

Home-grown tomatoes for Wisconsin

H.C. Harrison

Tomatoes are a popular crop in most home gardens in Wisconsin. They are a warm-season crop, requiring a relatively long, frost-free growing season. The tomato can be grown successfully in Wisconsin if suitable cultivars (varieties) are planted. Earlier-maturing cultivars are necessary for the northern counties of the state.

Tomatoes can be important nutritionally. They are particularly noted for their vitamin C content.

A fertile soil is best

Tomatoes can be grown on many kinds of soil. They will do best on a fertile, sandy loam soil. The soil should be well drained, but should not dry out easily. Make sure the soil is well supplied with organic matter. Avoid heavy clay soils and peat or muck soils. Be sure the soil pH is not lower than 5.8. A pH of 6.2 to 6.8 is preferred.

Don't grow tomatoes in the same spot two years in succession—rotate them with other crops.

Soil preparation

It pays to prepare the soil carefully. If erosion is not a problem, fall till or spade heavy soils. Leave the land rough until spring. Rototill or turn the soil 7 or 8 inches deep. Starting in early spring, rake the soil several times at regular intervals to keep down weeds and give a smooth, clod-free planting bed.

How to fertilize

A soil test can be helpful in determining soil nutrient needs.

If soil is rather low in organic matter and a sod or green-manure crop has not been turned under, adding compost or well-rotted manure will help produce better crop growth. Apply up to 1 to 2 bushels per 100 square feet before plowing or spading in fall; or work it into the soil several weeks before plants are set in spring.

The amount and kind of fertilizer required will depend on the soil type; on whether manure, green-manure, or compost has been added; on soil test results; and on the way fertilizer will be applied.

On sandy soils with low organic matter, broadcast 3 to 4 pounds of 10-10-10 per 100 square feet and work it into the soil before planting. Or use 2 to 4 pounds of 5-20-20 per 100 square feet plus compost or well-rotted manure.

For heavier soils broadcast 2 to 3 pounds per 100 square feet of 5-20-20 or 3-9-18 and work into soil before planting.

Choose the right cultivar

There are many cultivars to choose from. Be sure the one you select fits your needs, your growing season, and other conditions. It is usually best to grow several cultivars of different maturities to help ensure a continuous supply of fruit for all purposes over the longest possible harvest season.

Recommended cultivars are listed below. The abbreviation following each name tells whether the plant is determinate (D) or indeterminate (I).

Determinate plants are suited for caging or sprawling. The fruit of determinate cultivars tend to ripen all at one time. They are good to grow when you need large quantities at one time—such as for canning.

Indeterminate plants are suited for staking or caging. Indeterminate cultivars (plants continue to elongate) have flower clusters giving way to continued extension of the stems. Their fruits ripen throughout the summer. These cultivars are good to grow for fresh use.

Gardeners in the northern part of the state should choose early cultivars to fit the shorter growing season.

RECOMMENDED CULTIVARS

Early: Early Girl (I), Flash (D), New Yorker (D), Wayahead (D).

Main crop: Beefmaster (I), Better Boy (I), Brandywine (I), Burpee's Big Boy (I), Campbell 1327 (D), Celebrity (D), Floramerica (D), Heinz 1350 (D), Jet Star (I), Pink Girl (I), Ultra Sweet (D).

Paste: Roma VF (D), Viva Italia (D).

Yellow: Jubilee (I), Lemon Boy (I).

Small-fruited (good for containers): Gardener's Delight (I), Patio (D), Pixie (D), Small-Fry (D), Super Sweet 100 (I), Tiny Tim (D), Yellow Pear (I).

*D = determinate, fruit ripens at one time;
I = indeterminate, fruit ripens throughout the summer.*

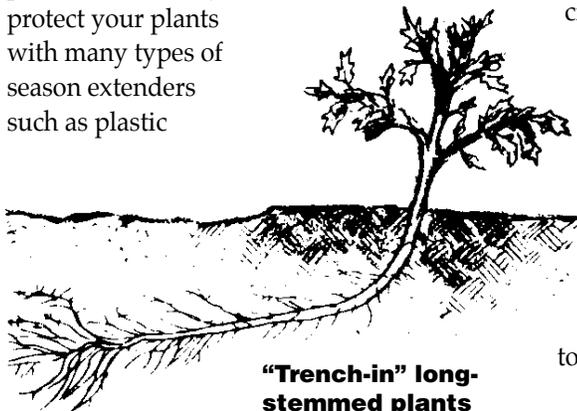
Use healthy, vigorous plants

Wisconsin's short growing season usually requires that tomato plants be started indoors. An 8-week-old plant is a good size for transplanting into the garden. Home gardeners usually find it most convenient to buy suitable plants from a local plant grower. Be sure you can get the particular cultivar you want.

The experienced home gardener can start plants indoors or in a small greenhouse around March 25 and transplant them into a cold frame or hot bed in late April. Most home gardeners do best if they wait to start their seeds in early April. Tomato seeds germinate best at a 70° to 85°F soil temperature. Plants should be vigorous, stocky, and free of disease. Avoid tall spindly plants, and plants with yellow or purplish foliage and hard thin stems.

Setting out plants

Tomato plants are very sensitive to frost, so don't set them out too early. Wait until the danger of frost has passed, and air and soil temperatures are favorable. This will be about May 20–25 in southern Wisconsin and after June 1 in northern Wisconsin. If you wish to plant early or if a late spring frost threatens after plants are set out, you can protect your plants with many types of season extenders such as plastic



“Trench-in” long-stemmed plants

tunnels, floating row covers, hotkaps, or cut-out milk cartons.

The amount of space to give each plant depends upon the cultivar, soil type and fertility, and whether or not plants are to be staked or caged. Use 10 to 12 square feet per plant for early cultivars. Late or main crop cultivars need more space, usually 15 to 20 square feet per plant. If plants are to be pruned and trained, space them 18 to 24 inches apart in the row, and place rows 30 to 36 inches apart. If caged, space plants 36 inches apart in rows that are 36 to 48 inches apart. Set plants about 5 to 7 inches deep. “Trench-in” plants with unusually long stems. Water the plants thoroughly several hours before they are set to ensure that a “ball” of soil adheres to the roots at transplanting.

Growing-season care

Cultivate or hoe—no deeper than 2 to 3 inches—around the plants weekly to control weeds. Do not cultivate after the vines cover the ground. To avoid spreading certain diseases, do not cultivate or work around the plants while they are wet with rain or dew.

Irrigate or water during dry spells to ensure better yields and quality. This practice will help reduce blossom-drop, blossom end rot, and some types of fruit cracking. When irrigating, soak the soil thoroughly 8 to 10 inches deep. Do not use light, frequent sprinkling.

Which is best—staking, caging, or no support? There are several factors to consider before you decide to support tomatoes on

stakes, cage them, or let them sprawl on the ground. Usually determinate cultivars (the terminal bud is a flower bud) are caged or left to sprawl; whereas indeterminate cultivars (the terminal bud is vegetative) are staked or caged.

Generally, plants that are staked, pruned, and tied need less space and yield larger and earlier fruits. But they also yield fewer fruits, with greater chance of sunscald and cracking.

Caged plants do not need pruning, and they yield higher quality, later fruits. These fruits are smaller and more numerous than those produced by staked plants. They also have less cracking and sunscald.

Unsupported, unpruned plants produce similarly to caged plants, except they occupy more space. Mulch unsupported plants to protect the fruit from contact with the soil.

Train and prune by setting a strong stake 6 feet long near each plant. When plants begin to branch, tie a strong cord firmly around the stake and loosely around the stem of the plant. Do this every week or so as the plant grows. Break off all shoots that develop between the leaves and the main stem as they appear.

Cage individual tomato plants in a cylinder of light-weight fencing material. Cages are usually about 18 to 24 inches in diameter and 4 feet high. They can be made or purchased from a local garden supply store.

Mulching plants with straw or a similar material will save cultivation, keep down weeds, save soil moisture, reduce blossom end rot, and provide cleaner, better quality fruit at harvest. Apply the mulch several inches deep, close to the plants after the soil has warmed up. Note: Mulched plants

may need some extra nitrogen fertilizer to prevent them from losing their usual green color. Apply 1/4 cup of ammonium nitrate or a similar nitrogen fertilizer per plant about July 1 and again about July 15 to ensure good growth.

Various synthetic mulch materials available on the market such as plastic can also be used for mulching tomato plants. The mulch is rolled out on the soil and the plants set in slits made in the material at proper intervals along the row. Tomatoes mulched with these materials often set fruit earlier and produce somewhat higher yields compared to unmulched plants. The

additional nitrogen fertilizer recommended for tomato plants when the common mulching materials are used is not necessary when using the plastic or paper.

“Blossom-set” or hormone sprays improve the “set” or formation of early tomatoes when night temperatures are below 55°F. The resulting fruit will be largely seedless. These hormones are not needed later in the growing season, when tomatoes normally set easily. Hormone materials under various trade names are available on the market. Use according to the manufacturer’s suggestions.

Prevent disease troubles

You can prevent plant diseases from occurring as well as control diseases that do occur if you get rid of diseased refuse and protect susceptible plants. Use resistant cultivars whenever possible to avoid diseases. Remember, too, that a vigorous, well-cared-for plant is better able to withstand disease and insect pressure than is a neglected one. Space your plants so that air can freely circulate and never water the foliage in the evening.

You should always get rid of diseased garden refuse—such as plant stalks, leaves, and roots—to prevent disease from spreading. Bury, burn, or put refuse in the trash for pickup.

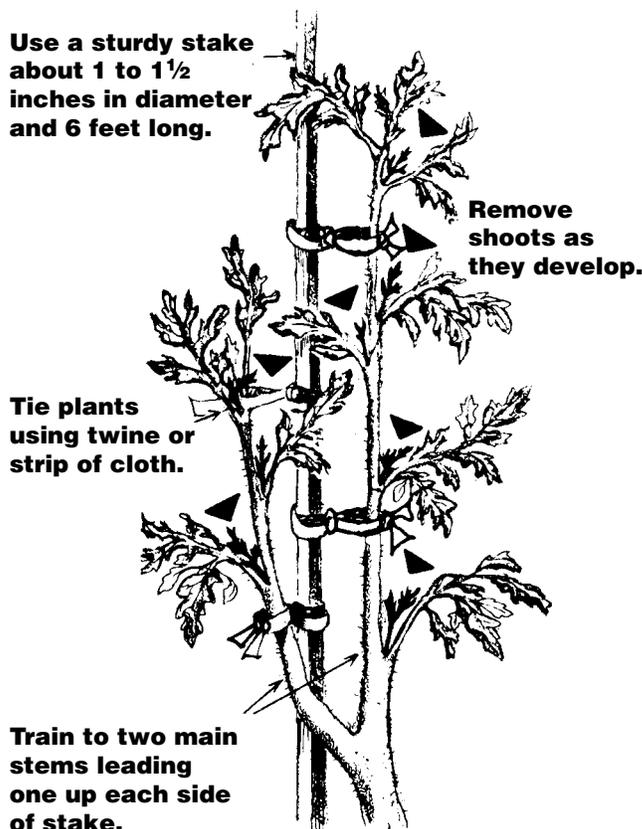
The most common diseases of tomatoes are described below.

Blossom end rot is a nonparasitic disorder of tomato fruit that appears quite often in home garden tomato plantings. The first sign of disease is a water-soaked spot near the blossom end of the fruit. This spot enlarges and turns brown, covering one third to one half of the surface. The tissue of the affected area shrinks and becomes leathery.

Blossom end rot is caused by a variety of factors involving a calcium deficiency. Its occurrence is reduced by providing an even supply of moisture with controlled irrigation. An even moisture supply promotes steady growth throughout the season. One inch of water per 5 to 7 days from either rain or irrigation meets the demands of most tomatoes in Wisconsin. Use of plastic or straw mulch conserves moisture and prevents large fluctuations in moisture supply.

Avoid excessive use of nitrogen fertilizer, particularly the ammonium form, as sidedress applications when

How to prune and tie plants



the plant is fruiting. This is especially important in cold or acid soils where high levels of the ammonium form of nitrogen are maintained for prolonged periods.

Do not plant in compacted soil. Compacted soils interfere with normal root development and thus water uptake during periods of moisture stress. Blossom end rot can become a severe problem on plants grown in compacted soils if moisture is a limiting factor.

Varieties of tomato differ in susceptibility to blossom end rot, with pear-shaped varieties most susceptible. The varieties Flora-Dade, Harvestvee, Mountain Fresh, Walter, and Wisconsin 55 are reported to be tolerant to blossom end rot.

You can also use a 77% calcium chloride product and mix a chemical spray using 1 tablespoon of the chemical in 1 gallon of water. Sprays may be needed before and during stress periods of heat and drought. Weekly or twice-weekly applications can be made, but should be repeated no more than necessary because of possible injury from accumulated salt on the foliage.

Early blight, caused by the fungus *Alternaria solani*, can affect seedlings but generally is observed on older plants. On seedlings, dark spots develop on cotyledon leaves, stems, and true leaves. Spotted cotyledon leaves may be killed, and spotted stems may be girdled. On established plants, dark brown spots with dark concentric rings develop first on oldest leaves. Spotted leaves may die prematurely, resulting in substantial early defoliation, fruit sunscald, and poor fruit color. On green or ripe fruit, spots usually begin at the stem end and develop into a black leathery sunken area, often with dark concentric rings.

This disease-causing fungus overwinters in residue from diseased plants, where it can persist for at least 1 year. The fungus also is seed-borne and can be introduced on seed and on transplants. Disease occurs under a wide range of weather conditions. It is promoted by heavy dews and rainfall and is severe on plants of poor vigor.

Cultural control methods include long crop rotations (3 to 4 years), weed eradication, proper amounts of fertilizer, and cautious ground irrigation. If purchasing plants, use only certified disease-free plants. Do not hold plants in beds for long periods after they reach transplant size. Maintain good plant nutrition since early blight will appear first on nitrogen deficient plants.

Cultivars have varying degrees of early blight tolerance. The cultivar Floramerica is reported to have good tolerance. Tomato cultivars such as Early Cascade, Joker, LaRossa, Mountain Fresh, Mountain Supreme, and Wisconsin 55 perform well under conditions which favor early blight. Early-maturing cultivars and cultivars that set most of their fruit within a short period of time are most susceptible to early blight.

An effective fungicide with specific homeowner directions is Ortho Vegetable Disease Control—1 tablespoon per gallon of water.

Septoria leaf spot, caused by the fungus *Septoria lycopersici*, is characterized by numerous small gray circular leaf spots with dark borders. A few black pin-point-size pycnidia (fungus reproductive structures) may be seen within the spot. The fungus survives in residue from diseased plants, and on or in seed. Wet weather favors fungus growth, spread, and subsequent disease development.

Plow under all crop refuse immediately after harvest. Burying the remains of plants deeply in the soil will substantially reduce survival of the leaf spot fungus if the plant debris thoroughly decays before the next planting of tomato. Since weeds harbor the fungus, clean cultivate and control weeds, especially horsetail. Use long rotations (3 to 4 years), particularly with legumes, to help free the garden area of the fungus. Carefully remove all tomato plants including dried leaves that may have fallen to the ground before tilling the garden in the fall. **DO NOT COMPOST** infected tomato debris.

Most tomato cultivars presently available are susceptible to Septoria leaf spot, although Sweet Million and Wisconsin 55 claim to have Septoria resistance or tolerance. Fungicide use is the same as for early blight. For more information, see Extension publication *Tomato Disorder: Early Blight and Septoria Leaf Spot* (A2606).

Anthracnose, a common rot on ripe fruit caused by the fungus *Colletotrichum coccodes*, first appears as small slightly sunken circular spots. Spots increase in size and the central portion darkens. Anthracnose spots on a single fruit often expand, merge, and cover a large area of the fruit. Spotted fruits may rot completely, often as a result of attack by secondary organisms. The anthracnose fungus overwinters in soil, in residue from diseased plants, and on and in seed. The fungus can become established on early blight leaf spots and on other dead areas on leaves. Fruit spots may develop where the fungus is splashed to the fruit, either from the soil or from plant parts. Green fruit can become infected, although spots will not appear until fruit ripen. Disease is prevalent on fruit that is overripe and

in contact with soil. Wet weather promotes disease development.

Control of anthracnose includes good sanitation practices and purchase of good seed. Fungicide use is the same as for early blight.

Late blight, caused by the fungus *Phytophthora infestans*, affects both tomatoes and potatoes. On tomatoes, symptoms appear on foliage and fruit. Irregular greasy-appearing grayish areas develop on leaves. These areas expand rapidly during moist conditions and a white downy mold appears at the margin of the affected area on the lower surface of leaves. If the white fungus growth is not observed, leaves with suspicious spots can be put into a polyethylene bag containing a moist paper towel (to supply moisture) and held for one day to promote appearance of this diagnostic sign.

On the fruit, grayish green water-soaked spots enlarge to indefinite size and shape. Affected areas become dark brown, firm, wrinkled, and have a relatively definite margin.

The disease-causing fungus overwinters in southern frost-free areas, on winter-grown tomatoes and potatoes, and in northern areas in potato cull piles, and in potato "seed." It may be introduced to tomato fields on transplants or may be wind-borne from diseased potato and tomato plants in nearby fields. Disease development is promoted by cool, wet conditions.

The pathogen survives during the winter months in Wisconsin in association with potato tubers. These tubers that overwinter in the soil can serve as an inoculum source for neighboring fields. Cultural control measures include the following: (1) destroy volunteer potato plants that grow from overwintered tubers; and (2) if

southern grown transplants are used, be sure that they have passed through a certification program and that they are free of foliar symptoms.

A few tomato cultivars now have some degree of resistance to late blight. These include Joker, Red Currant, and Yellow Currant. Fungicide use is the same as for early blight.

Fusarium and Verticillium wilts are soil-borne diseases that cause plants to wilt, then gradually turn yellow and die. Wilts can be brought into garden soils on plants grown in diseased soil. Plant wilt-resistant cultivars and follow a rotation that does not include wilt susceptible crops. For a current list of cultivars that are resistant to these two diseases, see Extension publication *Disease-Resistant Vegetables for the Home Garden* (A3110).

Prevent insect damage

Clean up all garden plants in the fall to help control garden insects. If insecticides are needed, use a good duster or sprayer and follow label directions carefully.

Check Extension publication *Managing Insects in the Home Vegetable Garden* (A2088), for advice on how and when to dust or spray plants. This publication also suggests ways to control insects using organic or cultural practices and explains the insect's life cycle. With a greater understanding of how the insect lives, you will be better equipped to control it.

Many cultural techniques such as use of row covers, aluminum foil mulch, beneficial insects, and color attractants can significantly decrease pest pressures. You should also remember that certain crops will have more insect pressures than others.

Insects usually cause little damage to tomatoes in Wisconsin. But sometimes certain insects can become troublesome.

Cutworms can damage or destroy young plants shortly after the plants are set into the garden. A good cultural control is to place cut-out milk cartons or metal cans around each plant making sure the container is about 1½ inches in the ground.

Flea beetles feed on the older, lower leaves creating small round holes. Flea beetles cause significant damage only when young transplants are first set out. Cover the plants with a floating row cover for a couple of weeks until they are well established.

Slugs and snails are active at night and can cause serious damage by eating holes in ripe tomatoes. Spread a slug and snail bait on the ground around the plants.

Tomato aphids are small, soft-bodied, sucking insects. When they build up on tomato plants you can wash them off with a hose or use an insecticidal soap solution.

Tomato hornworm and fruit worms are not too common in Wisconsin but occasionally may cause damage. An effective way to cope with these worms is to handpick and destroy them.

Follow label directions carefully when using pesticides. For more detailed information on pest control see *Managing Insects in the Home Vegetable Garden* (A2088), or for commercial producers see publication *Commercial Vegetable Production in Wisconsin* (A3422).

Weed control

Timely shallow cultivation or hoeing is usually the best way to control weeds in the home garden. Mulching with straw, hay, lawn clippings, or plastic and paper materials is also an excellent way to control weeds in small-scale tomato plantings. If you use plastic film for mulching, roll the material out between the rows and anchor the edges with soil. Many synthetic mulching materials do not decompose in the soil so remove them at the end of the growing season.

Chemical weed control is generally not recommended for home garden use. However, there are now herbicidal soaps that can be safely used in some gardening situations. Larger-scale tomato producers may find use of herbicides advantageous. Commercial growers looking for specific information on the use of herbicides for weed control in tomatoes should see Extension publication *Commercial Vegetable Production in Wisconsin* (A3422).

Harvesting

For fresh use and for canning, pick tomatoes when they are fully ripe. It is often necessary to pick every second day. Badly cracked, damaged, diseased, or misshapen fruit should be discarded. Use picking containers with smooth inner surfaces and don't drop fruit into containers.

Yields vary with location, season, and variety. Gardeners in central and southern Wisconsin can expect at least 12 to 15 pounds per plant. In northern Wisconsin 7 to 9 pounds per plant is more common.

Home gardeners can often stretch the harvest season several weeks beyond the first light frost in September by using plastic tunnels or floating row covers. Sprinkler irrigation will also protect tomatoes from frost. Start irrigation before temperatures drop to 32°F and continue until the temperature is again above 32°F and all ice has melted from the plants.

It is also possible to harvest the remaining green but mature tomato fruits from the vines in the fall to provide some fresh fruit for later ripening in storage. Mature-green tomatoes hold and ripen best at 55° to 70°F and 85 to 90% relative humidity. Do not expect them to hold for more than a few weeks.

References to products in this publication are not intended as endorsements to the exclusion of others which may be similar. Persons using such products are responsible for their use according to current label directions of the manufacturer.



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