and spread out too early thereby reducing yields.

Fall-transplanted strawberries should be protected using low tunnels covered with clear polyethylene plastic and/or inside hoops covered with Spunbond row cover cloth. Unprotected plants may become stunted, or killed by freezing temperatures and high winds. Trials on the Texas High Plains showed that strawberry plants grown inside tunnels and covered with row covers were protected from colder outside temperatures (see Figure 2).

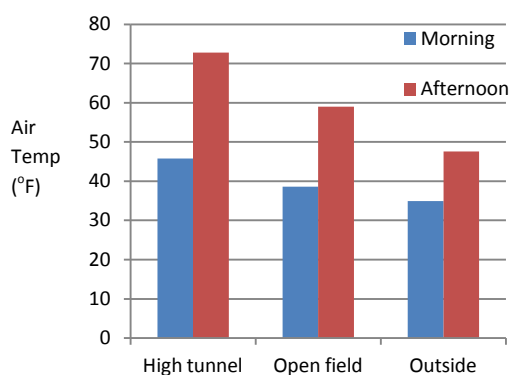


Figure 2. Difference in temperatures measured beneath Spunbond row covers for strawberries grown under high tunnels or in the open field at the Texas A & M AgriLife Research and Extension Center at Lubbock in 2012.

Strawberries are self-pollinating; however, honey bees are important to

increase fruit quality and yields. On the Texas High Plains, the winds can aid in the self-pollination process. Poorly-shaped berries may occur when winds and bees are absent resulting in cat-faced or irregularly-shaped fruit. Cold temperatures during the off- season (December through early March) may also result in misshapen and abnormal berries (see Figure 3).



Figure 3. Misshapen berries photographed March 22, 2012 resulting from poor pollination due to excessively cold temperatures. Photo credit: Pat Porter, Extension Entomologist; Texas A & M AgriLife Extension.

Periodically strawberries may need additional fertilizer throughout the season to improve plant health. Dilute fertilizers can be added to the soil through the drip system. Because strawberries are shallow-rooted, frequent irrigations are needed. Watch out for water that has high amounts of salts as these may burn the roots and plug drip system emitters. If salts do become a problem, flooding the entire garden with water may help push salts down below the root system.

Following peak yields (late March through May), strawberry runners may be allowed to grow and root, and if desired, plants may spread out in the garden area. In the system using black plastic mulch, it is

generally best to replant strawberries annually, though this adds more expense. However, strawberries on the Texas High Plains usually have difficulty spreading and growing from year to year given the low humidity and rainfall, higher soil pH, as well as the typical high winds.

There are many strawberry cultivars available for home gardeners. Strawberries generally fall into two fruit bearing categories: June-bearers primarily develop flowers in the early spring from buds that were developed during the previous fall, or under short-day conditions. June-bearing cultivars usually produce more fruit per plant than other types. Cultivars that showed excellent yields include ‘Chandler’, ‘Strawberry Festival’ and ‘Radiance’. Other cultivars that may be available at local nurseries include ‘Allstar’, ‘Surecrop’, ‘Cardinal’, and ‘Sequoia’, among others.

Ever-bearing strawberries usually produce fruit under long-day conditions. However, they do not produce a lot of runners, and therefore will not spread easily. Ever-bearers will produce a fall crop if they survive the summer heat. Day-neutral cultivars will produce under any day-length though temperatures above 70 °F will usually decrease flowering. Ever-bearing and day-neutral cultivars that showed a good response in the High Plains’ trials included ‘Albion’, ‘Seascape’, and ‘San Andreas’. Other cultivars to try include ‘Ogallala’, ‘Ozark Beauty’, ‘Tribute’, and ‘Tristar’. Much will depend on what your local nursery has available for sale.

## HARVESTING STRAWBERRIES

When transplanting in mid-September, and when using tunnels plus row covers for cold weather protection, research has shown that strawberries can be harvested at least once weekly beginning as early as late November (Wallace, 2012). However, during those colder months, berry pollination may be poor and quality reduced. Fruit taste and firmness may also be affected by the colder temperatures.

During peak harvest (March through May), it may be necessary to pick strawberries two to three times weekly, depending on temperatures and plant growth (Figure 4). Harvested berries should be fully ripe, as they will not ripen once picked. Pull berries off the plant and immediately place into containers. Be careful not to place berries too deep or bruising may increase berry rot. Also, refrigerate unwashed berries immediately, or wash and freeze for storage.

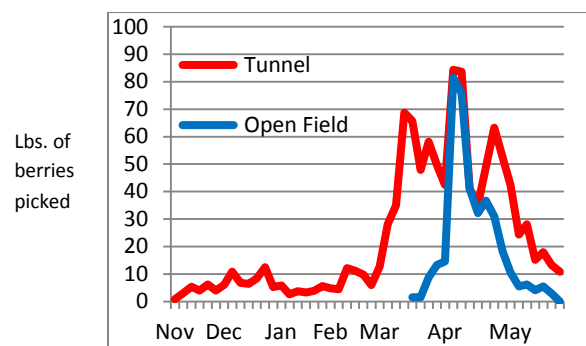


Figure 4. Typical harvest trend for strawberries grown inside tunnels or in the open field at the Texas A & M Agrilife Research and Extension Center at Lubbock, TX (2011 - 2012).

## PESTS AND THEIR CONTROL

Major pests of strawberries include birds, mice, spider mites, slugs and snails, and white grubs. Birds can be easily controlled by covering the tunnel with bird netting. Be sure to secure the bottom of the netting to the ground with stakes or bricks to keep birds from entering underneath.

Mice can be difficult to control, and are often found beneath the black plastic mulch. Mouse traps or bait placed safely throughout the garden area is generally their only means of control. Slugs and snails feed during the night, and baits should be used. Spider mites can be difficult to prevent, and due to warmer environments inside tunnels, they may appear on the leaves of strawberries much earlier than those grown outside. Predatory mites and insecticidal soaps may be the only options for their control. When applying insecticides, remember that it is best to spray in the evenings when bee activity is minimal.

Root and fruit diseases are common problems with strawberries. Nematodes may also stunt or reduce plant growth. Fortunately, the low humidity and rainfall found on the High Plains aids in reducing diseases, though using low tunnels may exacerbate any potential problems. Root rots including black crown rot, Red stele and Verticillium wilt can be increased by over-watering, especially if well-drained soils are not available. Adding compost and pine needles will help with drainage. Rotating strawberry beds with other annual crops will also help reduce disease potential. Nematodes are more of a problem with

sandy soils, and rotation with a grass species will aid in suppression, or using clear plastic mulch for several months prior to planting to solarize the soil may be beneficial.

The major fruit disease of strawberries is *Botrytis* gray mold, which attacks the fruit before and/or after harvest. It can be recognized by a gray, powdery mass that covers the ripening fruit. Heavy plant foliage and dead leaves may increase this disease. Increasing air movement around plants may help to reduce its spread. For additional pest management strategies, contact your local county extension office.

## USEFUL REFERENCES

Dickerson, G. W. 2004. *Home garden strawberry production in New Mexico*. Guide H-324. New Mexico State University Cooperative Extension Service. 8 pages.

Pace, M., J. Goodspeed, A. Hinton, and S. Olsen. 2001. *Strawberries for the home garden*. HG-515. Utah State University Extension, Electronic Publishing. 8 pages. Available online at: <http://www.hort.usu.edu/pdf/fruit/strawberries.pdf>.

Wallace, R.W. 2012. *Strawberries in protected cultivated systems*. Oral presentation given at Amer. Soc. Hort. Sci. Available online at: <http://ashs.org/db/horttalks/detail.lasso?id=10368>.

## CONSTRUCTING A LOW TUNNEL FOR STRAWBERRY HOME GARDENS

Constructing low tunnels for growing strawberries and vegetables in home gardens, especially on the Texas High Plains, will increase the potential for success. Low tunnels add protection from cold and freezing temperatures, and provide an environment similar to a greenhouse. Perhaps most important, low tunnels can protect strawberries from high winds and hail, which are particularly damaging.

The following photographs illustrate simple steps that can be used to construct a simple and cost effective low tunnel that is able to withstand the typical winds found on the Texas High Plains. Low tunnels built near or around windbreaks will likely withstand high winds better than those left in the open. Low tunnels do not need to be attached to a raised bed but may be placed directly into the garden soil. Please note that the materials used in this demonstration can be changed to meet the needs of individual gardeners and their garden sites.

Step 1 – If using electrical conduit to make low tunnel hoops, use a hoop bender to make the hoops more uniform.



Step 2a – Add compost or other pre-plant fertilizer to the garden soil.



Step 2b – Spread out the compost or fertilizer and mix thoroughly into the top 6-inches of garden soil.



Step 3 – Prepare the strawberry planting bed by digging the soil around the edges and then throw the soil into the center to build up the bed approximately 6 to 12-inches in height and about 24-inches wide.



Step 4 – Once bed is prepared, place the irrigation system (drip tape or a soaker hose) on top of the planting bed or bury it 4 to 6-inches deep for better root contact.



Step 5c – Place bricks or other heavy objects around the edges of the black plastic mulch to keep it from blowing off the ground during periods of high winds.



Step 5a – Using scissors, cut a piece of 48-inch black plastic mulch to the appropriate length and lay it on top of planting bed.



Step 6a – Depending on size of the low tunnel, measure the distance where rebar supports will be hammered into the ground.



Step 5b – Bury the edges of the black plastic mulch with enough soil to prevent high winds from lifting it off the ground.



Step 6b – Hammer the rebar ground posts into place at the locations where the tunnel hoops will be set.



Step 7 – Place the pre-bent tunnel hoops over the rebar at equal distances inside the raised bed frame or onto bareground.



Step 9a – Place the supporting purlin underneath the hoops at the center and secure to the tunnel frame.



Step 8a – Use a measuring tape to punch holes through the plastic at 12-inch spacing both in-row and between rows. Be careful not to cut the drip tape or soaker hose.



Step 9b – For this low tunnel, hose clamps were used to secure the purlin to the hoops. Be sure to have any sharp edges below the frame so the plastic covering won't tear.



Step 8b – Note even spaced and staggered holes between the two rows which will be used for transplanting the strawberries.



Step 10 – Secure the tunnel frame with wire at both ends to rebar previously hammered into the ground to help stabilize the frame.





Step 11a – Spread out the tunnel plastic covering for measuring and cut to correct size. Place pipes on sides and secure using duct tape, zip ties or clamps.



Step 11b – Cut off excess plastic from zip ties. The pipes can also be used to tie the sides of the tunnel to the ground.



Step 12 – After cutting, center the plastic covering over the top of the tunnel frame in preparation for securing it to the ground.



Step 13 – Secure the plastic cover to the tunnel frame and the ground by pulling it tightly across and place bricks or other heavy objects on the front and back ends of the tunnel. Weight of the pipes on the sides will hold plastic down, but may also need to be secured to ground during periods of high winds. Use rope or straps over the top of the tunnel during high winds if more protection is required.



An inside view of the finished low tunnel which is now ready for transplanting strawberries and other vegetables.




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