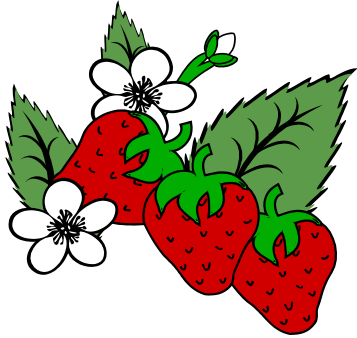


Managing Diseases in Small Fruit Plantings

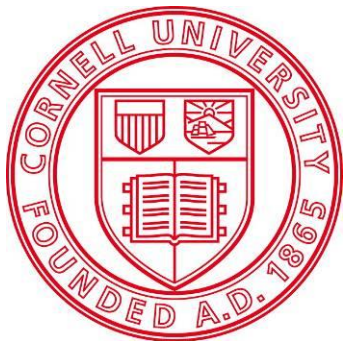


Regional Small Fruit School
Ballston Spa NY, March 24, 2016

Kerik D. Cox

NYSAES

*Plant Pathology and Plant-Microbe Biology Section,
School of Integrative Plant Science,
Cornell University*



Outline

- **Principles of disease management**
 - **Avoidance**
 - **Protection**
 - **Eradication**
 - **Chemical management**
- **Common diseases of small fruit**
 - **Identification & management**

Managing Diseases (principles)

- Avoidance: practices that avoid sources of disease
 - Select & prepare site to avoid pathogen presence, and minimize environmental factors favoring pathogen presence
 - DO NOT expose system to house plants or outside plant material



Managing Diseases (principles)

- Avoidance: practices that avoid sources of disease
 - Prevent pathogen introduction by using certified disease-free planting stock (usually for viruses)

NOURSE
The Best Berry Plants Since 1912

STRAWBERRIES

No part of this first time offering!
Don't miss out on this special and exciting opportunity!
Reserve Early!

Planting fruit.
Covering miles.
Delivering success.

We offer over 20 varieties of both strawberry and raspberry plants & the largest selection of indexed, virus tested fruit plants available.

Managing Diseases (principles)

- Protection: protect plants by avoiding factors that favor disease:
 - Covered production - avoids external sources of inoculum: (soil, wind, rain, weeds)
 - Hydroponic avoids soilborne inoculum, but favorable for aquatic pathogens and ↑ RH



Managing Diseases (principles)

- Protect plants by minimizing factors favoring disease:
 - Avoid overhead irrigation or excessive watering
 - Avoid excessive nitrogen fertilization
 - Succulent tissues encourage GH & HT diseases
 - Dense foliage increases drying times
 - Harvest/Post-harvest:
 - Avoid practices that may injure fruit or flowers



Managing Diseases (principles)

- Protect plants by minimizing factors favoring disease:
 - Optimize plant or pot spacing to ensure good air circulation (drying of fruit, flowers, and leaves)
 - Remove old plant material to increase air circulation



Managing Diseases (principles)

- Eradication (pathogen destruction):
 - Sanitation: remove & destroy infected fruit or plants, leaf litter, and dead plant material



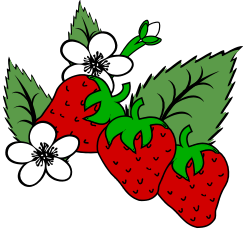
- Reduces disease inoculum and prevents spread of disease to neighboring plants

Managing Diseases (principles)

- Chemical management: (fungicides)
 - Protection
 - Apply to plants prior to infection
 - Majority of fungicides are protectants, but few protectants labeled for greenhouse use
 - Eradication
 - Destroys the pathogen on plant surface, or even after infection
 - Few fungicides have strong post-infection activity
 - Chemical management resources
 - Cornell Pest Management Guidelines (Print only)
<http://ipmguidelines.org/>
 - Organic production guides
http://nysipm.cornell.edu/organic_guide/fruit_org_guide.asp

Outline

- Principles of disease management
 - Avoidance
 - Protection
 - Eradication
 - Chemical management
- **Common diseases of small fruit**
 - **Identification & management**



Anthracnose

(Bud Break to Harvest)

- Pathogens:
 - *Colletotrichum sp* (St)
- Symptoms (St):
 - Fruit rot, shoot & crown, blight, leaf spot
 - Severe infections → wilt & death
- Signs (St):
 - Orange salmon-colored sporulation



Anthracnose

(Bud Break to Harvest)

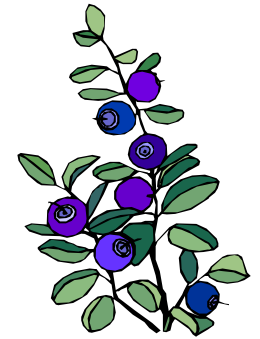


- Pathogens:
 - *Elsinoe veneta* (Br)
- Symptoms (Br):
 - Canes: Small sunken spots with a purple border
 - Drupelets may be infected and malformed
 - Severe infections ▶ defoliation, cane death



Anthracnose

(Bud Break to Harvest)



Pathogen: *Colletotrichum gloeosporioides* & *acutatum* (BI)

Symptoms (BI)

Cane and twig infection

Reddish brown lesions at buds

May girdle shoots

Severe infection → cane death

Fruit rot

Latent infection usually

Sunken lesions & salmon-colored sporulation → appears during harvest



Anthracnose

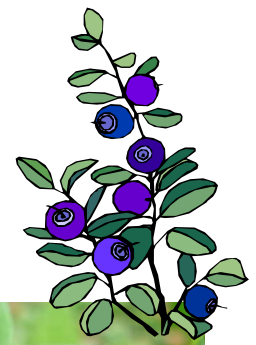
(Bud Break to Harvest)

- Management:
 - Use anthracnose free planting stock
 - Remove and destroy infected canes, plants, fruit
 - Promote air circulation to dry plants
 - Control weeds & widen plant spacing
 - V-trellising (Br), Primocane thinning (Br)
 - Prune for an open canopy (Bl)
 - Use drip irrigation and between-row straw mulch
 - Fungicide applications
 - At bud break reduce spore inoculum
 - Bloom through harvest during warm wet weather (St & Bl)



Botrytis (Gray Mold)

(Bloom to Harvest)



- Pathogen: *Botrytis cinerea* (St, Br, BI)
- Symptoms:
 - Soft rot of fruit
 - Blossom blight
 - Leaf & shoot blight (BI)
May kill shoots if prolonged wetness
- Signs:
 - Gray/brown tufts of mycelium and spores on flowers and fruit



Botrytis (Gray Mold)

(Bloom to Harvest)

- Management:
 - Promote air circulation to dry fruit
 - Control weeds & widen plant spacing
 - V-trellis (Br), primocane thinning (Br)
 - Prune for an open canopy (Bl)
 - Use drip irrigation and between-row straw mulch (St)
 - Prompt regular harvesting
 - Avoid a build-up of overripe fruit
 - Rapidly cool fruit via refrigeration

Botrytis (Gray Mold)

(Bloom to Harvest)

- Management:
 - Fungicide applications
 - Only effective w/ cultural management
 - Prior to rain events in bloom or at harvest
 - May not be necessary in dry seasons
 - Sulfur & copper fungicides ineffective!!
 - Anilinopyrimidine fungicides work really well
 - Switch, Elevate, Captevate

Leaf Spot Diseases

(Early Bloom)



Common Leaf Spot

- Pathogen: *Mycosphaerella fragariae*
- Symptoms: circular purple/rust red spots with gray/white centers



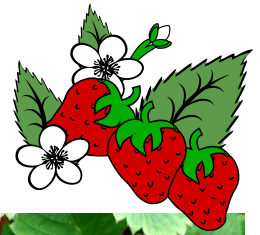
Leaf Scorch

- Pathogen: *Diplocarpon earliana*
- Symptoms: small purple blotches that coalesce and cover the leaf surface



Leaf Spot Diseases

(Early Bloom)



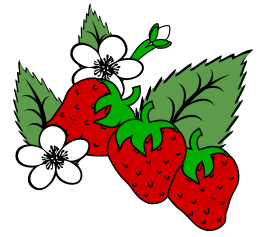
Leaf Blight

- Pathogen: *Phomopsis obscurans*
- Symptoms:
 - reddish/purple spots with light brown centers
 - Spots coalesce into large V-shaped lesions
- Consequences:
 - Reduce plant vigor
 - Increase susceptibility to winter injury and root diseases



Leaf Spot Diseases

(Early Bloom)



- Management:
 - Select spot and scorch resistant/tolerant varieties
 - Resistant: ‘Jewel’, ‘Canoga’, ‘Cardinal’, ‘Earliglow’, ‘Lester’, & ‘Redchief’
 - Tolerant: ‘Tristar’ & ‘Tribute’
 - No leaf blight resistant or tolerant varieties
 - Fungicide applications
 - One early season application: if disease pressure was high the previous year → reduce inoculum

Powdery Mildew

(Early Bloom)

- Pathogen: *Sphaerotheca macularis*
- Symptoms: leaf curling/distortion
- Signs: powdery mycelium and spores on underside of leaves
- Consequences:
 - Reduce plant vigor
 - Infect flowers and immature fruit → reduce crop



Powdery Mildew

(Early Bloom)

- Management:
 - Promote air circulation to reduce humidity
 - Control Weeds & widen plant spacing
 - Avoid excessive nitrogen fertilization
 - Avoid susceptible varieties
 - ‘Guardian’, ‘Earliglow’, ‘Darselect’, ‘Evangeline’, and ‘Annapolis’
 - Fungicide applications
 - Numerous materials available
 - Apply through bloom when flowers/immature fruit are threatened

Mummyberry

Pathogen: *Monilinia vaccinii-corymbosi*

Symptoms - Shoot infection:

Early green tip to shoot expansion

Rapid blight of leaf clusters (strikes)

Flower/fruit infection

Green fruit: white mycelium in locules

Mature fruit: grey to pinkish-tan rigid, but rubbery

Pseudosclerotia: Black spongy pumpkin-shaped fungal structures



Mummyberry

Management options

Remove and destroy mummies & ground cover like moss

Mulch planting - over ground cover - after removal

Shallow cultivation between and under bushes at bud break

Fungicide program – green tip to petal fall

Applications of conventional fungicides for shoot blight are of primary importance

Organic fungicides (sulfur and copper) not effective

Phomopsis Canker

(Early bloom to dormancy)

*Pathogen: Phomopsis
vaccinii*

Symptoms - Twig blight

Rapid wilt and death of
shoots (flagging)

Spreading reddish/brown
lesions (tip to base)

Canker

Flattened/sunken
discolored area at base of
canes

Leaf spot & fruit rot

Mycelium (mold) present

Fruit burst easily



All Canker Diseases

Management options

- Prune and destroy infected and old growth
- Remove dead canes to the crown

Avoid sites prone to spring frost

Fungicide applications

- Delayed dormant application of copper/sulfur to reduce inoculum
- Second sulfur application green tip if high disease pressure last season

Acknowledgments

