

Greenhouse Tomatoes

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Introduction

Greenhouse tomato production has attracted a great deal of attention in recent years. However, of all the greenhouse crops, tomatoes (*Lycopersicon esculentum*) are the most complicated to grow because they require the most management, the most labor, and the most light. A grower must be committed to meeting the daily demands of production in order to be successful. Prospective growers need to get as much information as they can about all aspects of greenhouse production before beginning this enterprise.

Marketing

The development of farmers markets, roadside farm markets, and produce auctions across the state offer significant opportunities to sell produce from the farm. Tomatoes can be sold directly from the greenhouse at retail prices. Wholesale markets include supermarkets, restaurants, caterers, and wholesale distributors.

Market Outlook

The U.S. greenhouse tomato market is increasing dramatically as many consumers will now pay an increased price for a red, ripe tomato. It is possible for Kentucky growers to sell greenhouse tomatoes in this expanding market. Early-season tomato production may also capture higher prices resulting in profitability from intensive production systems.

Excellent light, moderate heating costs, high yields, and good prices make spring the best time for greenhouse tomato production in



A number of different types of growing media can be used for greenhouse tomatoes, including good field soil, packaged commercial mixes, and various types of



Kentucky. On the other hand, fall and winter production generally results in low returns due to reduced yields and high fuel costs. For this reason, it is difficult to recommend production schedules where tomato harvest would be expected from December through mid February.

Production Considerations

Production systems

There is no single best system for successfully growing greenhouse tomatoes. Many production systems will work if the grower correctly manages fertilization and watering. With experience, individual growers will be able to determine the best and most economic techniques to use in their greenhouse.

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hydroponic media. Use only materials that have been sterilized, pasteurized, or manufactured under clean, disease-free conditions. Small growers often use in-ground soil culture in the beginning, but generally switch to perlite or pinebark culture as they learn more about tomato production. A drip irrigation system is used for the distribution of water and nutrients. Tomatoes require 4 square feet of space per plant.

This crop will require attention everyday to ensure success. Equipment (such as fans, vents, and irrigation emitters) must be checked daily to be sure they are functioning properly. The application of water and fertilizer, while generally controlled automatically with a time clock, needs to be monitored on a daily basis. Non-grafted greenhouse tomatoes are typically pruned to a single stem and suckers must be removed regularly. If flower clusters are hand-pollinated, they must be shaken or vibrated each day as soon as the petals open. Bumblebees are often the preferred method of pollination in greenhouse environments.

Actively growing tomatoes must be tied or clipped weekly to a string or twine support. A plant fully loaded with fruit may weigh as much as 10 to 15 pounds. Because the typical greenhouse structure is not strong enough to support a tomato crop, a separate support system may have to be constructed inside the greenhouse. Greenhouses designed to support a tomato crop are available from some manufacturers.

Variety selection

There are thousands of tomato cultivars available, but not all are suitable for greenhouse production. It is important, therefore, to select varieties that have been specifically bred for greenhouse conditions or have proven successful in greenhouse production. Most greenhouse cultivars are specifically bred for low light conditions common in greenhouses and have the ability to set fruit over an eight to nine month period of time. Common cultivars include 'Trust', 'Cobra', 'Matrix,' and 'Geronimo'.

Cultivars can differ in such horticultural traits as fruit characteristics (e.g. size, color, shape, and flavor), earliness (early-, mid-, and late-season), growth habit (determinate and indeterminate),

and disease resistance. Lack of physiological problems and yield uniformity are desirable traits in a greenhouse cultivar. Consideration must also be given to regional preferences and crop marketability.

'Cluster' or 'truss' tomatoes, first marketed in Europe, have become popular in the U.S. They are smaller vine-ripened tomatoes that are sold as a cluster of fruit with the vine still attached. These varieties have not been as popular with Kentucky growers.

Pest management

Environmental conditions that favor tomato growth also favor the rapid build-up and spread of insects and diseases. Potential disease problems include damping-off, root rots, fungal leaf spots, and impatiens necrotic spot virus. The most common greenhouse insect pests are thrips, aphids, and white flies.

Few pesticides are labeled for greenhouse vegetables; those that are cleared must be applied thoroughly and regularly due to their low toxicity. However, many greenhouse tomatoes are grown with reduced pesticides by manipulating the greenhouse environment, growing resistant cultivars, and using cultural controls as the primary defenses against diseases. Sticky yellow cards are used to monitor insect pest populations.

Many insect pests, such as white flies, are controlled by predatory insects. One must be careful to properly match predator insect with the pest at hand. For example, there are several species of whiteflies that have different predator insects—matching the wrong predator and prey will result in poor control.

Weed control in and around the greenhouse will also help reduce insect pests and disease problems; however, herbicides must never be applied in greenhouses when crops are present.

Harvest and storage

The stage of maturity at harvest will depend upon the market requirements; however, the longer the fruit can remain on the vine, the better the quality. Tomatoes should be harvested two to three times per week.

Labor requirements

Greenhouse tomato production is a labor-intensive enterprise, requiring approximately 25 person-hours per week (averaged over the season) for a 30 foot by 100 foot house (3,000 square feet). Transplanting and harvesting will require more time, while less time is needed from transplanting to the first harvest. Hand pollination alone will require 30 to 40 minutes each day for an experienced worker in a 30 foot by 100 foot greenhouse.

Economic Considerations

Greenhouse tomatoes require a significant start-up cost, as well as demanding labor and management. Initial investments include greenhouse construction, production system costs, and equipment.

The cost of a production-ready greenhouse, excluding land costs, can run approximately \$10 per square foot; costs may vary heavily depending on construction materials and greenhouse design. Total operating costs of approximately \$4 to \$6 per square foot can be expected. Total costs for hydroponic production, including all labor, can easily double from non-hydroponic production. Gross revenues beginning at approximately \$6 per square foot are possible. Returns over operating costs for greenhouse tomato production can range from \$3 to \$17 per square foot, depending on marketing system and price per pound.

Selected Resources

- The Greenhouse Business in Kentucky – A Review of Crops and How to Begin a Business (University of Kentucky, 2002) <http://www.uky.edu/Ag/CCD/anderson/greenhousesinkentucky.pdf>
- Greenhouse Tomato Production Practices (University of Kentucky, 2002) <http://www.uky.edu/Ag/CCD/anderson/greenhousetomatoes.pdf>
- Managing the Greenhouse Environment to Control Plant Diseases, PPFS-GH-01 (University of Kentucky, 2004) http://www.ca.uky.edu/agcollege/plantpathology/ext_files/PPFShtml/PPFS-GH-1.pdf

- Production of Greenhouse Tomatoes in Soil Beds (University of Kentucky, 2002) <http://www.uky.edu/Ag/CCD/anderson/greenhousetomatoesinsoil.pdf>
- Selected Resources and References for Commercial Greenhouse Operators (University of Kentucky) <http://www.uky.edu/hort/sites/www.uky.edu/hort/files/documents/greenhoureferencess.pdf>
- Greenhouse/Hydroponic Tomato Production (North Carolina State University) <https://tomatoes.ces.ncsu.edu/tomatoes-greenhouse-production-3/>
- Greenhouse Tomatoes (Mississippi State University Extension) <http://msucares.com/crops/comhort/greenhouse.html>
- Greenhouse Tomato Production Manual (Louisiana State University, 2012) http://www.lsuagcenter.com/en/lawn_garden/commercial_horticulture/greenhouse_production/Greenhouse+Tomato+Production+Manual.htm
- Hydroponic Crop Program (Ohio State University) <http://u.osu.edu/greenhouse/hydroponic-crop-program-introduction/>
- Integrated Pest Management for Greenhouse Crops (ATTRA, 1999) <https://attra.ncat.org/attra-pub/summaries/summary.php?pub=48>
- Managing Diseases of Organic Tomatoes in Greenhouses and High Tunnels (eXtension, 2011) <http://www.extension.org/pages/18337/managing-diseases-of-organic-tomatoes-in-greenhouses-and-high-tunnels>
- Virtual Grower 3 (USDA-ARS) <http://www.ars.usda.gov/Research/docs.htm?docid=22087>

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