Disease Management Strategies for Organic Apple Orchards

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Small Acreage Organic Orchard Establishment Workshop
Highland, NY
17 September 2014

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Common Apple Diseases of Concern

Bacterial: Fire blight – kills trees

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Common Apple Diseases of Concern

Bacterial: Fire blight

Fungal diseases:

Apple scab – spots on leaves and fruit

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Common Apple Diseases of Concern

Bacterial: Fire blight

Fungal diseases:

- Apple scab
- Powdery mildew

White “fuzz” on leaves, russetting on fruit.

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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.

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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.

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Common Apple Diseases of Concern

Bacterial: Fire blight

Fungal diseases:

- Apple scab
- Powdery mildew
- Cedar apple rust
- Quince rust

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

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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.

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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.

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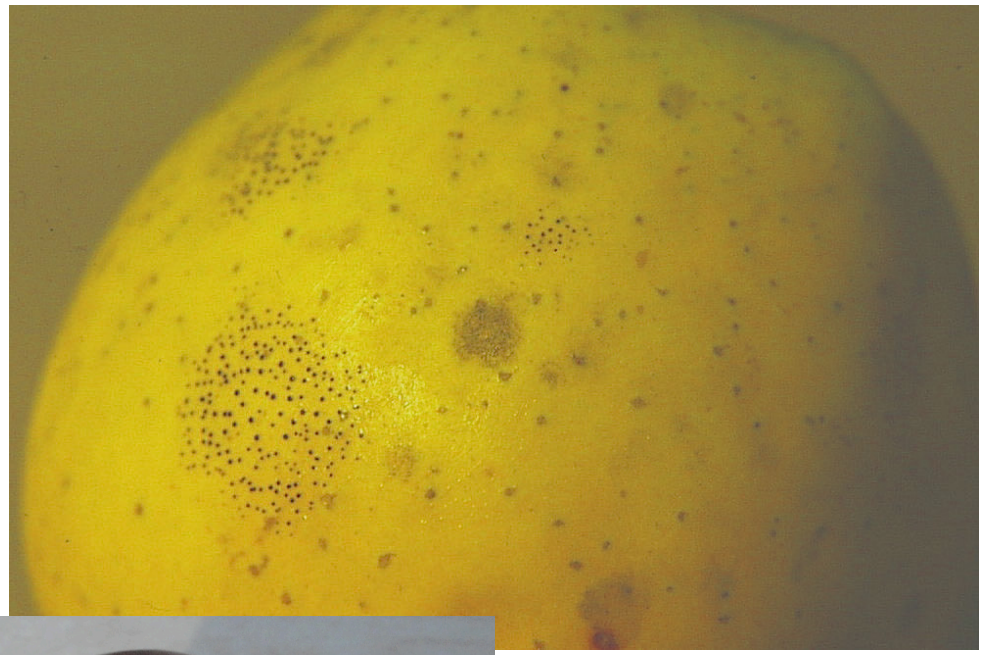
Common Apple Diseases of Concern

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.

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Disease Management Strategies

General strategies

Bacterial: Fire blight…. Site selection, cultivar selection, copper, biocontrols, sanitation.

Fungal diseases:

Apple scab …….. Resistant cult, copper, sulfur, LLS, sanitation.

Powdery mildew ……. Sulfur sprays

Cedar apple rust, Quince rust } { Site selection, remove cedars, sulfur sprays, (copper, LLS sprays?)

Black rot …… Site selection, sanitation, sulfur

Bitter rot ……. Site selection, avoiding water stress

Sooty blotch & flyspeck (SBFS) } { Site selection, sanitation, Copper, LLS sprays.

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Key Strategies: **Site Selection**

Management strategies

Bacterial: Fire blight…. Site selection, cultivar selection, copper, biocontrols, sanitation.

Fungal diseases:

Apple scab …….. Resistant cult, copper, sulfur, LLS, sanitation.

Powdery mildew ……. Sulfur sprays

Cedar apple rust, Quince rust: Site selection, remove cedars, sulfur sprays, (copper, LLS sprays?)

Black rot …… Site selection, sanitation, sulfur

Bitter rot ……. Site selection, avoiding water stress

Sooty blotch & flyspeck (SBFS): Site selection, sanitation, Copper, LLS sprays.

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Key Strategies: **Cultivar selection**

	Management strategies
Bacterial: Fire blight….	Site selection, cultivar selection, copper, biocontrols, sanitation.
Fungal diseases:	
Apple scab ……..	Resistant cult, copper, sulfur, LLS, sanitation.
Powdery mildew …….	Sulfur sprays
Cedar apple rust Quince rust	Site selection, remove cedars, sulfur sprays, (copper, LLS sprays?)
Black rot ……	Site selection, sanitation, sulfur
Bitter rot …….	Site selection, avoiding water stress
Sooty blotch & flyspeck (SBFS)	Site selection, sanitation, Copper, LLS sprays.

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Key Strategies: **Timely Sprays**

	Management strategies
Bacterial: Fire blight….	Site selection, cultivar selection, copper, biocontrols, sanitation.
Fungal diseases:	
Apple scab ……..	Resistant cult, copper, sulfur, LLS, sanitation.
Powdery mildew …….	Sulfur sprays
Cedar apple rust Quince rust	Site selection, remove cedars, sulfur sprays, (copper, LLS sprays?)
Black rot ……	Site selection, sanitation, sulfur
Bitter rot …….	Site selection, avoiding water stress
Sooty blotch & flyspeck (SBFS)	Site selection, sanitation, Copper, LLS sprays.

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Key Strategies: **Sanitation**

	Management strategies
Bacterial: Fire blight….	Site selection, cultivar selection, copper, biocontrols, sanitation.
Fungal diseases:	
Apple scab ……..	Resistant cult, copper, sulfur, LLS, sanitation.
Powdery mildew …….	Sulfur sprays
Cedar apple rust Quince rust	Site selection, remove cedars, sulfur sprays, (copper, LLS sprays?)
Black rot ……	Site selection, sanitation, sulfur
Bitter rot …….	Site selection, avoiding water stress
Sooty blotch & flyspeck (SBFS)	Site selection, sanitation, Copper, LLS sprays.

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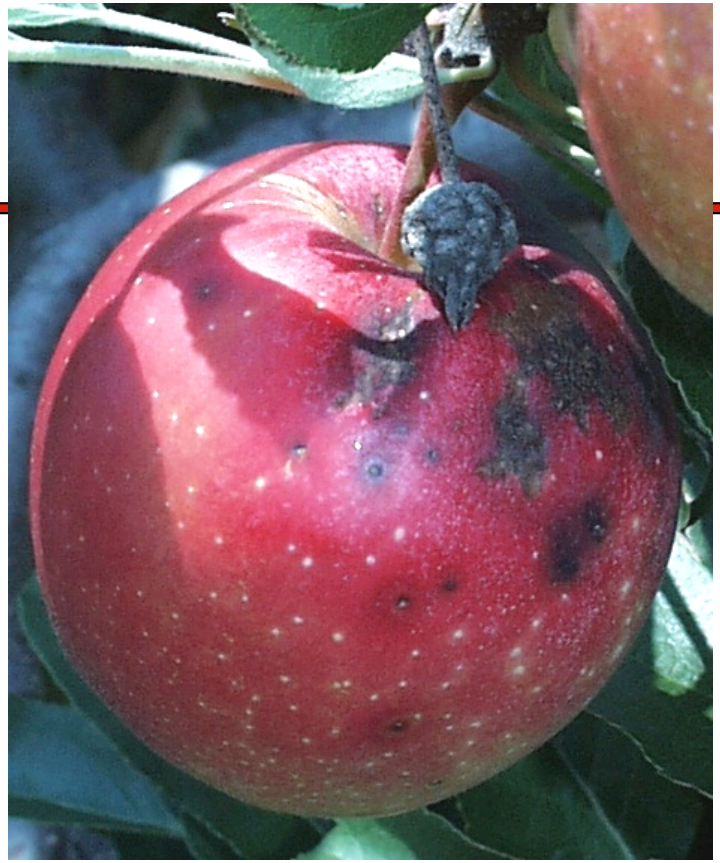
Preplant considerations



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

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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.

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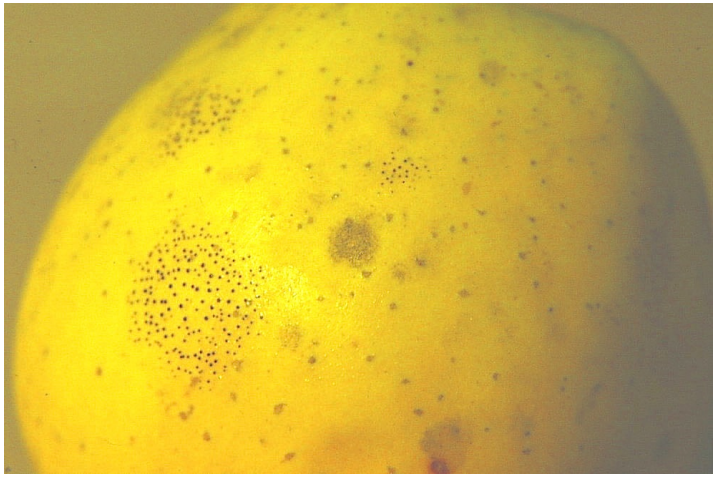
Preplant considerations

- 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.



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Prebloom disease control for black rot

Photo: Jim Schupp

Remove fruitlet mummies during winter pruning ??

- > 400/tree on Cortland on M.9
- ca. 70% can carry *Botryosphaeria*

Black rot: *Botryosphaeria obtusa*

Cultivar selection: old perspective

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.

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Using sulfur and LLS: old perspective

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 !!

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Using sulfur and LLS: old perspective

Yield reduction with sulfur and lime-sulfur is well-documented:

Palmiter, D. H., and Smock, R. M. 1954. Effect of fungicides on McIntosh apple yield and quality: a five-year study under Hudson Valley conditions, 1949-1953. N.Y.S. Agric. Exp. Sta.

- 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 a was 33% higher for ferbam-treated trees

Holb, I.B., DeJong, P.F., and Heijne, B. 2003. Efficacy and phytotoxicity of lime sulphur in organic apple production. Ann. Appl. Biol. 142:225-233.

- 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.

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Promising newer options:

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.

Jamar, L., Cavelier, M., Lateur, M. 2010. Primay scab control using a "during-infection" spray timing and the effect on fruit quality and yield in organic apple production. Biotechnol. Agron. Soc. Environ. 14(3): 423-439.

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Promising newer options:

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.

<u>Unresolved issues</u>:

- 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.

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QUESTIONS??

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