

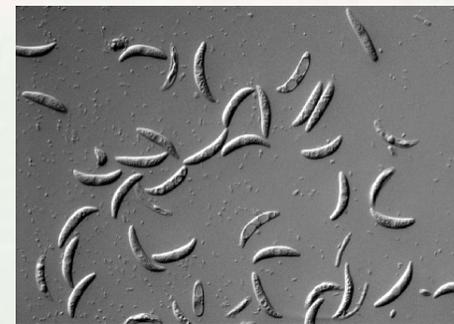
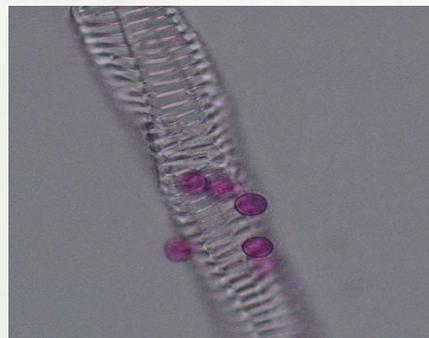


# DISEASES ON VEGETABLES AND ORNAMENTALS 2011



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Early Blight - Fruit Symptoms

# Plant Diseases

- **Biotic Factors**

  - Viruses

  - Bacteria

  - Fungi

  - Nematodes

- **Abiotic Factors**

  - Environmental Problems

  - Herbicides

  - Nutritional Deficiencies

  - Pollutants

# Non-pathogenic disorders

- Majority of diagnoses in Diagnostic Lab

## Blossom End Rot

- Localized Calcium deficiency
  - Caused by fluctuating soil moisture
  - Ensure uniform moisture and adequate drainage
  - Mulch
- Don't over-fertilize with nitrogen



Modified from  
Nina Zidack MSU

# Iron Deficiency -Chlorosis

Common in high pH Soils

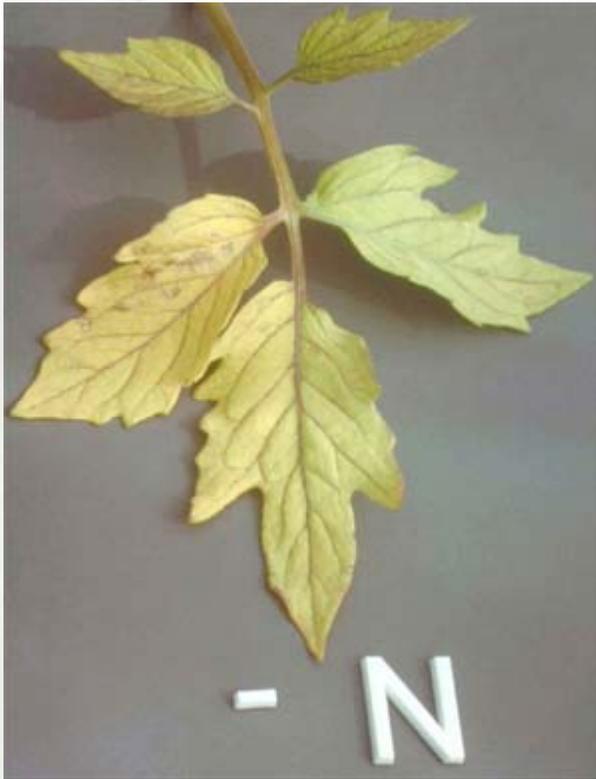
-Apply sulfur to lower soil pH -Apply chelated iron fertilizer foliar or soil applications



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# Iron Deficiency –vs nitrogen deficiency



**Short plants, chlorosis**  
**White bleached, older leaves**  
**reddish petioles**



**Intervenial chlorosis**  
**Youngest leaves**

# Herbicide Injury



# Insects?



Spider mite damage on epiplant.  
[Picture by W. Crandlow]

## Spider mites



## Leaf miners

# Plant Diseases

- **Biotic Factors**

Viruses

Bacteria

**Fungi**

Nematodes

**Most diseases caused by Fungi**

# Bacterial Diseases

- Some are Seedborne
  - Soilborne and/or residue borne
  - Infect through wounds, natural openings
  - Require high humidity
    - Free water on leaf surface
- Driving rain



# Bacterial Speck and Spot of Tomato

- Very similar symptoms
- Both cause leaf and fruit lesions

## Tomato – Bacterial Speck *Pseudomonas syringae* pv. *tomato*

- Favored by cool, moist conditions
- Spread Mechanical Transmission Driving Rain
- No registered chemical controls Biological Control?
- Chemicals registered for “spot” reduce disease
- Sanitation



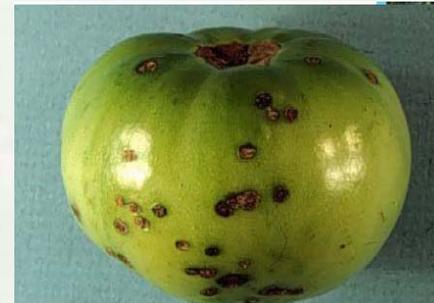
## Tomato – Bacterial Spot *Xanthomonas campestris* pv. *vesicatoria*

Favored by warm, moist weather

Control:

Sanitation

Mancozeb and Copper



Photos/ Modified from  
Nina Zidack MSU

# Bacterial Soft Rots - *Erwinia*

## Sanitation

**Rotation Onions – proper curing and cold storage**

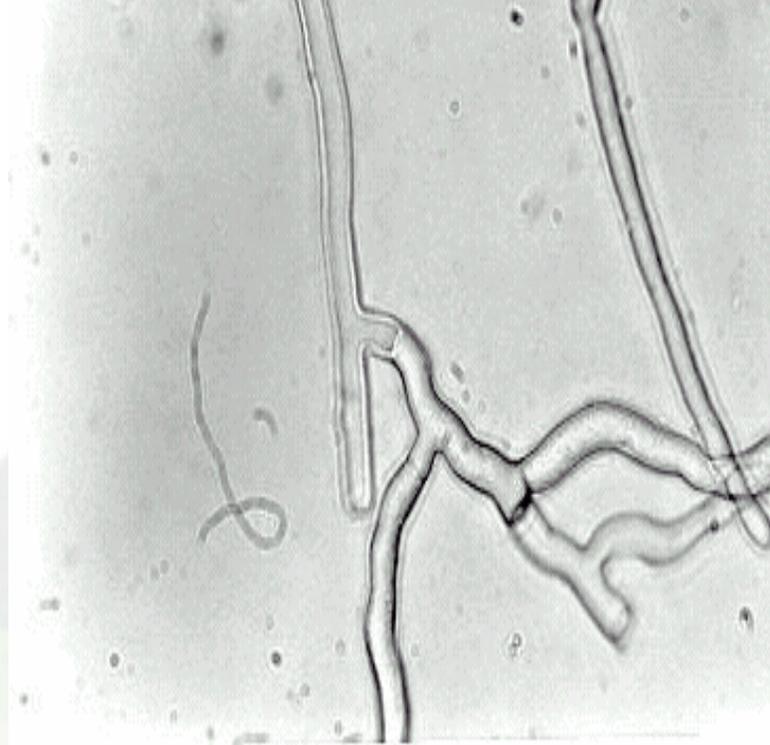
**Potatoes – sanitation, avoid injury, crop rotation, avoid soils which are too wet or dry, don't over irrigate, harvest when tubers are fully mature, provide adequate air circulation**

**Cabbage – avoid mechanical injury, sanitation, Time irrigation to avoid head formation**



Photos/ Modified from  
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# Diseases Caused by Fungi



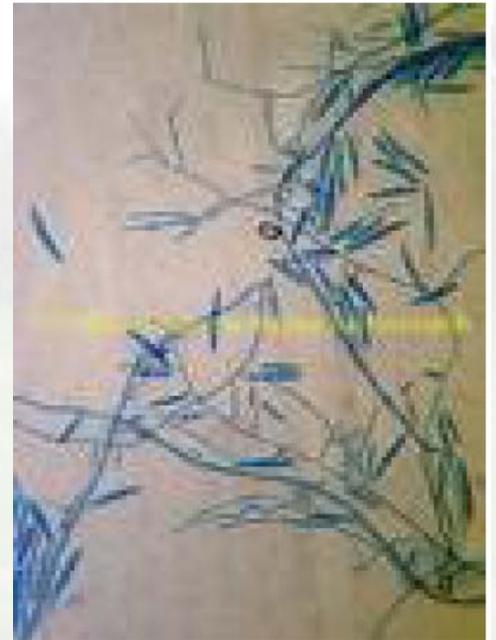
**Fungi= Are small, generally microscopic organisms, most of them filamentous, reproduce by spores; they lack chlorophyll.**



**More than 10,000 species of fungi can cause plant diseases problems**

# Fungal Plant Diseases

- **Root Diseases -Soilborne and Residue borne**
  - **Cankers –Rots**
  - **Wilts**
- Foliar Diseases – Residue borne, wind-blown and rain-splashed spores**
- **Leaf spots and leaf molds**



# Early Blight of Tomato

*Alternaria solani*

Dark Foliar lesion

Concentric rings, yellow halos

Starts in lower leaves and moves upward

Defoliation



Control

Avoid excessive moisture on leaves

Mulching, resistant varieties

Sanitation, crop rotation

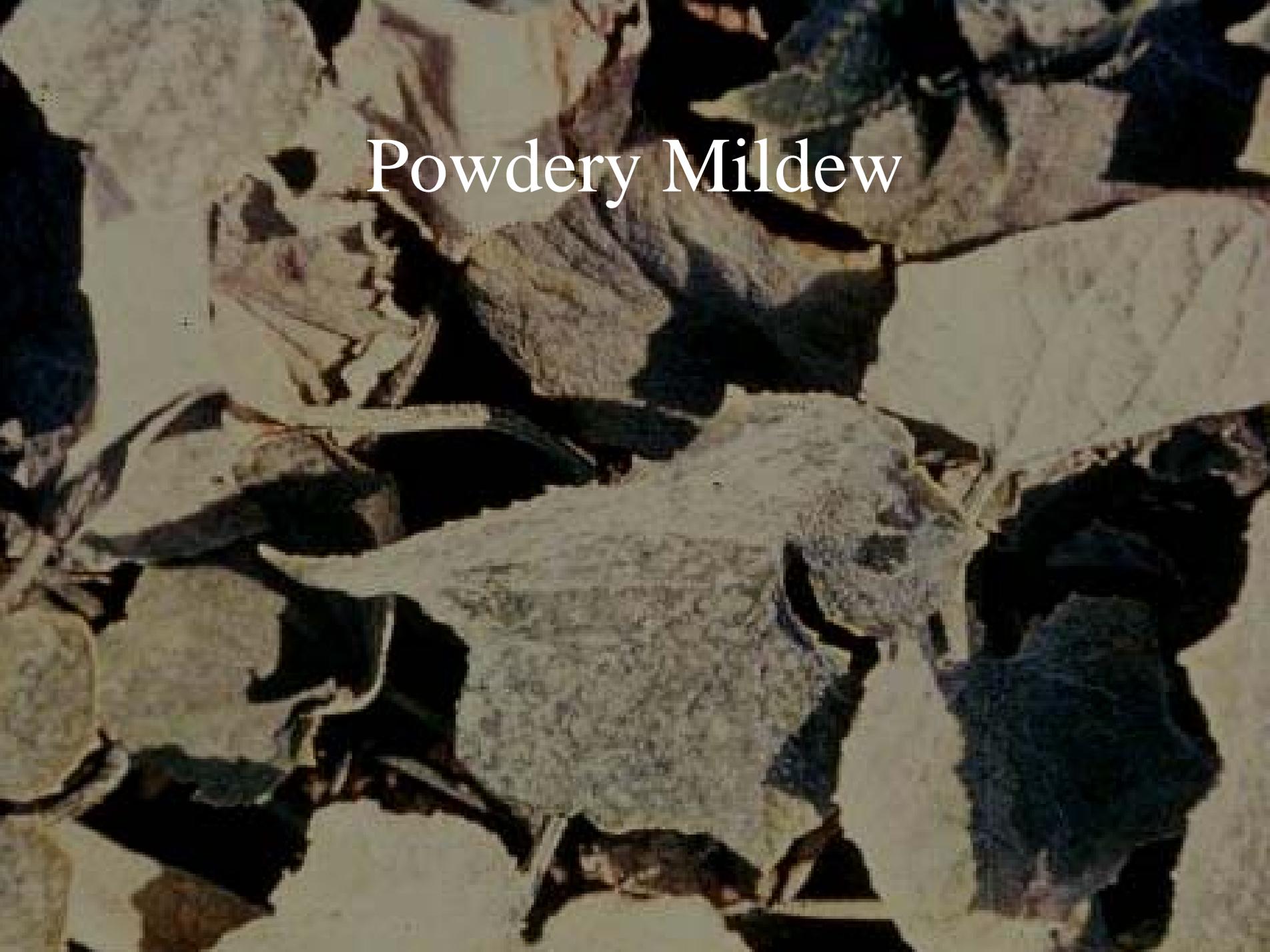
Fungicides



# Bean Rust



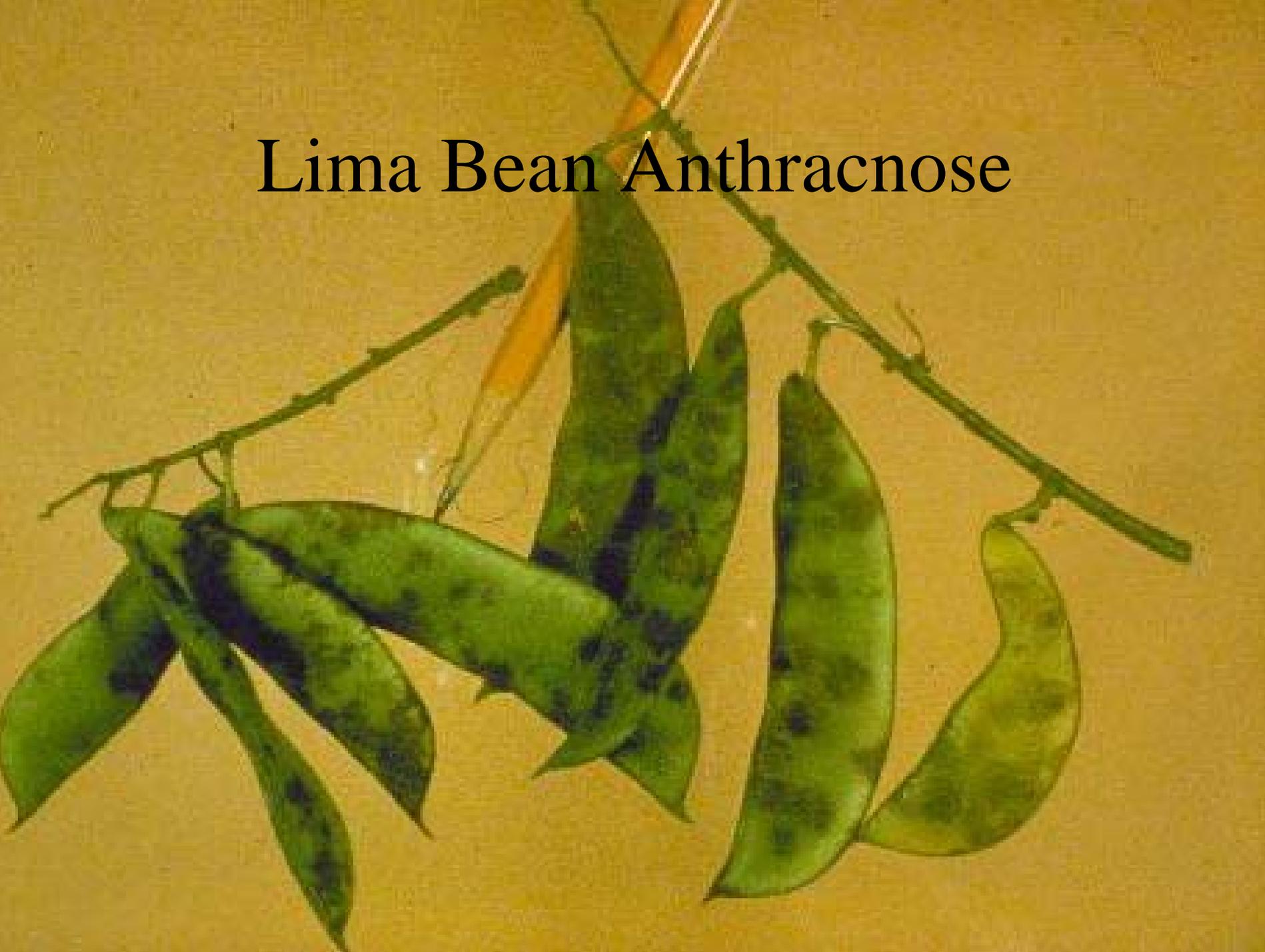
# Powdery Mildew



# Anthracnose



# Lima Bean Anthracnose



# Tomato Spotted Wilt Virus



**Wide host range (Tomatoes, potatoes, lettuce, peppers, Eggplants, peas, spinach, squash etc)**

**Dark Brown streaks in the main stem**

**Young foliage show inward cupping, off color leaves**

**Characteristic yellow concentric rings**

**Yellowing**

**Wilting**

**Caused by Thrips (insects)**



# **Control**

**Nothing you can do once plants are infected**

**Remove infected plants**

**Sanitation=remove infected debris**

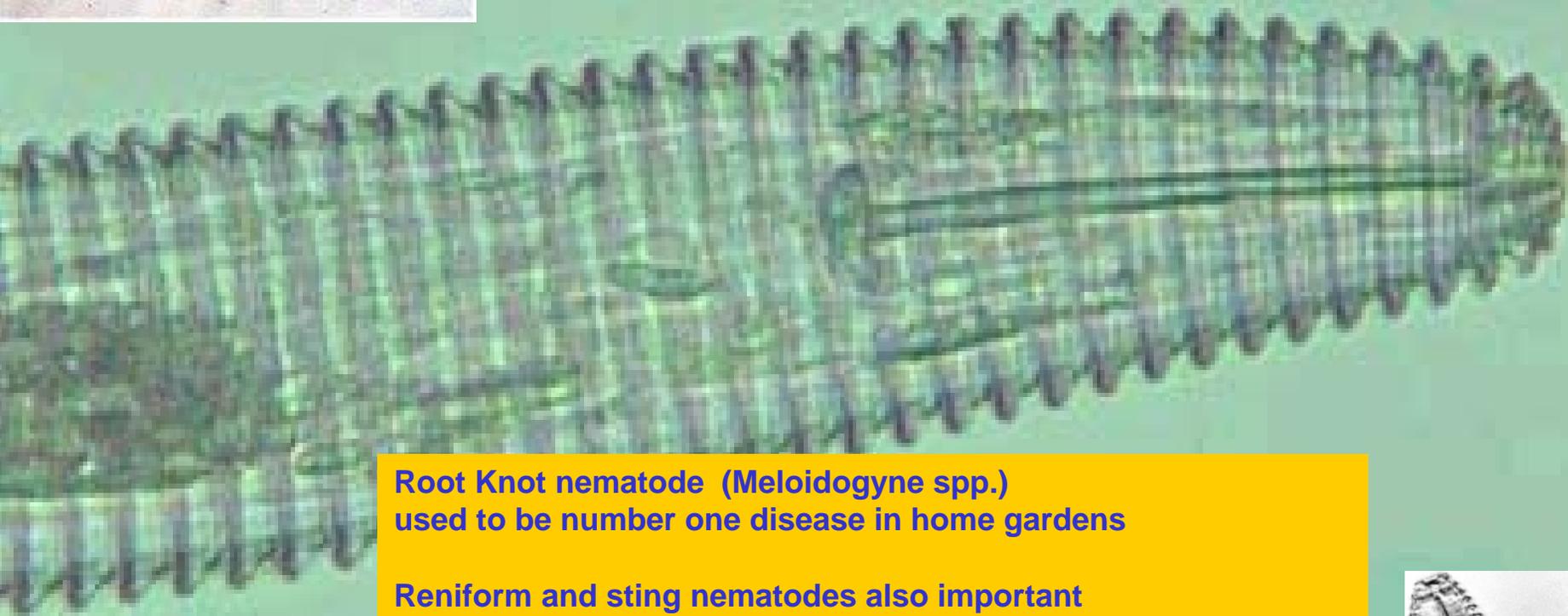
**Pull weeds**

**Control insects**

**Sanitize hands after handling infected plants**

**To avoid infecting healthy plants**

# Diseases caused by Nematodes on Vegetables

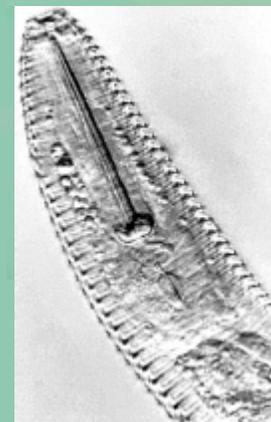


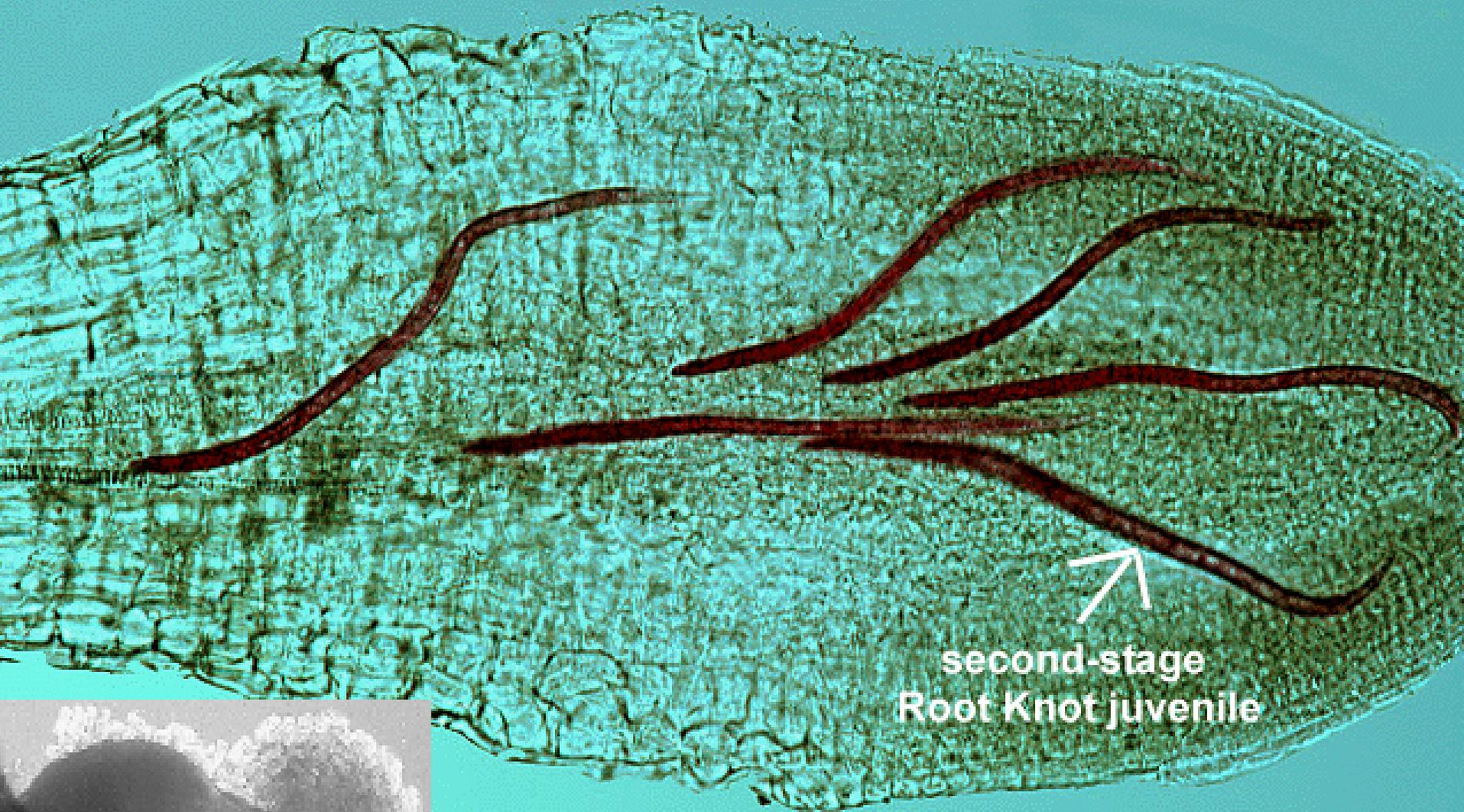
**Root Knot nematode (*Meloidogyne* spp.)  
used to be number one disease in home gardens**

**Reniform and sting nematodes also important**

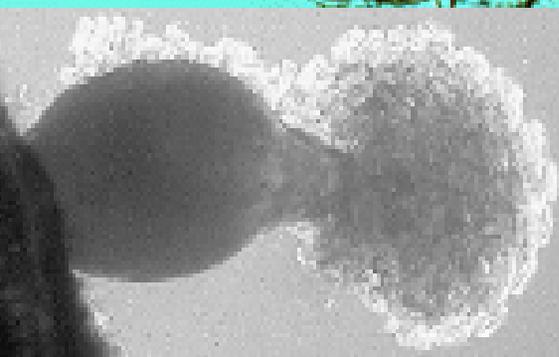
**Diagnosis; Observe the root system-knots and  
Short roots. Yellowing, stunted growth, thin,**

**Soil test for nematodes. Take random samples  
Collect and mix thoroughly. Send sample  
Immediately. April-September (avoid cold months)**





second-stage  
Root Knot juvenile



# **Control**

**No Chemical control available**

**Avoid plant stress: Drought, fertility**

**Water deeply and infrequently increases root growth**

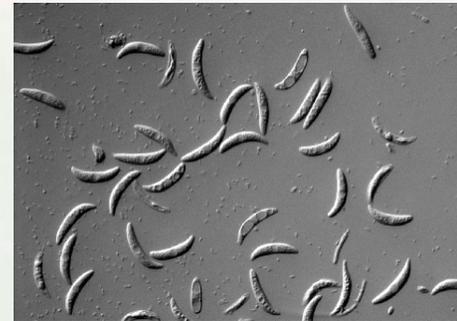
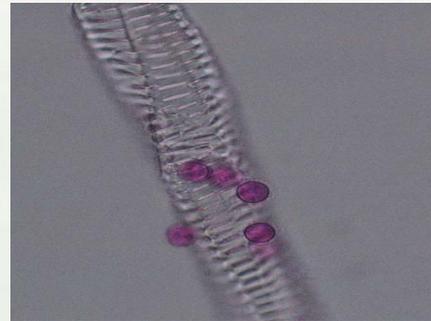
**Avoid excessive nitrogen fertilization**

**Avoid soil compaction**

**Soil amendments**



## DISEASES ON ORNAMENTALS



# Root rots

All year around

Peak in March-June and August-October

*Pythium*

*Phytophthora*

*Rhizoctonia*



# Symptoms

Affects most herbaceous  
ornamental plants

Plants wilt, yellow foliage  
Roots are light to dark brown  
and soft outer root cortex  
sloughs-off leaving the thread-  
like inner root

Root stele visible are dark  
brown or black

Causes damping-off



# Control

Infection is favored by wet soils and high soluble salts

Improve soil structure and drainage

Avoid planting too deeply

Remove infected plants from the area

Avoid plant stress

Fungicide drenches may reduce disease

# Fungal Leaf Spots

Leaf spots are produced by a number of fungi  
e.g. *Septoria*, *Cercospora*, *Entomosporium*



Leaf spots can be observed ALL year around  
Peaks on April-May and August-September



Rose Black Spot

# Symptoms

Randomly distributed definitive spots on leaves



Spots typically have a tan to gray center with a brown black or dark purple border

Black pimple-like fungal fruiting bodies can sometimes be seen at the center of the spot



May be associated with yellowing leaves and premature defoliation

Leaf spot Septoria

# Control

Rake and remove fallen leaf litter from the base of plants

Avoid long duration of leaf wetness

Do not water late in the day so the plants go through the night wet

Increase plant spacing or selectively prune branches to improve air circulation

Use of protective fungicides preventively or at first sign of disease

# *Alternaria* Leaf Spot

- Zinnia
- Dianthus
- Impatiens
- Marigold
- Geranium



• Purple spots

• Dry gray centers

• Center may drop out

# *Septoria* Leaf Spot

- Dogwood
- Rudbeckia
- Phlox
- Mums



- Spots- small round
- Centers- white - light tan or gray
- Purple or brown border
- May have zone of yellow tissue
- Pimple like structures
- Spots may grow together

# *Cercospora*



- Juniper
- Ligustrum
- Hydrangea
- Pansy
- Azalea

- Frogeye
- Specks on spot center
- Browning progresses up and out



# *Entomosporium*

- Pear
- Photinia
- Indian hawthorn
- Loquat



- Small reddish spots
- Older spots grayish w/ dark purple border
- Spots may join causing leaf blight
- Infected leaves drop prematurely
- Favors cool, wet weather and poor air circulation



# PHOTINIA Entomosporium leaf spot

Small reddish leaf spots

As spots age center with a dark purple border

Leaf spots may coalesce causing severe leaf blight

Severely infected leaves drop prematurely

Over time severely infected plants die

Infection is favored by poor air circulation and prolonged periods of leaf wetness



**Black spot of rose**  
*Diplocarpon rosae*

# CONTROL

Selectively prune plants to improve air circulation through plant

Increase plant spacing

Avoid wetting foliage

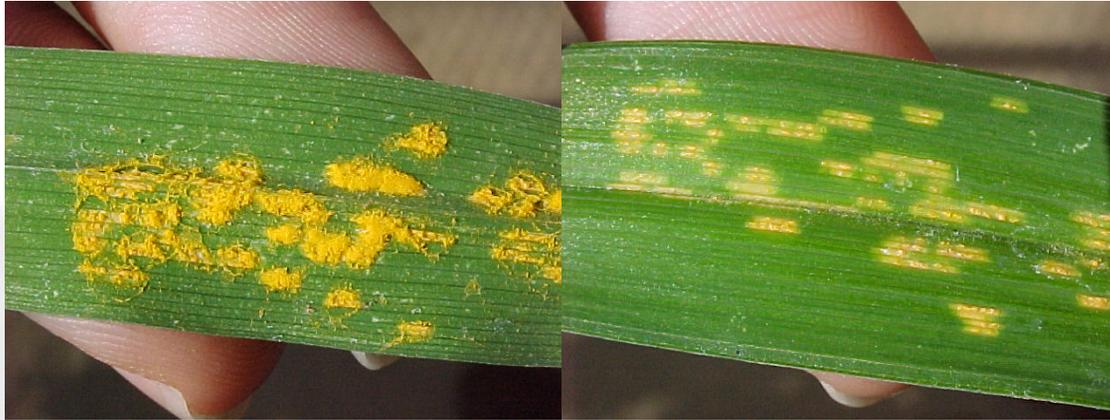
Apply protective fungicides (Chlorothalonil, Mancozeb, Propiconazole) when leaves emerge in spring and continue at 10-14 days intervals throughout growing season

# RUSTS

Leaf rust on daylily



# Daylily rust symptoms





# Daylily rust



Identified in all states on numerous cultivars

Spread mostly through the sale or trading of infected plants

Warm weather, extended leaf wetness, stressed plant can promote the disease

Won't kill the plant right away, but repeated infections will weaken the plant and ultimately, destroy it. Unsightly .

Control: Some fungicides are effective, several cultivars are resistant

Cut foliage and discard (especially over winter), fertilize using nitrogen

# Powdery Mildew

*Erysiphe* spp

*Sphaerotheca* spp

*Uncinula* spp

*Oidium* spp



Attack 7000 plant species.  
In Landscape: Begonia,  
Chrysanthemum, Euonymus,  
Dogwood, Gardenia, Rose,  
Hawthorn, Hydrangea, Lilac,  
Phlox, Sycamore, Zinnia, etc...



# Seasonal Occurrence

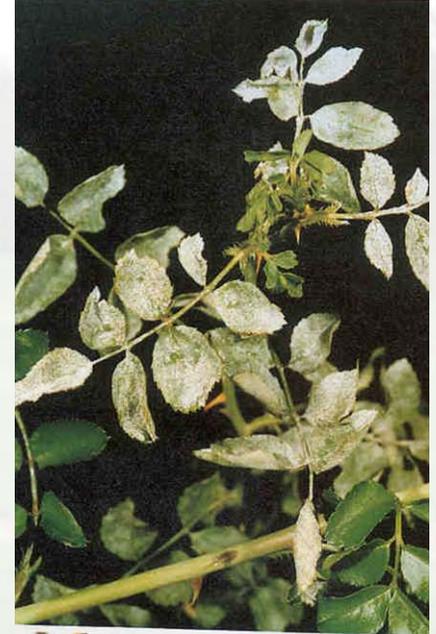
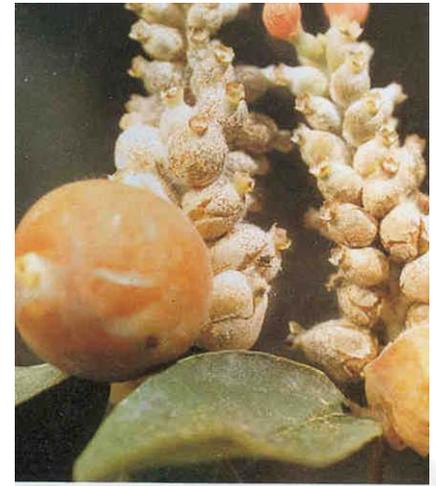
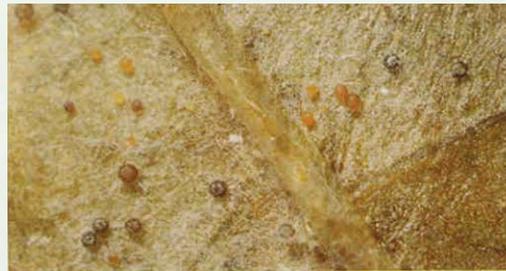
March-October  
peak in May-June



# Symptoms

White to grayish powdery patches on leaves  
stems, flowers

Mostly seen on new growth



# Control

Remove affected stems or leaves from the plant

Rake and remove fallen plant litter

Increase plant spacing or selectively prune branches to improve ventilation

Apply a fungicide spray at the first sign of infection

Do not wait until the entire leaf is covered with mildew

# **Powdery mildew on Crape Myrtle:** Same symptoms on different plant hosts

Control

Plant Resistant varieties:

Acoma, Tuskegee, Zuma, Apalache, Catawa, Caddo,  
Sioux, Yuma

Fenarimol (Rubigan), Myclobutanil (Systhane),  
Propiconazole (Banner Maxx), Triadimefon (Bayleton,  
Strike)



# Cankers and Stem Diseases



# Seiridium canker

Peak in April-May

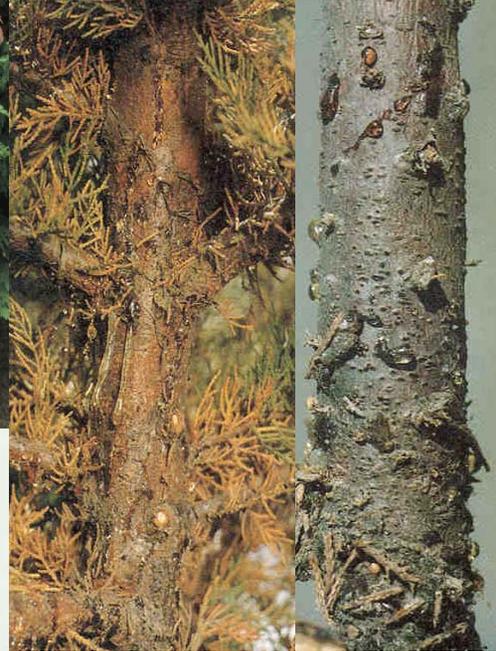
## Symptoms

Yellowing and browning of old foliage precedes fading and death of twigs and branches

Infection occurs from the lower branch and upward and from the inside out

Bark is darkened and resin exudes from margins of cankers and upward margins of cankers

Infected trees look thinly branched



# Cankers and Stem Diseases

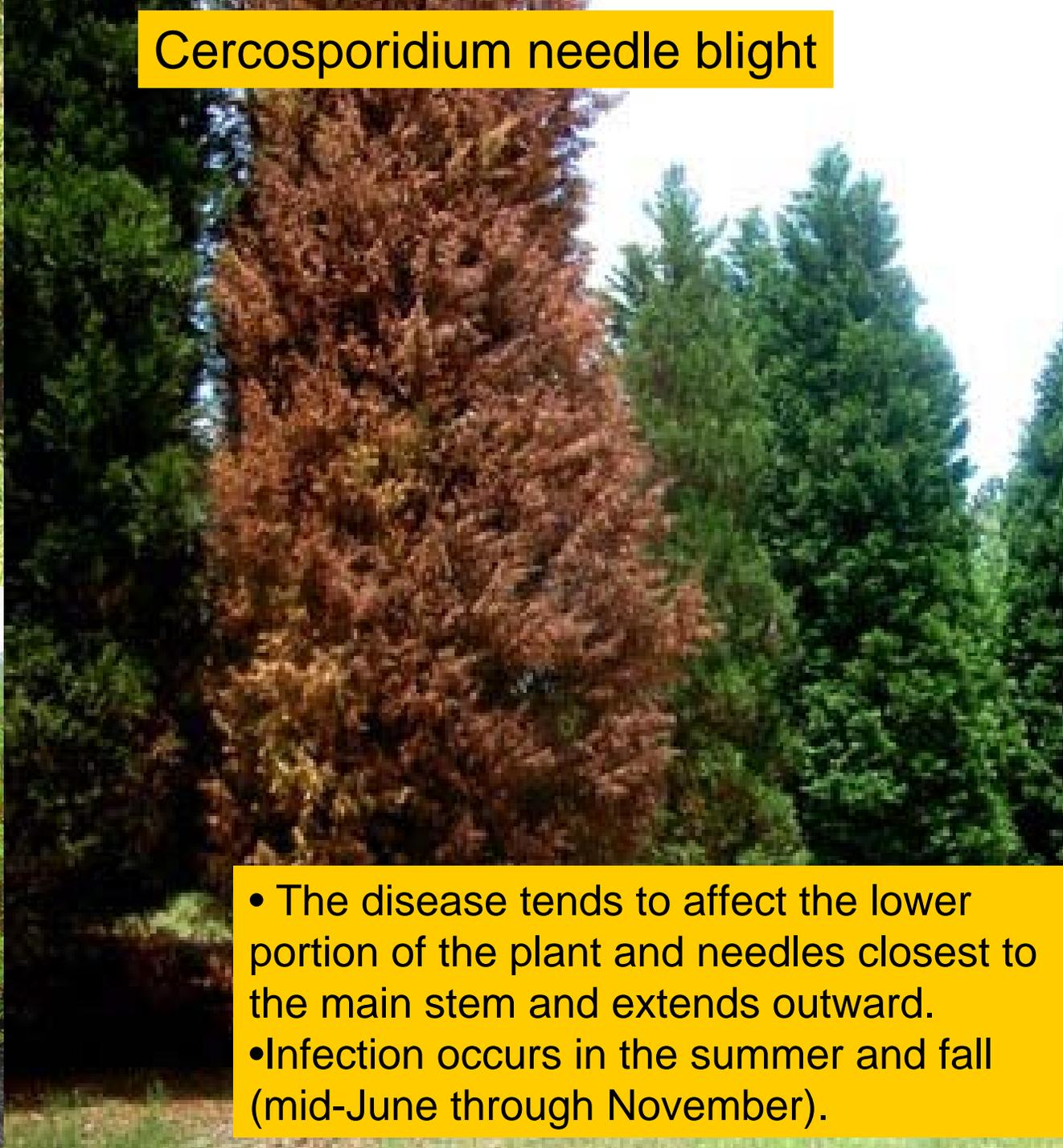
Stressed plants (drought-heat mostly) are particularly prone to the disease

There is no control other than pruning out the affected branches

Trees need to be irrigated during dry weather to reduce canker development

No fungicides are effective when once infection takes place

## Cercosporidium needle blight



- The disease tends to affect the lower portion of the plant and needles closest to the main stem and extends outward.
- Infection occurs in the summer and fall (mid-June through November).

## **Control measures include**

**Avoiding plant stress (nutritional, water), irrigating during periods of drought,**

**Removal of severely affected branches or plants,**

**Preventive fungicide applications can help reduce disease.**

**Copper hydroxide (Kocide), Mancozeb (Fore, etc.), Chlorothalonil (Daconil),  
or Myclobutanil (Systhane),**

**Heritage (azoxystrobin) can also reduce disease development.**

**Fungicides need to be directed to the inside and lower portion of the tree**

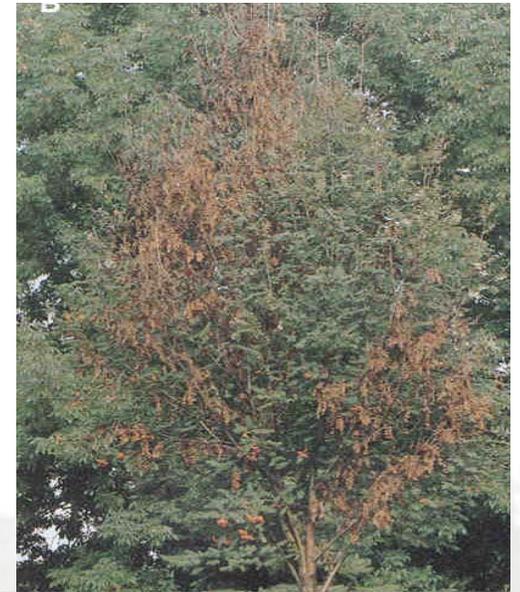
# BACTERIAL DISEASES

## Fire Blight

*Erwinia amylovora*

April-June peak in May-June

Affects plants in the Rosaceae family (Pear, Crabapple, Cotonoaster, Photinia, Pyracantha)



# Symptoms

Young twigs and branches die from the terminal end and appear burned or deep rust colored

Branch may bend resembling a shepherd's crook

Bad leaves and fruit generally remain on the branch

Infection occurs during blooming and is favored by wet conditions



# Control

Prune out branches 6 inches below the signs of damage

Disinfect pruning tools in 70 % isopropyl alcohol or 10 % bleach solution between each cut

Avoid heavy nitrogen fertilization, especially in the summer

Avoid splashing water

Plant resistant varieties

## **Diseases caused by nematodes**

Symptoms: Small swellings on roots; Yellowing of foliage; Stunting; Decline

Laboratory analysis is essential for definite diagnosis  
(root knot of boxwood)

## **Diseases caused by viruses**

Symptoms: Chlorosis, mottling, ring spots, dying tissues

Control: Eliminate vectors (insects), Clean tools, prune

