



## Greenhouse Cucumber Production Guide

This guide was created in collaboration with Carolina Greenhouses. All material in this guide is for reference only and is intended to provide basic information about crop production. Carolina Greenhouses and Transformation have no liabilities in plant production. If you have questions about the guide, please contact Transformation at [info@transformationproject.org](mailto:info@transformationproject.org).



**Transformation**

BEYOND HUMANITY  
MERCY FOR ANIMALS



## CAROLINA GREENHOUSES

1504 Cunningham Road  
Kinston, NC 28501  
(252) 523-9300

# Greenhouse Cucumber Production Guide

JUNE 2021

## Cucurbits

The genus *Cucumis* comprises almost 40 species, including cantaloupe, watermelon, squash, pumpkin, and gourd. These trailing plants are also called “vine vegetables.” While plants in this genus are native to the tropics, they are now cultivated worldwide. The fruits of this genus vary in size and shape, depending on species, but all usually develop from yellow flowers with five fused petals. Cucumbers are scientifically known as *Cucumis sativus*, belonging to the *Cucurbitaceae* family.

## Cucumber Production

Cucumbers are a monoecious crop, meaning male and female flowers are separate but borne on the same plant. As a result, this crop requires an insect vector, such as bees, for pollination. However, modern technology and plant breeding have allowed for gynoecious hybrids that bear only or mostly female flowers. This eliminates the need for pollination and allows the plant to bear seedless fruit while being more productive and developing faster, making it ideal for commercial greenhouse production.

There are approximately 100 different varieties of cucumbers, which can be divided into three distinct types: seedless, seeded, and mini. The type of cucumber produced usually depends on the particular market supplied: fresh whole, fresh sliced, or pickling. More varieties are grown for pickled-cucumber production than for all fresh markets combined. In the United States, cucumbers are the most commonly pickled vegetable. While cucumbers are grown around the globe, the United States is the fourth-highest cucumber-producing country, with North Carolina in the top five cucumber-producing states.

## Cultivar Selection

Cultivar selection is very important and has a large effect on yield and successful production. Of the variety of cucumber cultivars available for greenhouse production, many are produced by companies in European countries. But many of these companies have representatives for sales and technical support in North America, and seed is often distributed by greenhouse supply companies. Cultivars are ever changing, and climate is a factor in cultivar performance, so it is important to talk with a local extension agent or representative from the seed company about which cultivars perform best in each region at a given time. Additionally, factors such as disease resistance, plant vigor, early yield, total yield, maturity, fruit size and color, and fruit quality should be considered.



# Greenhouse Methods

## Environment

Cucumbers favor warm weather and fare best in temperatures between 65 and 85 degrees Fahrenheit. While cucumbers can withstand some temperatures outside this range, they will not tolerate extended exposure to temperatures below 55 degrees or above 90 degrees Fahrenheit. Cucumbers are completely intolerant of frost and require adequate light, water, and nutrients.

## Starting Cucumbers

Cucumbers grown in a greenhouse should be direct-seeded into trays or containers, possibly with the help of a Speedy Seeder. While cucumber seed may be rather expensive, germination is close to 100 percent, so putting only one seed in each tray cell or container is reasonable. After seeding, the trays or containers should be irrigated thoroughly from overhead to provide plenty of moisture.

The seed germinates rapidly in warm temperatures, with the optimal temperature being around 84 degrees Fahrenheit. Seedlings should emerge within two to three days, at which point the temperature should be lowered to about 77 degrees Fahrenheit. It is very important that cucumber plants do not become stressed during the seeding, germination, emergence, and seedling stages, as the plants are extremely sensitive. Plants should be grown for about two to three weeks, given appropriate temperature and light conditions, and then transplanted upon reaching the three- to four-leaf stage. The process of starting cucumbers and growing to the transplant stage should take place in a separate area of the greenhouse or even in a separate greenhouse entirely.



Figure 1. Photo of cucumber seedlings.

## Transplanting Cucumbers

Plants should be transplanted into the greenhouse quickly and efficiently, with plenty of water and nutrients, to avoid stress. Transplanting can be done into grow bags, with plants spaced about 16 inches apart within and between rows. Any size grow bag can be used for cucumber production. Grow bags need to be placed uniformly in rows about six feet apart, and each plant grown on a trellis. A good trellis setup is one that is at least six feet high, consisting of top and bottom wires and plastic twine connecting the two wires at each plant. In this case, posts would be no more than 15 feet apart, and the top wire should be tight. Drip-irrigation lines can be set up to run the length of the grow bags, with spray stakes in the bags beside the plants.



Figure 2. Photo of trellis system and grow bag transplants.

## Spacing and Pruning

The number of plants produced in a greenhouse depends on the size of the greenhouse as well as light conditions and pruning method. Each plant should be given five to nine square feet of greenhouse space, depending on the amount of available light. With low lighting, nearly twice as much space may be required to avoid overlapping and shading of leaf canopies. Cucumbers can be pruned using several methods, but the umbrella method allows for the accommodation of more plants.

Cucumber plants need to establish strong stem and root systems before secondary or fruit growth is encouraged. Accordingly, all lateral branches, flowers, and tendrils should be removed until the plants have eight to 10 leaf nodes. After eight to 10 leaf nodes develop, one female flower should be allowed to set at each subsequent node. Any flowers that appear damaged or crooked should be removed.

In the umbrella pruning system, the main stem of each plant is allowed to grow along the trellis, while all lateral branches are removed, until it reaches the overhead wire or string. After the development of one or two terminals above the overhead wire or string, the growing point of the main stem can be removed. At this stage, lateral growth of two branches near the top of the plant are encouraged and trained over the overhead wire

or string so that the branches grow downward. The growing point of each lateral branch is removed when they nearly reach the ground. Fruits will develop at the node of every leaf and should be picked quickly, with the main-stem fruit being picked first to encourage continued plant productivity and fruit growth.

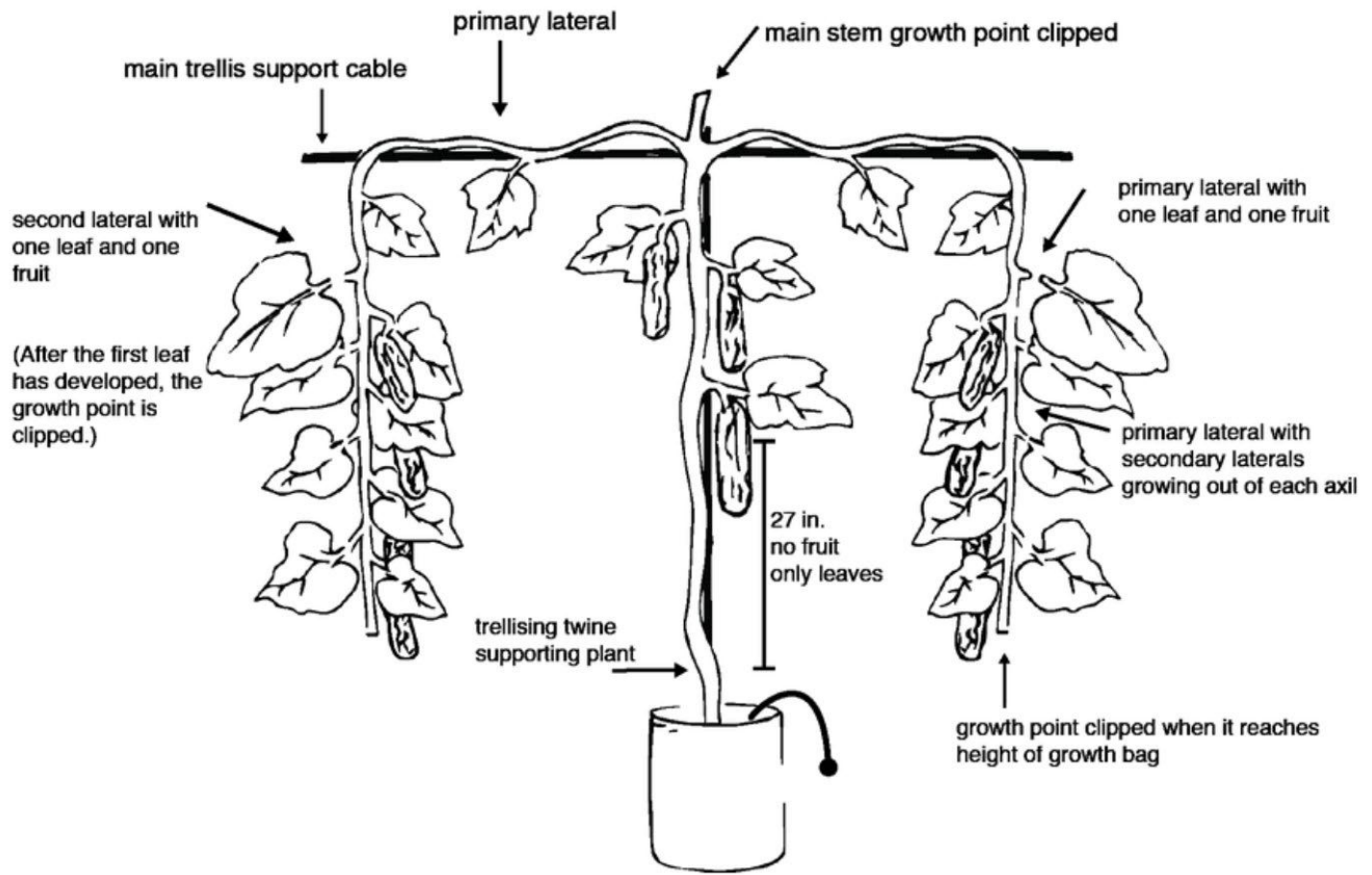


Figure 3. Diagram of umbrella pruning system.  
(Source: Singh and Dunn, 2017.)

## Soil Conditions

Cucumbers favor a pH of 6.0–6.5 but can withstand a pH range of 5.5–7.0. However, soil outside the 6.0–6.5 range can result in poor plant growth and reduced yield. Cucumbers require a moderate amount of water and nutrient solution, which can be provided by drip irrigation and should be in the 5.5–6.0 pH range. Water and nutrient solution requirements vary according to growth stage. When irrigating, feed solution until there is a 10 percent leachate, or solution running through the bag, to ensure that all parts of the root zone and growing media receive an adequate amount of solution.

## Temperature Requirements

Temperature requirements for cucumbers grown in a greenhouse change according to growth stage. The optimal temperature for cucumbers is about 75 to 77 degrees Fahrenheit until the first picking, after which the temperature can be reduced two degrees. Additionally, after the first picking, night temperatures may be gradually reduced to about 63 degrees Fahrenheit. Since cucumbers have a 10- to 12-week production period, more than one cycle may be grown in a year. Fans and a cool cell in summer and heaters in winter can help temperatures remain within tolerable ranges. Additionally, in winter, after first picking, heaters may be gradually turned down.

## Water and Nutrient Requirements

The amount of water and nutrient solution required for success will vary according to plant size. Smaller transplants will require less water or nutrient solution than will larger plants. It is essential to provide the correct amount of water to avoid flooding the roots of the plants and depriving them of oxygen. In addition, too little moisture affects fruit size and shape, while too much moisture encourages disease. Frequency of irrigation application will vary according to plant growth stage and size as well as greenhouse temperatures, ranging from once or twice daily after transplanting to multiple times per day during harvest on warm days. Watering in the morning with minimal wetting of the foliage by aiming the drip-irrigation stake at the base of the plant will help prevent disease.

## Fertigation

Delivering water and nutrient solutions using drip irrigation as previously described is known as fertigation. Fertigation has several advantages, including efficient delivery of nutrients, localized and precise application, controlled application rate and timing, and lower cost of application. Liquid or water-soluble fertilizers are most common with fertigation, and a variety of fertilizers can be used in cucumber production. Choice depends on farmer preference or region. Many horticultural companies offer a variety of commercial fertilizers and mixes. It is important to talk with a company sales representative or local extension agent about the best fertilizing practices for the region. Complete fertilizers are commonly used in greenhouse cucumber production, with nitrogen, phosphorus, and potassium (N-P-K) ratios of 8-8-8 or 4-10-10.



Figure 4. Photo of fertigation lines.

## Pest and Disease Control

Pest and disease control is an important factor in commercial cucumber production, as pests and disease can severely impact yield and fruit quality. Pesticides can help. The first step in preventing pest damage is pest identification. A wide variety of pests, including insects, bacteria, fungi, and viruses, can affect cucumbers. A local extension agent or sales representative of a commercial chemical company can advise on best-performing pesticides as well as which to use for each pest or pathogen. Some plant varieties have disease resistance, while others do not, an important consideration when choosing which cultivar to grow.

Greenhouse environmental conditions can also affect pathogen presence. High humidity with low ventilation and increased moisture, especially on foliage, will create an ideal environment for pathogens such as bacteria and fungi, which cause wilt, mold, and mildew. One way to decrease the chances of these pathogens and favorable environments for them is to avoid overhead irrigation, which causes increased wetting of foliage. In addition, increasing ventilation and air flow in the greenhouse with adequate fans will help.

Viruses are widely spread by insects feeding on weeds outside the greenhouse. Controlling weeds around the greenhouse is important and helps prevent viruses from entering, as no cucumber varieties are resistant to any viral disease. If plants contract viral diseases in the greenhouse, symptomatic plants should be removed to slow the spread. Additionally, a good way to decrease insect pests in the greenhouse is to limit ways for them to get in through vents, fans, doorways, and small openings by covering them with screens.

## Pests and Diseases

Cucumbers are susceptible to a wide variety of pests and pathogens. Major insect pests include cucumber beetles, pickleworms, aphids, mites, whiteflies, thrips, and vine borers. Bacterial and fungal pathogens cause diseases such as powdery mildew, downy mildew, bacterial wilt, fusarium wilt, gummy stem blight, anthracnose, gray mold, and pythium rot. Lastly, viral diseases such as cucumber, squash, and watermelon mosaic virus are common.



Figure 5. Photo of cucumber plant infected with mosaic virus.

## Harvesting

Cucumbers can be harvested at a variety of stages and times, depending on size, maturity, available market, fruit yield, and quality. Most varieties should be ready to harvest within 50 to 70 days. Fruit should be harvested when it is uniform in length, shape, and diameter and before the blossoming end starts to yellow. It is important to harvest cucumbers frequently, at least every two to three days, as the fruits mature quickly. In addition, poor-quality fruits should be culled to allow other fruits to develop properly. Harvesting in a continual and timely manner allows cucumber plants to be more productive, as they can support a limited number of fruits at one time.

Depending on the variety and market that cucumbers are being produced for, harvesting can start when the fruit reaches two inches in length and continue up to any size. But fruit should not be allowed to get oversized. Harvesting may last as long as 10 to 12 weeks, depending on frequency, variety, and yield. Cucumbers can be harvested by turning them parallel to their vine and quickly snapping to avoid damage to the vine and allow for a clean break.

## Storage

Since cucumbers are primarily composed of water, they are susceptible to shriveling and should be kept out of direct sunlight. Storage and shelf life can be extended by shrink-wrapping cucumbers to help prevent water loss. Fruit should be stored at approximately 50 degrees Fahrenheit, with temperatures no cooler than 45 degrees and no warmer than 55 degrees Fahrenheit. Storage temperatures that are too low can result in chilling injury, while those that are too high can result in yellowing and shriveling. Additionally, cucumbers should be stored with a high humidity of around 95 percent but no less than 85 percent. This provides the fruit adequate moisture to help reduce shriveling. Cucumbers should not be stored near produce that emits ethylene, such as tomatoes, apples, peaches, and cantaloupes.

## Packaging

Cucumbers are usually sorted by size, shape, market type, and quality and packaged accordingly. Garden type or mini cucumbers are packaged in fiberboard cartons in counts of 30, 32, 36, 40, 42, or 46 with boxes weighing about 25 to 30 pounds. Slicing cucumbers are usually packaged in bushel cartons or wire-bound crates ranging from 47 to 55 pounds, cartons ranging from 26 to 32 pounds, or lugs ranging from 28 to 32 pounds.



Figure 6. Photo of cucumber carton.

## Growing Timeline

Overall, cucumbers advance through several growth stages and provide several rounds of fruit to be harvested. The expected growing season of cucumbers is around 10 to 12 weeks. The first stage of cucumber production in a greenhouse, when the plant is about six inches long, lasts for one to two weeks. Stage two lasts for two to three weeks and begins when the plant reaches 12 inches long. The production of fruit marks stage three, the longest stage, which lasts for about six to seven weeks. Stage four is considered the late-season stage and lasts about one to two weeks.

---

## References

1. Dittmar, Peter, et al. *2020–2021 Vegetable Production Handbook of Florida*. Gainesville, FL: University of Florida, 2021. <https://edis.ifas.ufl.edu/pdf/CV/CV29200.pdf>.
2. Dekevich, David. "Cucumbers." Food Source Information. Colorado State University. Updated August 2021. <https://fsi.colostate.edu/cucumbers/>.
3. Doubrava, Nancy, Robert Dufalt, and Barbara Smith. "Cucumber." Home & Garden Information Center. Clemson University. September 19, 2018. <https://hgic.clemson.edu/factsheet/cucumber/>.
4. Hochmuth, R.C. *Greenhouse Cucumber Production—Florida Greenhouse Vegetable Production Handbook, Vol. 3*. Gainesville, FL: University of Florida, IFAS Extension, 2015. <https://edis.ifas.ufl.edu/publication/CV268>.
5. Iowa State University. "Cucurbits." Accessed June 21, 2021. <https://hortnews.extension.iastate.edu/cucurbits>.
6. Johnson, Hunter, and Gary W. Hickman. "Greenhouse Cucumber Production." *Aggie Horticulture* (blog). Texas A&M Agrilife Extension. Accessed June 21, 2021. <https://aggie-horticulture.tamu.edu/greenhouse/hydroponics/cucumber.html>.
7. Oregon State University. "Cucumbers, Greenhouse." Updated February 3, 2010. <https://horticulture.oregonstate.edu/oregon-vegetables/cucumbers-greenhouse>.
8. Relf, Diane, and Alan McDaniel. *Cucumbers, Melons, and Squash*. Blacksburg, VA: Virginia Cooperative Extension, 2009. <https://www.gloucester.va.info/DocumentCenter/View/3960/Cucumber-Melons-and-Squash-PDF>.
9. Singh, Hardeep, and Bruce Dunn. *Pruning Hydroponic Crops*. Stillwater, OK: Oklahoma State University, August 2017.
10. Western Institute for Food Safety & Security. *Cucumbers*. Davis, CA: Western Institute for Food Safety & Security, n.d. [http://www.wifss.ucdavis.edu/wp-content/uploads/2016/05/FDA\\_WIFSS\\_-Cucumbers\\_PDF.pdf](http://www.wifss.ucdavis.edu/wp-content/uploads/2016/05/FDA_WIFSS_-Cucumbers_PDF.pdf).