

# Carrots

## Cultivars

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

## Climate and Soil Requirements

Deep, loose, fertile soils that have good water holding capacity are necessary for the development of long, straight roots. Well-drained sandy loam, peat or muck soils are ideal for carrot production.

Deep fall-plowing 8 to 10 inches (20 to 35 cm) followed by spring tillage will leave a fine seedbed for uniform germination. Prepare land in three or four row beds to prevent compacted tire tracks in growing area.

## Seed Treatment

Seed treatment is recommended for seed decay, damping off and seedling blight. Refer to the fungicide section.

## Seeding and Spacing

*Dates:* Early crop - May 10 to 15; Storage crop - May 24 to 31

*Depth:* Seed depth of 0.75 to 1 inch (2 to 2.5 cm) deep is most satisfactory. Since the seed is very small, at no time should it be planted more than 1 inch (2.5 cm) deep.

*Row Spacing:* 22-34 inches (55 – 85 cm) depending on planting and harvesting machinery.

*Rates:* Fresh market: 2-4 lb/ac Processing: 0.88-1.79 lb/acre

## 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

The carrot is not tolerant to drought or high temperatures. It needs steady and relatively large

amounts of water for optimum growth. If high temperature conditions exist when seedlings are just emerging, irrigation will prevent serious damage to the young plants.

Irrigation can be used very effectively to overcome heavy soil crusting that can reduce the stand if not controlled.

## **Pest Management**

### **Diseases**

#### **Aster Yellows**

The symptoms of aster yellows on carrots first appear as a reddening of several leaves. Crown growth becomes yellow and brittle, followed by hairy root development.

Control leafhoppers that spread the phytoplasma (see insecticide section). Avoid growing carrots near forage legumes or other areas where leafhopper populations are high.

#### **Sclerotinia Mould and Bacterial Soft Rot**

Follow a crop rotation of three years between successive crops. Rotate with onions, beets, flax, buckwheat, cereals or corn. Avoid beans, sunflowers, lettuce, parsnips, cole crops including canola (rapeseed) & mustard, peas, lentils, cucumber and celery since all are susceptible to *Sclerotinia*. For effective control, fungicide sprays must contact lower leaf petioles and crowns.

#### **Bacterial Soft Rot and Watery Soft Rot**

Handle the crop carefully to avoid root damage. Cull during harvest if rots are present.

Disinfect storage area before storage using a 2 per cent solution of copper sulphate (for example, 1 kg/50 L water or 2 lb/10 gallons water). Allow storage area to dry before storing carrots.

#### **Cavity Spot**

This disease is caused by several *Pythium* species. It rarely reduces yield but can significantly affect quality.

Cavity spot is most easily seen on freshly washed carrots. The cavities appear as elliptical lesions that are sunken a few millimetres below the surface of the root. The lesions are elongated horizontally and darken with age. There are no foliar symptoms of the disease. Typical cavity spot symptoms are normally seen on carrots that have been growing for at least 12 weeks.

It is advisable to grow carrots on raised beds to reduce excessive soil moisture levels. Crop rotation will not reduce severity of cavity spot. Relatively resistant cultivars are available. Contact your vegetable specialist or seed company representative.

#### **Leaf Blights (*Alternaria* Blight and *Cercospora* leaf spot)**

For cultural control, using fungicide treated seed, following a two to three year rotation with other vegetables and avoiding fall plowing of infected crop residue is recommended. See the fungicide section in the *Guide to Vegetable Crop Protection 2003* for chemical control.

*Apply fungicide when:* Blight appears on 1 – 2% of the leaf area. This coincides roughly with the time when blight is first detectable.

After the first application, a recommended fungicide should be applied at 7-10 day intervals when weather is favourable for blight. The intervals between sprays are extended when the weather is unfavourable for blight. Lack of rainfall or cool nights (minimum temperature less than 5°C) are unfavourable for blight.

#### **Rusty Root (*Pythium* Root Dieback)**

Follow a 3-year rotation with unrelated crops. Avoid severely infested fields. Sow seed after the soil has warmed up in the spring and use disease-resistant cultivars. Establish uniformly spaced plant populations with precision-seeding equipment and avoid stands of dense foliage.

#### **Violet Root Rot**

This *Rhizoctonia* disease generally shows up in patches in the field and is characterized by soil sticking to the carrot root in a leathery-textured and purplish-coloured mass. Foliar symptoms in-

clude wilting tops and dead patches in the field. These symptoms may not always appear until the disease is serious. The fungus causing this disease persists for several years and affects primarily carrots. The best control is to rotate with other crops, such as onions or crucifers. Avoid spreading soil from infested areas to non-infested areas.

### **Crown Rot**

This disease is caused by a different species of *Rhizoctonia* than Violet Root Rot. Diseased plants appear stunted and wilted in patches in the field. Horizontal, dark-brown lesions develop near the top of the root and may penetrate several millimetres deep. Infected crowns appear dry, rotten and dark brown. There are presently no known control methods other than crop rotation, improving drainage and early harvest.

## ***Insects***

### **Aster Leafhopper**

Leafhoppers spread the disease aster yellows. They are not known to overwinter in Manitoba as adults or larvae, but may as eggs. Most of the population of leafhoppers in Manitoba is a result of migration from the southern U.S. Leafhoppers can be monitored with a sweep net to help determine when and if sprays are required. Without monitoring, there is no way to predict whether scheduled spraying with insecticides will provide any control. It is equally important to control weeds in headland and ditchbanks.

To use the Aster Yellows Index (AYI), monitor aster leafhoppers with a sweep net. Multiply the number of aster leafhoppers captured in 100 sweeps by the percentage of leafhoppers carrying aster yellows in your area (contact Vegetable Crops Specialist for Infectivity Percentage).

Use this formula:

# leafhoppers (in 100 sweeps) X % infectivity =  
AYI

Treat when the AYI equals 20 to 25 for head lettuce, 30 to 35 for celery and romaine, and 50 or 100 for carrots.

### **Carrot Weevil**

Carrot weevil has not been identified as a pest in Manitoba. Monitoring for the weevil greatly improves timing of sprays and determines whether they are needed or not. The Ontario Ministry of Agriculture and Food recommends spray applications when carrots are in the second to third true-leaf stage. Repeat once 10-14 days later. Do not apply more than twice per season or later than 40 days before harvest.

### **Carrot Rust Fly**

Carrot Rust Fly has not been identified as a pest in Manitoba. In Ontario, the first generation of flies is normally present from late May until late June, the second generation from late July until September.

Carrots seeded after June 1 are rarely attacked by the first generation of the carrot rust fly. Carrots harvested by early September should escape most second generation damage. If possible, avoid growing carrots immediately adjacent to sheltered areas.

### **Cutworms**

Cutworms are an occasional problem in carrots. Apply treatments at the two to five leaf stage if monitoring indicates a problem. Most cutworms disappear below the soil surface during the day and emerge to feed at night. Chemical controls are most effective if applied to moist soil in the early evening.

## **Physiological Disorders**

### ***Special Problems***

#### **Greening**

Constant hilling throughout the growing season is essential to prevent green-shouldered carrots.

#### **Off-shape Roots**

These may be caused by:

- lack of stand,
- poorly prepared seedbed,

- excess moisture at certain periods.
- excessive packing of soil by equipment.

### **Browning**

Caused mainly from excessive drying of roots following harvest, such as:

- harvesting in excessive heat.
- neglecting to remove carrots from field immediately after harvest.
- delay in cooling of roots in storage.
- excessive drying in storage through lack of humidity control.

### **Preventive Measures**

- Harvest under cool conditions when possible.
- Prevent drying from field to storage.
- Remove field heat rapidly after carrots have entered storage with proper air flow and temperatures at 0°C.
- Maintain storage humidity and temperature as close as possible to 100% and 0°C, respectively. Avoid moisture from forming on the root pile.

- Soaking the pile periodically after carrots are in storage helps prevent drying. However, this practice may favour development of sclerotinia soft rot in stored carrots.

Refer to Fungicide/Bactericide, Insecticide and Weed Control Sections in the *Guide to Vegetable Crop Protection 2003* for registered products.

### **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**

Mature topped carrots can be stored for up to six to seven months at 0°C and a relative humidity of 90% - 98%.

Storage rots occur from infections of the carrot that occurred in the field or through wounds at harvest. Rapid cooling of carrots after harvest is very important for reducing storage rots.

Proper sanitation of the storage and handling equipment is necessary to help reduce storage losses.