



Organic Tomato Production

For more information, contact: Annette Wszelaki, Commercial Vegetable Extension Specialist
(Phone: 865.974.8332, Email: annette@utk.edu, Website: <http://organics.tennessee.edu>)

ORGANIC CROP PRODUCTION WORKSHOPS

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GROWING GUIDE:

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Let's Get Growing...



Variety selection

Choosing the proper variety is one of the most important decisions you will make for any crop and tomato is no exception, with thousands of varieties available.

When choosing a variety, consider your market, disease resistance, production system, and climatic adaptability.

Selecting a site

When choosing where to put your tomato crop, remember tomatoes like full sun and lots of water, so be sure you have access to both. A well-drained soil ensures that they plant roots stay healthy to deliver the nutrients those tomato fruit will need.

Crop rotation

Crop rotation is a critical component for pest management in organic systems. Tomato and its relatives (potato, eggplant and pepper) belong to the nightshade or Solanaceae family. Ideally, you should rotate to a another family for a minimum of 3 years, but the longer the better. Using green manure and compost can also help with disease suppression. However, using grasses or small grains before a tomato crop can result in high wireworm or cutworm populations. Be sure to

plow down these crops a minimum of 6 weeks before planting, again the longer, the better.

Preparing the soil

Good soil is the foundation of organic production. Building soil with a combination of cover crops, green manures, compost and rock minerals, will provide you with the high yielding tomatoes.

Tomato generally requires about 90 lbs N/acre. Most of this can be supplied by legume cover crops. Half of this can be applied pre-plant and the remainder side-dressed when fruit are beginning to form.

Add any lime that may be needed in the fall so the field will be ready in the spring. Tomatoes grow best in neutral soil with a pH of 6.5-7, so you rarely need to add more than 1 lb of agricultural limestone to an are of 100 sq. ft.

Fertilizing

Cottonseed meal and blood meal are semi-fast acting sources of N that can be added at the equivalent of 45 lbs N/acre when the fruit begins to form. Plants can also be fertigated with liquid fertilizer, such as fish emulsion or seaweed.

Planting

Be sure to wait to plant until

soil temperatures have warmed up to above 60 degrees. Tomatoes need their space— within a row, plant 18-24 inches apart. If you are planting more than one row, space the rows at least 3 feet apart. Don't worry if you get a bit of late start planting and your plants get leggy. Tomatoes are very forgiving and can be planted right up to the first leaves, as shown here:

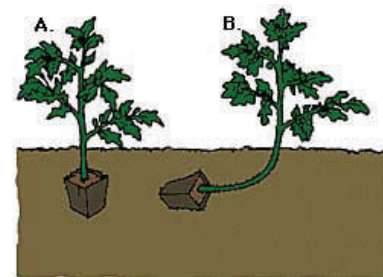


Diagram courtesy of Texas A & M University.

Be sure to water your tomatoes in after planting. Diatomaceous earth around the stem can help guard the plant from cutworms.

Staking

Staking will improve your air flow, earliness, fruit size, yield, quality, protection from sunburn and pests, and ease of harvest. Stakes can be made out of wood (1" x 2") or metal t-posts. The Floridaweave is a staking technique to cover a lot of ground fairly quickly. Start by setting stakes between



Fig. 4. Prune tomatoes by removing small side shoots or suckers as they grow.

Diagram courtesy of Texas A & M University.



Braconid wasp pupae covering the back of a tobacco hornworm.

every second plant shortly after transplanting. When plants are 12-15" high, start to weave string around the first two plants, then cross in front of the next stake and loop around the back of the stake and pull tight, loop around the stake again. Go all the way down the row and then weave back down the other side of the row. Add another row of twine every 6" up the plant. Laughing Stalk Farm in MO has posted a video of their time-saving method for trellising on YouTube.

Watering

Tomatoes need LOTS of water to grow and develop. The rule of thumb is an inch of water per week. Water the plants slowly and deeply to build a strong root system. Shallow watering will encourage a weak root system. Mulching helps retain moisture.

Pruning

Early season varieties (< 70 days) generally do not require pruning. Later season or indeterminate varieties will need some of their side shoots or suckers removed to prevent them from becoming too bushy and ensure good size fruit (Fig. 4). When plants are caged, less pruning is required.

Weeds

Weeds, especially those in the nightshade family, can harbor diseases that are easily transferred to the tomato as you walk through the field

or the wind blows. Keep the tomato patch clean by hand weeding or mulching.

Smoother crops, like small grain cover crops, can help reduce weeds.

Practicing a no-seed threshold, or removing all weeds before they set seed, can have a dramatic impact on the weed population for future years.

Alternatively, the critical period for tomato is 4-5 weeks after transplanting. If weed competition is avoided during this time, there should be no reduction in yield.

Between rows, living mulches, such as white clover or ryegrass can be used to suppress weeds. These may require mowing to avoid competition.

Mulches used in the row form a barrier to light and prevent weed growth. If using an organic mulch, like straw, be sure to provide a 6 inch layer. Plastic or biodegradable mulches must be removed at the end of the season in an organic system.

In no- or minimum till systems, tomato can be planted directly into a rolled or mowed crop, such as vetch. This provides additional benefits, like the slow release of N.

Insects

Many pests can be found on tomatoes during the season. Growing healthy plants is the first step toward effective pest control.

Crop rotation can break up the disease cycles of the pests. Also, planting beneficial habitat can attract insects, such as lady beetles, lacewings, and parasitic wasps, that will naturally combat the pests. Trap cropping can also be an effective means of pest control. Sweet corn acts a trap for tomato fruitworm. Weeds near the crop, especially nightshades, can harbor pests.

There are a large number of organic insecticides available. Their efficacy varies with the pest.

Common tomato pests:

Aphids– These small, pear shaped insects are commonly found on the underside of the leaf. They suck the sap out of the plant and can damage fruit appearance. Soap solution will take care of them.

Cutworms– These are fat, gray worms about an inch long. They cut the plant off at ground level. Diatomaceous earth will discourage them.

Hornworms– These large green worms with a horn at the back eat up leaves and fruit. Handpick them or plant beneficial habitat to attract parasitic wasps (at left).

Stink bugs– These are the brown, green or black shield shaped bugs that live up to their name & cause hard white or cloudy spots just under the fruit skin surface. Sprays are effective.

Tomato Varieties from A-Z



The skies the limit when it comes to tomato varieties. They range widely in size, shape, color, plant type, disease resistance and season of maturity. So, how do you choose? Decide who your market is and what they will be using them for (canning, sauce, fresh), then choose the varieties best suited to your intended market.

Guide to Abbreviations

A=Alternaria
F=Fusarium
N=nematodes
T=Tobacco mosaic virus
V=Verticillium
AAS=All America Selection

Tomato type. Tomatoes are **determinate** if they eventually form a flower cluster at the terminal growing point, causing the plant to stop growing in height. Plants that never set terminal flower clusters, but only lateral clusters and continue to grow taller are called **indeterminate**. Older varieties are almost all indeterminate. These produce abundant foliage and ripen flavorful fruit. They may, however, be extremely late in maturing. The first determinate varieties developed had real problems with inadequate foliage cover and taste, but they ripened very early. Newer determinates produce better foliage, may grow taller and ripen fruit of similar quality to modern indeterminate varieties. They ripen their fruit over a shorter period of time, so successive plantings may be desirable.

Indigo Rose, Territorial Seed Co.

Amish Paste- 75 days- A great heirloom variety for canning. Meaty fruit great for sauce.
 Black Cherry- 70 days- Purple black cherry tomatoes with nice flavor.

Celebrity- 70 days- Large red, determinate resistant to VFNT.
 Defiant PhR- 70 days- Red slicer bred for late blight resistance.

Garden Peach Tomato, Southern Exposure Seed Exchange



Early Girl- 54 days- Earliest full size tomato, indeterminate, resistant to V.

Fox Cherry- 80-90 days- Prolific vine, 1 1/2 red cherry fruit, indeterminate.

Garden Peach- 80 days- Light yellow, fuzzy fruit with pink blush when ripe. Tennessee native.

Hungarian Italian Paste- 79 days- Pear-shaped, 2-3 oz, red fruit, determinate.

Indigo Rose- 75 days- Dark purple, cocktail-sized fruit, high in anthocyanins, compact indeterminate.

Japanese Black Trifele- 74 days- Burgandy, 4-6 oz, pear shaped fruit, harvest when shoulders green for best flavor, indeterminate.

Koralik- 61 days- One-inch, red cherries, prolific producer, determinate.

Legend- 60-70 days- Red slicer, parthenocarpic, tolerance to late blight, determinate.

Moskvich- 60 days- Early deep red, 4-6 oz., indeterminate.

Nebraska Wedding- 60 days- Large, deep orange fruit.

Old German- 85 days- Giant, reddish-yellow slicer, upto 2 pounds!

Pale Yellow Egg- 80 days- Almost translucent egg-shaped cherry, indeterminate.

Quick Pick- 60 days- Heavy yielder of round, red, smooth fruit, indeterminate, resistant to VFNTA.

Red Calabash- 80-90 days- Thin skin, 2-3 oz. beefsteak, indeterminate.

Stupice- 60-65 days- Cold tolerant, red, 2-inch, oval fruit, indeterminate.

Taxi- 80 days- Bright yellow, compact plant, determinate.

Uncle Mark Bagby- 75 days- Vigorous potato leaf plants, 8-12 oz. pink fruit similar to Brandywine but much more productive in warmer climates, brought to western Kentucky in 1919 by Mark Bagby, indeterminate.

Valencia- 76 days- Round, 8-10 oz., orange fruit, indeterminate.

Washington Cherry- 60 days- High yielding, round, deep red cherries, determinate.

Yellow Pear- 75 days- Prolific producer (single plant known to produce over 1,000 fruit), excellent flavor.

Green Zebra- 75 days- Green and yellow striped, medium size fruit, mild, sweet acidic flavor.



Defiant, Johnny's Selected Seeds

Diseases

The first line of defense in any disease management program is selecting resistant varieties. If saving seed, select for resistance. Hot water treatments can prevent seedborne diseases (see reference below). Practice crop rotation away from nightshades for at least 3 years. Practice good sanitation. Raised beds can help to ensure good drainage. Orient rows parallel to prevailing wind to maximize air flow. Prune suckers below the first flower cluster. Trellis. Mulch can prevent soil splash. Use drip irrigation.

Copper compounds are one of the most effective organic fungicides available, but are toxic to earthworms, blue-green algae and other soil microorganisms. Bacterial diseases are also developing resistance to copper compounds. There are many biofungicides available with varying results, though Sere-nade has been found to provide consistent control.

High tunnel production can go a long way in reducing and spreading disease by keeping water off of the foliage.

Grafting susceptible varieties onto disease-resistant rootstock is very effective.

Common tomato diseases:

Bacterial spot and speck– Early symptoms are small dark lesions that are later surrounded by a yellow halo. Can sometimes come in on transplants.

Early Blight– First appears as small circular spots with characteristic dark concentric rings on the leaves, ranging from a pinpoint to 1/2 inch in diameter in size. Preventative copper sprays are your best defense.

Tomato Spotted Wilt Virus– A virus moved from plant to plant by thrips. The top of the plant will start to turn brown and die first, the rest of the plant can follow. Thrips like it hot and dry.

Physiological Issues

Flower drop– Occurs when night temperatures are below 55 degrees or day temperatures are above 95 degrees and night temperatures remain above 75. Over fertilizing can also cause bloom drop.

Leaf roll– Older leaves of some varieties can roll and become stiff or leathery.

Most common on pruned plants. Can be pronounced in hot weather.

Blossom end rot– Very common, but not a rot at all. Occurs when calcium in the soil cannot move up into the plant. Consistent soil moisture can prevent this problem. Mulch!

Sunscald– Just like us, when fruits are exposed to the sun too long, due to exposure through the canopy, they can 'scald' and develop uneven color. Maintain healthy foliage, avoid excessive pruning and adjust plant spacing to provide fruit cover.

Cracking– This is usually dependent on the variety, but fluctuations in soil moisture can also increase the problem.

Catfacing– Contorted at the blossom end, with a rough blossom scar. This can happen if there is cold weather (60-65 degrees daytime and 50-60 degrees nighttime) at blossom time or from thrips. Row covers can help protect plants from the cold. Varieties vary in their susceptibility to catfacing.

Zippering– Brown tissue resembling a zipper running down the side of the tomato

from the stem to blossom end. This results from incomplete attachment of the anther during fruit formation or incomplete shedding of the flower petals. Variety selection is the best defense against zippering.

Puffiness– Leads to oddly shaped fruit, resulting from poor pollination. The locular jelly fails to fill the fruit cavity, reducing eating quality. Attributed to cool field temperatures or not enough vibration during greenhouse pollination.

Yellow shoulder– usually caused by excessive heat and insufficient potassium.

Gray wall– Characterized by grayish discoloration in the fruit wall. Usually appears on green fruit before ripening. Increased by cloudy weather, wet, cool conditions, high N and low K, and compacted soil.

Harvest and Storage

Now that you have a bumper crop of tomatoes, be sure to maintain that home grown flavor by storing them at room temperature! Do not refrigerate tomatoes after harvest. Tomatoes exposed to temperatures below 50 degrees for a prolonged period of time are prone to chilling injury. Green fruit are more susceptible to chilling injury than red-ripe.

References

ATTRA Organic Tomato Production

<http://attra.ncat.org/attra-pub/summaries/summary.php?pub=33>

Hot water treatment of vegetable seed to eradicate bacterial plant pathogens in organic production systems [Online]. S.A. Miller and M.L. Ivey, 2005, Ohio State University Extension Bulletin HYG-3086-05.

<http://ohioline.osu.edu/hyg-fact/3000/3086.html>

Laughing Stalk Farmstead Videos– Timesaver– Trellising Tomatoes

<http://www.youtube.com/>

eOrganic Tomato References

http://www.extension.org/organic_production

