

## Important Pest and Diseases of Beet Root and Their Management

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The beetroot is the taproot portion of a beet plant. The beetroot has high nutritional value e.g. carbohydrate- 9.50 g, fat- 0.17 g, protein- 1.61 g, vitamin A, B complex, C, minerals and best known for antioxidants. It provides health benefits, such as reducing blood pressure, improving digestion and lowering the risk of diabetes. Beetroot is a cool season vegetable crop growing in winters throughout the world.

**Scientific Name:** *Beta vulgaris*

**Family:** Chenopodiaceae

### Common Pest and Diseases of Beetroot and Their Management

#### 1. Bacterial Blight

**Causal organism:** *Pseudomonas syringae* pv. *Aptata*

This disease is spread by water, and via rain or irrigation, as well as by aphids. The bacteria thrive in moist, warm conditions. It may also be spread by wind and garden tools, so it can be hard to avoid.

#### Symptoms

The infected leaves show irregular to circular shaped spots with tan to dark brown centers and dark black borders. In some instances symptoms also appear on the edges of the leaves which initially may appear water-soaked and later turn yellow and then necrotic. These spots may join together between the veins and the dried area falls off, which gives a ragged appearance.

The pathogen also infects other crops like bean, eggplant, lettuce, and pepper. The leaves exhibit circular spots with irregular edges. The spots will look dry, with a brown or tan color on the interior and dark borders. These spots can turn yellow and appear water-soaked before they turn necrotic and rot. They may also run together, making leaves look ragged – or the leaves may drop off entirely.



Infected leaf

#### Management

- The first step for preventing this disease is to use mulch around your plants to prevent splashing water from landing on the leaves.
- Sterilize gloves, spade, and other garden tools each time by 10 percent bleach and 90 percent water.

- As a preventative measure, spray plants once a week with neem oil or Bonide, a biofungicide containing *Bacillus amyloliquifaciens*
- If mild symptoms of an infection, trim off the affected leaves.
- If the disease has returned, continue to trim off the affected leaves. Otherwise, to pull and dispose of the plants.
- Don't put infected plant parts in compost, It is risk spreading this disease all over garden.
- Use healthy and disease free seeds.

## 2. Scab

**Causal organism:** *Streptomyces scabies*

Bacteria survive in soil; disease emergence favors dry conditions.

### Symptoms

It infects other root crops like potatoes, turnips and carrots. Plants have large, round spots that can either be ruptured, turn brown and rupture the epidermis; raised corky spots on root surface that are gray, white or tan in color. Usually still eat the roots, just need to peel the skin and scabby damage off.



**Infected Beet**

### Management

- Maintain soil at a pH below 5.5. This will go a long way toward keeping scab away. Also keep the soil watered well.
- Regular crop rotation is also important. Don't plant root vegetables in the same spot in the garden more than once every three years.
- Do not plants in soil know to be infected; avoid crop rotation with potato.

## 3. Beet Curly Top Disease

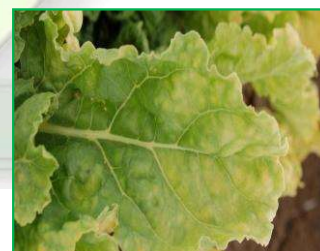
**Causal organism:**

*Beet curly top virus (BCTV)*  
*Beet severe curly top virus (BSCTV)*  
*Beet mild curly top virus (BMCTV)*

### Symptoms

The infected leaves become a dwarf, crinkle and rolled upward and inward. The veins become irregularly swollen on the lower surface. The diseased beet shows discoloration of the vascular tissue. The young roots become dwarfed and rootlets are twisted and distorted.

Underground, the roots become twisted and stunted, and start losing their ability to take in nutrients. This causes the foliage to turn yellow and stop growing. As a result of this chlorosis, they're unable to photosynthesize or absorb sunlight and will eventually wilt and die.



**Infected leaf**

### Vector

The beet curly top virus is transmitted by beet leafhopper, *Circulifer tenellus*. The virus infects many weed plants and act as a source of inoculum for the next cropping season.

### Management

- Grow available resistant varieties.
- Keep the field free from overwintered weeds.
- Spray suitable insecticide to control leafhoppers like Carbofuran 3 G 3.5 kg/ha, Phosalone 35 EC 120 ml



**Vector- Leafhopper**

## Beet Western Yellows Virus

### Symptoms

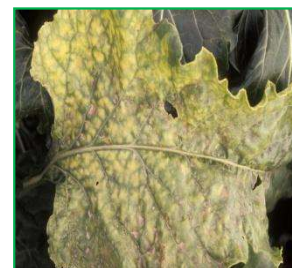
The symptoms first start on older leaves as yellowing between the veins with possible small reddish brown spots which gives a distinct bronze cast on infected leaves. Later the leaves become thick, leathery, and brittle.

### Vector

The virus is transmitted by aphids (green peach aphids and black bean aphids). It has an extensive host range.

### Management

Grow available resistant varieties. Keep the fields free from the previous season crop in the off season. Control aphids.



**BWYV Infected Leaf**

## 4. Cercospora Leaf Spot

**Causal organism:** *Cercospora beticola*

### Symptoms

Brown to gray flecks or spots surrounded by red-purple halos on leaves; yellow or brown necrotic leaves. It's spread by wind and rain, and it favors high temperatures and high humidity promote infection; fungus overwinters on crop residue or in seed.

### Management

- Rotate crops every 2-3 years.
- Apply a fungicide at first sign of disease like chlorothalonil, myclobutanil ( apply every 10-14 days interval)
- Plough crop debris into soil immediately after harvest.
- Be sure to water at the base of plants to prevent moisture from landing on the foliage.
- Apply mulch around the base of plants to prevent water splashing up from the soil.



**Infected Leaf**

## 5. Damping Off

**Causal organisms:** *Rhizoctonia solani*, *Phoma betae*, *Pythium ultimum*, *Aphanomyces cochlioides*

Warm, wet weather favors disease emergence; beet very susceptible

### Symptoms

Seedlings collapsing, constriction of plant crown. Seedlings may fail to emerge, or they might collapse when they're young. A water soaked stem at the base, which will look thin and brown. Black roots if you pull up the seedling. It's often identifiable by a fuzzy white mold on the surface of the soil as well. While lots of plants may be affected by damping off, beets are extremely susceptible.

### Management

- Planting directly in the garden rather than transplanting root crops, use raised seed bed.
- Treat seeds with fungal culture prior to planting like *Tricoderma viridae* 4 g/kg of seed or Thiram 3g/kg seed.
- Plant in well draining soil. Do not plant until soil is sufficiently warm.
- Use well decomposed compost.



**Infected Seedling**

## 6. Downy Mildew

**Causal organism:** *Peronospora farinose*

It favors cool temperatures and high humidity

### Symptoms

Plant leaves appear lighter green, small, puckered, thickened leaves, fuzzy gray growth on both leaf surfaces. Fungus survives in crop residues over winter to infect new crop.

### Management

- Managing water on plant foliage is absolutely essential to preventing this disease. Keep moisture off the leaves in the morning will go a long way toward keeping this pathogen at bay. That means watering at the base of plants, applying mulch around them to prevent splashback, and watering in the late morning instead of at night.
- Prune out a fifth of beet leaves at the first sign of disease, to increase air circulation and allow any water or dew that's present to dry more rapidly.
- Use a preventative fungicide like copper spray. Begin treatments two weeks before disease normally appears or when weather forecasts predict a long period of wet weather.
- Grow available resistant varieties. Remove and destroy the infected crop debris.



**Infected Leaf**

### 7. Fusarium Yellows and Root Rot

**Causal organism:** *Fusarium oxysporum f. sp. Spinaciae*, *Fusarium oxysporum f. sp. Betae*

The pathogen survives on weeds like pigweed, Kochia, and lambs quarters during off season.

### Symptoms

The infected leaves exhibit yellowing between the larger veins. Later entire leaves become dry, brittle and remain clustered around the crown. Typically only one side of the leaves is affected and appears scorched. The vascular tissues of infected plants become discolored. Plant appears wilted during day time and recovers at night. The tip of taproot becomes black due to rotting.

### Management

- Keep weeds out of field, since these types of fungi also live on pigweed and lamb's-quarter. It can also live in the soil for up to seven years.
- Fungi thrive in moist conditions, so be careful not to overwater.
- Follow crop rotation. Don't plant beets in the same place more than once every three to five years to prevent recurrence of this disease.
- Once detect fusarium root rot or yellows, it's too late to stop it. Pull the plants and dispose of them.
- Grow resistant varieties.



**Infected Plant**

### 8. Powdery Mildew

**Causal organism:** *Erysiphe betae*

The spores are transmitted by air. If the weather conditions are good, one can see, particularly on the upper surface of the older leaves dark brown to black, globular, sexual reproductive structures (chasmothecia = cleistothecia). This disease is most common in warm, humid weather conditions with temperatures between 60-80°F.



**Infected leaf**

## Symptoms

Initially the symptom appears on older leaves as small, scattered, circular, white mycelium mats on lower surface. Later all the leaves of the plant infected and appear dusty white on both surfaces. If the disease is severe the leaves become yellow and then turn purplish-brown.

## Management

- Make a 50-50 mix of milk and water and spray leaves every few days as a preventative measure.
- Watering first thing in the morning, so the foliage has time to dry out in the sunlight – and be sure to water at the base of plants.
- While the disease isn't spread by water, it favors areas with poor air circulation and damp, humid conditions in the soil and on plants. Planting in well-draining soil.
- Check for the recommended spacing of plants.
- As the plant grows, consider snipping off a few leaves from each plant to improve air circulation.
- If only a few leaves are impacted, cut them off with a pair of clean shears.
- Grow available resistant varieties. If the disease is severe, spray suitable fungicide.

## Insect and Pests

### 1. Beet cyst nematode

**Scientific Name:** *Heterodera schachtii*

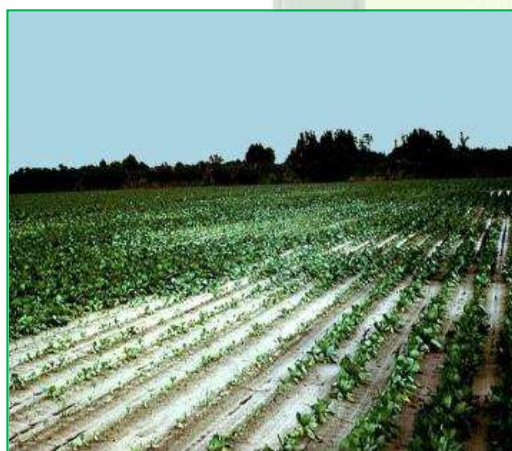
Nematodes are mainly transmitted by irrigation water, equipment, weed plants etc.

## Symptoms

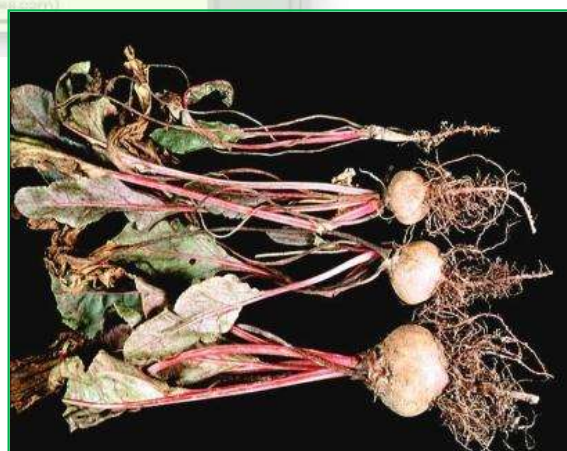
The symptoms may vary depend on the stage of the crop infected by the nematode. The infected seedling exhibit stunting and reduced leaf growth. Also the older leaves of seedlings will become yellow and wilted during the hot period of the day. Below ground, the roots appear stunted with lots of secondary roots. Also the infected roots show yellow-brown cysts. If the nematodes infect the older plants the symptoms are not much noticeable.

## Management

- Keep the field free from weeds.
- Follow crop rotation.
- Deep summer ploughing helps in exposing cyst in the soil to sunlight.
- Grow available resistant varieties.



Infected Field



Infected Beet

## 2. Root Knot Nematode

**Scientific Name:** *Meloidogyne spp.*

### Symptoms

Galls on roots which can be up to 3.3 cm (1 in) in diameter but are usually smaller, reduction in plant vigor, yellowing plants which wilt in hot weather. Galls can appear as quickly as a month prior to planting, nematodes prefer sandy soils and damage in areas of field or garden with this type of soil is most likely.

### Management

- Plant resistant varieties if nematodes are known to be present in the soil.
- Check roots of plants mid-season or sooner if symptoms indicate nematodes, solarizing soil can reduce nematode populations in the soil and levels of inoculum of many other pathogens.



**Infected Beet Root**

## 3. Darkling Beetle (Rove Beetle)

**Scientific Name:-** *Blapstinus spp.* , *Staphylinid spp*

### Symptoms

Feeding damage on stems, death of seedlings, seeds dug up, insect is a dull blue-black or brown beetle about 0.6 cm (0.52 in) long, tips of antennae are often enlarged, resembling a club. Beetles are generally active at night, during the day beetles hide in organic debris.

### Management

- Ditches filled with water can prevent spread of beetle to/from adjacent fields.
- Remove all weeds from garden borders.
- If beetle is problematic then appropriate insecticides can provide control, insecticides are usually in the form of baits.



**Rove beetle**

## 4. Leafminers

**Scientific Name:** *Lyriomyza spp.*

### Symptoms

Thin, white, winding trails on leaves, heavy mining can result in white blotches on leaves and leaves dropping from the plant prematurely, early infestation can cause fruit yield to be reduced, adult leafminer is a small black and yellow fly which lays its eggs in the leaf, larvae hatch and feed on leaf interior. Mature larvae drop from leaves into soil to pupate, entire lifecycle can take as little as 2 weeks in warm weather, insect may go through 7 to 10 generations per year.

### Management

- Check transplants for signs of leaf miner damage prior to planting.
- Remove plants from soil immediately after harvest.



**Adult**



**Infested leaf**

- Only use insecticides when leaf miner damage has been identified as unnecessary spraying will also reduce populations of their natural enemies.
- Collect and destroy mined leaves
- Ploughing the field after summer showers, removing the crop debris from the field, exposing the different stages of insect's viz., egg, larvae and pupae to sunlight greatly reduce the pest abundance and prevent the pest population build-up.
- Spray NSKE 5%.
- Apply safe chemical insecticides at recommended doses only if the insect population crosses the ETL.
- Spray Quinalphos 25 EC 2ml or Methyldemeton 25 EC 1.6ml or Dimethoate 30 EC 2ml /lit of water.

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### 5. Aphid

Numerous aphids can infest vegetable crops, e.g., bean aphid, cowpea aphid, green peach aphid, melon aphid, and potato aphid.

**Scientific Name:** *Aphis fabae* (bean aphid), *Myzus persicae* (green peach aphid), *Aphis gossypii* (melon aphid), and *Acrosiphum euphorbiae* (potato aphid)

#### Host crops

In addition to beet, cucumber, corn seed, melon, potato, tomato, eggplant and pepper, aphids can feed on many other vegetables including broccoli, cabbage, spinach, Swiss chard, squash, pumpkin, as well as many weed species including Brassicaceae (cruciferous) weeds.

#### Symptoms

Aphids range in color from nearly black to nearly white, with some that are tan, orange, green, or red. All are tiny and pear-shaped. Some have wings, and others don't. They suck on the sap of plants, leaving behind a sticky residue called honeydew, which also attracts ants and creates the perfect environment for fungi. A large infestation may cause leaves to curl and yellow. They can stunt leaf and root growth as well.

#### Management

- Blast the plant with a strong spray of water from the hose as first line of attack. Sometimes can knock them loose, and they won't return.
- Encourage beneficial insects like parasitic wasps, ladybugs, lacewings, soldier beetles, and syrphid flies to visit garden.
- Spray 100 ml 30.5% SC imidacloprid systemic insecticide and



**Aphid**

for home garden the insecticidal soap and botanical oils are most effective to aphids.

### 6. Cutworms

**Scientific Name:** Various cutworms can feed on beets, e.g., *Agrostis ipsilon* (black cutworm), *Apamea devastator* (glassy cutworm), redbacked cutworm (*Euxoa ochrogaster*), army cutworm (*Euxoa auxiliaris*), spotted cutworm (*Xestica c-nigrum*), and variegated cutworm (*Peridroma saucia*).

#### Host crops

Wide host range, including many vegetables such as beet (sugar beet, table beet, fodder beet), bean, carrot, onion, spinach, potato, etc. Subterranean species feed on plant roots and stems, cutting the plants at the soil surface. Climbing species are nocturnal, i.e., they hide in the soil during the day and cut off plants at the soil surface or feed on new leaves and stems in the crown.

Caterpillars cut the seedlings near the soil surface. The cut plants are sometimes seen to have been dragged into the holes where the leaves are eaten. Young larvae can create shot holes while feeding on tender leaves of seedlings. Older larvae are very destructive to early season planting. They spend the daylight hours below the surface of the soil and become active at night, generally feeding on the stem of seedlings or sometimes the entire seedling, often causing death of the seedlings.



### Management

- Collect and destroy caterpillars mechanically as they may be curled near the base of young plants or just a few inches deep in the soil
- Encourage predatory birds to visit the fields by placing birdbaths and feeders near the planting beds
- Force hibernating stages of the cutworms to the soil surface, e.g. by turning the soil or irrigating regularly, to expose them to scorching sunlight and predatory birds
- Broadcast Bt. mixed bait (mix 2 g of *Bacillus thuringiensis* formulation with 1 kg of wheat bran) @ 10 kg bait /ha over the surface of new planting beds one week before planting. Cutworms already present in the soil will eat the baits instead of new seedlings.
- Use poison bait (mix 2 g malathion 5% dust with 1 kg of wheat bran) @ 10 kg bait/ha in the evening on weed free soil
- Broadcast insecticide (chlorpyrifos) treated sand (20% EC Dursban @ 3 litre per 10 kg sand) @ 10 kg treated sand /ha in the field before planting
- Treat soil with chlorpyrifos e.g. Dursban 10% G @ 20 kg/ha before planting

### 7. Spider Mites

**Scientific Name:** *Tetranychus* spp. including twospotted spider mite (*Tetranychus urticae*), strawberry spider mite (*Tetranychus turkestanii*), and Pacific spider mite (*Tetranychus pacificus*)

#### Host crops

Wide host range, including many vegetables such as bean, carrot, spinach, potato etc.

#### Symptoms

Small dark red or dark brown spiders about 1 mm long suck on the lower surface of the leaves. Numbers can increase rapidly during warm weather

#### Management

- Spider mites can be controlled by miticides like karathane (dinocap), omite (propargite 1ml per liter water, dicofol 18.5 EC @ 2.5 ml/l, spiromesifen oz @ 1ml/l.
- Cultural control of mites is giving the adequate irrigation at the time of drought.
- For biocontrol use predatory mites *Persimilis* mite *Phytoseiulus persimilis*.

