Candy S. DeBerry, Ph.D.
cdeberry@washjeff.edu

Tips for Terrific Tomatoes

Determinate (Bush) vs. Indeterminate (Vining)

- Determinate plant types are typically short and stout, stop growing at 3 feet, and set fruit all at once, resulting in a harvest period of 2 – 3 weeks. Because of their smaller size, determinate tomatoes do not require tall or complex support structures (wire cages work for determinate plants), and can easily be grown in large containers.
- Indeterminate tomatoes grow much taller and wider than determinate tomatoes (typically 6 – 10 feet tall) and fruit until frost.

Heirloom (Open-pollinated) vs. Hybrid (F1 or F2)

- Heirloom (open-pollinated)
  Advantages: Flavor, much wider variety of types and colors, can save seed.
  Disadvantages: More susceptible to fungal, bacterial, and viral diseases.
- Hybrid (F1 or F2)
  Advantages: Tolerance or resistance to many tomato diseases (this varies with variety).
  Disadvantages: Less variety of shapes and colors, generally lack complex "old-fashioned tomato" flavor, will not grow true from seeds.

Hardening Off Seedlings

- Gradual exposure to outside conditions so that plant does not go into shock from sudden change of environment.
- Day one: set plants outside in shaded area, protected from wind, for 1 – 2 hours.
- Each day, gradually increase outside time and exposure to light for the next 7 – 10 days, until the plants are outside all day in direct sunlight for 6 or more hours.

Planting

- The site should receive at least 6 – 8 hours of direct sun each day.
- Planting is best done on a cool, cloudy or overcast day to reduce stress on the plants.
- Tomatoes can form roots along their stem, and deep planting results in tomatoes that can more easily take up water and nutrients from the soil. Therefore, for tomatoes, the stem should be buried deeply in shallow trench (up to first true leaves) and covered with soil.
- I like to mix into the soil for each tomato plant a couple of handfuls of compost, 3 - 4 crushed eggshells, and about a quarter-cup of kelp meal.
- Don't pack in or compress the soil around the plant. It needs to be loose so that water and air can penetrate.
- After settling the plant into the soil, water deeply, about 2 cups/plant.

Soil

- Loam and clay loam are most productive, although tomatoes will grow in a range of soils.
- Good drainage is a must: tomato roots cannot tolerate being waterlogged. Avoid heavy clay.
- Annual soil tests are recommended: mail-in test kits are available from state cooperative extension agencies.
- Optimum soil pH 6.0 – 6.5
  At pH < 5.5, magnesium (Mg) availability decreases significantly.
  Also, low pH and low soil calcium (Ca) causes blossom end rot.
  At high pH, zinc (Zn) and iron (Fe) availability decreases significantly.
- Low requirement: nitrogen (N) and the micronutrients magnesium (Mg), boron (B), and copper (Cu).
- Moderate requirement: phosphorus (P).
- High requirement: potassium (K) and the micronutrients calcium (Ca), iron (Fe), manganese (Mn), zinc (Zn).

Candy S. DeBerry, Ph.D.
cdeberry@washjeff.edu

Fertilizer

- Nitrogen sources: Tomatoes are not heavy feeders on nitrogen, but nitrogen can be easily leached from soils. Compost or a legume cover crop turned in at least two weeks prior to planting can usually supply nitrogen needs for one season. Other organic sources include blood meal, feather meal, fish meal, crab/shrimp meal, or composted animal manures.
- Phosphorous sources: rock phosphate, colloidal phosphate.
- Potassium sources: kelp (seaweed) extract or meal, greensand, untreated (mined) potassium sulfate, sulfate of potash-magnesia (Sul-Po-Mag, if you need to add both potassium and magnesium). Some people rake a very light dusting of wood ashes into the soil (use caution and check soil pH, as wood ashes raise pH and make soil more alkaline).
- Calcium sources: finely crushed eggshells (slow release) or garden lime (use caution and check soil pH, as lime raises pH and makes soil more alkaline).
- Micronutrient sources: kelp (seaweed) extract or meal, compost, cover crops, worm castings.
- Mycorrhizal fungi form a mutually beneficial (symbiotic) relationship with many types of plants. Tomatoes have been shown to have improved disease resistance, increased numbers of fruits, and increased fruit weight. There are many commercially available sources of mycorrhizal fungi spores: look for “myco” or “mycorrhizal fungi” in the name/label.

Support Methods

- Why tie tomato vines to upright supports? Healthier plants, larger harvests, and earlier harvests.
- Allows foliage to dry quickly, limiting several factors that encourage harmful fungal spores to reach fruits and leaves, such as wet leaves, poor air circulation, and soil splashed up by rain.
- Sprawling (unsupported).
- Large variety of support methods: rot-resistant wood stakes, trellis, cages, stake-and-weave (Florida weave).

Pruning

- Sanitation is crucial to prevent spread of diseases. Do not work with tomatoes when their foliage is wet.
- When working with my tomatoes, I use disinfectant hand lotion between each plant, and spray my tools with 70% isopropanol (rubbing alcohol) or 10% vinegar solution between plants.
- All dead and/or diseased foliage should be bagged and disposed of in the trash. Do not compost or burn tomato foliage.

Watering

- Soil should be damp 6 – 8 inches down from surface. Always check before watering!
- Tomatoes require 1 – 3 inches/week, depending upon the temperature, size of the plant, and whether it is in vegetative growth stage or actively fruiting.
- Even moisture is a must: uneven moisture causes blossom end rot and cracking of the fruits.
- Do not wet foliage when watering. This encourages fungal and bacterial diseases.
- Supplement rainfall with hand watering, drip irrigation, or soaker hoses.
- Deep, infrequent watering is far better than frequent, shallow watering.

Mulch

- Retains moisture, inhibits weeds, regulates soil temperature.
- Synthetic: red plastic (some studies have shown the color red increases yield by up to 20%).
- Organic: leaf mold, straw, grass (break down and supply nutrients and improve soil quality).
- Underlay organic mulches with sheets of newspaper (do not use glossy pages) or non-shiny cardboard.
- Interplant with weed-suppressing plants, such as cover crops or other vegetables.

Insect Pests

- Tomato hornworm *(Manduca quinquemaculata)* is the most likely pest. These large, pale green caterpillars are the larval form of the five-spotted hawkmoth. They grow rapidly and eat voraciously. Because their coloring blends well with tomato foliage, the first sign gardeners notice is usually defoliation of leaves (eaten down to the veins) or piles of small dark frass (excrement). Pick caterpillars off plants and destroy them.
- If hornworm caterpillars appear to have rows of white, rice-shaped objects attached, do not kill the caterpillar. The white objects are cocoons of braconid wasps, which are a parasitoid of the tomato hornworm. Parasitized hornworms will stop feeding and die as newly-hatched wasps emerge from their cocoons.
- Insecticidal soaps: Neem oil for aphids, mealybugs, whiteflies, mites.
- Botanical extracts: Pyrethrum for aphids. Can be toxic to humans, bees, and beneficial insects.
- Microbial insecticides: *Bacillus thuringiensis* (Bt) for caterpillars. Highly specific and safe to nontarget organisms.

Biotic Diseases

- Biotic diseases are caused by fungi, bacteria, and viruses. There are a lot of tomato diseases!
- Affecting the root system: fusarium wilt, verticillium wilt, bacterial wilt, nematodes, rhizoctonia.
- Affecting above-ground stems and foliage: early blight, late blight, septoria leaf spot, bacterial canker
- Affecting fruit: bacterial spot, bacterial speck, anthracnose.
- Excellent online information about tomato biotic diseases, prevention, and treatment:
  - A Visual Guide: Tomato Foliage, Stem & Root Problems, Missouri Botanical Garden http://www.missouribotanicalgarden.org/Portals/0/Gardening/Gardening%20Help/Visual%20Guides/Tomato%20Foliage%20Problems.pdf
  - Tomato Diseases and Disorders, Iowa State University Extension, https://store.extension.iastate.edu/product/4618

Abiotic Diseases

- Abiotic diseases are caused by environmental conditions and/or physiological disorders.
- Blossom end rot is caused by failure to uptake calcium, which is most frequently caused by lack of water. Prevent it by making sure that plants have even moisture. Some people incorporate finely-crushed eggshells into soil. Take care if adding garden lime, as it can raise soil pH and make it too alkaline.
- Cat facing is caused by insufficient pollination, physical damage, excessive nitrogen in soil, or herbicide damage.
- Sunscald is caused by excessive exposure to bright sunlight. Don't over-prune plants: leave enough leaf cover.
- Cracking usually results from rapid fruit growth when the plants receive a lot of water or rain after a dry period.

Crop Rotation

- To break the cycle of pests and disease, rotate your crops every year.
- Avoid planting tomatoes (or other members of the Solanaceae family, i.e., pepper, eggplant, ground cherry, tomatillo, potato) in the same place year after year. A 4-year rotation (before planting the same crop in the same location) is considered ideal.

Companion Planting

- Basil, borage, chives, mint, parsley, and bee balm improve tomato flavor, and repel flies and caterpillars.
- Marigolds repel soil nematodes.
- Garlic, onions, zinnia, marigolds, and nasturtium are natural repellants to aphids and whitefly.
- Plant these nearby to attract beneficial insects: clover, buckwheat, fava beans, mustard, cowpeas, and species in the carrot (*Umbelliferae*), sunflower (*Compositae*), and mint (*Lamiaceae*) families.
- Tomatoes should not be planted near members of the Brassica family (broccoli, Brussel sprouts, cabbage, cauliflower, collard, kale, kohlrabi, rutabaga, turnip), fennel, dill, or walnut or butternut trees, as these all stunt growth of tomatoes.
- Tomatoes should not be planted near other members of the Solanaceae family (eggplant, peppers, tomatillos, potatoes), as they share many diseases, especially early blight and late blight.
- Avoid planting tomatoes near corn, which are both eaten by the corn earworm (aka tomato fruit worm).

Candy S. DeBerry, Ph.D.
cdeberry@washjeff.edu

Organic methods to control blight on tomatoes

Excerpted and modified from: http://northcoastgardening.com/2015/05/tomato-blight/

Plant blight-resistant tomato varieties

Commonly-available varieties include 'Stupice', 'Iron Lady', 'Jasper', 'Lemon Drop', 'Pruden's Purple', 'Red Currant', 'Defiant PhR', and 'Mountain Magic'.

Plant grafted tomatoes

Grafted tomatoes are essentially two tomato plants spliced together, combining the superior flavor of heirloom or hybrid varieties with highly disease-resistant rootstock.

General cultural tips for preventing blight on tomatoes

- Buy your seeds and/or starts from a reliable source.
- Make sure there is enough space (at least 24") between your plants for air circulation.
- Use trellis and plant supports to keep plant branches and leaves off of the ground.
- Mulch with organic matter or use red plastic as a barrier between tomato foliage and the soil.
- Check and tend your plants frequently during wet weather or if they are stressed.
- Don't water tomato plants from above.
- Water early in the day so any foliage that does get wet is dry by nightfall.
- Clean up your garden area promptly at the end of the gardening season. Remove all plant debris and put it in the trash. Never compost tomato plants. Blight fungi can over-winter in the soil and in infected plant debris.
- Rotate your crops yearly if possible, even if you have to plant tomatoes in containers.
- Two preventative sprays which are popular include 1. milk (1:10 dilution in water), and 2. baking soda (3 T baking soda, 1 T vegetable oil, 2 drops dishwashing detergent in 1 gallon water).

Preventing early blight *(Alternaria solani)*

- If tomatoes show signs of early blight, begin a spraying program of alternating organic copper spray and Serenade biological fungicide, both of which are safe to use on edibles.
- Don't spray copper and Serenade during the same week as there is some evidence that copper decreases the effectiveness of Serenade.
- Use caution when using copper. Spray early in the morning to avoid harm to bees. Because copper can build up in the soil and cause toxicity, don't grow tomatoes in the same spot every year if you use copper frequently.

Preventing late blight *(Phytophthora infestans)*

- Remove any volunteer tomatoes and potatoes that come up in the garden.
- Actinovate, which contains the beneficial bacteria *Streptomyces lydicus*, can be used as a preventive measure.
- Oxidate, made of activated peroxide, can be used as a preventive measure.
- **If late blight infects your plants, you must pull out all the plants which are affected and dispose of them in the trash. Do not compost them** as this highly contagious and devastating disease can infect the rest of your plants, and spread to other tomatoes (and potatoes) in the neighborhood.