

Advanced Master Gardener Training

Vegetable Diseases

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Vegetable Diseases Damping-Off/Seedling Blights

- **Causes**
 - Pythium spp.
 - Rhizoctonia solani
 - Fusarium spp.
- **Hosts: Any vegetable**
- **Favorable environment**
 - Cool soil temperatures
 - Wet soils



Vegetable Diseases Damping-Off/Seedling Blights

- **Control**
 - Use a pasteurized soil mixture
 - Use decontaminated pots, working surfaces and tools
 - 10% bleach
 - 70% alcohol
 - Commercial disinfectants

Vegetable Diseases Damping-Off/Seedling Blights

- **Control**
 - Moderate soil moisture
 - Use a soil with adequate drainage
 - DO NOT over-water
 - Germinate seeds at higher temperatures

Vegetable Diseases Damping-Off/Seedling Blights

- **Control**
 - Use fungicides to protect seedlings
 - Captan
 - Streptomyces lydicus
 - Trichoderma spp., Gliocladium spp., Pseudomonas spp., Bacillus spp.
 - Apply as a seed treatment or drench

Vegetable Diseases Fungal Leaf Blights

- **Causes**
 - *Septoria lycopersici* (Septoria leaf spot)
 - *Alternaria solani* (early blight)
 - *Phytophthora infestans* (late blight)
- **Hosts**
 - Tomato
 - Potato (early blight, late blight)
- **Favorable environment:** Cool, wet weather



Vegetable Diseases Fungal Leaf Blights

- **Control (early blight, Septoria leaf spot)**
 - Remove and destroy infested debris (burn, bury, hot compost)
 - Move tomatoes to new location (?)
 - Plant resistant varieties (?)
 - Space plants far apart
 - Mulch around the base of plants
 - **DO NOT** over-mulch

Vegetable Diseases Fungal Leaf Blights

- **Control (early blight, Septoria leaf spot)**
 - **DO NOT** overhead water
 - Remove infected leaf tissue (?)
 - Use fungicides to prevent infections
 - Chlorothalonil, mancozeb
 - Copper
 - Alternate active ingredients (FRAC codes)
 - Apply at 7-14 days intervals

Vegetable Diseases Fungal Leaf Blights

- **Control (late blight)**
 - Remove and destroy
 - Infected plants, fruits, tubers
 - Volunteer tomato and potato plants
 - Weed hosts
 - **DO NOT** use last year's potatoes as seed potatoes
 - **DO** use certified seed potatoes

Vegetable Diseases Fungal Leaf Blights

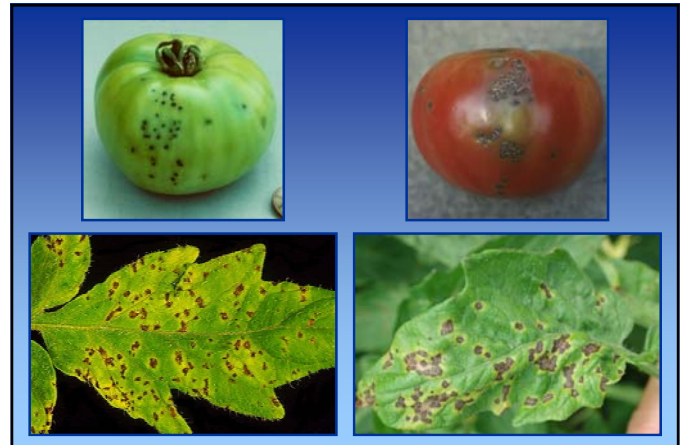
- **Control (late blight)**
 - Grow resistant tomato varieties
 - “Late Blight Management in Tomato with Resistant Varieties”
<http://www.extension.org/pages/72678/late-blight-management-in-tomato-with-resistant-varieties#.VVNSsPIVhBd>

Vegetable Diseases Fungal Leaf Blights

- **Control (late blight)**
 - Use fungicides to prevent infections
 - Chlorothalonil, mancozeb
 - Copper
 - Alternate active ingredients (FRAC codes)
 - Start applications based on Blitecast (<http://www.plantpath.wisc.edu/wiveqdis/>)
 - Apply at 7-14 day intervals

Vegetable Diseases Bacterial Tomato Diseases

- **Causes**
 - *Pseudomonas syringae* pv. *tomato* (bacterial speck)
 - *Xanthomonas* spp. (bacterial spot)
- **Host: Tomato**
- **Favorable environment**
 - Cool, wet weather (bacterial speck)
 - Warm, wet weather (bacterial spot)



Vegetable Diseases Bacterial Tomato Diseases

- **Control**
 - Dispose of contaminated plant debris (burn, bury, hot compost)
 - Remove and destroy volunteer tomatoes
 - Start with pathogen-free seeds and plants
 - Hot water treat seeds (122°F, 25 minutes)
 - Move tomatoes to new location
 - Space plants far apart

Vegetable Diseases Bacterial Tomato Diseases

- **Control**
 - Mulch around the base of plants
 - DO NOT over-mulch
 - DO NOT overhead water
 - DO NOT handle plants when wet
 - Use bactericides to prevent infections
 - Copper
 - Apply at 7-14 days intervals
 - Tolerant bacterial strains are a problem

Vegetable Diseases Blossom End Rot

- **Cause:** Calcium deficiency
- **Affected plants**
 - Tomato
 - Pepper
 - Eggplant
 - Cucurbits (cucumber, squash, pumpkin)
- **Favorable Environment:** Drought



Vegetable Diseases Blossom End Rot

- **Management**
 - Test soil to determine calcium level
 - Add calcium as needed
 - Bone meal
 - Egg shells
 - NOT lime (usually)
 - Water plants adequately and uniformly

Vegetable Diseases Vascular Wilts

- **Causes**
 - Verticillium spp. (Verticillium wilt)
 - Fusarium oxysporum (Fusarium wilt)
- **Hosts**
 - Solanaceous vegetables (tomato, potato, pepper, eggplant)
 - Cucurbits (pumpkin, squash, cucumber)
- **Favorable environment:** Wet/dry weather

Vegetable Diseases Vascular Wilts

- **Control**
 - Rotate crops to avoid pathogen build-up
 - DO NOT plant susceptible vegetables in infested areas
 - Plant non-hosts in infested areas
 - Plant resistant varieties (VFF)
 - DO NOT over-water
 - DO NOT over-mulch
 - DO NOT use fungicides or biological controls



Vegetable Diseases Walnut Toxicity

- **Cause: Juglones**
 - Black walnut
 - Butternut
 - Hickory
- **Affected plants**
 - Many vegetables
 - Asparagus, cabbage
 - Tomato, potato, pepper, eggplant



Vegetable Diseases Walnut Toxicity

- **Management**
 - **DO NOT** plant sensitive vegetables near walnut trees
 - Plant tolerant vegetables
 - Beans
 - Beet
 - Carrot
 - Corn
 - Melon
 - Onion
 - Parsnip
 - Squash
 - Plant sensitive vegetables
 - in raised beds
 - in pots

Vegetable Diseases Walnut Toxicity

- **Management**
 - Keep walnut leaves and fruits out of your garden
 - **DO NOT** compost walnut leaves and fruits
 - Remove volunteer walnut trees
 - Remove mature walnut trees (?)

Vegetable Diseases Herbicide Injury

- **Causes**
 - Growth regulator herbicides
 - 2,4-D
 - Dicamba
 - Other herbicides
- **Affected plants**
 - All vegetables
 - Tomatoes



Vegetable Diseases Herbicide Injury

- **Management**
 - **DO NOT** use herbicides
 - If you or your neighbors do use herbicides, make sure that you or they
 - Follow application directions exactly
 - Apply herbicides at low wind speeds (< 5 mph)
 - **DO NOT** apply herbicides too close to sensitive plants
 - Apply herbicides at low pressure
 - Use amine rather than ester forms of herbicides

Vegetable Diseases Powdery Mildew

- **Causes**
 - Miscellaneous powdery mildew fungi
 - Oidium spp.
- **Hosts**
 - Cucurbits (cucumber, squash, pumpkin)
 - Other vegetables (pea, tomato)
- **Favorable environment: High humidity**



Vegetable Diseases Powdery Mildew

- **Control**
 - Remove and destroy plant debris
 - Burn (where allowed)
 - Deep bury
 - Hot compost
 - Reduce humidity
 - Plant less densely/thin existing stands
 - Grow vining plants on a trellis
 - Use resistant cultivars/varieties

Vegetable Diseases Powdery Mildew

- **Control**
 - Use fungicides to prevent infections
 - Dithiocarbamates, myclobutanil, propiconazole, tebuconazole, thiophanate-methyl
 - Sulfur, neem oil, other plant-based oils
 - 1.5 Tbsp baking soda + 3 Tbsp light-weight horticultural oil in 1 gal water
 - Alternate active ingredients (FRAC codes)
 - Apply when humidity is >60-70%
 - Apply every 7-14 days

Vegetable Diseases Downy Mildew

- **Causes**
 - Pseudoperonospora cubensis
 - Peronospora belbahrii
- **Hosts**
 - Cucurbits (cucumber, squash, pumpkin)
 - Basil

Vegetable Diseases Downy Mildew

- **Favorable environment**
 - High moisture
 - High humidity
 - Moderate/warm temperatures



Vegetable Diseases Downy Mildew

- **Control**
 - Start with clean seed and transplants
 - Grow less susceptible/resistant varieties
 - Red varieties of basil
 - Sweet basil 'Eleonora'
 - Certain cucumber and cantaloupe varieties with lesser success for squash and pumpkin varieties
 - **DO NOT** overcrowd plants
 - **DO NOT** overhead water

Vegetable Diseases Downy Mildew

- **Control**
 - Destroy diseased/asymptomatic plants (burning, bag/landfill)
 - Use fungicides to prevent infections (cucurbits)
 - Chlorothalonil, mancozeb, phosphorus acids
 - Copper
 - Start applications based predictive models (<http://cdm.ipmpipe.org>)
 - Apply at 7-14 day application interval

Vegetable Diseases Bacterial Wilt

- **Cause:** *Erwinia tracheiphila*
- **Hosts:** Cucurbits (cucumber, squash, pumpkin)
- **Favorable environment:** None
- **Transmission:** Cucumber beetles

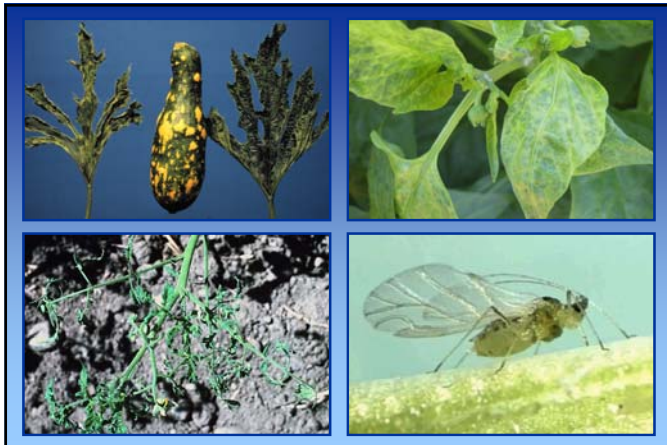


Vegetable Diseases Bacterial Wilt

- **Control**
 - Use floating row covers
 - Apply insecticides to control cucumber beetles
 - Remove infected plants
 - If you decide to keep infected plants, water them adequately
 - DO NOT use bactericides or biological controls

Vegetable Diseases Cucumber Mosaic

- **Cause:** *Cucumber mosaic virus*
- **Hosts**
 - Cucurbits
 - Pepper
 - Tomato
 - Other vegetables
- **Favorable environment:** None
- **Transmission:** Aphids



Vegetable Diseases Cucumber Mosaic

- **Control**
 - Plant resistant/tolerant varieties
 - Plant based resistance
 - Plant based tolerance
 - Genetically modified plants
 - Eliminate weed hosts
 - Apply insecticides to control aphids
 - DO NOT use bactericides or biological controls

Vegetable Diseases Common Scab

- **Cause:** *Streptomyces scabies*
- **Hosts**
 - Potato
 - Carrot
 - Other root crops
- **Favorable environment:** High soil pH



Vegetable Diseases Common Scab

- **Control**
 - Plant scab-free potato stock
 - Routinely rotate crops
 - DO NOT grow host plants in an infested areas
 - Plant non-hosts in infested areas
 - Move potatoes to another location
 - Plant scab resistant varieties
 - Lower soil pH
 - DO NOT use chemical or biological controls

Vegetable Diseases Bacterial Soft Rot

- **Cause:** *Pectobacterium carotovorum*
- **Hosts**
 - Potato
 - Carrot
 - Other vegetables
- **Favorable environment**
 - Wet soils
 - Wet storage conditions



Vegetable Diseases Bacterial Soft Rot

- **Control**
 - Moderate soil moisture
 - DO NOT overhead irrigate
 - Have good soil fertility (particularly calcium)
 - Harvest vegetables (potatoes) promptly
 - DO NOT bruise/injure vegetables
 - Keep harvested vegetables dry
 - Remove any rotted vegetables immediately

Vegetable Diseases Black Rot

- **Cause:** *Xanthomonas campestris* pv. *campestris*
- **Hosts: Crucifers**
 - Brussels sprouts, cabbage, collards
 - Broccoli, cauliflower, kale, kohlrabi, rutabaga, turnips
- **Favorable environment:** Wet weather



Vegetable Diseases **Black Rot**

- **Control**
 - Buy high quality (certified pathogen-free) seed or transplants
 - Heat treat seeds
 - 35 min, 122°F (Brussels sprouts, cabbage, collards)
 - 20 min, 122°F (broccoli, cauliflower, kale, kohlrabi, rutabaga, turnips)

Vegetable Diseases **Black Rot**

- **Control**
 - Routinely rotate crops
 - DO NOT grow host plants in an infested areas
 - Plant non-hosts in infested areas
 - Fertilize properly (particularly nitrogen)
 - DO NOT overhead water
 - DO NOT handle plants when wet
 - Remove and dispose of contaminated plants (burn, bury, hot compost)

Vegetable Diseases **Black Rot**

- **Control**
 - Decontaminate infested items
 - 10% bleach
 - 70% alcohol
 - Commercial disinfectants
 - Use bactericides to prevent infections
 - Copper
 - Apply at 7-14 days intervals
 - Tolerant bacterial strains are a problem

Vegetable Diseases **Aster Yellows**

- **Cause:** Aster yellows phytoplasma
- **Hosts**
 - Carrot
 - Potato
 - Other vegetables
- **Favorable environment:** None
- **Transmission:** Aster leafhopper

Vegetable Diseases **Aster Yellows**

- **Control**
 - Remove diseased plant material and debris
 - Hot compost
 - Bury
 - Burn (where allowed)
 - Control leafhopper vector (?)



Vegetable Diseases Common Smut

- Cause: Ustilago maydis
- Host: Sweet corn
- Favorable environment
 - None (ear infections)
 - Hail (leaf and stalk infections)



Vegetable Diseases Common Smut

- Control
 - Plant resistant varieties
 - Reduce physical damage to corn plants
 - DO NOT use chemical or biological controls
 - Give up on your corn and eat the smut (huitlacoche)

Vegetable Diseases Corn Rusts

- Cause
 - Puccinia sorghi (common rust)
 - Puccinia polysora (Southern rust)
- Host: Sweet corn
- Favorable environment
 - Moderate temperatures
 - Long periods of leaf wetness



Vegetable Diseases Corn Rusts

- Control
 - Plant resistant varieties
 - Use fungicides to prevent infections
 - Chlorothalonil, mancozeb, propiconazole, tebuconazole
 - Alternate active ingredients (FRAC codes)
 - Apply at 7-14 days intervals

Vegetable Diseases Bean Leaf Diseases

- **Causes**
 - *Pseudomonas syringae* pv. *syringae* (bacterial brown spot)
 - *Xanthomonas campestris* pv. *phaseoli* (common blight)
 - *Pseudomonas syringae* pv. *phaseolicola* (halo blight)

Vegetable Diseases Bean Leaf Diseases

- **Hosts**
 - Snap bean
 - Kidney bean
 - Lima bean
- **Favorable environment: Driving rain (?)**



Vegetable Diseases Bean Leaf Diseases

- **Control**
 - Purchase high quality seed
 - Use resistant varieties where available
 - DO NOT overhead water
 - Use bactericides to prevent infections
 - Copper
 - Apply at 7-14 days intervals
 - Tolerant bacterial strains are a problem

Vegetable Diseases Root Rots

- **Causes**
 - *Pythium* spp. (Pythium root rot)
 - *Rhizoctonia solani* (Rhizoctonia root rot)
 - *Fusarium* spp. (Fusarium root rot)
 - *Thielaviopsis basicola* (black root rot)
 - *Phytophthora* spp. (Phytophthora root rot)
 - *Aphanomyces euteiches* (Aphanomyces root rot)

Vegetable Diseases Root Rots

- **Hosts**
 - Snap beans
 - Peas
 - Carrots
 - Other vegetables
- **Favorable environment: Wet, cool soils**



Vegetable Diseases Root Rots

- **Control**
 - Routinely rotate crops
 - DO NOT grow host plants in an infested areas
 - Plant non-hosts in infested areas
 - Improve soil drainage
 - DO NOT over-water
 - DO NOT over-mulch

Vegetable Diseases Root Rots

- **Control**
 - Use fungicides to prevent infections
 - Streptomyces lydicus
 - Apply at seeding
 - Apply at 7-14 day intervals after emergence (spray/drench)

Vegetable Diseases White Mold

- **Cause:** Sclerotinia sclerotiorum
- **Hosts**
 - Snap beans
 - Carrots
 - Many other vegetables
- **Favorable environment**
 - Cool temperatures
 - High moisture (including high humidity)



Vegetable Diseases White Mold

- **Control**
 - Buy high quality vegetable seed
 - Prevent introduction through other seed
 - Routinely rotate crops
 - Avoid planting susceptible vegetables in infested areas (5-7 yrs)
 - Plant non-hosts in infested areas
 - Plant beans (and other vegetables) with wider row spacings

Vegetable Diseases
White Mold

- **Control**
 - DO NOT over-water
 - DO NOT over-mulch
 - DO NOT over-fertilize
 - Control broad-leaf weeds
 - Use biological control products
 - *Coniothyrium minitans*
 - Parasitizes sclerotia

Vegetable Diseases
Where to Go for Help

*Plant Disease Diagnostics Clinic
Department of Plant Pathology
University of Wisconsin-Madison
1630 Linden Drive
Madison, WI 53706-1598
(608) 262-2863
pddc@wisc.edu
<http://pddc.wisc.edu>
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