Disease Management Strategies for Organic Apple Orchards

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Common Apple Diseases of Concern

Bacterial: Fire blight – kills trees

Infected blossoms  Dead trees
Common Apple Diseases of Concern

Bacterial: Fire blight

Fungal diseases:
Apple scab – spots on leaves and fruit
Common Apple Diseases of Concern

Bacterial: Fire blight

Fungal diseases:
- Apple scab
- Powdery mildew

White “fuzz” on leaves, russetting on fruit.
Common Apple Diseases of Concern

Bacterial: Fire blight

Fungal diseases:
- Apple scab
- Powdery mildew
- Cedar apple rust

Requires red cedar as an alternate host; orange teliohorns develop on cedars in spring and release spores.
Common Apple Diseases of Concern

Bacterial: Fire blight

Fungal diseases:
- Apple scab
- Powdery mildew
- Cedar apple rust

Causes necrotic leaf spots or yellow lesions on leaves and superficial yellow spots on apples.
Common Apple Diseases of Concern

Bacterial: Fire blight

Fungal diseases:
- Apple scab
- Powdery mildew
- Cedar apple rust
- Quince rust

Quince rust

Requires red cedar as an alternate host; causes fruit deformities and may cause fruit abortion if infections occur on stems.
Common Apple Diseases of Concern

Bacterial: Fire blight

Fungal diseases:
Apple scab
Powdery mildew
Cedar apple rust
Quince rust

Black rot

Overwinters in fruitlet mummies; causes decay spots and/or red lenticels.
Common Apple Diseases of Concern

Bacterial: Fire blight

Fungal diseases:
- Apple scab
- Powdery mildew
- Cedar apple rust
- Quince rust
- Black rot

Bitter rot

Causes “V”-shaped decay; exacerbated by combined heat and drought stress.
Common Apple Diseases of Concern

Bacterial: Fire blight

Fungal diseases:
- Apple scab
- Powdery mildew
- Cedar apple rust
- Quince rust
- Black rot
- Bitter rot

Sooty blotch & flyspeck (SBFS)

Superficial discoloration that appears in late summer.
Disease Management Strategies

**General strategies**

Site selection, cultivar selection, copper, biocontrols, sanitation.

Bacterial: Fire blight

Fungal diseases:

- Apple scab: Resistant cult, copper, sulfur, LLS, sanitation.
- Powdery mildew: Sulfur sprays
- Cedar apple rust: Site selection, remove cedars, sulfur sprays, (copper, LLS sprays?)
- Quince rust
- Black rot: Site selection, sanitation, sulfur
- Bitter rot: Site selection, avoiding water stress
- Sooty blotch & flyspeck (SBFS): Site selection, sanitation, Copper, LLS sprays.
**Key Strategies: Site Selection**

**Bacterial: Fire blight**

**Fungal diseases:**
- Apple scab
- Powdery mildew
- Cedar apple rust
- Quince rust
- Black rot
- Bitter rot
- Sooty blotch & flyspeck (SBFS)

**Management strategies**

- Site selection, cultivar selection, copper, biocontrols, sanitation.
- Resistant cult, copper, sulfur, LLS, sanitation.
- Sulfur sprays
- Site selection, remove cedars, sulfur sprays, (copper, LLS sprays?)
- Site selection, sanitation, sulfur
- Site selection, avoiding water stress
- Site selection, sanitation, Copper, LLS sprays.
Key Strategies: **Cultivar selection**

**Management strategies**

Site selection, cultivar selection, copper, biocontrols, sanitation.

**Bacterial:** Fire blight

**Fungal diseases:**
- **Apple scab:** Resistant cult, copper, sulfur, LLS, sanitation.
- **Powdery mildew:** Sulfur sprays
- **Cedar apple rust:** Site selection, remove cedars, sulfur sprays, (copper, LLS sprays?)
- **Quince rust:** Site selection, sanitation, sulfur
- **Black rot:** Site selection, sanitation, sulfur
- **Bitter rot:** Site selection, avoiding water stress
- **Sooty blotch & flyspeck (SBFS):** Site selection, sanitation, Copper, LLS sprays.
Key Strategies:  **Timely Sprays**

**Management strategies**
- Site selection, cultivar selection, copper, biocontrols, sanitation.
- Resistant cult, copper, sulfur, LLS, sanitation.
- Sulfur sprays
- Site selection, remove cedars, sulfur sprays, (copper, LLS sprays?)
- Site selection, sanitation, sulfur
- Site selection, sanitation, avoiding water stress
- Copper, LLS sprays.

**Bacterial:** Fire blight

**Fungal diseases:**
- Apple scab
- Powdery mildew
- Cedar apple rust
- Quince rust
- Black rot
- Bitter rot
- Sooty blotch & flyspeck (SBFS)
Management strategies

Site selection, cultivar selection, copper, biocontrols, sanitation.

Bacterial: Fire blight

Fungal diseases:
Apple scab
Powdery mildew
Cedar apple rust
Quince rust
Black rot
Bitter rot
Sooty blotch & flyspeck (SBFS)

Resistant cult, copper, sulfur, LLS, sanitation.
Sulfur sprays
Site selection, remove cedars, sulfur sprays, (copper, LLS sprays?)
Site selection, sanitation, sulfur
Site selection, avoiding water stress
Site selection, sanitation, Copper, LLS sprays.

Key Strategies: Sanitation
Preplant considerations

Three major diseases in the northeast are difficult to control with OMRI-approved fungicides:

- cedar apple rust
- quince rust
- black rot fruit decays

Plan in advance to control these diseases using non-chemical approaches
Preplant considerations

• Locate the orchard at least 300 feet away from unmanaged land that can harbor inoculum for scab, rust diseases, black rot, bitter rot, and sooty blotch/flyspeck (SBFS).

• Where possible, eliminate all cedar trees within 500 ft of orchards because cedar rust diseases are almost impossible to control with OMRI-approved fungicides.
Preplant considerations

- To minimize SBFS problems:
  - Select sites with good air movement.
  - Plant late-maturing cultivars as far as possible from unmanaged perimeters.
  - Plant early-maturing cultivars near perimeters because they will be harvested before SBFS becomes severe in most years.
Prebloom disease control for black rot

Remove fruitlet mummies during winter pruning ??
- > 400/tree on Cortland on M.9
- ca. 70% can carry *Botryosphaeria*

Photo: Jim Schupp

Black rot: *Botryosphaeria obtusa*
1. Plant scab-resistant cultivars!

2. Plant scab-resistant cultivars!

3. Plant scab-resistant cultivars!

4. If you don’t want to grow scab-resistant cultivars, buy a farm in Washington State where scab is not a problem!

Rationale: Sprays needed to control scab (sulfur, lime-sulfur) are toxic to trees and will gradually weaken trees and reduce yield.
Fungicides for organic apple production:

1. Sulfur:
   - No post-infection activity
   - Subject to wash-off in rains
   - Weak on rusts, summer diseases

2. Liquid lime-sulfur:
   - Stinks; caustic to applicator
   - Provides 48-96 hr of kickback
   - Fruit thinner when applied with oil

Seasonal programs reduce yield by 20 to 40% compared to conventional pesticides!!
Yield reduction with sulfur and lime-sulfur is well-documented:


- Trees receiving ferbam produced 17% more harvestable fruit than similar trees that received sulfur sprays.
- Yield of fruit that met U.S. No. 1 grade standards was 33% higher for ferbam-treated trees.


- In a 2-yr trial with Jonagold and Boskoop, yields under conventional fungicides were 33 and 39% higher, than those with sulfur or LLS.
- Sulfur and LLS treatments also reduced the percentage of top-grade fruit by 10-15% compared to conventional fungicides.
1. Scab control options developed in Europe:
   • apply products with exacting timing at 120-340 DH after the start of rains.
   • Precise timing allows use of lower rates.
   • Very low rates of sulfur-plus-copper or sulfur-plus-potassium bicarbonate are effective in this scheme.
   • May be weak on rusts, fruit rots, summer diseases.
   • Spray timing requires 24/7 dedication during spray season.

2. Fire blight options from WA state
   • Blossom Protect during bloom
   • Low rates of copper plus Double Nickel for shoot blight control.
   • Alternatives to antibiotics will be expensive and current blossom blight models may not be useful.

Unresolved issues:
   • Best fungicide options for controlling rust diseases.
   • Best strategies for controlling summer fruit rots:
     Problem: LLS can be used to control sooty blotch & flyspeck, but using LLS results in higher losses to summer fruit rots.
QUESTIONS??