

Peppers

Cultivars

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

Climate and Soil Requirements

Peppers are a warm season crop producing best within the range of 20° to 27° C. Peppers are very susceptible to light frosts and freezing temperatures. As such the crop must be transplanted after the last spring frost, normally end of May or early June.

In Manitoba, peppers are successfully produced on a diversity of well drained soils. Ideally, loamy

soils with a pH 6.5 – 7.5 are best suited to pepper production.

Transplants

Use treated seed 2.8 oz. (80 g) seed is required for one acre of transplants) and a sterile media in 128 cell trays. The time required to produce field ready transplants is approximately eight weeks. Optimum temperature for germination is 29°C (range 18 to 35°C). Transplant growth requires daytime temperatures of 18 to 24°C and 15° to 18°C at night.

Prior to setting the transplants into the field, the plants should be hardened 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

A standard planting arrangement for pepper crops is single rows with 3 ft (1.0 m) between rows and 17 inches (45 cm) between plants within the row (9,000 plants/ac).

Peppers may also be planted on twin rows at 5 ft (1.5 m) centres, with 17 inches (45 cm) between the twin rows, and 17 inches (45 cm) between plants within the row.

Plasticulture

Research has demonstrated that the use of plasticulture (plastic mulches and mini-tunnels row cover) can improve the production of peppers. These practices are relatively expensive but have many advantages including:

- earlier harvest
- increased yield
- higher quality produce
- soil moisture retention
- reduced disease pressure due to minimal soil/plant contact

- reduced fertilizer leaching
- weed control
- increased season long nutrient availability

Black plastic mulch is recommended for peppers because it warms the soil, retains moisture and controls weed growth. Twin row culture is recommended on plastic mulch.

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.

Mini-tunnel row covers can be used to make some crops produce earlier by increasing the canopy air temperature and protecting young transplants from wind damage.

In Manitoba white polyethylene supported by wire hoops over the crop are often used with peppers and other warm season crops. (They are not recommended for use on fresh-market tomatoes, because fruit-set can be delayed in the tunnels.) The plastic should have slits or perforations for ventilation. Commercially available layers install hoops, lay the plastic covers over the hoops and bury the edges of the row cover in one operation. In Manitoba, mini-tunnels are removed towards the end of June.

Floating row covers are not recommended for use on upright-growing crops like tomatoes and peppers, because they can cause abrasion on the plant's shoot tips.

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.

Irrigation

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 seven 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 to 2.4 inch (40 to 60 mm) of available soil moisture in the rooting zone. On these soils, heavier and less frequent irrigations 1.5 to 2.4 inches (40 to 60 mm) of water every 10 to 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 radishes 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.

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

Pest Management

Diseases

Seed Borne Fungi

As a precaution against fungi that can survive in pepper seed, purchase hot-water treated seed or treat as follow: Using a large cheesecloth bag, fill half full of seed and place in a large container of warm water. Stir the seed bags and water to maintain uniform temperature, measure temperature with an accurate thermometer. Soak seed at 50°C for 25 minutes

Damping-off, Seedling Blight and Seed Decay

Treat with a seed treatment fungicide recommended in the fungicide/bactericide section of the *Guide To Vegetable Crop Protection 2003*. These

diseases tend to be problems under conditions of high soil moisture in cool, poorly drained soils. The fungi responsible for these diseases persist in soil indefinitely. Always use high-quality seed.

Anthracnose

Dark, round spots with black specks on foliage and fruit. Avoid irrigating at times that would produce long periods of free moisture on the plant surface. Keep fields weed-free, as the fungus can survive between rotations on weeds. A three-year or longer rotation is recommended, as infested crop debris can take three years to decompose completely. Rotate with crops other than tomatoes, potatoes or eggplants.

Bacterial Spot

Bacterial spot is the major bacterial disease of peppers in Manitoba. Many of the same strains that infect tomatoes also infect peppers. Hot-water or acid-treated seed (see tomato section) is the best method of controlling bacterial spot.

Lesions start out on the leaves as small, water-soaked spots that later become large, irregular necrotic areas with a pale tan central area and dark edges. The centre of the spot may drop out, giving leaves a "shot-hole" or ragged appearance. As the disease progresses, an irregular blighting may be seen throughout the plant. In severe infections, leaves may turn yellow and drop. On fruit, the bacterial initially causes green, circular, slightly raised lesions, which later become brown and scabby.

It is not possible to completely control this disease with chemical sprays. A reduction in the number of lesions may be achieved through the application of copper bactericides. In periods of extended wet weather and extensive disease pressures, control using copper materials may not be satisfactory.

Virus Diseases

Aphids may vector virus diseases such as cucumber mosaic virus (CuMV) to peppers. Monitor and control aphids regularly.

Western Flower Thrips (WFT) may occasionally vector the Tomato Spotted Wilt Virus (TSWV) to

field peppers. The WFT is a small (1 to 2 mm) insect that can easily be confused with onion thrips.

Certain weed species are alternative hosts for some pepper viruses, so controlling weeds within the crop and in field borders may reduce sources of infection.

Verticillium Wilt

Grow transplants in sterilized soil. Avoid transplanting in infected soils. Crop rotation with non-host crops is recommended. The incidence of wilt may be higher following peppers, tomatoes, eggplant, potatoes, strawberries and raspberries.

Other diseases common to peppers include Early and Late Blight and Septoria Leaf Spot. Refer to Insecticide Section of the *Guide to Vegetable Crop Protection 2003* for control product recommendations.

Insects

Aphids

Natural predators such as lady beetles, spiders, lacewings, and parasites usually control aphids. Continuous use of broad-spectrum insecticides may disrupt beneficial populations, resulting in aphid resurgence. Examine the undersides of leaves on 50 to 100 plants. No threshold is established, but more than 10 per leaf could be considered a potentially damaging level. If monitoring indicates a need for control, refer to the Insecticide Section of the *Guide to Vegetable Crop Protection* for control recommendations.

However, insecticide sprays may not be effective in controlling the spread of viruses by aphids, as aphids transmit the virus on the first feeding on the plant, before the insecticide can take effect.

Tarnished Plant Bug

Tarnished plant bugs feed on the flower buds of peppers, causing blossom drop and reducing fruit set. They may also pierce the fruit when feeding, causing indentations and yellowing of the flesh, and allowing rot organisms to invade the site.

European Corn Borer

Peppers are susceptible to corn borer attack when the fruit are the size of walnuts (1.1 inch (3 cm) in diameter) and must be protected from then until harvest if corn borers are present. Use Pheromone traps to monitor adult flight activity, or scout fields for egg masses and feeding activity.

For effective chemical control, thorough distribution of spray material is required. Solid or hollow-cone nozzles on drop pipes provide improved coverage.

Cutworms

When monitoring indicates a problem, apply recommended control products listed in the Insect Control Section.

Most cutworms remain in the soil during the day and emerge to feed at night. Chemical controls are most effective if applied to moist soil in the early evening.

In Manitoba, cutworms are frequently a problem throughout most of the month of June.

Weather Related

Sunscald: This may occur whenever fruit is excessively exposed to hot sun. A yellowish-white patch appears on the side of the fruit facing the sun. A blister-like area develops which eventually becomes depressed, grayish-white with dry paper like surface.

Weeds

Competition from weeds can reduce yield and also make harvesting more difficult. For recommended herbicides refer to the *Guide to Vegetable Crop Protection 2003*.

Harvest and Storage

Immediately after harvest, peppers should be cooled and held at 7° to 10°C and relative humidity of 85 to 90%. Temperatures below 7°C will subject the fruit to chilling injury followed by decay.

Peppers should be shipped to market as soon as possible.