UNIVERSITY OF FLORIDA
Cooperative Extension Service
Institute of Food and Agricultural Sciences

SP 215

Pepper Production Guide for Florida: Crop Establishment[1]

G.J. Hochmuth and C.S. Vavrina[2]

Florida peppers can be grown using both direct-seeding methods and transplanting (Figure 1). Crops develop faster from transplants so that now, pepper crops are not often started from direct-seeding. Nearly all peppers are planted from containerized transplants. Field planting dates, rates, and spacing recommendations for the major pepper production regions are presented in Table 1.

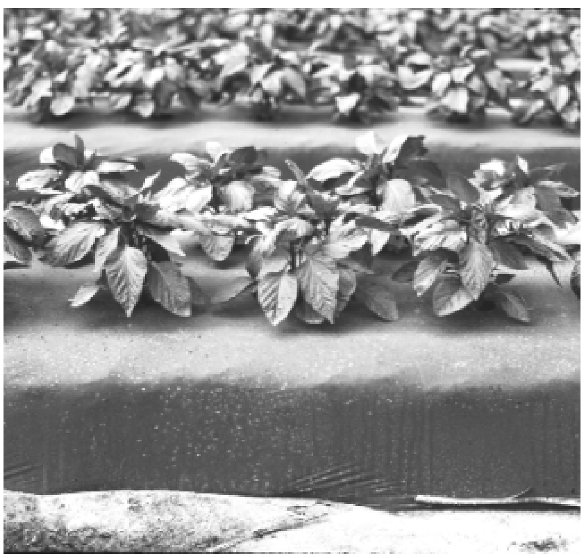

Figure 1. Uniform stands of pepper in twin-rows on mulched beds.

Table 1. Crop establishment information for pepper in Florida.

Planting Dates	
Northern Florida	Aug./Feb. -Mar.
Central Florida	Aug.-Sept./ Jan.-Mar.
Southern Florida	Aug.-Feb.
Distance between rows (in)	36-48[y]
Distance between plants (in)	10-24
Seeding depth (in)	0.5-0.75
Seed per acre in field (lb)	2-4
Seed per acre in transplants (lb)	0.25-0.50
Days to maturity from seed	90-95
Days to maturity from transplant	65-75
Plant population per acre	17,500[z]

[z]Standard mulched pepper spacing of 10 inches in row, two rows per bed on 6-foot centers.

[y]Single rows of pepper, usually in nonmulched culture.

1. This document is a chapter of SP 215, last printed in 1990 as Circular 102 E. SP 215, Pepper Production Guide for Florida, last printed in 1990 as Circular 102 E, is a publication of the Commercial Vegetable Guide Series, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Publication date: August 1997. For more information about how to order the complete print document, SP 215, call UF/IFAS Distribution at (352) 392-1764. Please visit the FAIRS Website at **http://hammock.ifas.ufl.edu**.

2. G.J. Hochmuth, professor, Horticultural Sciences Department; and C.S. Vavrina, associate professor, Southwest Florida REC-Immokalee; Cooperative Extension Service, Institute of Food and Agricultural Sciences (IFAS), University of Florida, Gainesville, FL 32611. The Pepper Production Guide for Florida is edited by G.J. Hochmuth, professor, Horticultural Sciences Department, IFAS.

Direct Seeding

Very few pepper crops are now established in Florida by direct-seeding. Peppers are most effectively direct-seeded through plastic using the plug mix method where pepper seeds, fertilizer, and water are blended with a growing medium of 30 percent vermiculite and 70 percent peat. Recommended insecticides, fungicides, and growth-enhancing chemicals also can be blended with the mix. The mix is prepared in cement mixers and often allowed to stand in bags for 24 to 48 hours prior to planting to allow seeds time to imbibe water and begin the germination process.

For peppers, it may be advantageous to use pregerminated seeds for a faster and more uniform stand. Some seed companies already offer seeds that have been primed.

The final plug mix is placed in the field by precision plug mix applicators at l/8 to l/4 cup per hill. The plug mix method can be used in conjunction with open field or mulched culture. Two types of plug mix planters are available depending on how the hole in the mulch is opened. One type punches the hole while inserting the plug mix; the second burns a hole with a propane burner. The latter is preferred for peppers because it does not leave a torn flap of plastic behind that might damage young pepper seedlings during windy conditions. The closed-jet burner type is preferred over the open-flame burner because the former can be used during windy or rainy conditions.

With the plug mix system, it is necessary to apply water via overhead irrigation or water wagon every two days during hot, dry weather until the seedlings are well established. Watering also helps keep fertilizer salt concentration low in the seed area. Once established, the seedlings are thinned to one to two plants per hill. Optimum spacing in some production areas using full-bed plastic mulch and seep irrigation is twin rows with hills 10 inches apart and two plants per hill. The rows on the bed are about 15 inches apart.

Transplanting

Most Florida pepper crops are transplanted using containerized transplants, although some bare-root transplants are still used. Containerized transplants are placed in the field with the growing medium attached to the roots; therefore, they suffer less transplant setback than bare-root plants, resulting in more uniform stands. In addition, they are less likely to wilt down onto the mulch where they might be burned by the hot plastic surface. Furthermore, the transplanting machines that can place transplants through plastic mulch function better if there is a root/soil ball present.

When transplanting, especially in cool soils, plant establishment might be enhanced by use of small amounts of starter fertilizer solution. Any fertilizer high in soluble phosphorus, such as 10-52-17 used at 3 to 4 pounds per 50 gallons of transplant water might stimulate early root development.

Field studies have been conducted to evaluate depth of planting of transplant in the field. Results showed that burying the transplant at least up to the cotyledonary node might be advantageous for increasing transplant vigor, early yield, fruit size, and total yield. Deeper planted transplants probably have their root systems placed in more favorable moisture conditions than plants placed nearer to soil surface.

Bare-Root Transplants

Only a small portion of the Florida pepper crop (mostly in northern Florida) are started with bareroot transplants. Most peppers are started with containerized plants.

Bare-root transplants should be grown from high-quality, fungicide-treated seed on fumigated or virgin soil that has a pH of 6.0 to 6.5. Small amounts of fertilizer (1-2-2 pounds of N-P_2O_5-K_2O per 1000 square feet) should be incorporated into the seedbed area. Irrigation must be available. Seed should be broadcast or sown in rows 6 to 8 inches apart with 20 to 30 seeds per foot of row. Protection from wind and frost should be made available through the use of plastic-covered structures, cold frames, or various types of row cover materials. Ventilation should be practiced on hot, sunny days. Nematodes, insects and diseases should be controlled by appropriate means.

Seedlings that are approximately 5 inches tall are ready to be transplanted. They should be loosened from the soil before lifting to minimize damage to the roots. Do not soak or irrigate the transplants after pulling because of increased risk of disease organism spread. Provide shade and plant immediately. These challenges and risks with pepper transplant production have caused most growers to switch to containerized pepper transplants produced by plant growers specializing in containerized transplants.

Containerized Transplants

The best containerized transplants are produced in the multi-cell or tray-pack systems. Trays are made of plastic or styrofoam and produce a seedling root ball of various shapes and sizes. Little information exists on the most appropriate cell size to use. Larger transplants produce earlier yields but are more expensive to produce. The most economical and most manageable size for peppers seems to be the cell size surface area of approximately ½ to 1 square inch.

Containerized transplants should be produced in a greenhouse where growing conditions can be carefully controlled. Sterile trays and sterile, soilless mix (usually a peat/perlite or peat/vermiculite mix) should be used. Filling and seeding trays is time-consuming and can be mechanized by various tray-filling and vacuum-seeding machines. Often seeding accuracy can be optimized by the use of coated or pelletized seed. Once seeded and in the greenhouse, careful attention must be given to the transplant crop for water needs, fertility, and pest control.

A nitrogen fertilization program used in the transplant house has an effect on the performance of the transplant in the production field. Pepper plants grown with excess N (greater than 45 parts per million N) are more difficult to establish and do not yield any more than transplants grown with 30 to 45 parts per million N. More information on containerized transplant production is available from Bulletin 302, “An Introduction to the Production of Containerized Vegetable Transplants” from Florida Cooperative Extension Service.

Irrigation

All vegetable crops require adequate and timely irrigation, and where natural rainfall is lacking, supplemental irrigations must be made. On sandy soils, peppers require ½ to 1 inch of water per week during early growth and l to l½ inches during fruiting. Soil moisture should be monitored with tensiometers with the gauge reading kept at -8 to -15 centibars for sandy soils. The subsurface (seep) irrigation system, which can maintain constant levels of moisture, is the least costly method of irrigation because of low capital investments, but it has a low water-use efficiency and is not available for all pepper-producing regions.

Overhead irrigation is a very satisfactory method of irrigation for both mulched or nonmulched peppers and requires less pumped water than the seepage method. Salt injury may be less likely on overhead-irrigated than seep-irrigated peppers. There are several types of overhead irrigation systems including traveling guns, center pivots, movable pipe, and solid-set pipe. One disadvantage of the overhead system is the increased potential for spreading foliar disease organisms.

Drip irrigation systems have many merits and are becoming popular. These merits include reduced water usage, the capability of fertilizing through the system, and the possibility of higher yields from more constant water supply and reduced foliar disease problems in comparison to overhead irrigation. The reduced water usage is a very important attribute and is the primary reason for drip usage on farms located near metropolitan areas where water is in short supply.

Drip irrigation might be used satisfactorily in combination with other methods, particularly with a seepage system. Here, one attraction is the capability of providing the fertilizer through the drip system and eliminating or reducing the use of in-bed fertilizer, which is subject to leaching to the ground water. The downward movement of water from the drip tubes might also help reduce salt injury to the plants.

Fruit-Set Problems

Fruit set. Pepper plants occasionally produce an abundance of foliage with very little fruiting. There are several possible reasons for this condition, all of which indicate plant stress at flowering:

1) Temperature – Periods of high temperatures (above 90°F) and periods of cold temperatures (below 50°F) lead to flower abortion. Because Florida peppers are planted in cool, late winter or spring seasons, and in late summer or early fall periods, it is probable that unfavorable temperatures cause many of the cases of poor fruit set seen in Florida.

2) Moisture – Lack of moisture during fruit set will cause pepper plants to shed flowers and even small fruit.

Excess nitrogen has been blamed for poor fruit set, although there is very little supporting research data. Work in Illinois showed no yield reduction even after extremely high rates of nitrogen were sidedressed after some fruit had been set on the plant.

Poor fruit-set problems can be avoided by several means. Very little can be done to avoid temperature stress. However, certain row covers might help in cool periods. Irrigation to maintain adequate soil moisture is important to prevent flower abortion due to drought. Overhead irrigation used during hot periods can cool plants and might help reduce flower loss. Plastic mulch also helps maintain soil moisture and reduce moisture fluctuations. Certain varieties are more prone to stress-induced flower abortion.

Fruit buttoning. Under cool growing conditions, fruit length can be reduced so that flatter-than-normal fruits result. The only way to minimize this problem is to select varieties less prone to this problem, usually by selecting longer-fruited varieties for winter production.

Sun burning. Pepper fruits exposed to direct sunlight can reach temperatures well over 100° F and burn leading to a sunken, tan, shriveled area. Fruit must be protected from direct exposure to sunlight by adequate foliage cover. Adequate fertilization and foliar disease control are important factors for reducing sunburn. Heavily fertilized and irrigated plants are succulent and branches are prone to breakage during harvest activities. Fruits remaining on the plant for continued sizing might be exposed to sun burning.

Frost Protection

Presently, the most effective method of frost protection is overhead irrigation during the freeze period. Timely and complete coverage is required. Sprinklers should be placed so that 50 percent overlap is ensured and turned on when the temperature falls to 32°F. The nozzles should make one revolution per minute with the amount of water applied depending on temperature and wind conditions (more water with colder and windy conditions). They should continue to apply water until the temperature rises and the ice begins to melt or until the wet-bulb temperature rises above 32°F.

Another possible method of frost protection might be row covers such as hoop-supported polyethylene or unsupported nonwoven materials. Research in northern states has shown substantial frost protection from these covers, and they are useful in Florida as well. Application of the covers can be mechanized and they can be reused.