HS789

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Generalized Sequence of Operations for Tomato Culture - Florida Greenhouse Vegetable Production Handbook, Vol 3[1]

G. J. Hochmuth[2]

The following is an outline of operations for tomato production using various cultural systems. Details are found in the appropriate sections of this handbook.

A. Equipment and Production Area

1. Benches are set up and disinfested with 5% to 10% bleach solution.

2. Light intensity is set at least at 1000 to 1500 foot candles and temperature is set at 75F to 85F. Special greenhouse section, growth chambers, or growth rooms can be used.

B. Seeding

1. Sanitized or new trays with drainage holes are used. Plastic bedding plant trays 11 x 22 inches work well. Seedling rockwool or foam seeding block slab are placed in trays. Individual seeding cubes should be about 1 to 1.5 inches square at base to prevent tipping when seedling is placed in the NFT growing tube. For the rockwool system, the cubes need to be size matched with the larger growing blocks.

2. Seeds are dropped singly into the predrilled holes in the cubes.Trays are marked and the cubes dampened with plain water adjusted to pH 6.0.

4. Seeded trays are placed in the germination area, and checked regularly for moisture.

5. Once sprouted, seedlings will need to be placed under optimum light and temperature regimes mentioned above.

C. Transplant care

1. Seedlings will emerge in 8 to 10 days.

2. Seedlings need to be moistened with dilute nutrient solution until they are ready to be transplanted.

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2. G.J. Hochmuth, professor of Horticultural Sciences and Center Director, North Florida Research and Education Center, Institute of Food and Agricultural Sciences, University of Florida. The Florida Greenhouse Vegetable Production Handbook is edited by George Hochmuth, professor of Horticultural Sciences and Center Director, North Florida Research and Education Center - Quincy and Bob Hochmuth, extension agent IV, North Florida Research and Education Center - Suwannee Valley, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL 32611.

3. As seedlings enlarge, they might need to be spaced out to prevent them from becoming too spindly. Individual cubes can be broken apart and spaced out in the trays or they can be broken apart and placed on a corrugated nutrient flow table over which nutrient solution flows. In the rockwool culture system, the small cubes, at this stage, are transferred to the larger blocks. For the perlite system, seedlings 3 to 4 inches tall can be transplanted to the perlite bags. With either system, the seedlings need to receive adequate amounts of nutrient solution.

4. Seedlings need to be inspected regularly for insects and disease.

5. Once the seedlings for the rockwool system are transferred to the larger blocks, they can be placed on the growing slabs in the greenhouse or left in the trays to size more. It might be advantageous to immediately place blocks on the slabs in the greenhouse. This also will reduce chances of problems with spindly plants in the transplant area. Seedlings for the PVC pipe system can be left to size if needed.

D. Preparing the production house.

1. Prior to transplanting, the production house needs to be cleaned and in operational readiness.

2. Floors and production surfaces should be disinfested with 5 to 10% bleach. PVC tubes should be cleaned and angle of repose checked. Trough culture mix needs to be checked for volume, pH, and EC, and sterilized.

3. Nutrient solution delivery systems need to be flushed and checked for operational efficiency. Filters need to be cleaned. All flow rates need to be checked.

4. PVC sump tank, stock tanks, and growing tubes need to be flushed with 5% bleach solution. The rockwool and perlite irrigation starting tray needs to be cleaned and tested.

5. All greenhouse environmental control systems need to be checked. This includes thermostats or controllers, alarm systems, fan motors and belts, furnaces, blowers, heat distribution tubing, and vents.

6. Cooling pad sump tank needs to be flushed and cleaned. Water distribution pipe needs to be checked for plugged outlets and pad return system needs to be checked for leaks. Sump tank should be filled and the float valve checked. An antialgal program should be initiated at this time.

E. Transplanting.

1. Transplants 4 to 6 inches tall are ready to go to the production house. For perlite, rockwool, bag, or trough culture, seedlings can go from the cube stage to the production house at the fourstage without additional time in the seedling area. Seedlings for the PVC tubes can be planted to the production house directly from the cube mat stage as long as the seedlings will stand erect when placed in the growing tubes.

2. For the PVC system, seedlings are placed in the pipes and the nutrient flow started. Nutrient solution for early season is dilute, made up from recipes in the fertilizer section of this handbook. Nitrogen concentration should be no more than 70 ppm. The time clock should be set for 9 to 10 minutes ON and 5 to 6 minutes OFF every 15-minute period.

3. For the trough or bag systems, transplants are placed in the media and the nutrient solution flow begun. Media should be checked often to ensure that flooding does not occur.

4. Transplant blocks for the rockwool system are placed on the slab through cross-slits and the irrigation emitter placed on top of the block with the flow of water directed at the block, not the plant stem. The irrigation system is then operated to apply nutrients to the blocks. Operation of the irrigation system might need to be manual or by time clock early in the season (a week or two). After this, the system can be operated by the starter tray. This procedure ensures that the seedlings receive enough nutrient solution while the roots are being established in the slabs. After this, the controller should be set to deliver about 150 mls (1/3 pint) solution per slab per irrigation event. Control should be managed by the starter tray. Time sequence might need to be changed depending on need for EC control in the slab as described in the fertilizer section of the handbook.

5. Set exhaust fans for 78 to 85F (west fan). Cooling pad thermostat should be set at about 80F.

6. Jet fan can be set to operate at temperatures below 85F where groundfloor heat distribution tubes are used. This will help circulate air in plant canopy and reduce potential for Botrytis disease. Some growers with groundfloor heat ducts report success with Botrytis disease by operating the jet fan 24 hours a day in the winter.

7. Night temperatures should be maintained at or above 62F. Pulsing outside air into the greenhouse by a timer on the jet-fan vent will help reduce humidity in the house during the night.

8. Irrigation systems need to be inspected for plugged emitters. Supply lines for PVC tubes need to be checked.

9. Plants need to be inspected for insects or disease and control programs initiated.

10. In the PVC tube system, the nutrient solution level in the tank and the pH and EC levels need to be checked daily. Adjustments are made as needed. This should be done early in the day. The EC level should be checked in the trough or peat bag systems. In the rockwool system, samples of the slab leachate solution and the delivered solution should be checked for EC and adjusted as described in the fertilizer section of the handbook.

11. Growers should keep records of EC, pH, temperature, etc.

12. As soon as flowers appear, pollination should begin. Pollinate between l0 AM and 3 PM.

13. Suckers should be removed as soon as they reach 2 to 3 inches in length.

14. Plant clips are attached when plants reach 12 to 15 inches tall and start to tip. Plants are clipped (or taped) and suckered regularly.

15. At least once per week the roots in the PVC pipe discharge area will need clipping.

16. On a weekly basis, the environmental control systems need checking.

17. For the PVC pipe system, the sump tank needs weekly flushing and replenishing.

18. At first or second cluster, the plants should be leaned slightly by moving twine down the trellis cable a foot or so. This will prepare the plant stem for the leaning and lowering process so that stem breakage is reduced.

F. Growing the crop (third cluster-on)

1. Growers should continue daily and weekly operations outlined above.

2. Nutrient concentration should be increased as outlined in the fertilizer section of this handbook. Nitrogen concentration should be about 90 to 100 ppm. If bullishness becomes evident, reduce N concentration to 80 to 90 ppm.

3. The time clock for PVC system might need to be changed depending on flooding potential. Increasing the OFF cycle is recommended if roots are not being drained completely between ON cycles.

4. As plants reach the cable, about five clusters will be present and harvest will begin. Tomatoes will need to be harvested at least three times weekly for most of the season.

5. Lower leaves will need to be removed and the plants lowered on an approximate 2-week interval.

6. Plants need to be checked for insects and diseases.

7. Growers will need to continue pollinating, pruning, suckering, clipping (or taping), etc.

8. After the fifth cluster, the nutrient solution concentration can be increased to the high rate (recommendations appear in the fertilizer section of the handbook).

G. Terminating the crop

1. Pollination can be ceased about 40 to 45 days prior to termination date.

2. Plants can be topped (clip terminal bud off) at 40 days prior to termination date.

3. Fertilization and harvesting must continue.

4. For the PVC system, the nutrient solution circulation can be stopped on the day before the crop is to be removed. For the perlite or rockwool system, the irrigation can be ceased 3 to 5 days prior to plant removal to help dry out the slabs making them easier to handle.

5. Plants are clipped at the base and removed to a burial area. Roots in the PVC pipes are removed and the pipes cleaned. Rockwool slabs or perlite bags are removed and discarded or sterilized prior to reutilization.

6. All plant material is removed and the greenhouse and growing surfaces cleaned.

7. Sump tanks and irrigation systems are flushed and cleaned.

8. The time between crops should be used to inspect and perform maintenance duties on the greenhouse and operational systems.

Suggested References for Greenhouse Tomatoes

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Wittwer, S. H., and S. Honma. 1979. Greenhouse tomatoes, lettuce, and cucumbers. Mich. State Univ. Press, East Lansing, MI.

More Information

For more information on greenhouse crop production, please visit our website at http://nfrec-sv.ifas.ufl.edu.

For the other chapters in the Greenhouse Vegetable Production Handbook, see the documents listed below:

Florida Greenhouse Vegetable Production Handbook, Vol 1

Introduction, HS 766

Financial Considerations, HS767

Pre-Construction Considerations, HS768

Crop Production, HS769

Considerations for Managing Greenhouse Pests, HS770

Harvest and Handling Considerations, HS771

Marketing Considerations, HS772

Summary, HS773

Florida Greenhouse Vegetable Production Handbook, Vol 2

General Considerations, HS774

Site Selection, HS775

Physical Greenhouse Design Considerations, HS776

Production Systems, HS777

Greenhouse Environmental Design Considerations, HS778

Environmental Controls, HS779

Materials Handling, HS780

Other Design Information Resources, HS781

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