

Tomatoes

Cultivars

Contact Manitoba Agriculture and Food's Vegetable Specialist for variety information.

Climate and Soil Requirements

Tomatoes are a warm-season crop. Tomatoes must be set out in the field as transplants after all danger of frost has passed. By using plant protectors (Hot caps, Walls o' Water, plastic tunnels, etc.), plants can be set out somewhat earlier.

Tomatoes require direct sunlight for optimum production. Tomatoes do not thrive in cold weather or extreme heat. Fruit set will not occur at prolonged temperatures below 14°C or above 30°C.

Tomatoes will produce good yields on a wide range of fertile, well drained soils with pH of 5.5 – 7.5.

Seed Treatment

Seed treatment with a registered fungicide is necessary to prevent seed decay and damping-off.

Hot water treatment is an effective, non-chemical method to reduce bacterial and fungal pathogens on seed. It is particularly important for the control of bacterial diseases of tomatoes, peppers and cole crops.

Tomato seed can be treated at 54°C for 25 minutes. Plant seeds within a few days of treating.

Tomato seed can also be treated by soaking dry seed in three parts of 0.6 Molar hydrochloric acid (i.e., mix one part acid with 19 parts of distilled water) for one hour with frequent agitation. Drain the acid, thoroughly rinse in distilled water and dry. A 0.1 Molar hydrochloric acid (available from scientific supply companies) can also be used to soak the seeds for one hour with frequent agitation and, in this case, the seeds can be dried without rinsing in water.

Transplants

Use treated seed (3 ounces of seed required for 10,000 transplants) and a sterile planting media in 128 to 288 cell trays. For early market tomatoes transplant to 24 – 50 cell trays after first true leaf has developed. Time required to produce field ready transplants is five to eight weeks. Optimum temperature for germination 29°C with night temperatures of 15°– 18°C.

Prepare transplants for the harsher environment of the field by hardening them off. Warm season crops should not be hardened at temperatures below 13°C.

Watering of the transplants can be reduced to let the plants wilt slightly, as part of the hardening

process. Do not let plants wilt excessively. Increasing air movement around the transplants also assists in the hardening process.

Consider holding plants outside for several days before field planting. This allows them to become acclimated to field conditions while they are still in their trays. Select a location that is exposed to full sunlight but is protected from drying winds. Check plants regularly and water as required.

Do not harden off plants by withholding fertilizer, as this can result in nutrient deficiencies and delay field establishment.

Seeding and Spacing

For fresh market tomatoes, recommended plant spacings are:

Row Spacing:

Large vined - (indeterminate or bush)
5-6 ft (1.5 – 1.8 m)

Small vined - (determinate and semi-determinate or staking) 3-5 ft (0.9 – 1.5 m)

In-Row Spacing:

Large vined - (indeterminate or bush)
20-27 inches (50 – 70 cm)

Small vined - (determinate and semi-determinate or staking) 12-24 ft (30-60 cm)

Plasticulture

Use of plastic mulch will result in improved earliness, yield and quality of fresh market tomatoes. Plastic mulches warm the soil, conserve moisture and keep the fruit clean, thus reducing soil-borne fruit rots. Black plastic mulch is recommended because it also provides weed control. If plastic mulch is used, drip irrigation is recommended.

Without drip irrigation, plastic mulch should not be laid on dry soil. If the soil is very dry, irrigate or wait for rainfall before laying. Soil moisture is required for plant growth and is important for heat retention. Lay mulch two to three weeks prior to planting for maximum soil heating.

The use of floating row covers on upright-growing crops like tomatoes and peppers is not recommended because abrasion damage to the plant's shoot tips will occur.

Fertility

Refer to Tables 1 through 9 for this crop. For general recommendations in the absence of a soil test, refer to Table 10 in the fertility section.

Starter Fertilizer

Apply a high phosphorus starter fertilizer in the transplant water when transplanting tomatoes. Starter fertilizer is especially important when planting in cool soils in early spring. Starter fertilizers are available in several forms including liquids (10-34-0 or 6-24-6) or granular materials (10-30-20 or 10-52-10). Apply according to the following recommendations:

Starter Solution Recommendations for Tomatoes (for sandy soils with less than 2% organic matter, use half the recommended rates.)

Soil temperature less than 18°C: Use full label rate as recommended.

Soil temperature between 18 – 27°C: Use half of recommended rate.

Soil temperature greater than 27°C: Starter not normally required.

Irrigation

Irrigation is both a science and an art. Amount of irrigation water to be applied depends on amount of rainfall, soil type and associated “available soil moisture”, rooting depth of the crop and crop stage. For example, sands and coarse sandy loams retain approximately 1 inch (25 mm) of available soil moisture in the crop's rooting zone. Under average conditions, a crop will use this moisture in 7 days. On these soils, a weekly irrigation of 1 inch (25 mm) of water would be required to maintain high yields.

Fine sandy loams and silty loams retain 1.5-2 inch (40-60 mm) of available soil moisture in the rooting zone. On these soils, heavier and less frequent irrigations (1.5-2 inches (40-60 mm) of water every 10-14 days) are required for optimum yields. Application of more water than is required wastes water and can cause leaching of fertilizers and pesticides.

Different vegetable crops also vary in their response to irrigation. Shallow-rooted crops such as celery, lettuce, onions and radish require frequent, light irrigation. Deep-rooted crops can use water from a greater volume of the soil profile and do not require irrigation as frequently.

Tomatoes produced on well-drained, friable soils will root to intermediate depths of 1-2 ft (30-60 cm). As a general rule, tomatoes should receive approximately 1 inch (25 mm) of water per week. Tomatoes should not suffer water deficits during flowering, fruit set and enlargement.

Pest Management

Diseases

Bacterial Spot

It is not possible to completely control this disease with chemical sprays. The most effective results have been achieved when applications are made early, before significant disease is observed.

Conditions favourable for bacterial spot include 24 - 30°C with free moisture on the leaves. If weather conditions are favourable for bacterial disease infections prior to the initiation of a chemical control program, choose one of the recommended spray combinations in the Fungicide/Bactericides in the *Guide to Vegetable Crop Protection 2003*.

If moist, windy conditions prevail, repeat within five days of the initial bacterial control spray.

Bacterial Canker, Bacterial Speck

Optimum conditions for bacterial speck are cool (18-24°C), moist weather, while bacterial canker prefers warm (24-32°C), wet weather. Bacterial speck infections can show up as a downward turning and wilting of the lower leaves, often only on one side of the plant. A reddish-brown discoloration may be seen in the vascular tissues of the stem. Stem cankers and “bird’s-eye” lesions on the fruit may be present. Bacteria spread in the field cause the foliar blight symptoms. The leaves develop brown to black margins, which often curl upward, bordered by a thin, yellow band.

It is not usually possible to control these diseases in the field with chemical sprays. Seed-borne bacterial canker can be prevented with a hydrochloric acid seed treatment. There are no practical control measures for tomato bacterial diseases after they are found in the field. Clipping and handling transplants can spread disease.

Note: Avoid working in fields when foliage is wet. Wash machinery with a high pressure hose after working in contaminated fields.

Anthracnose, Early Blight, Septoria Leaf Spot

Anthracnose is a common and serious disease affecting the tomato fruit. If uncontrolled, it can quickly cause severe losses in marketable fruit.

Early blight, alone or in combination with Septoria leaf spot, can cause severe defoliation in a tomato crop. Septoria leaf spot can cause rapid defoliation and severe crop losses. It usually becomes prevalent after plants have begun to set fruit.

Properly timed fungicide sprays are effective at reducing losses due to these diseases. Spray when first fruits are about walnut size (or when first fruits appear on early cultivars). Repeat sprays as necessary. During continuous moist weather, intervals should be five to seven days. In warm dry weather, intervals can be extended to 12 to 14 days if diseases are under control. For anthracnose, continue spraying until late-August to early-September.

Late Blight

Late blight has the potential to cause severe crop losses. It is usually only a concern mid-to-late season but is very weather dependent. Scout fields regularly to detect early problems. Control is best achieved with a preventative fungicide program that provides constant foliar protection, especially during wet weather.

If late blight is present and conditions are favourable (moisture and 21°– 26°C days and 10° – 15°C nights), follow a five-to-seven-day fungicide schedule.

Septoria Leaf Spot

If monitoring indicates a need, spray with one of

the fungicides recommended in the Fungicide/Bactericide section of the *Guide to Vegetable Crop Protection 2003*.

Fusarium Wilt, Verticillium Wilt

A long crop rotation (four to six years) is recommended to reduce populations of the Fusarium and Verticillium fungi in the soil. Grow cultivars resistant to fusarium wilt and verticillium wilt if suited to your area and market.

Viral Diseases (Mosaic, Streak)

Ensure that transplants are healthy and certified disease-free. Do not handle tobacco in any form when handling plants. Wash hands with soap and water before handling tomato plants. Control weeds in and around the field. Do not harden transplants by leaving them in headlands or other weedy places. Properly clean machinery after using it in infected fields. Some viruses can survive in root debris. Use a minimum two year rotation between susceptible crops. Destroy infected plants found during transplanting and during the season.

The Western Flower Thrips (WFT) may occasionally vector the Tomato Spotted Wilt Virus (TSWV) to field tomatoes. The WFT is a small (1-2 mm) insect that can easily be confused with onion thrips. Regular and consistent monitoring for both thrips and potential virus symptoms in transplant houses and the field is necessary. No insecticides are labeled currently for thrips on field tomatoes.

Insects

Cutworms

Early-season species of cutworms can clip off transplants at the soil line, reducing stands. Variegated cutworms are problematic later in the season.

Early detection is essential for control, as larger insects are more difficult to control. Visually inspect three plants at 10 sites within the field and treat if one or more larvae per 30 plants is found. Alternatively, pheromone traps can be used to de-

tect peak moth flights. Control measures are warranted when trap catches reach seven moths per trap per week.

If monitoring indicates a need, spray with one of the pesticides recommended in the Insecticide section of the *Guide to Vegetable Crop Protection 2003*. Sprays are most effective when applied in the late afternoon or early evening.

Aphids

Aphids are an infrequent problem in tomatoes. Hot, dry summers are favourable to their development. The potato aphid and the green peach aphid are the most common types of aphids found in tomatoes. Inspect 10 leaflets/plant on three plants at 10 sites within the field. If monitoring indicates a problem (more than 0.5 aphids/leaflet), spray with one of the pesticides recommended in the Insecticide section of the *Guide to Vegetable Crop Protection 2003*.

Tarnished Plant Bug

Tarnished plant bug (and stink bug) damage can be a problem for fresh market tomato crops. If monitoring indicates a need, spray with one of the pesticides recommended in the Insecticide section of the *Guide to Vegetable Crop Protection 2003*.

Colorado Potato Beetle

Young Colorado potato beetle larvae are much easier to control than adult beetles. As a result, regular field scouting increases the effectiveness of foliar sprays. Visually inspect three plants at 10 locations in the field for adults and larvae. Treat the field or portion of the field if levels exceed 0.5 CPB/plant in the first two weeks after transplanting or one CPB/plant later in the season. Border sprays may provide adequate protection from migrating Colorado potato beetles in new tomato fields.

Warning: Colorado potato beetles have developed a strong resistance to a number of insecticides. To slow development of further resistance, it is essential for all growers to rotate between chemical groups each time a spray is applied.

Hornworm

If hornworms are present and monitoring indicates a need (one or more larvae per 30 plants), spray with one of the pesticides recommended in the Insecticide section of the *Guide to Vegetable Crop Protection 2003*.

Grasshopper and Cricket

Maintain weed-free borders and fence rows. If these insects are a problem, spray around the edge of the field with one of the pesticides recommended in the Insecticide section of the *Guide to Vegetable Crop Protection 2003*.

Physiological Disorders

Disease

Blossom-End Rot (BER)

This disease is a localized calcium deficiency in the blossom-end of the fruit that prevents proper development of that tissue. It occurs when dry soil conditions reduce the amount of water movement into the plant, thus reducing the movement of calcium to the fruit. Therefore, BER is caused primarily by drought, not by a deficiency of calcium in the soil.

Side-dressing with calcium nitrate will not prevent BER if adequate moisture is not available. Foliar sprays of calcium are also not effective, because most of the calcium is taken up and fixed in the leaves, and very little reached the fruit. Under drought conditions, growers should avoid deep cultivation, which can prune roots and reduce moisture uptake, making BER more severe. Blossom-end rot can be controlled by irrigation, which allows more movement of calcium into the plant.

Physiological Leaf Roll

This condition occurs quite often just prior to ripening of the first fruits. It is more common on indeterminate (staking) varieties than on determinate (bush) types. Symptoms are thickening of the lower leaves accompanied by a tendency to roll in-

ward. The leaves become very brittle and damage easily. Leaf roll may be caused by irregular water supply or severe pruning. It is a temporary condition and appears to have no effect on crop yield or quality.

Grey Wall

Blotchy ripening or greywall refers to a fruit disorder associated with low light intensity (such as would occur in dense canopies), low temperature, excessive soil moisture, soil compaction, high nitrogen levels and low potassium levels. Bacteria may also be involved, this is still uncertain.

Weeds

Weed control is achieved through an integrated approach using mechanical, manual and chemical methods. Refer to the Herbicide Section of the *Guide to Vegetable Crop Protection 2003*.

Weather Related

Sunscald

Sunscald occurs on fruits exposed to high temperatures in direct sunlight. A large, whitish area appears on the exposed fruit and occurs when little foliage is covering the fruit.

Artificial Ripening of Mature Greens

For all around colour, flavour and handling ability, ripen mature green tomatoes at 21°C. Tomatoes develop their most intensive red colour and flavour when held at 21°C for ripening. At temperatures above 24°C the fruit ripens on the soft side, lacking flavour, colour and firmness. If they are held at temperatures below 10°C for extended periods of time, the fruit will not ripen fully even though it is returned to ideal ripening conditions. After the fruit has reached a firm ripe stage, it may be held at temperatures of 7°-10°C, 90% relative humidity, without loss of colour or flavour. Temperatures below 7°C will subject the fruit to chilling injury followed by fruit decay.