Fire blight
How do significant fire blight outbreaks happen?

• Warm temp conditions (70s – 80s F) during bloom leading to blossom blight infection

• Early shoot blight infection (within 1-2 weeks after petal fall) leading to secondary cycles of spread

• Infection of a susceptible variety on your farm spreading blight to $$$ varieties
2016 – bloom, NW Michigan

Growth of the fire blight pathogen on flowers at the NWMHRC

Growth was very fast due to warm temps

High population thresholds on flowers, major disease risk

Daily high temperatures

Northwest Research Station

E. amylovora populations log_{10} CFU

0 1 2 3 4 5 6 7 8 9

1:00 10:00 19:00 4:00 13:00 22:00 7:00 16:00 1:00 10:00 19:00 4:00 13:00 22:00 7:00

5/19/16 5/20/16 5/21/16 5/22/16 5/23/16 5/24/16

Fuji - Ea Population

Gala - Ea Population

72.6° 73.2° 77.1° 72.8° 80.3° 86.1°
2016 – bloom, NW Michigan

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Daily high temperatures
MaryBlyt EIP values
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Once growth starts happening in orchards, newly-opening flowers will be quickly colonized
When conditions favor growth of fire blight pathogen on flowers:

- Rapid spread of pathogen to other flowers
  - Quick growth on those newly-colonized flowers
- 1-2 days: populations reach critical numbers
- Rain event will wash those cells to base of flower where infection will occur
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Blossom blight infection can lead to epidemic conditions if weather favors further spread.
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Two critical factors for successful fire blight management

• Prevent blossom blight

• Prevent early shoot blight
Two critical factors for successful fire blight management

• Prevent blossom blight
  – Greatly reduce chances for significant shoot blight infection

• Prevent early shoot blight
  – Reduce chances for significant shoot blight infection
  – Lower the risk of blight spreading into central leader of young high-density trees
Fire blight management strategies

• Remove / reduce inoculum
  – Prune cankers
  – Early season copper

• Control blossom blight
  – Streptomycin, Kasumin during bloom

• Control early shoot blight
  – Apogee
Fire blight cankers:

Pathogen overwintering site

Ooze emergence in spring

Insects (flies) are attracted to the ooze, carry pathogen cells to flowers
Copper at bud break

- Coat apple trees with a blanket of copper
  - Reduces inoculum from cankers missed during pruning
- Only useful in orchards that had blight in the last 2 years

- Typical application rate is 2 lbs metallic copper per acre
- Use fixed coppers, long residuals on trees
  - Cuprofix, Kocide etc
  - Copper ions will be slowly released with rains, hopefully will be present when Erwinia bacteria emerge from cankers
- Optimally, can reduce about 50% of overwintering inoculum
Materials Currently Available for Fire Blight Disease Management

- **Overwintering Inoculum**
  - Copper – 2 lbs metallic / A

- **Blossom Blight**
  - Streptomycin (Agrimycin and generics)
  - Kasumin
  - Oxytetracycline (Mycoshield, FireLine)

- **Shoot Blight**
  - Prohexadione-Ca (Apogee)
Antibiotic use for blossom blight control

• Use a fire blight disease prediction model
  – MaryBlyt, Cougar Blight
  – MaryBlyt EIP > 70

• Antibiotic sprays (streptomycin and Kasumin) are bactericidal; time them to reduce/eliminate Erwinia populations on stigmas

• Streptomycin and Kasumin are the best choices in high disease pressure situations
Streptomycin resistance

- We have detected streptomycin resistance in several growing regions in Michigan
  - Southwest MI – widespread, some locations remain sensitive
  - Fruit Ridge -- widespread
  - Oceana, west central area -- scattered
  - Northwest MI -- scattered
  - Benzie – one detection
Streptomycin resistance

• Streptomycin-resistant fire blight pathogen can move between orchards
• Kasumin – necessary replacement in SW, Fruit Ridge
• Other regions – start working with Kasumin but streptomycin is still 1st choice material
  – Second option is streptomycin / oxytetracycline tank mix (full rates of both)
• Strain surveys, resistance screening conducted yearly by Sundin lab
Oxytetracycline and Blossom Blight Control Under Higher Pressure
Notes on Antibiotics for Fire Blight Disease Management

• Streptomycin and Kasumin are fairly equivalent in control
• Use a surfactant such as Regulaid for optimal distribution on flower surfaces

• Oxytetracycline or Serenade are only good options under lower disease pressure
  – Mary Blyt EIP 30-70 range
Application timings, need for re-treatment

Conditions after Strep or Kasumin spray:
Timing (~ 50% bloom vs full bloom)
Rainy weather
Warm (high EIP) conditions
Shoot Blight Infection can Kill Young Trees Planted on Susceptible Rootstocks
Apogee (Prohexadione-Ca)

- Reduces shoot growth
- Shoot-specific treatment
- Excellent control of shoot blight
- “Apogee effect” – takes about 10-14 days after application
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- Excellent control of shoot blight
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- Consider ¼ to ½ rate on young high-density plantings, especially highly-sensitive varieties
Fire Blight Summary – NW MI

• Streptomycin (if no resistance present)
  – MAXIMUM 3 sprays per season is ideal
• Kasumin – best alternate to strep
• FireLine, Mycoshield – alternate to strep
• Apogee for shoot blight control
  – Consider a reduced rate for young, high-density trees
• Copper early
Problems with fire blight-susceptible rootstocks

High density apple planting on M9 rootstock

Collingwood, Ontario
Nov., 2016
Two issues that can kill MANY trees in high density plantings:
1. Shoot blight moving rapidly to central leader
2. Rootstock blight
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