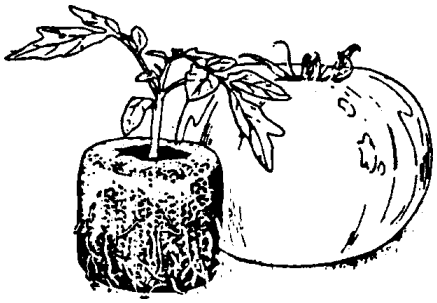
Cornell Cooperative Extension
Nassau County

Horticulture Program
Eisenhower Park
East Meadow, N.Y. 11554

Home Grounds Fact Sheet

Growing Tomatoes in the Long Island Garden



Once a garden curiosity, the tomato has become one of the most popular vegetable crops. It can be grown in many areas under many different conditions. Because it is well-adapted and people get a great deal of satisfaction from growing them, tomatoes are grown in almost every home vegetable garden on Long Island.

Select a Good Site:

Sunlight is one of the most important requirements for a good vegetable garden. Tomatoes require a great deal of sunlight (8 hours), especially for setting fruit, and for this reason, the garden should be in an open area away from shade-producing trees and buildings. If the garden must be located near a shaded area, it is best to place it so that the plants have a southern exposure. Then the plants can receive the direct sunlight for the greatest length of time.

In addition to adequate sunlight, the site should also be well drained with porous soil that is easy to work. Areas where water will stand on the surface should be avoided because tomatoes cannot stand "wet feet" for long periods of time.

Organic Matter:

All soils can benefit from the addition of organic matter. Where soils are very sandy, it is extremely important to add large quantities of organic matter to help retain moisture and fertilizers. Organic matter also supplies the plants with additional nutrients.

Manure is a good source of organic matter, but it should be well-rotted and plowed or spaded in deeply in the fall. Avoid manure that contains a great deal of straw. Use manure at the rate of one bushel for each 75 square feet with 1 1/2 lbs. of super-phosphate added.

Peat moss is an expensive source of organic matter. Be sure to have your soil tested because peat moss has a low pH rating.

Compost is the best source of organic matter and is not expensive. It is also a good way to get rid of leaves and other plant material. Keep the compost pile moist and turn it over two or three times during the year to help it decompose. It should be nicely decomposed before it is used in the garden. **Do not** compost diseased vegetables because the pile will just be a source of disease inoculum for your garden in the future.

Compost is available free to residents of certain municipalities. Call your town hall to see if you can get free compost. For instructions on making your own compost, see Home Grounds Fact Sheet D-2-28.

Lime and Fertilizers:

Long Island soils are naturally very acid and require liming to raise the pH. To be sure, especially if the garden is in a new location, a pH test is necessary.

Tomatoes grow best when the pH is between 6.2 and 6.8, so apply the amount of limestone specified by your pH test results. Finely ground dolomitic limestone should be used. Dolomitic limestone is a good source of magnesium, frequently deficient in our native soils.

Cornell Cooperative Extension offers a pH test performed at its Nassau County office and a mailer for a complete soil analysis performed at Cornell University in Ithaca. Many garden centers also offer soil tests. For instructions on taking a sample see Home Grounds Fact Sheet A-1-0.

The fertility program should start with a complete fertilizer such as 5-10-5 or 5-l0-l0 at the rate of 4 to 5 pounds for each 100 square feet. A 5-10-5 fertilizer contains 5% nitrogen, 10% phosphorus and 5% potassium.

If you are starting in a new location, 5 lbs. of 5-10-5 should be adequate, provided that the pH is raised to between 6.2 and 6.8. On older locations, you might want to change to 5-10-10 or 10-10-10 at about 2 to 4 lbs. per 100 square feet.

Apply fertilizer, lime and organic matter to the soil, then rototill to a depth of 8-12 inches.

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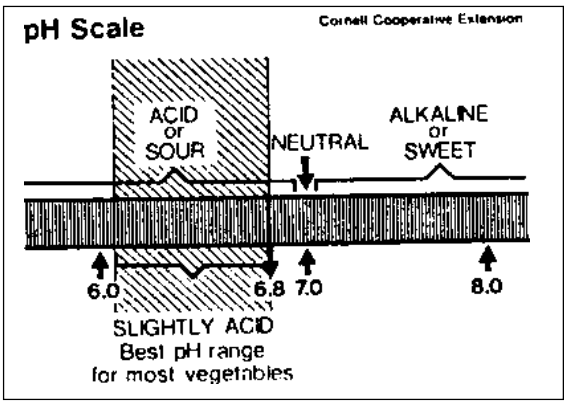


Healthy Plants are Essential:

Whether you grow your own plants from seed or buy plants already started, you should be sure they are healthy and in good condition to transplant. The tomato plants should be stocky, medium sized (about 6 inches high), relatively young, have a good green color, and free of diseases and insects. Too often plants are lanky and when planted out will not withstand any wind or warm weather. Seldom does one get an earlier yield by purchasing larger plants with flowers and/or small fruit already present.

Many people who grow their own plants like to use peat pots filled with a good soil or a soilless mix (peat-perlite, etc.) The 2 x 2 inch pot is good - but the larger the pot, the better the chance to have a sturdy plant for the garden.

If you use any soil in the seedling mix, be sure it is sterilized. You can do this by placing a small amount of **dampened soil** in a metal pan in an oven at 180°F for 30 minutes. (Be advised: this will generate quite an odor!)

To grow plants in pots or Jiffy-7 pellets, seed at least 2 tomato seeds per container and keep the soil temperature at 70°F until seedlings appear above the ground. Be sure to keep the growing media moist at all times, but avoid continued saturation. Enclosing the seed containers in a sealed plastic bag until germination provides additional warmth and humidity. Keep out of direct sun and remove plastic as soon as germination occurs above ground. When the plants have the first true leaf, thin them so you have one plant per pot.

Once the tomatoes germinate, they should be placed in an area where there is plenty of light. Artificial lights are good, but have to be very bright and close (about 8") to be beneficial. It is best to have the plants exposed to sunlight 8 to l0 hours a day, if possible. They should be ready to plant in 5 to 6 weeks.

Transplanting:

Many home gardeners anxious to grow tomatoes plant them much earlier than they should. Unless some method of frost protection is used, tomatoes should not be planted until all danger of frost is passed. In many areas of Long Island, the average date of the last killing frost is about April 20. Many times we have light frosts after that date that will damage or kill tomatoes. Do not plant before May 15; the soil temperature is **too cold** for good results before that date.

Spacing tomatoes correctly is quite important. This depends mainly on three things:

l) type of equipment used, such as cultivators;
2) type of mulch used, such as plastic, and woodchips;
3) whether or not the plants will be staked.

As a general rule, rows should be 3 to 6 feet apart (you may go as close as 2 feet if the tomatoes are staked or when planting dwarf varieties). In the row, the plants should be spaced so that each plant has at least 4 square feet if staked, and 8 to 16 square feet if they are not.

Staking: **(diagram, pg. 3)**

In most gardens, it is advisable to stake tomatoes to increase your yield and conserve space. You can purchase wire tomato cages or use wooden stakes (8ft. or longer).

If you use stakes, be sure to drive them into the soil either before or at planting time so as not to disturb the root system. The above ground part of the stakes should be at least 6 feet and strong enough to support the weight of the plant and fruit. Strings or wire (twist-ems) can be used to hold the plant to the stake. Be sure not to tie them too tight or they will cut the stem. Old nylon stockings or strips of rags work well, too. All but 2 or 3 side shoots or suckers and the mainstem are removed so the plant has only 3-4 stems.

Heavier posts may be set every 10 to 12 feet and a heavy wire stretched across their tops. Heavy strings should lead down from this wire to the individual plants. A loose loop is tied around the stem just above the soil, and as the plant grows the stem is twisted around the string at least once a week.

Mulching:

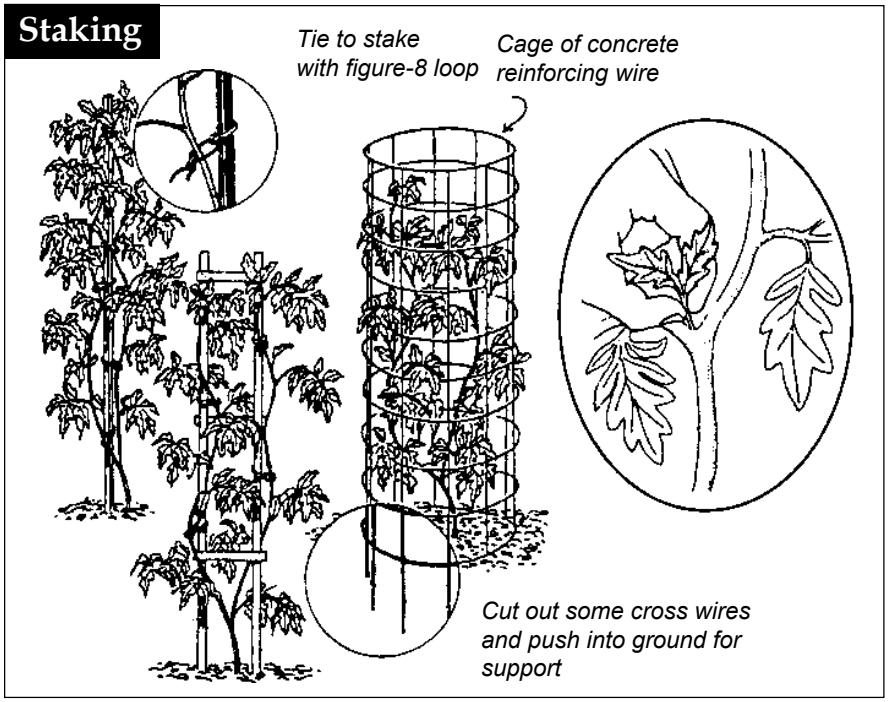
Mulches cover and cool soil, minimize evaporation and reduce weed growth. There are several different types of mulch that can be used in the vegetable garden.

Newspaper is inexpensive and provides all the benefits of mulch when laid down in a thick layer. You may not like its appearance.

Black Plastic: is excellent for weed control, helps conserve moisture, and is used to keep fruit from touching the soil. It also helps prevent some soil-borne fungi from being splashed up onto the plants. Plastic does not break down so it must be picked up after the season is over.

Straw and shavings: are good mulches for control of weeds and, upon decomposition, will add valuable organic matter to the soil. These mulches form an insulation if applied too early and will keep the soil abnormally cold. (Apply about 2-3 weeks after planting.) Be sure to apply additional nitrogen to the soil.

Grass Clippings: be sure clippings are **free** of any chemicals or diseases that can affect tomatoes. Grass clippings are inexpensive, readily available, and when tilled into the soil in fall are a good source of organic matter.



Sidedressing:

Because tomatoes are heavy feeders, sidedressing with a small amount of fertilizer will be worthwhile once or twice during the growing season. Overfertilizing can cause plants to grow rapidly, but will also make the flowers drop without producing fruit.

Harvesting:

Tomatoes should be harvested twice weekly as they ripen. All rotten and damaged fruit should be removed to protect the healthy ones.

Just before the first frost in the fall, you can pick the mature green fruit and ripen it inside. Do not hold green tomatoes at temperatures below 55°F or they will not develop a good flavor. Increase the temperature to 65° to 70°F for the tomatoes you wish to ripen. Higher temperatures will cause them to soften. (You can hasten ripening by placing green tomatoes in a bag with a ripe banana!)

Tomatoes can give you a great deal of satisfaction in your vegetable garden. They are not very difficult to grow if you are willing to put in the necessary time and effort.

Problems of Tomatoes:

Physiological Problems

Failure to set fruit - Every year gardeners have tomatoes that flower but do not set fruit. This is caused by low night air and soil temperatures (below 55°F), abnormally hot weather, low soil moisture, excessive shading, or over-fertilizing.

For the early tomatoes, it is essential to use varieties that will set well during the cold periods in May and June. (See Home Grounds Fact Sheet B-1-31, "Vegetable Varieties.")

Blossom end rot is caused by insufficient calcium uptake when fruits are forming. The first symptom of blossom end rot is a slight water soaked area near the blossom end of the fruit. The circular lesion soon darkens and enlarges until the fruit begins to ripen. The size of the spot may range from a speck to half the size of the tomato. Fruit that is not badly affected may still be eaten - just cut out the spot.

Calcium deficiency usually results from improper soil pH. It is very important to have your soil tested in advance of planting. Heavy rain, drought or improper irrigation cause wide fluctuations in soil moisture that interfere with calcium uptake. Hoeing or cultivating should be done no closer than one foot from the plants to avoid root pruning. Mulching will eliminate the need for cultivation and help maintain soil moisture at an even level. Lastly, do not over-fertilize; rapid growth caused by over fertilization can contribute to blossom end rot.

Cat Face is an abiotic disease caused by factors that seriously disturb initial fruit development during blossoming. Symptoms are extreme malformation and scarring of the fruit. The larger beef steak type tomatoes are more susceptible. Look for varieties that are cat face resistant. Cat facing can also be caused by cool weather during fruit set and injury from 2,4-D herbicide.

Cracking - in concentric cracking, the fruit develops circular, concentric cracks around the stem end of the fruit. In radial cracking, the fruit cracks radiate from the stem end.

Conditions that may cause cracking include: periods of very fast fruit growth with high temperature and moisture levels; initial fruit growth during a dry period followed by heavy rain or irrigation during ripening and wide differences in day and night temperatures.

Graywall or blotchy ripening - part of the fruit fails to ripen. Symptoms are first observed as flattened, blotchy, brownish-gray areas that develop on green fruit. As the fruit matures these areas remain gray or turn yellowish resulting in uneven ripening. Sometimes dark brown vascular tissue can be seen in the fruit walls when the fruit is cut.

Environmental factors that appear to be associated with this disorder are high nitrogen, low potassium, high soil moisture, high humidity, temperature fluctuations, low light intensity and soil compaction. In addition, certain bacteria, fungi and/or tobacco mosaic virus are thought to be involved in gray wall.

Leaf roll - this disorder is characterized by upward rolling of tomato leaflets on older leaves. Leaf roll has been associated with varieties having specific gene (wilty gene); symptoms usually are seen when plants have a heavy fruit load. Environmental factors reported to promote symptoms include high temperature, drought, and prolonged periods of wet soil conditions.

Herbicide Injury - Hormone type herbicides such as 2,4-D, Banvel D, etc. used near the garden can cause serious damage on tomatoes. The symptoms are downward curling leaves and twisting new growth. (Symptoms are very similar to many of the common virus diseases.) Do not spray these materials on a windy day or near the vegetable garden. Don't use grass clippings for a mulch or in a compost pile if the lawn was recently treated with a herbicide.

Integrated Pest Management (IPM) Considerations

IPM is a common sense approach to pest control and plant care. It employs a number of measures to prevent, control or reduce plant problems. These include using resistant plant varieties, proper plant selection and placement, good aftercare and biological and/or mechanical controls. As a last resort, after all other remedies have been explored, a pesticide* that is least toxic to people and natural predators, can be considered. Prior to using any pesticides, plants should always be monitored for the degree of infestation and a sensible control measure considered.

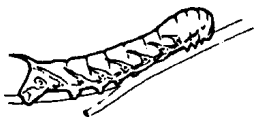
* A pesticide is a substance that kills, or attempts to kill, a particular pest, e.g. **insect**icide, **fung**icide, **herb**icide, etc.

Insects

Aphids sometimes called plant lice, are tiny insects that suck the juices out of plants. They may be green, yellow, brown or black. Aphids not only reduce plant vigor by stealing nutrients from the plant, they also carry virus and disease organisms from plant to plant.

***Control*:** Spray plants with insecticidal soap as needed. Be sure to spray the undersides of the leaves. Wait one day before harvest. **(see note A.)**

Tomato Hornworm is a large, (up to 3" long) pale green caterpillar with white and black diagonal stripes. A red or black "horn" projects from the rear of the insect. A brown form also exists, though it is not as common. The adult moth, called a sphinx or hawk moth, is medium to large and heavy bodied with thick antennae. The moth is mottled gray-brown with yellow spots on the side of its abdomen and has a wingspread of 4-5".



Injury: The hornworm feeds on leaves and new stems of the tomato. Because of their protective coloration, they often go unnoticed until extensive damage appears. When skeletonized branches and/or dark green pellet droppings are found, inspect the undersides of leaves for these voracious caterpillars. During July and August they occasionally feed on fruit.

***Life Cycle*:** The moth overwinters as a pupa deep in the soil and emerges as an adult moth in late spring, at which time it lays spherical green eggs on the undersides of tomato leaves. In approximately five days the eggs hatch and develop into larvae. In 3 to 4 weeks the larva is mature. The larva burrows into the soil to pupate for 2 - 4 weeks, then adult moths emerge to begin a new generation. One to four generations may emerge a year.

Natural factors help control hornworm. One is a small parasitic wasp (*Cardiochiles nigriceps*, a Braconid wasp) that lays its eggs in the hornworm. Occasionally, you may see hornworms with small white egg-shaped objects protruding from their backs. These are the wasp's cocoons. The larvae feed inside the hornworm and kill it upon their emergence.

***Control*:** Hand-picking the hornworms from infested plants is most effective during July and August. Any hornworms exhibiting the parasitic wasp cocoons should be allowed to remain. Extensive populations in large gardens can be controlled with the organic insecticide *Bacillus thuringiensis* (commonly called Bt). **(see note A.)**

Root Knot can be severe on tomatoes, cucurbits, eggplant, lettuce, spinach, carrot, parsnip, cabbage and celery. Affected tomato plants usually are stunted and may wilt in hot, dry weather. A diagnostic symptom is easily detected on roots of all affected plant species: roots contain elongated and round swellings (root knots) on both large and small roots. Root knot is caused by several species of the root knot nematode. Nematodes are tiny, usually microscopic worms. Nematodes may be introduced on transplants and then spread within garden beds.

***Control*:** Rotate crops and buy resistant transplants (the letter N will follow the variety name) from a reputable nursery.

Diseases

Verticillium and Fusarium Wilts are caused by fungi that clog the vascular tissue of tomatoes. These soil-borne fungi can persist for many years. Leaf symptoms appear on oldest leaves first. They turn yellow, dry up and drop prematurely. Both wilts are soil borne and widespread on Long Island. They also infect potatoes, peppers, eggplant, melons and many other vegetables and some ornamentals. The only solution is to use resistant varieties. (See Home Grounds Fact Sheet B-1-31, "Vegetable Varieties.") The letters VF or VF1F2 should follow the variety name.

Early Blight is caused by the fungus *Alternaria solani*. 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.

Control: Garden sanitation is very important because this disease-causing fungus overwinters in residue from diseased plants. Use drip irrigation instead of sprinklers to avoid wetting leaves. Do not crowd plants. Remove all weeds to increase air circulation. **(see note A.)**

Only you can decide if you want to use chemical pesticides on your home-grown tomatoes. The only non-chemical option is to quickly remove infected plants to prevent spread to your other plants.

Anthracnose first appears as small slightly sunken circular spots on ripe fruit. 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 seed.

Garden sanitation is an important control. The fungus can become established on early blight leaf spots and other dead areas on leaves. Fruit spots may develop where the fungus is splashed on the fruit, either from the soil or from plant parts. Wet weather promotes disease development.

Viruses are usually associated with excessively deformed growth, but spotting, mottling and streaking are also symptoms. The virus itself is a tiny infectious protein substance that cannot even be seen under an ordinary microscope, but the symptoms of infection are easily apparent. Viruses are long-lived. They can be spread by contaminated hands, tools or insects such as aphids and plant hoppers. Insects obtain the virus from feeding on infected weeds or plants and passing it to healthy plants when they begin feeding. Under normal conditions, soil is not usually the source of infection. The three viruses that most commonly attack tomatoes are:

A. Tobacco Mosaic Virus

Symptoms:

- foliage is mottled light and dark green; mottling may eventually lead to death
- curling and slight malformation of leaflets
- plants may be stunted
- leaves develop a rough texture
- plants bear little fruit
- some fruit may be mottled or streaked
- fruit may have poor flavor

Tobacco Mosaic Virus also affects eggplant, pepper, squash, aster, roses and other plants. It is very infectious; it can be spread by brushing against plants.

Control: Best controlled by sanitation. Never touch a healthy plant after handling diseased material. Rogue out infected plants. Try to avoid entering the garden when dew is still on the leaves. **Never** let anyone smoke in or near your garden. If you are a smoker, be sure to wash your hands before touching your plants. Some varieties that have been advertised as being resistant to Tobacco Mosaic Virus include 'Celebrity,' 'Park's Whopper,' 'Quick Pick VFFNTA,' 'Park's Extra Early,' 'President Hybrid Big Pick' and 'Little King VFFNTA Hybrid'. Check your seed catalog for details and other possible varieties.

B. Cucumber Mosaic Virus

Symptoms:

- stunted plants
- short internodes
- extremely distorted and malformed leaves

The shoestring symptom is characterized by extremely narrow leaves. This virus is spread by aphids.

Control: Remove weeds from area. Do not plant tomatoes near phlox, marigold, petunia, zinnia or hollyhock. Other vegetables such as cucumbers, peppers and melons may also be sources of infection.

C. Double Streak Virus-

caused by a combination of Tobacco Mosaic Virus (TMV) and Potato Virus X (PVX).

Symptoms:

- yellow and green mottling of leaves
- small grey brown spots develop into dead spots (severely spotted leaves may die)
- dwarfed and curled leaves
- numerous dark brown streaks on stems and petioles
- reduced fruit set
- rough fruit with brown patches

Control: Tomatoes should not be planted near potatoes in the garden and the same control practices should be followed as for TMV.

Control For All Virus

Watch carefully for aphids and other sucking insects. Follow control recommendations to keep them from feeding on tomatoes, thereby preventing transmission; use clean tools and have clean hands when handling tomatoes or removing weeds. Don't smoke in the garden.

note A. Chemical pesticides are available. If you choose to use chemical pesticides, contact your local Cooperative Extension office for specific recommendations.

WHENEVER YOU USE A PESTICIDE, ALWAYS READ THE LABEL AND FOLLOW THE MANUFACTURER'S INSTRUCTIONS AND RECOMMENDATIONS.

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