

## Tomatoes Growing II

Tomato (*Lycopersicon esculentum*) is of the Solanaceae or nightshade family, as is pepper, eggplant and potato. Tomatoes were introduced to Europe in the early 1500's from the sub-tropical Americas. It was returned to eastern North America in the late 1700's but not generally cultivated for food until after 1820.

### Varieties

There are numerous varieties of tomatoes. Tomatoes are usually categorized as **early**, **mid-season** or **late**. Maturity is indicated by the number of days from transplanting to first ripe fruit.

Another consideration is whether the tomato cultivar 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 (I) tomato plants grow, flower, and set fruit over the entire growing season. Since they continue to make new leaves all season, this has the additional advantage of maintaining some leaves on the plant if leaf spot diseases really take hold later in the summer.

Another characteristic 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.

**Heirloom varieties** – The definition of heirloom is widely debated, though the term is often used for varieties that pre-date 1945 and were handed down from one generation to the next. 1945 marks the end of World War II and is roughly the beginning of widespread use of hybrid varieties. Heirlooms are open pollinated, meaning that seed saved year to year will grow a plant which is true to type. Heirloom tomato cultivars come in a wide variety of colors, shapes, flavors and sizes. Since these varieties don't lend themselves to mechanical harvesting or being transported long distances, the only way to enjoy them is to grow them yourself.

Learn about the different varieties of tomatoes from seed catalogues. A partial list of seed companies located in New England includes:

Chas. Hart Seed Co., Wethersfield CT <http://www.hartseed.com/>  
Fedco, Waterville ME <http://www.fedcoseeds.com/>  
Johnny's Selected Seeds, Winslow ME <http://www.johnnyseeds.com/>  
NESEED, Hartford CT <http://www.neseed.com/>  
Pinetree Seeds, New Gloucester ME <https://www.superseeds.com/>

## **Soil Preparation and Fertilization**

Choose a planting site which will get direct sunlight most of the day. Open airy sites allow good air flow which helps reduce foliage diseases and cold air injury.

Tomatoes are best grown in moderately to highly fertile soils. For early crops, sandy loam soils with southern exposures are best because they drain quickly and warm up readily. Tomatoes are a crop requiring high heat. Little or no growth takes place at soil or air temperatures below 55 to 60°F.

### Organic Fertility

The organic approach to fertilization involves feeding the soil, rather than just feeding the plant. Soil organic matter is an important component of soils. Use of finished composts and rotted or composted animal manures are effective ways to add organic matter to soil. The nutrient content of manures and compost varies depending on a number of factors including the source, moisture content, handling, and storage. Finished compost provides a little nutrient value, having an analysis of about 1-1-1 (N – P<sub>2</sub>O<sub>5</sub> - K<sub>2</sub>O)

Composts and manures provide some nutrient value but should be supplemented with other organic fertilizers. -The following lists organic sources of fertilizer and their availability to plants.

*Nitrogen:* Alfalfa pellets (slow availability), dried blood (medium-rapid availability), cottonseed meal (slow-medium availability), fish emulsion (rapid availability) and soybean meal (slow-medium availability).

*Phosphorus:* Rock phosphate (slow availability) and bone meal (slow availability).

*Potassium:* Wood ash (rapid availability), alfalfa pellets (slow availability), cocoa shells (slow availability) granite dust (very slow availability) and green sand (very slow availability).-

Organic sources with slow or very slow availability are not soluble or effective for short-term availability and are best used building soil reserves over the long term.

Natural fertilizers can be purchased as "single ingredient" fertilizers such as dried blood, bone meal or green sand or complete fertilizer such as 4-6-6 or 5-3-3 with a combination of organic sources of macronutrients in one bag. There are dry forms of organic fertilizer such as dried blood and liquid forms such as seaweed and fish emulsion. Natural fertilizers release nutrients slowly and some very, very slowly over a period of time. Only a portion of the total nutrient content is immediately available for plant use. This means that in a garden with low initial fertility, more fertilizer will need to be added than is immediately required by the plants.

Natural fertilizers vary in their analysis. For this reason, it is advised to follow fertilizer recommendations provided on the fertilizer bag/container by the manufacturer or provided by the soil test laboratory as a result of a soil test.

### pH and Lime

Tomatoes will tolerate a fairly acid soil (pH 5.4); however, best yields are obtained between pH 6.0 and 6.6. Most soils will benefit from the application agricultural limestone applied at a rate of 5 lbs./100 square feet. It is best, however, to have a soil sample tested by the University of Massachusetts Extension Soil Test Laboratory ( <http://www.umass.edu/soiltest/> ) and follow recommendations. Lime is more effective when applied in the fall.

### Synthetic Fertilization

Tomatoes respond well to fertilizer applications, especially phosphorus. Excess nitrogen fertilizer can result in plants with extremely vigorous vine growth but little fruit production.

*Prior to planting:* Liquid or dry fertilizer is normally applied at the time of transplanting. Dry fertilizer is best placed 3-4" inches from the stems.

**Or,** broadcast 2-1/2 to 3 pounds of 5-10-5, 5-10-10 or 1 pound 10-10-10 per 100 square feet of garden area. Lime can be applied at the same time. Rake into the top few inches of soil.

*Sidedress:* One or two side dressings of one to two pounds of 5-10-10 or half as much of 10-10-10 (or equivalent amounts of other fertilizers) per 100 square feet can be applied after the first fruit clusters are formed. Apply three to four inches from the stems and water the fertilizer into the soil.

### **Plants: Planting and Care**

Tomatoes are a warm season crop. 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. Due to their long growing season and temperature requirements, tomatoes are set out as transplants in Massachusetts' gardens after danger of frost is past and temperatures average 55 to 60°F. This might be the first week of May to the second week of June depending on location in the state. Gardeners can either purchase plants at local garden centers or start their own from seed in flats or pots indoors 6 to 8 weeks before the average last spring frost in their location.

When purchasing tomato transplants, choose plants with straight, sturdy stems about the thickness of a pencil. Plants 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.

*Planting:* If the plants are to be staked and pruned, space 3 feet between rows and 12 to 18 inches between plants. If plants are to be grown unstaked, space rows 4 to 5 feet apart with 3 feet between plants for vining varieties. Space 3 feet by 3 feet for self pruning or semi-dwarf types. Tomato plants will develop roots along the stem and may be set deep 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. Water thoroughly immediately after transplanting. Stakes and cages should be placed at planting time or soon after so as to not disturb the roots.

Where space is limited or soil conditions poor, tomatoes can be grown in containers using a commercially available soilless growing media. Most any container is suitable as long as drainage is provided. Pay special attention to watering and fertilizing container-grown tomato plants.

*Staking:* Properly pruned, staked or trellised tomatoes come into production 7 to 10 days before the same tomatoes grown on the ground. Staked (trellised) tomatoes should be pruned to one or two main stems. A wooden or bamboo stake 5 to 6 feet high is driven firmly into the ground 3 to 4 inches away from the base of the plant at the time of transplanting. When plants are 18 inches tall, the stem(s) are loosely tied to the stake with soft cord, strips of cloth, or other material. In a two-stem system, the first strong bud appearing in a lower leaf axil is allowed to grow and all other axillary buds are pinched out as the stems grow. Staking usually produces large, cleaner fruit than unstaked tomatoes growing on the ground, but yields per plant are lower. The fruit on unstaked plants is also more likely to be damaged by rodents.

*Wire tomato cages* may be used as an alternative to staking or flat ground culture. Indeterminate varieties can fill a cage 18 to 24 inches in diameter and five feet high. Caged plants need not be pruned. Unsupported and caged tomatoes may be left to branch normally.

*Weed management:* Weeds should be controlled by shallow hoeing. Pull weeds near the tomato plants or cover with soil. A four inch mulch of straw will prevent weed growth, conserve water and keep flat grown tomatoes off the ground. Black plastic may be used in place of organic mulches. It is particularly important that unstaked plants be mulched with clean straw, black plastic or some other suitable material to keep the fruit off the ground and prevent rotting.

*Water* -Tomatoes need about one inch of water per week. If rain is insufficient, soak thoroughly once a week using a soaker hose. Avoid wetting foliage during irrigation to prevent leaf diseases. Irregular watering may cause blossom end rot or fruit splitting.

### **Pests**

Several diseases and insects such as early and late blight, fusarium and verticillium wilt, flea beetle and tomato hornworm may attack tomatoes. Many newer varieties of tomatoes are resistant to fusarium and verticillium wilt, and a few are resistant to early and late blight.

#### *Insect management*

*Tomato hornworm:* Handpick unless there are white “eggs” on the back of the hornworm which indicates it is being parasitized by a beneficial wasp. Leave hornworms that are parasitized to encourage populations of beneficial wasps. Use *Bacillus thuringiensis* (biological control) on young caterpillars.

*Cutworm:* Use barriers by placing 3”-4” vertical collars such as a paper cup with bottom removed around each transplant. Set collars 1”-2” into the soil.

*Flea beetle:* Dust plants with mild alkali such as wood ash or lime. Protect young seedling by using row covers.

*Disease management* - Avoid over-watering or planting in poorly drained soils to prevent root diseases. Space plants for good air circulation and plant in well-drained soil. The use of raised beds and organic matter as a soil amendment will help on sites that are poorly drained.

Apply mulch around plants to keep disease spores from splashing from soil onto foliage. Use drip irrigation and avoid overhead watering to prevent foliar diseases. If this cannot be done, water in the morning so that upper plant parts dry off rapidly. Do not cultivate or harvest when plants are wet.

Monitor crops regularly for disease symptoms.

Maintain a “cleanliness” program in the garden. Remove and destroy all badly diseased plants, trash, weeds and dying plant parts. Many pathogens survive between crops in or on the residue from diseased plants, so it is important to remove as much of the old plant debris as possible. Weeds should be eliminated as they may harbor pathogens or serve as a host for insects that may transmit viruses and other pathogens. Frequent disinfestations of tools will also help prevent the spread of pathogens.

Use fertilizers and any pesticides only as directed. Measure accurately and apply properly to avoid toxicity to plants.

### *Common Physiological Problems of Tomato*

- **Blossom drop** may be caused by temperatures below 55°F, or above 85°, or by excessive nitrogen fertilizer.
- **Blossom end rot**, a common problem in tomatoes, is associated with insufficient uptake of calcium to the fruit. It may be caused by inadequate or uneven water supply, excessive nitrogen, and certain other conditions which interfere with calcium nutrition in the fruit. Symptoms are sunken, leathery, blackened area at the blossom scar of immature fruit and may be more prevalent on staked plants than tomatoes growing on the ground. It usually develops during or immediately following a period of water stress, such as a drought of two or three weeks' duration. Severe blossom end rot may be greatly reduced by irrigation during dry periods.
- **Misshapen fruit** may result from poor pollination, often caused by cool, wet periods during flowering.
- **Sunscald** of fruits occurs when green tomatoes are overexposed to direct sunlight. Excessive pruning and loss of diseased foliage are common causes.
- **Growth cracks** in fruits are common when long, dry periods are followed by rainy periods.
- **Deformed stems and leaves** may signal injury from herbicides used on nearby lawns to control broadleaf weeds or when grass clippings from treated lawns are used as a mulch.
- **Failure to set flowers** could be due to insufficient sunlight and/or excess nitrogen (overfertilization).

### **Harvesting, Ripening and Storage**

For immediate use, tomatoes are best when picked fully red, ripe and moderately firm. For best eating quality, ripening and color development, store at 65-70°F. Tomatoes are susceptible to chilling injury if stored at temperatures below 50°F for more than 24 hours. Continual exposure to these temperatures will prevent normal ripening even after temperatures are elevated.

Tomatoes may also be picked when mature green (presence of light color at blossom end) and fully sized. At this stage they will ripen readily at room temperature (70°F).

---

*UMass Extension Agriculture and Landscape Program 4/12*

UMass Extension is an equal opportunity provider and employer, United States Department of Agriculture cooperating. Contact your local Extension office for information on disability accommodations. Contact the State Extension Director's Office if you have concerns related to discrimination, 413-545-4800 or see [www.extension.umass.edu/civilrights/](http://www.extension.umass.edu/civilrights/).