Growing Tomatoes in the Home Garden

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One of the most popular of all home garden vegetables is the tomato. Originating in Central and South America, the tomato was thought by early American colonists to be poisonous and was not recognized as a useful vegetable until the 1800s. Eaten raw or in innumerable cooked dishes, today the tomato is an almost daily part of the American family diet. When grown as staked plants, tomatoes require a relatively small amount of space, yet are capable of producing 8 to 10 pounds or more of fruit per plant. Tomatoes are low in calories and a good source of vitamin C.

Climatic Requirements

Tomatoes are warm-season plants and should be planted only after danger of frost has passed. Temperature is an important factor in the production of tomatoes, which are particularly sensitive to low night temperatures. Blossom drop can occur in early spring when daytime temperatures are warm, but night temperatures fall below 55 degrees F as well as in summer, when days are above 90 degrees F and nights above 76 degrees F.

Soil Requirements

Tomatoes can be grown on many different soil types, but a deep, loamy soil, well-drained and supplied with organic matter and nutrients is most suitable. As with most garden vegetables, tomatoes grow best in a slightly acid soil with a pH of 6.2 to 6.8.

Fertilizer

Tomatoes respond well to fertilizer applications, especially phosphorus. Excess nitrogen fertilizer can result in plants with extremely vigorous vine growth but little fruit production. Apply 2-1/2 to 3 pounds of a complete fertilizer, such as 5-10-10, 5-20-20, or 8-16-16 per 100 square feet of garden area. Work the fertilizer into the soil about 2 weeks before planting. An additional side dressing of a nitrogen fertilizer may be desirable after the first cluster of flowers have set fruit.

Recommended Cultivars

There are probably more tomato cultivars available to the home gardener than any other garden vegetable. A few will be named here, but it's worthwhile talking to other local gardeners to find out what other cultivars do well in your area; or just experiment by trying one or two new cultivars each year. When choosing cultivars, keep in mind the different ripening periods.

Tomatoes are usually categorized as early, mid-season or late. Another consideration is whether the tomato cultivar you choose is determinate or indeterminate in growth habit. Determinate (D) tomato plants grow to a certain height and then stop. They also flower and set all their fruit within a relatively short period of time. This is an advantage if the tomatoes are being grown primarily for canning purposes. Indeterminate tomato plants grow, flower, and set fruit over the entire growing season.

Another characteristic to look for when choosing tomato cultivars is disease resistance. Many cultivar names are followed by one or more letters indicating resistance to Verticillium wilt (V), Fusarium wilt (F), or nematodes (N). Disease resistance can be an important consideration, especially if you have experienced these problems with tomatoes in the past.

Early: Moreton Hybrid (V), Jet Star (VF), Pik-Red (VF)(D), and Pilgrim (VF)(D).

Mid-season: Heinz 1350 (VF)(D), Better Boy (VFN), Burpee(VF), Roma (VF)(D)(paste type), Floramerica (VF), Celebrity (VFN)(D), Red Star (VFN), Market Pride (VF)(D), and Mountain Delight (VF).

Late: Supersonic B (VF), Ramapo (VF), Supersteak (VFN)(D), Mountain Pride (VF), Beefmaster (VFN).

Yellow and Orange: Jubilee, Sunray (F), Lemon Boy (VFN).

Large vine with small fruit (not suited to cage or container culture): Small Red Cherry, Large Red Cherry, Red Pear, Yellow Pear, Small Fry, and Sweet 100.

Dwarf vine with medium fruit: Patio, Pixie. Dwarf vine with small fruit: Tiny Tim, Presto, Baxter's Bush Cherry.

Establishing the Plants

Due to their long growing season and temperature requirements, tomatoes are set out as transplants in Ohio gardens. In central Ohio, the last spring frost date is about May 20, and tomatoes may be planted anytime after this.

When purchasing tomato transplants, choose those with straight, sturdy stems about the thickness of a pencil. They should have 4 to 6 young true leaves, no blossoms or fruit, and be free of insect pests and diseases. Plants in individual containers or cell packs experience little or no transplant shock and become established quickly.

Tomato plants will develop roots along the stem and may be set deeply at transplanting with the first set of leaves near the soil surface. If transplants are in peat pots, remove the rim of the pot or be sure the rim is below the soil surface, so that the soil ball will not dry out. A soluble starter fertilizer, high in phosphorus can be applied at planting time. Use according to label directions.

Tomatoes grown unstaked are usually planted 3 feet apart in rows 5 feet apart. Plants to be staked are planted 2 feet apart in rows 3 to 4 feet apart. Plants to be caged are planted 30 to 36 inches apart. Stakes and cages should be placed at planting time or soon after so as to not disturb the roots. Unstaked plants should be mulched with clean straw, black plastic or some other

suitable material to keep the fruit off the ground and prevent rotting.
Where space is limited or soil conditions poor, tomato plants can be grown in containers using a disease-free planting mix. Most any container is suitable as long as drainage is provided. Pay special attention to water and fertilizer needs of container-grown tomato plants.

Cultural Practices

Once the tomato plants are established, apply a mulch to conserve moisture and suppress weed growth. If weeds do appear, they may be pulled by hand or removed by shallow cultivation. An even moisture supply is important, especially once the tomato fruits begin to develop. If the soil becomes too dry, blossom-end rot can be a problem. If too much water is applied at one time, ripening fruit may split.
Staked plants are usually pruned to a single or double stem and periodically tied loosely to the stake with soft twine. Pruning is accomplished by removing all the branches or "suckers" that grow from the leaf axils, leaving only the main stem or the main stem and one additional branch near the base. Unsupported and caged tomatoes may be left to branch normally. Staked and pruned tomatoes produce fewer but larger fruit than caged or unsupported plants.
There are numerous insect and disease problems of tomatoes that space prohibits describing in detail here. If problems arise, contact your local Cooperative Extension office for identification and control recommendations.

Tomato Herb Sauce with Pasta

Hot pasta is tossed into a fresh salsa like sauce for a quick and delicious meal.
2 cups chopped fresh tomatoes (3 medium)
2 ounces feta cheese, crumbled
1/2 cup finely chopped red onion
1/4 cup chopped fresh basil
1 tablespoon olive oil
2 large garlic cloves, pressed
1 tablespoon chopped fresh oregano
12 ounces 3/4-inch pasta shells, freshly cooked
Combine first 7 ingredients in large bowl. Immediately add freshly cooked pasta. Toss well. Season generously with pepper and serve immediately. Serves 4.

COMMON TOMATO PROBLEMS

Tomatoes are the most popular homegrown vegetable in America – and probably the most misunderstood. One common misconception is that tomatoes thrive on hot weather – the hotter the better. While comfortable warmth does encourage good vine growth and fruit production, excess heat causes fewer fruit to set. Tomatoes are native to the Andes Mountains, where summer days are warm but nights are cool. If daytime temperatures hit the hundreds and don't cool down to at least 75º at night, tomato blossoms are likely to drop. When a hot spell strikes, you can help keep soil temperatures down by applying an insulating mulch and keeping the plants well-watered.

Blossoms-end Rot

Tomatoes can be affected by other adverse weather conditions. One common disease, blossom-end rot, is caused by a lack of calcium combined with a swing in weather from excessive rain to drought as the plants mature. The tissues at the blossom end of the fruit shrink, causing a dark, flattened or sunken spot that may cover nearly half the fruit. Treatment involves adding calcium oxide to the soil and spraying the plants with a 10% calcium chloride solution.

Stem Rot and Fruit Mold

Stem rot is simply treated by cutting off the infected areas. To prevent fruit mold, plants should be staked to keep the fruit from touching the ground. Harvested tomatoes should be kept at a storage temperature of 45 to 50º.

Root Rot, Oedema, and Sunscald

Tomatoes can't handle too much of a good thing, whether it's fertilizer, moisture or sunlight. Root rot, indicated by midday wilting, is caused by over-fertilization during very hot weather. Treat by adding sulfur to the soil to increase the soil acidity.
Small, wartlike bumps on the undersides of the tomato leaves indicate oedema, a sure sign of overwatering, while yellow or white patches mean sunscald. Tomato plants can't handle constant exposure to direct sunlight. If they're not protected, the discolored patches will blister and become large flattened spots with a papery white surface, often darkened by growth of secondary fungi and internal decay. Shade is the easy answer to the problem.

Fusarium Wilt

Only a few tomato diseases will cause serious, widespread damage. Fusarium wilt is probably the most damaging and hardest to control. The fungus Fusarium Oxysporum F. Lycopersici penetrates the skin and infests the vascular system, causing rapid wilting and death. In seedling that first sign is a downward curvature of the oldest leaves; in older plants the leaves turn yellow first. Once the disease is underway it cannot be controlled; preventive measures are the only answer. These are discussed in detail later.

Verticillium Wilt
The fungus Verticillium Albo-Atrum is not as destructive as fusarium, although early symptoms are similar, with leaves curving up rather than down. The infestation usually won't kill the plant, but will stunt its growth, reducing yields to a few small fruits. Leaves usually drop off, exposing the fruits to sunscald. Again, preventive measures are the only answer.

Tobacco Mosaic
The most ravaging and highly infectious of all plant viruses, tobacco mosaic is a common malady of tomatoes, tobacco, peppers, eggplants, petunias, and orchids. First sign of the disease is a mottling on the foliage – yellowish patches amidst the health dark green color. Newer leaves curl and twist, with a fernlike effect. Infected plants often live to maturity, but their yield is greatly reduced. The spread of the virus can be controlled by removing all suspicious plants and their neighbors. Never smoke while working in the garden and wash hands thoroughly after handling tobacco in any form- the disease is often present even in processed tobacco.

Tomato Anthracnose
Late-season fruit rot is a problem caused by the fungus Glomerella Phomoides. It's fairly common in the Northeastern and North Central states. It starts as small, circular sunken spots on near-ripe tomatoes that quickly increase and penetrate deeply into the flesh. Water-soaked at first, they dry and darken as they grow, usually developing pinkish, cream or brown pore masses in their centers. A zineb compound like Field's Tomato dust is usually and effective cure. Remove all diseased fruits before treating plants.

Early Blight
Early blight is caused by the fungus Alternaria Solani. It attacks young tomato plants in hot, moist weather. Dark brown spots first appear on lower, shaded foliage – they're marked with concentric rings that produce a target effect. Soon spots appear on all leaves, grow together to blight large portions of the foliage and expose the fruit to sunscald. Collar rot of young tomato seedlings in another symptom as well as dark leathery spots near the stem end of older fruits. Zineb, maneb, captan, or ziram spray provide effective control. An all-purpose fungicide applied early in the season works well, too.

Late Blight
Late blight, the fungus Phytophthora Infestans, spreads and kills with amazing speed. It can occur in any humid region, in any season, but is to be most feared in the East and Southeast. Infected plants first show dark, water soaked leaf spots and big, dark brown spots on the fruit. Most of the leaves soon hang lifeless and the fruit drops to the ground to rot. Seedlings will show small dark spots on their stems or leaves, followed by death within 2 or 3 days. The disease is virtually impossible to check once it gets started, but it can be prevented with applications of maneb or zineb.

Damping Off
Soil fungi, especially Rhizoctonia Solani, attack and kill off tomato seedlings or even sprouting seeds in cold, wet soil. The disease, called damping off, causes the plants to rot and fall over. Preventive measures are the only answer.

Leaf Spot
Leaf spot is caused by various fungi and shows up as brown, ringed spots on the leaves and stems. It spreads slowly and is not a cause for alarm unless it reaches a point where enough foliage is lost that fruits are in danger of sunscald. Treat with maneb or zineb after removing diseased plants. Field's Tomato Dust produces good results.

Leaf Mold
A common problem in greenhouses, leaf mold is caused by the fungus Cladosporium Fulyum. Diffuse, whitish spots

appear on the upper surface of older leaves, slowly enlarging and turning yellow. The undersurface of the patches has a velvety, oily-brown coating of disease spores. Regulating ventilators seem to provide the most practical solution since infection occurs only when humidity is high.

Nematodes

Commonly know as roundworms or eelworms, nematodes are threadlike, microscopic parasites. They live off of tomatoes, preferring the roots to the stems and buds. Infestations are especially hard to control because the symptoms are diverse and duplicate those of other diseases: poor seedling emergence, gradual decline, stunting, failure to form flower buds, midday wilting, yellowing of leaves. Death can sometimes follow the first symptoms in just a few days. Root-knot nematodes, the most destructive kind, make swellings on roots that can't be broken off.

Effective nematocides are available, but all are highly toxic and must be used with care. If you suspect your tomatoes have been infected with nematodes, dig up a plant and its surrounding soil, put it in a plastic bag and take or mail the specimen to your local extension office. They will tell you what to do next.

Preventive Measures

With planning and care, all of the major tomato diseases can be prevented. Start by rotating your crops – never plant tomatoes in same place two years in a row. Cover crops of marigolds and asparagus add a substance to the soil that deters root-knot nematodes.

Soil preparation begins in the fall. Burn the season's garden refuse and thoroughly clean the area to be planted. Avoid low, soggy ground.

Purchase certified, virus-free seed. Choose disease-resistant varieties – the letters V, F, T, and N after the varieties name indicate resistance to verticillium wilt, fusarium wilt, tobacco mosaic, and nematodes, respectively.

Disinfect tomato seed to prevent early blight and damping off. Either soak them in hot slat water (3 hours at 100º) or use the more effective chemical disinfectants like thiram, formaldehyde and mercuric chloride. Start the seeds in a sterile medium like vermiculite, perlit or sphagnum moss.

Transfer your tomato seedlings (after examining their roots for nematode galls) to rich, moisture-retentive soil, add a balanced fertilizer and till deeply. Cultivate through the season, but not when plants are wet – moisture speeds the travel of disease organisms. Keep the plants weeded and mulch to conserve moisture. Handle seed, seedling, and plants when hands are clean. Never handle diseased, then health plants, without washing hands in between.

State and federal agencies usually give public warning when late blight is imminent. This is the time to spray or dust with maneb or zineb. Field's Tomato Dust will protect plants not only from blight, but from leaf spot, anthracnose, and most other fungal diseases.

DISEASE-RESISTANNT VARIETIES

NAME	MATURITY DATE
Hybrid Celebrity VFFNT	70 Days
Hybrid He-Man Slicer VF	70 Days
Hybrid Big Red Champions VFN	70 Days
Hybrid Big Pick VFFNT	70 Days
Sweetie VF	70 Days
Lemon Boy Hybrid VFN	72 Days
Heinz 1439 VF	72 Days
Hybrid Better Boy VFN	75 Days
Roma VF	75 Days
The Beef Hybrid VF	76 Days
Pink Girl Hybrid VF	76 Days
Hybrid Beefmaster VFN	85 Days

PESTS OF TOMATO

Tomatoes are subject to attack by a large number of insect pests from the time plants first emerge in the seed bed until harvest. Aphids, flea beetles, leafminers, and spider mites threaten young plant-bed tomatoes. In the field, flea beetles, aphids, leafminers, stink bugs, and fruitworms cause minimal damage to the foliage. However, severe damage may result either from their feeding on the fruit or by spreading certain diseases.

Greenhouse tomatoes have many of the same pests as field tomatoes. Tiny pests such as aphids, whiteflies, leafminers, and spider mites are more likely to infest greenhouse crops than beetles, grubs, or caterpillars. Occasionally moths enter through holes in screens or fans and lay eggs in the greenhouse. Even in screened greenhouses, armyworms, fruitworms, and loopers may be brought into the greenhouses on plants.

KEY TO TOMATO PESTS

A. Pests that feed on the upper plant

1. Pests that mine leaves or bore into fruits and/or buds
    a. **Tomato fruitworm** - Early instars: cream colored or yellowish-green with few markings; later instars: green, reddish, or brown with pale stripes and scattered black spots; moderately hairy; up to 1 ½ inches mm long; 3 pairs of legs, 5 pairs of prolegs; holes are chewed in fruits and buds
    b. **Tobacco budworm** - This caterpillar is similar to the tomato fruitworm except mature worms are somewhat smaller and slightly more slender than tomato fruitworms; in addition, the microscopic spines on the skin of tobacco budworms are more slender, longer, and occur closer to the setae (hairs)
    c. **Tomato pinworm** - Young yellowish-gray larva only a few millimeters long, making blotch mines in leaves; older yellow, green, or gray, purple-spotted larva less than ½ inch long, folding leaves and webbing them together, or boring into stems, buds, and fruit; fruits with pinholes and discolored blotches
    d. **Vegetable leafminer** - Colorless to bright yellow maggot, up to ¼ inch long, with pointed head; makes serpentine mines in leaves; each mine slightly enlarged at one end
2. Chewing pests that make holes in leaves
    a. **Blister beetles** - Several species of slender, elongate beetles up to ¾ inc long; have prominent heads; bodies variously colored but usually black, black with yellow margins, or black and yellow striped; stringy black excrement on heavily infested plants; foliage ragged; plants sometimes stunted
    b. **Cabbage looper** - Green caterpillar with longitudinal white stripes; body up to 1 ¼ inches long, tapers toward the head; 3 pairs of legs near head; 3 pairs of fleshy prolegs; young larva on underside of leaf; consumes tender leaf tissue leaving most veins intact
    c. **Colorado potato beetle** - Yellowish-brown, oval, convex beetle up to ½ inch long with 5 black longitudinal stripes on each wing cover and several black spots on the pronotum (area behind the head); feeds on leaves and terminal growth
    d. **Flea beetles** - Various species of tiny, darkly colored beetles 2.5 to 4.5 mm long; have solid color body or black body with pale yellow stripe on each wing cover; tiny round holes in foliage
    e. **Hornworms** - Green to reddish-brown caterpillars up to 3 ½ iniches long with red or black anal horn; body with 7 diagonal or 8 V-shaped marks on each side; round black spiracles along side of body ; strips leaves from vines; infrequently feeds on fruit leaving large, open superficial scars
3. Sap-sucking pests which cause leaf discoloration, leaf or fruit deformation, or defoliation
    a. **Aphids** - Soft-bodied, pear-shaped insects with a pair of dark cornicles and a cauda protruding from the abdomen; may be winged or wingless -- wingless forms most common; feed in colonies; cause discoloration or mottling of the foliage; excrete honeydew on which sooty mold grows
        1. **Green peach aphid**- Pale yellow to green wingless adult up to 2.4 mm long; winged adult with dark dorsal blotch on yellowish-green body; nymph with 3 dark lines on abdomen.
        2. **Potato aphid** - Adult and nymph both solid pink, green and pink mottled or light green with dark stripe; adult up to 3.5 mm long; long, slender cornicles about twice as long as cauda
    b. **Greenhouse whitefly** - White moth-like insect about 1.5 mm long; found in conjunction with tiny yellow crawlers and/or green, oval, flattened, immobile nymphs and pupae; leaves yellow and drop from plant; some plants stunted and non reproductive; black sooty mold often present on leaves
    c. **Stink bug** - Green or brown (nymph green with orange and black markings) shield-shaped insect; adult up to ¾ inch long; pierces buds and fruit causing buds to drop and fruit to be deformed
    d. **Silverleaf whitefly** - Adult is slightly smaller (0.96 mm in the female and 0.82 mm in the male), slightly more yellow in color and holds its wings roof-like at about a 45-degree angle; nymphs appear glassy to opaque yellowish and have a flattened and scale-like body with the margin near the leaf surface; pupa is flattened, dome-shaped and lack setae; plants stunted and non reproductive with black sooty mold present
    e. **Western flower thrips** - Adult is about 1 mm long, varies from a pale yellow to dark brown and has a

rounded, narrow abdomen; larvae are distinctly yellow; plants are distorted and have a silvery appearance; an important vector of spotted wilt virus

B. Pests that feed on roots or lower stems

1. **Cutworm** - Fat, basically gray, brown, or black caterpillar 1 ½ - 2 inches long when fully grown; 3 pairs of legs near head; 5 pairs of fleshy prolegs; active at night; young caterpillar climbs on leaves, older caterpillar severs seedling stems near the ground; hides during the day in soil burrows at the bases of plants
2. **Southern potato wireworm** - Slender, wire-like cylindrical larva with 3 pairs of short legs near the head and a pair of fleshy anal prolegs; white, cream, or yellow-gray body with red-orange head capsule; about ½ inch long when fully grown; closed notch in last abdominal segment; ragged, irregular holes in roots