APHANOMYCES

Aphanomyces cochlioides

photo by: C. I. Schneider

Identification

- Aphanomyces is caused by a fungus in the soil
- The fungus will over winter in the soil as spores

photo by: C. I. Schneider

Cause of Infestation

- Under wet warm conditions, the oospores will germinate to produce zoospores that are mobile in the soil
- These spores will swim in the water in the soil and infect the sugarbeet root
- Infection can occur at anytime throughout the growing season
- Optimum soil temperatures are from 68° to86° F
- Soil moisture must be 100% since zoospores need free water to swim
- Infections do not occur at temperatures less than 60° F

Detection

- Aphanomyces attacks the root and hypocotyl – (region between cotyledons and seed)
- Hypocotyl and root rapidly turn black and shrink to a dark thread
- When the fungus infects a sugarbeet later in the growing season, it will cause the root to turn brown and black in color near the root tip and at areas where the lateral roots meet the main taproot

Damage

- Young seedlings may dampen off
- Young seedlings are weak and are more susceptible to the wind
- Sugarbeets that have been infected late in the growing season often survive, but when foliage is removed at harvest, rotted roots are easily dislodged or are too small to be harvested
- The roots will have reduced yield and sugar content

Control

- Select varieties with resistance
- Plant Tachigaren treated seed
- Plant as early as possible
- Cultivate to keep the soil dry
- Improve field drainage
- Increase the length of rotation
- Control weeds
- Avoid the spread of contaminated soil

photo by: L. D. Leach

BACTERIAL LEAF SPOT

Pseudomonas syringae

photo by: W. M. Dugbee

Identification
- Bacterial leafspot is a fluorescent bacterium

Detection
- Bacterial leafspot produces irregular-shaped to circular spots that are 3/16 to 1/4 inch in diameter
- The spots have dark green gray centers with very dark to almost black borders. This can be confused with Cercospora Leafspot that produces spots with light gray centers.
- In areas where spots from bacteria leaf spot grow together, portions of the leaf tend to tear, producing a ragged leaf

Causes of Infection
- The bacteria must survive in the vegetative stage of growth on living plants, seed, or organic matter in the soil
- A wound or an injury on a susceptible plant, caused by insects or farming, is necessary for infection
- The optimum temperature for growth is 77° to 86° F, with a maximum of 95° F and a minimum of 36° F
- Requires high relative humidity for prolonged periods

Damage
- Although bacterial leafspot is found in many production areas in the US, the disease rarely causes significant economic loss

Control
- No field control strategies have been developed for bacterial leafspot
- Varieties differ in tolerance levels

photo by: C. Windelf

BEET CURLY TOP

Beet Leafhopper Circulifer tenellus

photo by: C. Schlagel

photo by: C. Schlagel

Identification

- Curly Top is a virus transmitted by the sugarbeet leafhopper
- Leafhoppers overwinter on numerous annual host weeds
- Occurs in semi-arid climates
- The spring hatched leafhoppers will move into the succulent beet vegetation, carrying the virus with them

Detection

- Rolled up leaves that are twisted
- Veins on the leaf underside are rough and produce pumping or swelling
- Cross sectioned root will be blackened
- Many lateral roots may appear, causing a bearded look
- If the infection occurs early in the growth stage, the beets may die or suffer major losses

Control

- Plant early
- Curly top resistant varieties
- Close canopy early
- A border treatment with an insecticide can form a barrier to help suppress damage

BEET WESTERN YELLOW VIRUS

Green Peach Aphid – Myzus persicae

photo by: C. Schlagel

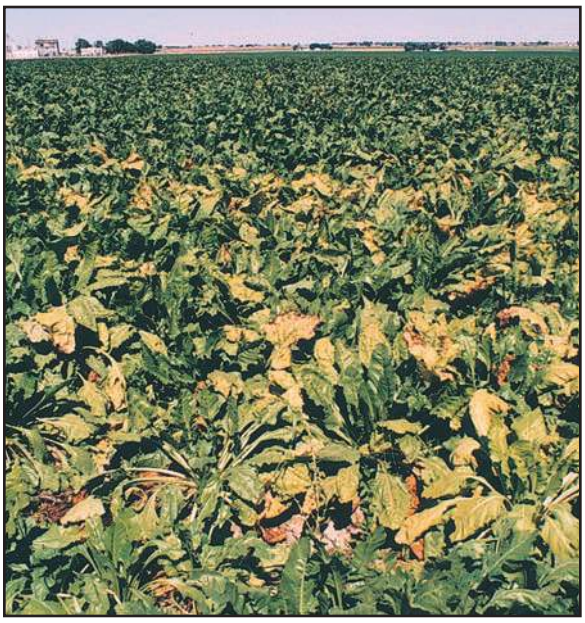

photo by: C. Schlagel

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Identification

- Beet Western Yellows is caused by a virus

Detection

- Symptoms appear as yellowing on tops of older mature leaves
- As the infection develops, yellowing increases throughout the plant
- The veins remain green in color
- The leaves become thick and brittle

Cause of Infection

- The virus is spread by 8 species of aphids, particularly the green peach aphid
- The plant shows symptoms 12 to 35 days after inoculation by aphids
- Infected leaves are often attacked by alternaria

Control

- Difficult to control
- Separate new plantings from infected crops

CERCOSPORA LEAF SPOT

Cercospora beticola

photo by: C. Schlagel

photo by: H. A. Lamey

Identification

- Cercospora leaf spot is caused by a fungus
- Can cause reduced tonnage, sugar, and sugar quality

Detection

- Begins on older leaves
- Progresses to younger leaves
- Symptoms may occur in as few as five days after infection (10 – 14 day infection cycle)
- Circular spots about 1/8 inch in diameter with ash gray centers
- Dark brown to reddish purple brown borders
- Gray centers will have tiny black dots or a fuzzy blue-gray appearance
- In severe cases, spots may grow together to kill entire leaf
- Under ideal conditions, more spores are produced every 5 days

Cause of infestation

- Primary infections occur from germination of spores in infected beet debris
- Spores spread by wind, water, and insects
- Thrives in temperatures between 68° to 79° F, greatest at 75° to 79° F
- Thrives in a relative humidity between 90 & 100%, greatest at 100% for 8.5 hours
- Spores will not form in temperatures below 50° F
- Daytime temperatures of 80° to 90° and nighttime temperatures above 60° favor disease development

Cercospora Leaf Spot

photo by: H. A. Lamey

Cause of Damage

- Cercospora spots are a form of defoliation
- Under normal conditions, sugarbeets draw energy from their leaves to produce sugar in their roots
- Defoliation diminishes a beet's ability complete this process and produce sugar and root yield
- As leaves are defoliated, the beet cannot produce sugar
- As leaves are defoliated, the beet uses stored sugar to grow new leaves, rather than growing a larger root or storing additional sugar
- Severely diseased leaves wither and die, resulting in full leaf defoliation

Beet Damage

- Reduced tonnage
- Reduced sugar
- Roots of diseased plants do not store as well as healthy plants

Control

- Crop rotation – three years or longer
- Plant beets at least 100 yards from a field infected last year
- Good control is needed in adjacent fields to reduce infection in subsequent years crops
- Plowing beet refuse helps reduce inoculum survival and dispersal
- Variety resistance
- Fungicides – two types: protectant and systemic (Fungicides should be rotated to avoid fungal resistance)

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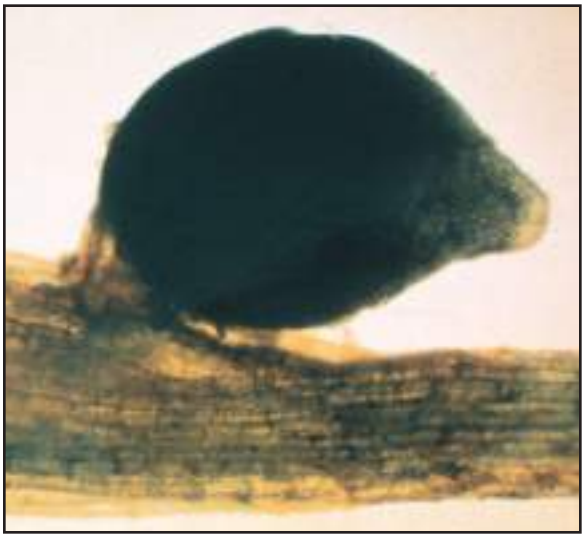
CYST NEMATODE

Heterodera schachtii



Identification

- The most widespread and most yield-limiting factor in sugarbeet production
- Cyst nematode eggs can lie dormant in fields for years
- Once their cycle of growth begins, nematodes continue to produce several generations that feed from the host vegetation
- Nematode males and females have different shapes
- Females are lemon shaped, white and show up on hair roots
- Their body slowly turns from white to brown
- The female cyst often contains more than 250 eggs
- The hatching of the larvae and the movement out of the cysts, is caused by favorable ground temperatures 50°+ F, moisture and soil aeration

Cause of Infestation

- A hatching factor from the secretion of the host plant, stimulates and attracts the larvae to the host plant (Sugarbeets and some weed species are host plants)
- The larvae penetrates the root tissue and causes the cell walls to dissolve
- The beet's ability to absorb moisture and nutrients is hindered

Detection

- Underdeveloped patches in the field
- Sunlight causes the leaves to wilt
- Infected plants remain smaller and lighter in color, and show nutrient deficiency
- A bearded sugarbeet root is often described in the field

Control

- No resistant beet varieties yet available
- Nematocide or fumigants
- Avoid spread by not returning tare soil to the field
- Longer sugarbeet rotations can be helpful in combination of controlling other host species including many weeds
- Trap cropping with an oil radish or mustard has greatly reduced the populations of cyst nematodes

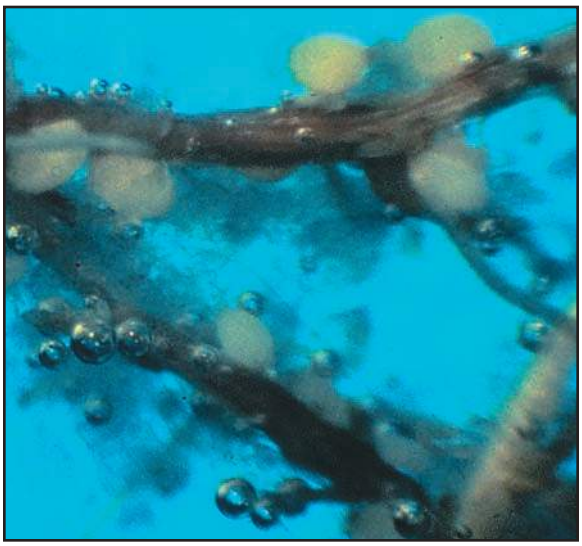


photo by: A. E. Steele

ERWINIA

Erwinia carotovora subsp. betavasculorum

photo by: E. D. Whitney

photo by: E. D. Whitney

Identification

- Erwinia is a root rot caused by a bacteria
- It is a warm weather disease found mostly in the western US
- Can be confused with rhizoctonia

Detection

- Early symptoms include black streaks running up the petioles and froth from the crowns
- Diagonal cut beets will turn pink or red when exposed to air
- Starts in the crown or petioles and rots down from the inside out
- Previously injured or weak beets are susceptible to infection
- The disease requires an infection point
- Hail or tearing from cultivation are the most common causes of an infection point

Control

- Prevent injuries to beet
- Judicious use of nitrogen
- Avoidance of throwing or splashing of soil into crowns

FUSARIUM

Fusarium oxysporum

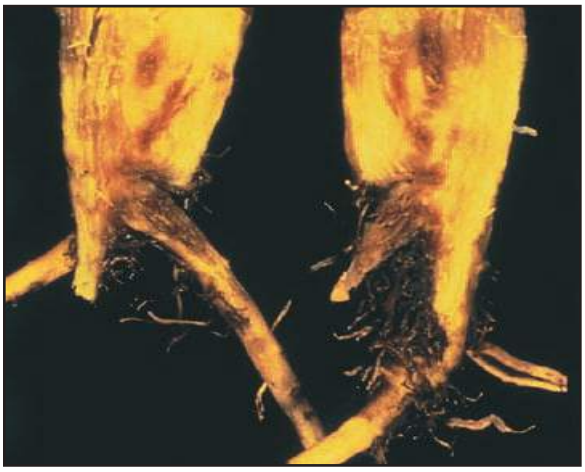


photo by: E. G. Ruppel

Identification

- Fusarium is caused by a fungus
- Fusarium is a vascular wilt disease of sugarbeets
- Typically found in hot, arid, irrigated production areas
- Survives in soil for many years
- Spreads by moving infected tare dirt
- Infected area will grow slowly
- Can be confused with seedling Aphanomyces, Pythium, Phytophthora, or Rhizoctonia
- Flooding, tillage, root aphids, and wind damage can cause similar symptoms

Detection

- Appears early to mid-summer
- Vascular system in the root becomes blocked
- Wilting of leaves
- Older leaves show yellowing between larger veins early in the growing season
- Older, lower leaves turn yellow and die
- Infects root tip and progresses upward
- Vascular discoloration, usually a reddish brown

- A crosscut of the beet will show the darkened vascular rings
- Root tip may become completely blackened in advanced infections
- Under high soil fungus populations, damping-off of seedlings can occur
- Plant regains vigor overnight, but wilt rapidly during the day as temperatures rise

Cause of Damage

- Plugged vascular system blocks moisture and nutrients from entering the beet

Beet Damage

- Wilting of beets
- Reduced sugar and tonnage
- Sugarbeet may not survive, unless temperatures remain cool

Control

- Lengthen sugarbeet rotation
- Early planting will result in more growth before favorable temperatures for development occur
- Resistant varieties

photo by: C. L. Schneider

POWDERY MILDEW

Erysiphe polygoni

photo by: C. Schlagel

photo by: E. G. Ruppel

Identification

- Powdery Mildew is a foliar disease caused by a fungus
- Found in warm-dry climates of the Western US
- Can occur in all sugar beet growing areas of the US

Detection

- Starts as small radiating, whitish, dusty mats on older leaves of the plant
- Under ideal conditions, the foliage can be covered in a few days
- Optimum temperatures is between 56° and 86° F
- Growth is inhibited by free water on the foliage, so the spread is less under sprinklers
- A field of heavily infected plants may take on a bluish cast

Cause of Damage

- The foliar mildew covers the leaf and hinders the plants ability to conduct photosynthesis
- Reduced photosynthesis reduces growth and sugar production
- Reduction of sugar and tonnage may be up to 30%

Control

- Resistant varieties
- Fungicides
- If disease appears less then 5 weeks before harvest, a control may not be needed
- Crop rotation is unimportant since the disease cannot overwinter in dead tissue

RHIZOCTONIA ROOT AND CROWN ROT

Rhizoctonia solani

photo by: M. E. Stanghellini

Identification

- Rhizoctonia root and crown rot is the most common root disease of sugarbeets in the US
- Rhizoctonia is a fungus

Detection

- Sudden wilting of leaves
- Noticed late in growing season during final cultivation or later
- Disease typically runs down the beet row

- Several black lesions will appear on the root
- As the disease progresses, these lesions may grow together and cover the entire surface of the root
- This dry rot has a sickly sweet odor that is produced from rotting beets
- Sugarbeet roots remain firm until the plant dies, unless bacteria enters
- The inside of the root will appear white and healthy until advanced stages of decay, when it turns brown and the root rots completely
- A dark brown to black discoloration of the youngest leaves and petioles near the center of the crown often are observed
- Symptoms include chlorosis of the leaves and sudden wilting with many leaves turning black and dying around the crown

Cause of Infection

- Overwinters in soil and in plant tissue
- In the spring and summer it resumes growth and infects through leaf petioles, crowns, or roots

photo by: E. G. Ruppel

photo by: C. Schlagel

- Over hilling of plants with cultivation often aggravates the disease
- Favors warmer or hot temperatures

Beet Damage

- Root and crown tissue rot
- Adjacent roots become infected and can die
- Up to a 50% loss is possible
- Infected roots may lower quality if found in beet sample

Control

- Cultural control (less dirt on crown)
- Tillage (without hilling) and fertilizing to promote good plant growth
- Adequate soil drainage
- Crop rotation with corn and small grains (no beans or potatoes)
- Plant resistant varieties

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RHIZOMANIA

Beet Necrotic Yellow Vein

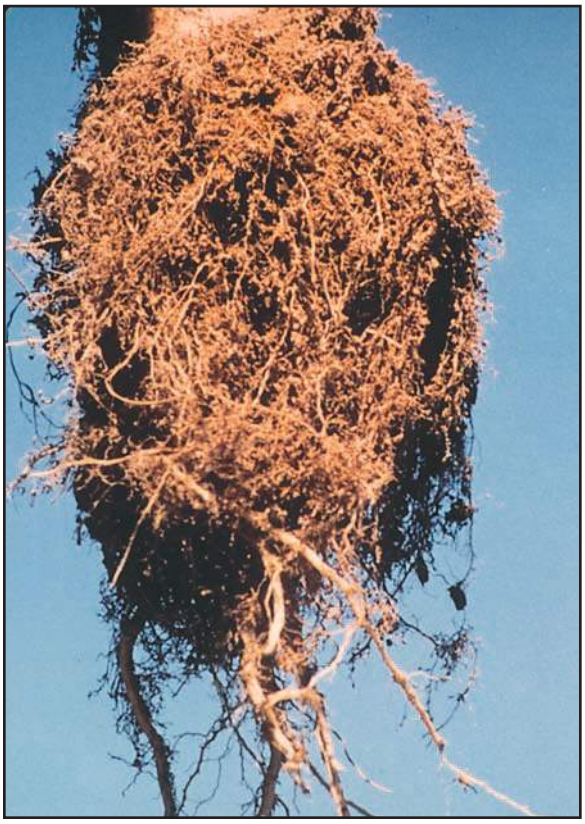

photo by: J. Gallin

photo by: J. Gallian

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Identification

- Rhizomania is one of the most destructive beet diseases
- Can cause a 100% loss in an infected field
- The disease is transmitted and carried by a fungus
- The fungus is carried by the wind, equipment, and tail water
- Excessive water and poor soil structure influence the development and propagation of the fungus

Detection

- Stunting of the root
- Large number of small lateral roots growing out of the main tap root
- The beet will have a heavy bearded look
- The root may be small with dark veins or totally rotted off
- The vascular rings are visibly darkened
- Leaves will be bright in color and extend upright from an abnormally large crown
- Leaves may wilt and become flabby
- Leaves may show yellowing veins

Beet Damage

- Infection blocks moisture and nutrients from entering the beet

Control

- Resistant varieties
- Avoid planting in infected fields
- Long crop rotations (May not be effective)
- Early planting to have a larger canopy developed before warm temperatures arrive

SUGARBEET ROOT APHID

Pemphigus populivenae

photo by: S. R. Winter

photo by: C. Schlagel

Identification

- Overwinters in the larvae stage on trees (Rocky Mountain States) or as aphids in sugarbeets or weed hosts
- Winged adults migrate from their winter hosts to sugarbeets in early summer and produce up to seven generations of wingless aphids
- Aphids are a white to yellowish green
- The female body is about a 1/16" long
- Aphids live in a white waxy secretion which repels water

Detection

- Infestations start out as small round patches in the field
- Patches have wilted leaves during the heat of the day
- Surface of roots are covered with white, waxy material secreted by the insect
- Beet leaves can turn from dark green to yellowish green and eventually wilt and actually shrink in size
- In extreme cases of aphid infestation, both winged and non-winged aphids can be found on the petioles of the beets

Cause of Infestation

- Aphids thrive in high temperatures and in limited soil moisture
- Under ideal conditions, numerous aphid generations may be produced
- Aphids spread by crawling through cracks in the soil and on the soil surface
- Winged aphids can fly
- Aphids can be moved by both wind and water

Cause of Damage

- Feeds mainly on the secondary roots of beets
- Feeding reduces the beets' ability to take up water and nutrients

Beet Damage

- Beets wilt and become stunted
- Aphids reduce the size and the quality of beet roots
- Aphid damage opens the door to other infestations such as alternaria
- Can cause reduced tonnage, sugar, and quality

Control

- Crop rotation and plowing can reduce infestations
- Variety resistance
- No current insecticide control
- Irrigation can slow the production of future generations