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Producing high quality ripe bell peppers is a challenge for many growers, as they are slower-growing and later to mature than many other fruiting crops. As such, they are an increasingly popular crop for greenhouse production: protected culture allows for an extended growing season, higher yields, and improved fruit quality compared to field-grown crops. We aim to provide adequate growing instructions for those looking to grow greenhouse-adapted pepper varieties in both low and high-tech greenhouse or high tunnel systems.

PROPAGATION:

Sow seeds $\frac{1}{4}$ – $\frac{1}{2}$ inches apart into 20-row flats in the desired medium 6–8 weeks prior to transplanting. Maintain a constant, 80–90°F/27–32°C soil temperature to achieve an ideal germination percentage and uniformity—heat mats are beneficial for maintaining a consistent temperature. When the first true leaves start to show, transplant the seedlings into cell-type containers or blocks. Containers 2 inches or larger will produce larger, stronger root systems.

FERTILITY:

Peppers perform best in well-drained fertile soil with high levels of calcium and phosphorus and a pH of 6.5–6.8. If you are growing a long-term crop that will be in the ground for 4 months or more, it is not possible to provide all the necessary nutrients from pre-planting fertility; side dressing or fertigating with extra nutrients will be necessary mid-way through the growing season. Use plant tissue testing to monitor the health of the plants and add extra nutrients when necessary.

TRANSPLANTING/SPACING:

When transplanting into the greenhouse, try to maintain temperatures of 73–74°F/23°C during the day and 69–70°F/21°C during the night for the first week to promote rapid vegetative growth and root establishment.

For 2-stemmed plants, use a plant density of 3–3½ plants (6–7 stems) per square yard (9 square feet). For 4-stemmed plants of a medium-to-large-fruited variety, maintain the same 6–7 stems per square yard spacing, but with half as many plants. For 3–4-

stemmed plants of a small-fruited variety, plant at the same density as if for a 2-stemmed plant (3–3½ plants per yard); while this results in a very dense row of vegetation, the plants can tolerate it and it helps to offset the reduction in yield inherent to growing these types compared to larger-fruited varieties.

One common row-spacing method to achieve this density is to grow two rows of plants per bed, trellised to 2 parallel overhead wires 2 feet apart with walkways 3 feet wide. Each stem is anchored 6 inches or so from the next one. Some growers prefer to use 2 wires per row (4 total in a bed with two rows): 1 wire positioned directly overhead the row of plants and a second wire positioned 8 inches in from the first set; this allows for alternating every other stem along the row, and therefore spacing the pepper stems out to 1 foot from each other on each wire.

CLIMATE:

Peppers are naturally slow-growing and need warm temperatures for fast growth. A very specific, ideal growing regiment is described below, primarily for the benefit of those growers with more sophisticated greenhouse setups. Please note that if your conditions vary modestly the plants will still produce a crop, but the yield and quality might be slightly compromised. While low-tech greenhouses with less extensive climate control conditions cannot be optimized to the same extent as high-tech greenhouses, they still provide many benefits to the grower beyond simple field production. Our greenhouse pepper assortment has been trialed extensively in low-tech conditions, and selected for

their strong performance and adaptability, among other qualities.

7–10 days after transplanting into the greenhouse, lower night temperatures to 64–68°F/18–20°C and keep a daytime temperature of 70–75°F/21–24°C. A wider range between daytime and nighttime temperatures generally promotes more generative, fruiting growth whereas a flatter temperature profile, with day and nighttime temperatures more even to each other, encourages more vegetative, leafy growth. Do not allow the greenhouse to fall below 61°F/16°C, or else all plant growth will stall. Peppers have difficulty setting fruit at nighttime temperatures above 68°F/20°C, so on warm summer nights it is important to get the temperature below that level. Temperatures above 90°F/32°C can sterilize pollen, also leading to poor fruit set, so during the heat of the summer it is especially important to be able to effectively vent your greenhouse.

TRELLISING:

There are two common styles of trellising peppers in a high tunnel or greenhouse: using stakes along with a basket-weave system or growing pruned plants with a restricted number of leaders vertically up to an overhead wire. There are pros and cons to both methods; briefly summarized, the basket-weave system provides much needed support to the plants for a minimum of labor input, but at the cost of restricted airflow, risk to fruit quality, and a more challenging harvest, whereas the branch-pruning system, while much more labor-intensive, better utilizes the vertical space of the greenhouse, improves overall plant health and fruit quality, and increases the overall longevity of the crop.

This document focuses on the methods and techniques required for the branch pruning and vertical trellising method. More information and an instructional video about this method can be found on our website at <https://www.johnnyseeds.com/pepper-library>. If you prefer to use basket-weave trellising, please refer to or request our technical sheet, Basket-Weave Trellising.

BRANCH PRUNING:

Each pepper plant is pruned to 2 or 4 stems, and each stem is then trellised up a hanging string to make the best use of vertical space. Growing peppers on a 2-stemmed plant will result in larger peppers than those grown on a 4-stemmed plant. Two-stemmed plants will be more resilient under hotter-than-ideal conditions. We recommend pruning larger-fruited varieties to two stems and smaller fruited varieties to four stems (the initial two stems plus both subsequent branches). Here are the steps for branch pruning:

1. Once the plants are big enough to start to need support, tie strong twine to the overhead wire at the desired spacing: you will need as many separate lengths of twine as the number of leaders you intend to prune to. Synthetic twine is preferable, as natural twine can degrade and break under greenhouse conditions. (*Image 1*)
2. Anchor the other end of the twine just below the lowest branch of the leader it will be supporting with a loose knot or with trellis clips. (*Image 1*) If the knot is too tight it can damage or kill the plant. Twist the stem of the plant around the twine or clip with trellis clips every 2 weeks or as needed to keep it supported and growing up the twine. Clips should be positioned directly below the branches to provide better support and resistance against the plant sliding down. Repeat this process for each leader the plant has.



Image 1: Trellis and trellis clips



Image 2: First split

3. Remove the first (or “king”) flower that is set in the first split (node) before the pepper fully develops. This will give the plant time to develop enough vegetatively to support a fruit load. (*Image 2*)

Every node after the initial split will result in 1 leaf, 1 flower, and 2 branches. Field pepper varieties may sometimes form three or more branches per node, but greenhouse peppers are bred to more consistently form 2 even branches. It is typical to remove the flowers at the second and third nodes, but if all conditions are optimized, some growers allow fruit to set after removing just the first one.

4. At each node after the initial split, choose the strongest of the 2 branches to continue forming the stem. Terminate the weaker branch, leaving the “flag leaf.” This flag leaf will protect the pepper directly below it from sunscald. (*Images 3 & 4*)

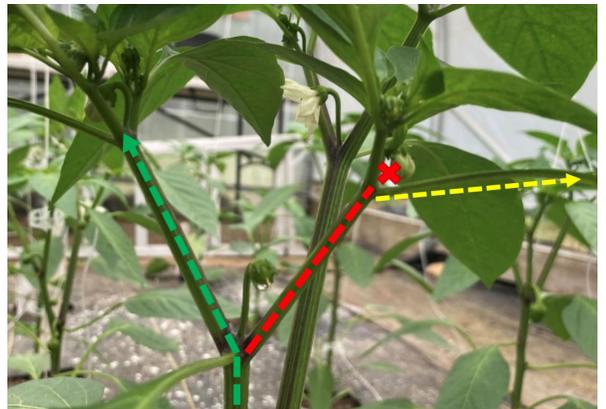


Image 3: The branch noted in green is kept and the branch noted in red is removed. The cut (marked with an x) is placed above the flag leaf, which is marked in yellow.



Image 4: The terminated branch (marked in red) retains the flag leaf.

5. Do not prune within 8 inches of the top of the plant, taking care not to cause damage to the growing point.

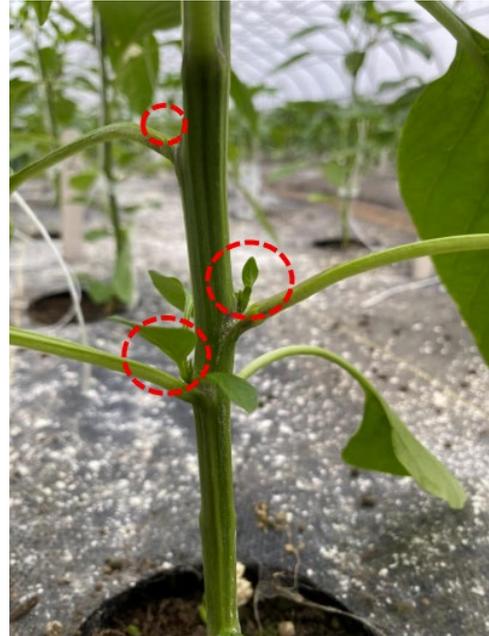


Image 5: Suckers

Prune every 2 weeks, or after about 6 inches of growth since the last pruning. Bell pepper plants will typically set 4–5 fruits before aborting the next few flowers; it is normal for the plant to set fruit in “flushes.” Remove fruits if they are deformed or unmarketable to allow the plant to put the energy into setting more fruit farther up the plant.

SUCKERING

Small side-shoots (usually called “suckers”) will sprout at each leaf node. Suckers can be pinched off the main stem to promote airflow and general plant health. (*Image 5*)

HARVEST:

Harvest fully ripe fruit for immediate sales. If not being sold right away, harvest peppers when they are 80% or more final ripe color. They will reach full color in storage. Using pruners or a knife, cut the fruit off flush with the main stem of the plant. Make sure not to leave a stub on the plant, as this can be an entry point for pathogens.

DISEASES AND PESTS:

Practice crop rotation or use new media to reduce incidence of soil-borne disease. Minimizing the amount of time with temperatures below 65°F/18°C will reduce the amount of botrytis.

Pests that may be a problem include aphids, thrips, pepper maggot, and multiple types of boring caterpillar. If insect pests are a problem, release beneficial insects to control pests. Preventative applications of DiPel® can be an effective control for caterpillars.

STORAGE:

Peppers should be stored at 44–46°F/7–8°C and 90–95% relative humidity. Do not store them with ethylene-producing vegetables like tomatoes, as ethylene will promote ripening to the point of being overripe.