

Cytospora Canker Progress Update

Colorado State University



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Cytospora Canker

- ▶ “Weak parasite”, cannot invade “healthy intact bark”
 - ▶ Requires a wound as a mode of entry (Biggs, 1989)
- ▶ Trees decrease in production each growing season from time of infection to eventual death of the tree (Biggs & Grove, 2005)



Pruning cut with Cytospora infection



Cytospora canker



Cytospora canker

Questions

- Which chemicals are effective against *Cytospora*?
 - In the lab?
 - In the field?
 - Canker cover (canker painting)?
- When is spore production at the highest?
- Are trees susceptible year-round?

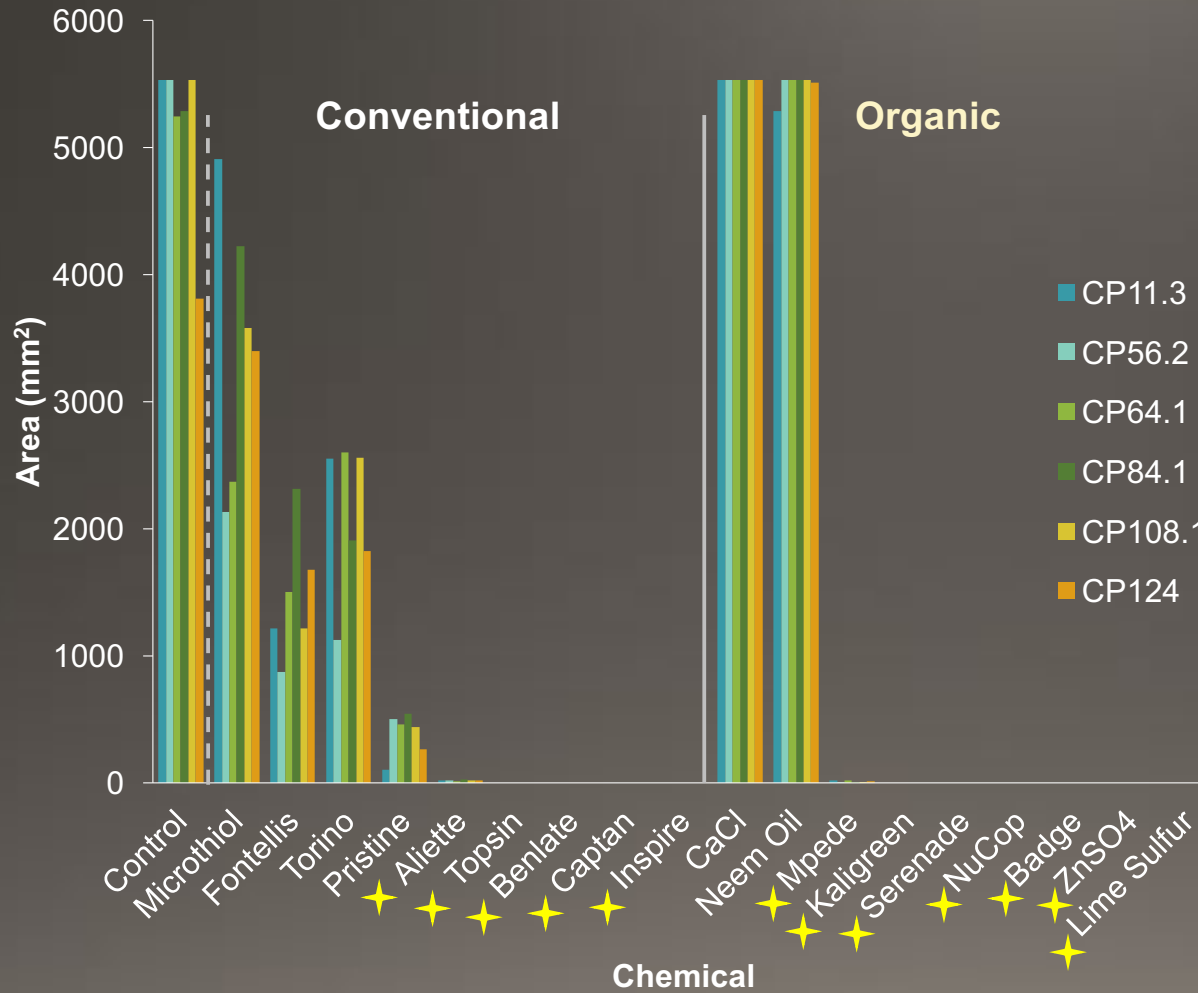
Petri-Dishes Chemical Challenge Trials

- Tested 6 isolates
- Media amended with 18 different chemicals
- Measured growth at 25°C (77°F) every 24 hours for 7 days



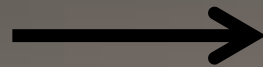
Cytospora growth in media

Petri-Dishes Chemical Challenge Day 7



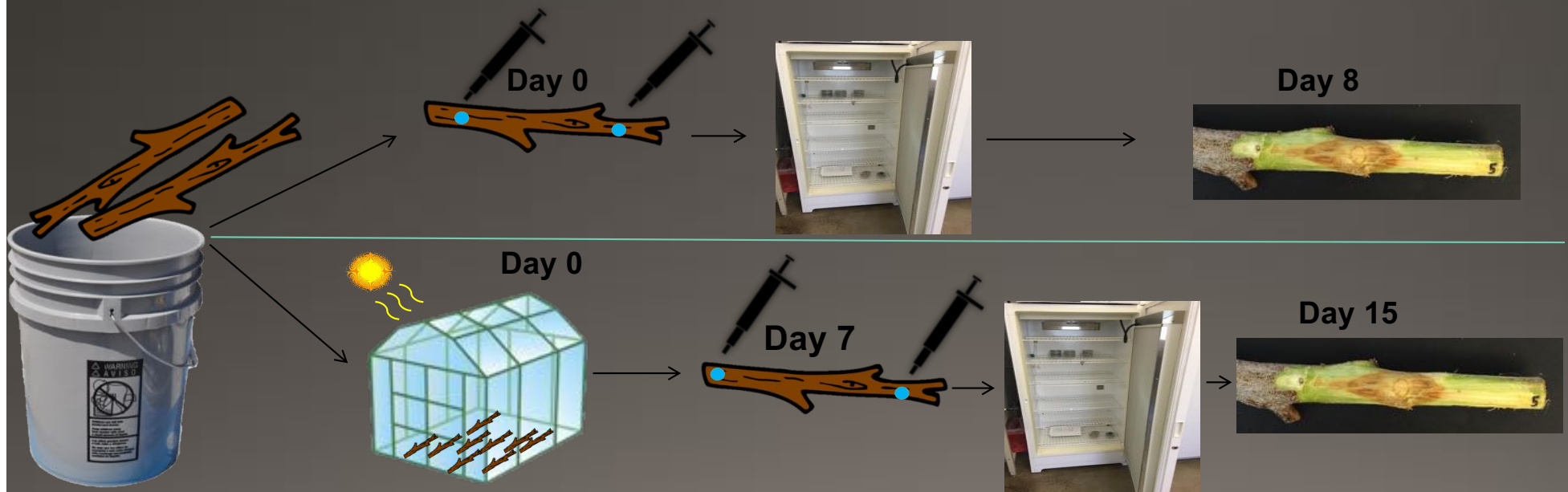
Best Chemicals (Petri Dishes)

- Conventional
 - Aliette, Topsin, Benlate, Captan, Inspire
- Organic
 - Mpede, Kaligreen, Serenade, NuCop WP, Badge X2, ZnSO₄, Lime Sulfur
- Next step:
 - Test effective chemicals on removed branches (in lab)

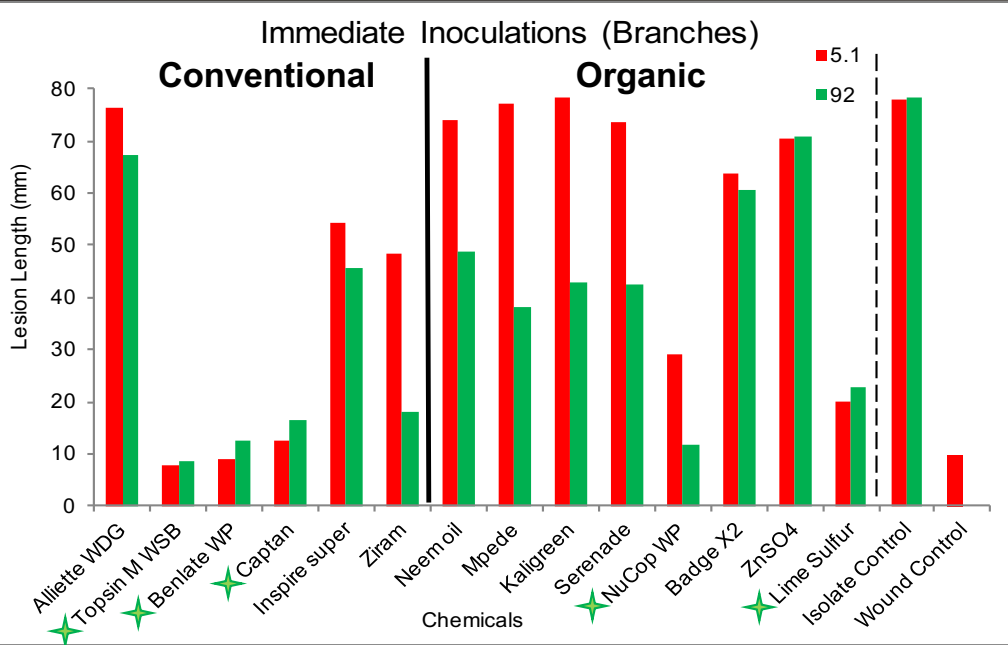


Chemical Efficacy Trials (on removed branches)

- Tested 2 isolates, on branches dipped in successful chemicals
 - Immediate vs delayed inoculations
- Measured growth, at 28°C (82°F), on the 8th day after inoculation

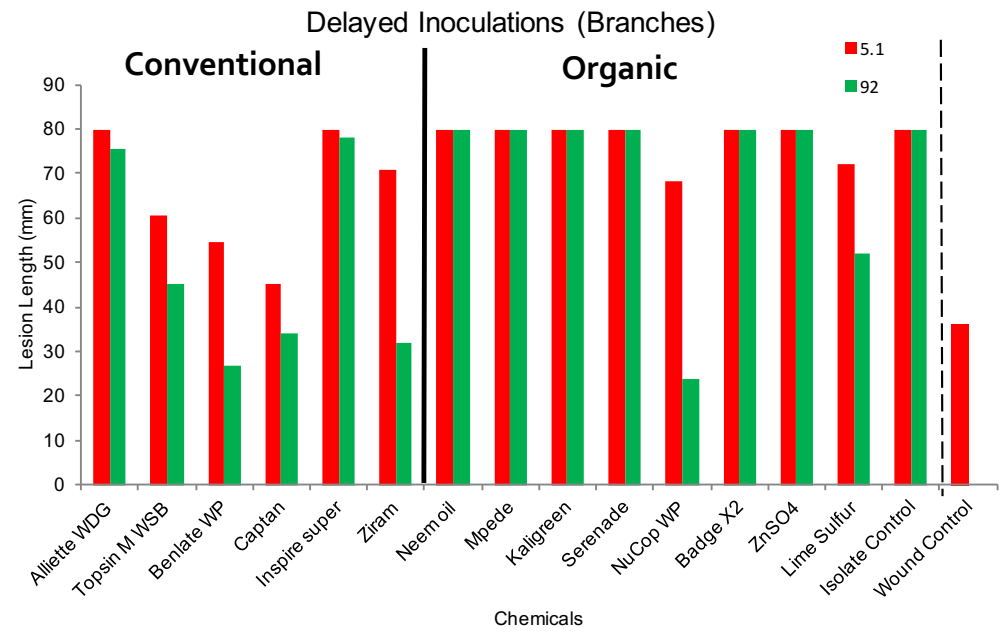


Chemical Efficacy Trials



Most Effective Chemicals

- Conventional
 - **Topsin M WSB**
 - Benlate WP
 - **Captan**
- Organic
 - **NuCop WP**
 - **Lime Sulfur**



Questions

- Which chemicals are effective against *Cytospora*?
 - In the lab?
 - In the field?
 - Canker cover (canker painting)?
- When is spore production at the highest?
- Are trees susceptible year-round?

Chemical Testing (In The Field, Summer + Fall)

- **Chemical sprays** on **prune** cuts (mid rate chemical application)
 - Conventional: Topsin, Captan
 - Organic: NuCop, Lime Sulfur
- **Chemical paints** on **prune** cuts (mid rate chemical application)
 - Conventional: (Topsin + 50% Latex), (Captan + 50% Latex), Latex alone
 - Organic: (NuCop + Surround), (Lime Sulfur + Surround), Surround alone



Prune wound on 1 year old shoot



Chemical application



Cytospora spore suspension inoculation



Parafilm wrap over *Cytospora* inoculation



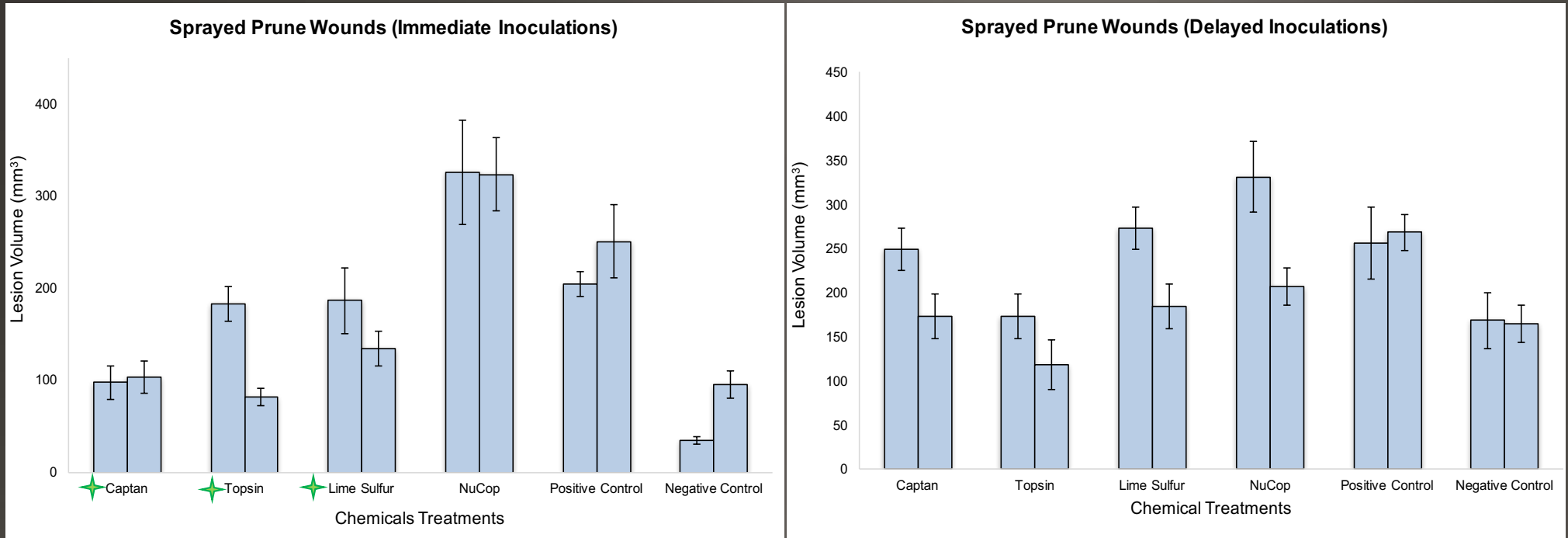
Opening *Cytospora* infected branch

Prune →



Cytospora lesion in prune wound

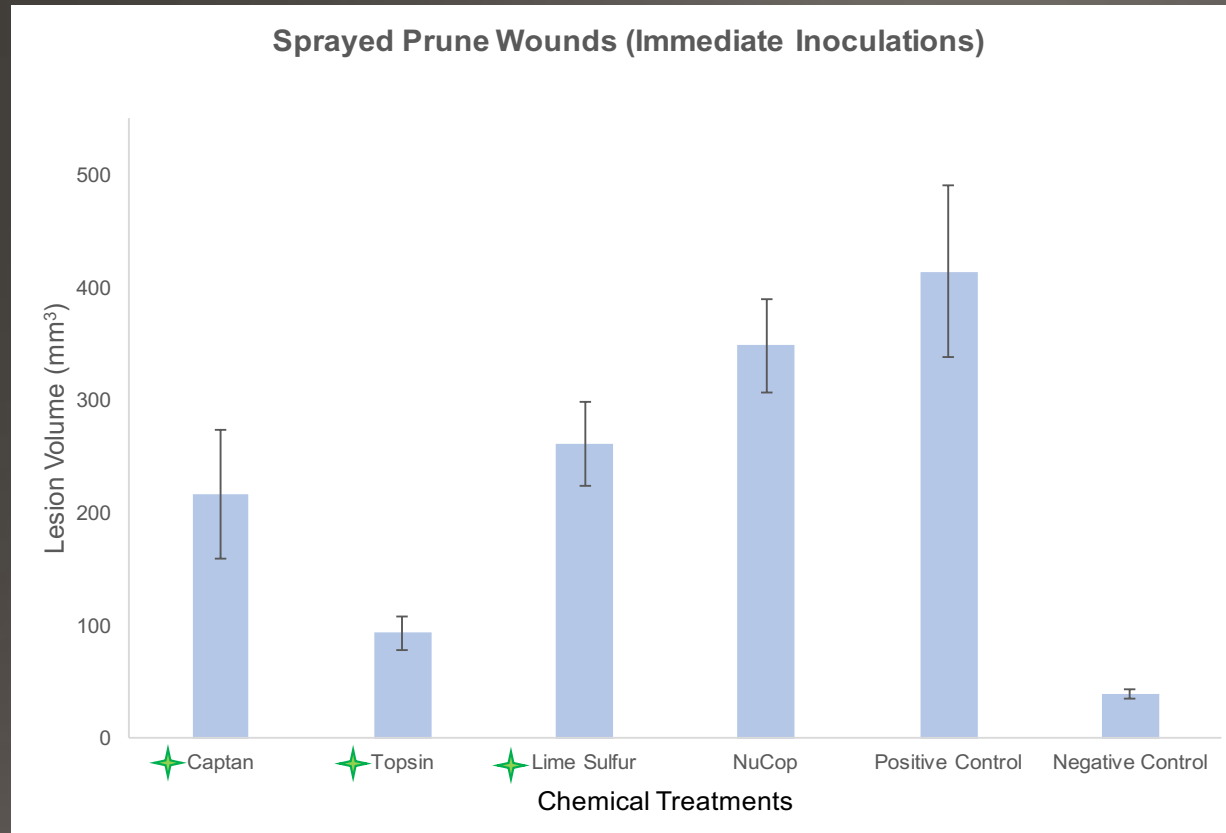
Summer Chemical Sprays (2 Months Growth)



Most Effective Chemicals

- **Captan** (3.5 qt per 200 gallons)
- **Topsin** (1.25 lb per 200 gallons)
- **Lime Sulfur** (22 gallons per 200 gallons)

Fall Chemical Sprays (5 months growth)



Most Effective Chemicals

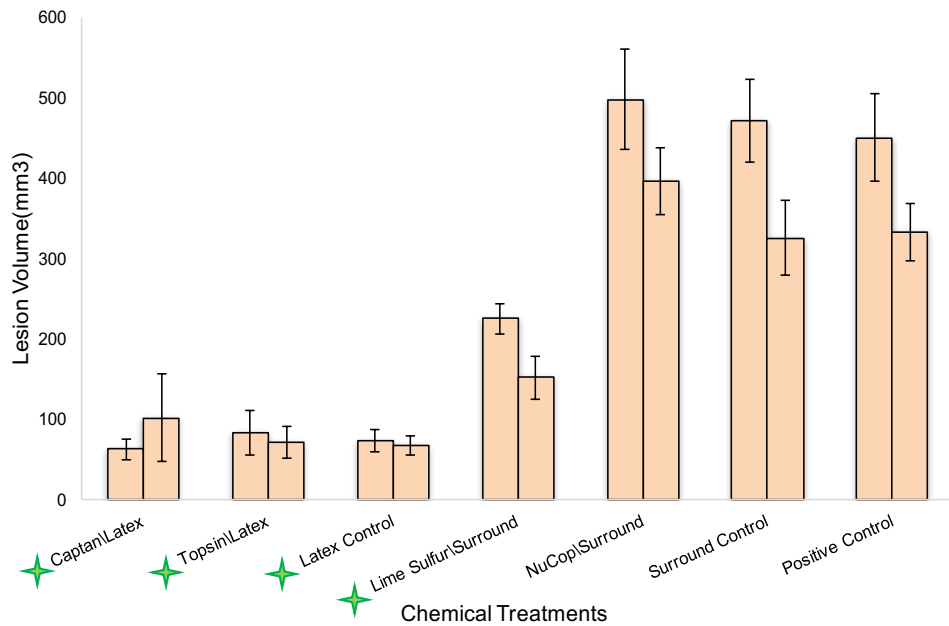
- **Captan** (3.5 qt per 200 gallons)
- **Topsin** (1.25 lb per 200 gallons)
- **Lime Sulfur** (22 gallons per 200 gallons)

Chemical Testing (In The Field, Summer and Fall)

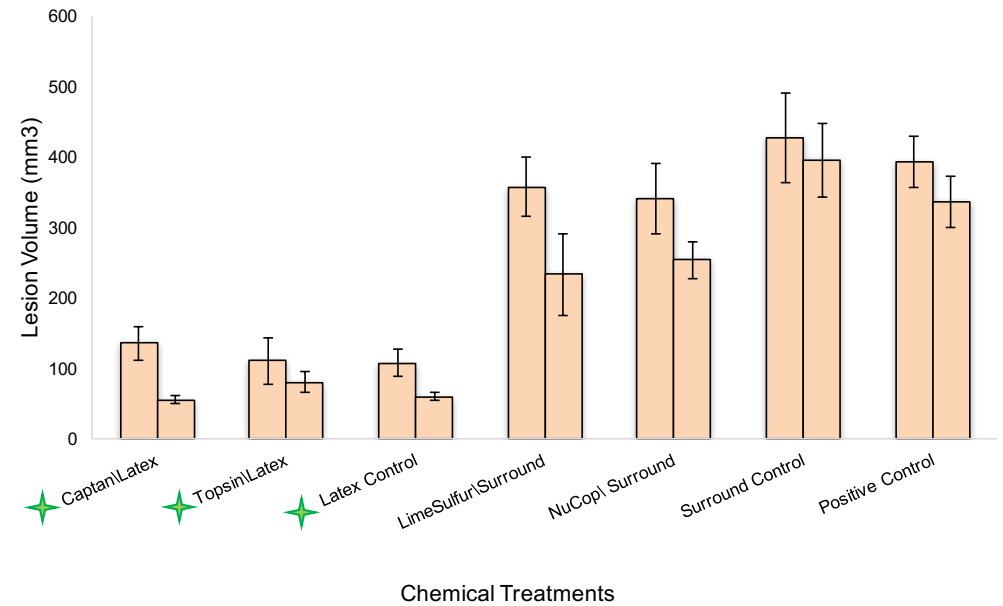
- **Chemical sprays** on **prune** (mid rate chemical application)
 - Conventional: Topsin, Captan
 - Organic: NuCop, Lime sulfur
- **Chemical paints** on **prune** (mid rate chemical application)
 - Conventional: (Topsin + 50% Latex), (Captan + 50% Latex), Latex alone
 - Organic: (NuCop + Surround), (Lime Sulfur + Surround), Surround alone

Summer Chemical Sprays (2 Months Growth)

Painted Prune Wounds (Immediate Inoculations)



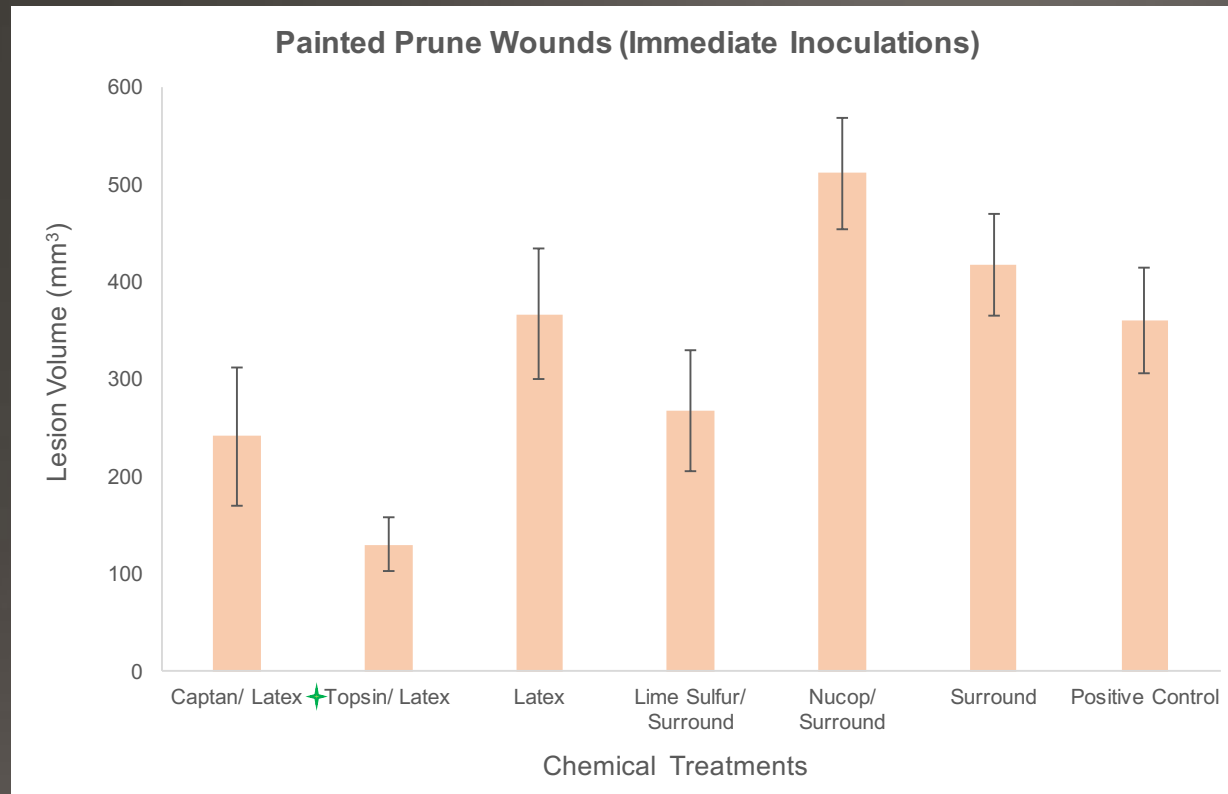
Painted Prune Wounds (Delayed Inoculations)



Most Effective Chemicals

- **Latex Control** (50% latex)
- **Captan/Latex** (3.5 qt per 200 gallons, 50% latex)
- **Topsin/Latex** (1.25 lb per 200 gallons, 50% latex)
- **Lime Sulfur/Surround** (22 gallons per 200 gallons)

Fall Chemical Paints (5 Months Growth)



Most Effective Chemicals

- Topsin/ Latex (1.25 lb per 200 gallons, 50% latex)

Questions

- Which chemicals are effective against *Cytospora*?
 - In the lab?
 - In the field?
 - Canker cover (canker painting)?
- When is spore production at the highest?
- Are trees susceptible year-round?

Chemical Testing In The Field

- **Chemical sprays** on **prune** (mid rate chemical application, **Summer & Fall**)
 - Conventional: Topsin, Captan
 - Organic: NuCop, Lime sulfur
- **Chemical paints** on **prune (Summer & Fall)**
 - Conventional: (Topsin + 50% Latex), (Captan + 50% Latex)
 - Organic: (NuCop + Surround), (Lime sulfur + Surround)
- **Chemical paints** on existing cankers
 - Conventional: (Topsin + 50% Latex), (Captan + 50% Latex), (50% Latex alone)
 - Organic: (NuCop + Surround), (Lime Sulfur + Surround), (Surround alone)

Painting Existing Cankers With Chemicals



Painted canker

Topsin + 50% Latex



Painted canker

Captan + 50% Latex



50% Latex alone



Painted canker

Lime Sulfur + Surround



Painted canker

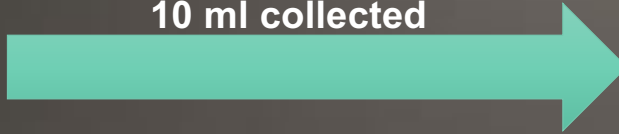
NuCop + Surround



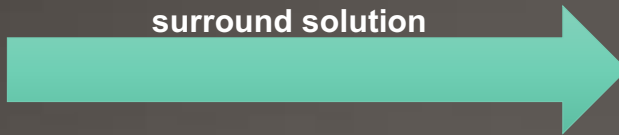
Surround alone



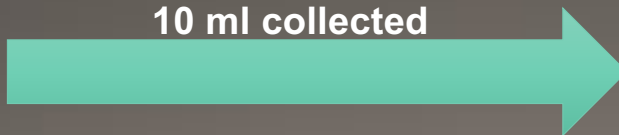
10 ml collected



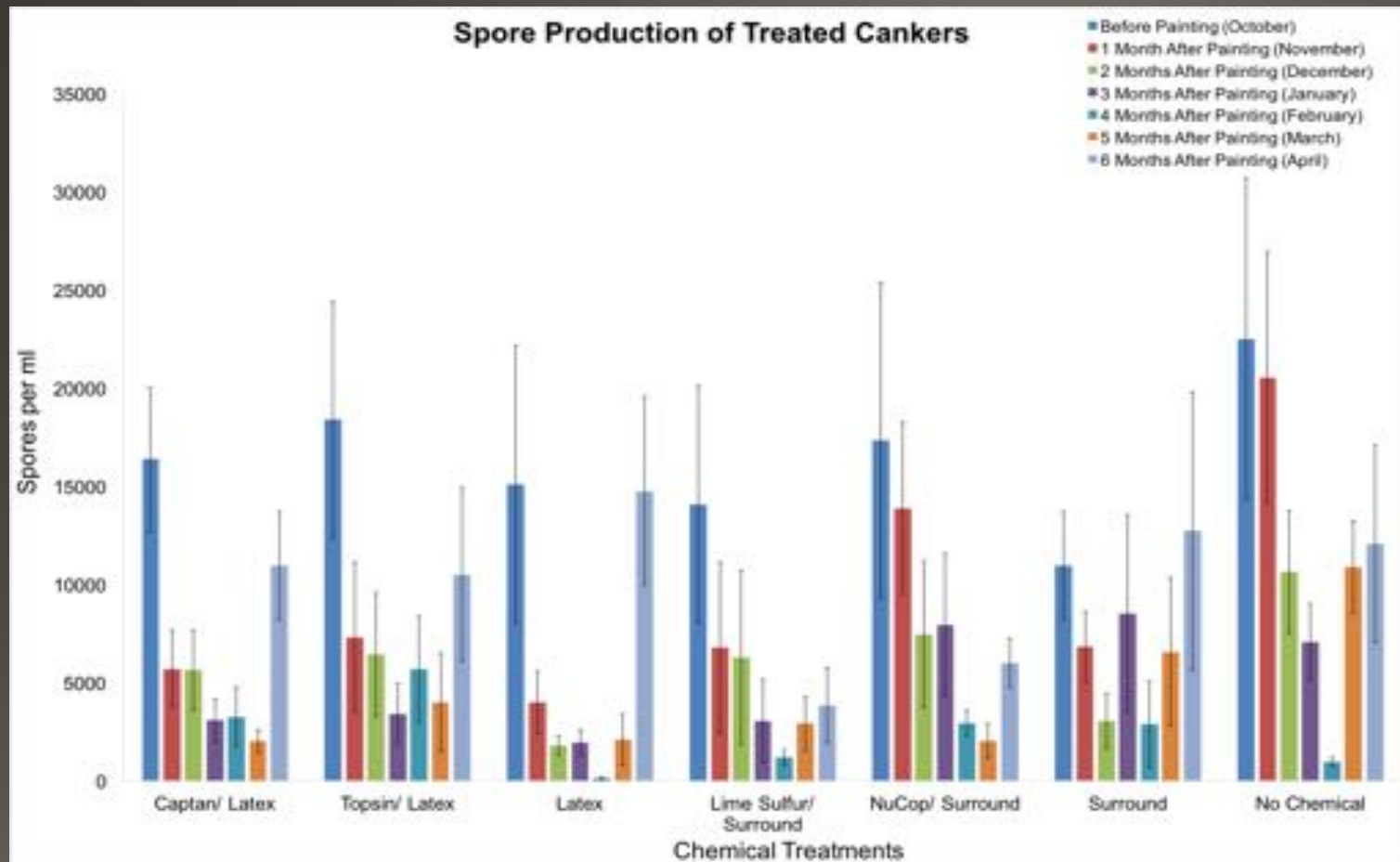
50% latex solution
or
surround solution



10 ml collected



Painting Existing Cankers With Chemicals



► 8 Cankers per Chemical treatment (56 total cankers)

Best Chemicals For Canker Cover

- Conventional
 - 1. 50% Latex solution **alone** or with Captan\ Topsin
 - Four month coverage
- Organic
 - 1. **Lime Sulfur** + Surround solution
 - Four month coverage

Questions

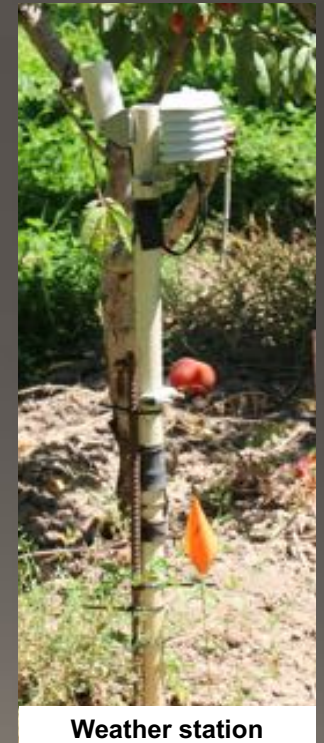
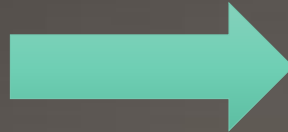
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 - Canker cover (canker painting)?
- When is spore production highest throughout the year?
- Are trees susceptible year-round?

Monthly Spore Counts

- Monthly monitoring of cankers from different locations
- Locations: Western Colorado Research Center & Palisade
- Collections made every 2 weeks

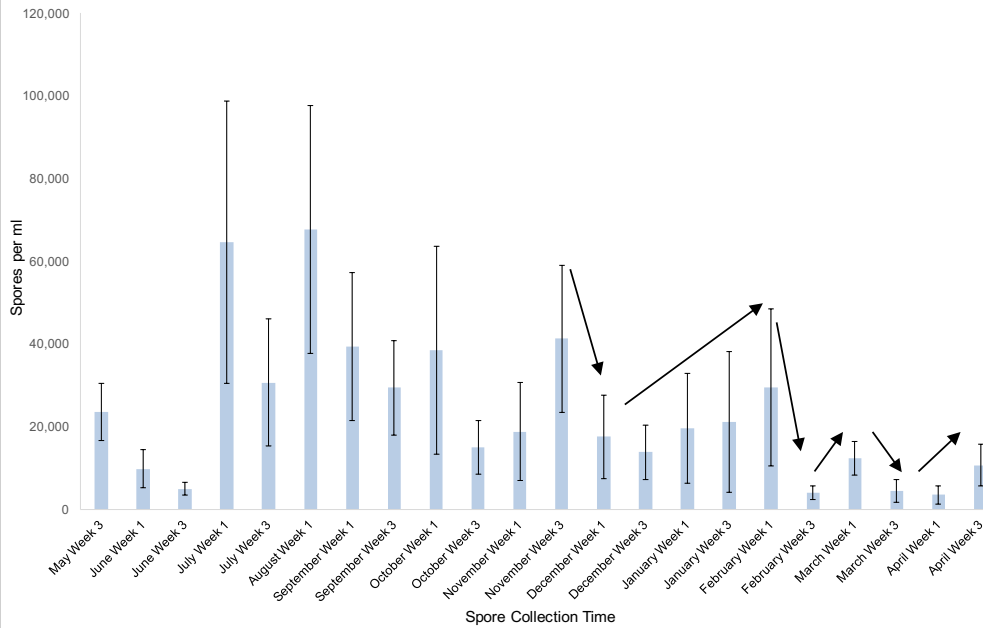


10 ml collected

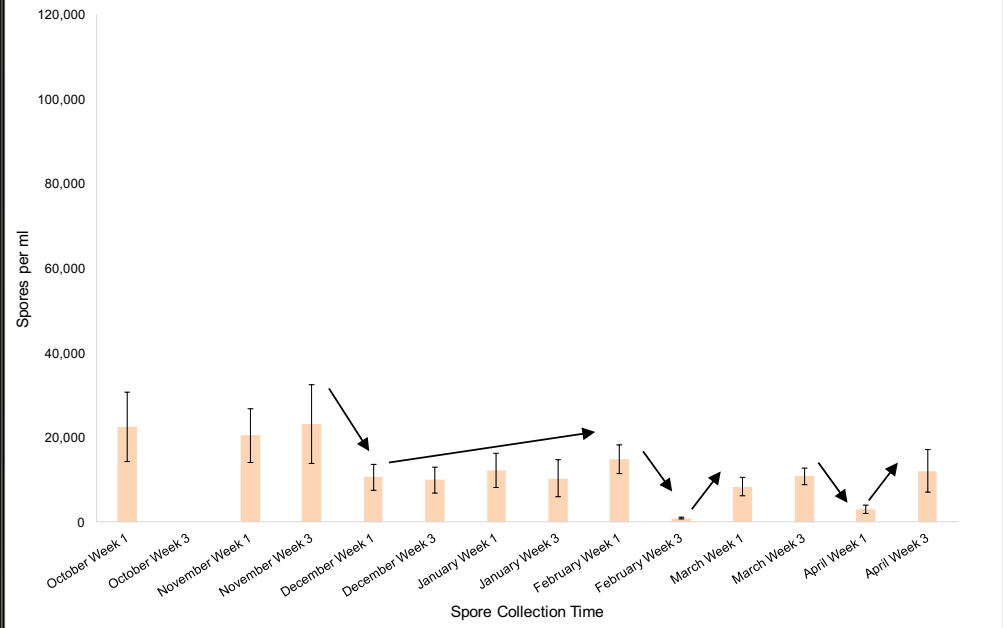


Spore Production (2 Locations)

WCRC Monthly Spore Collections



Palisade Monthly Spore Collections



Questions

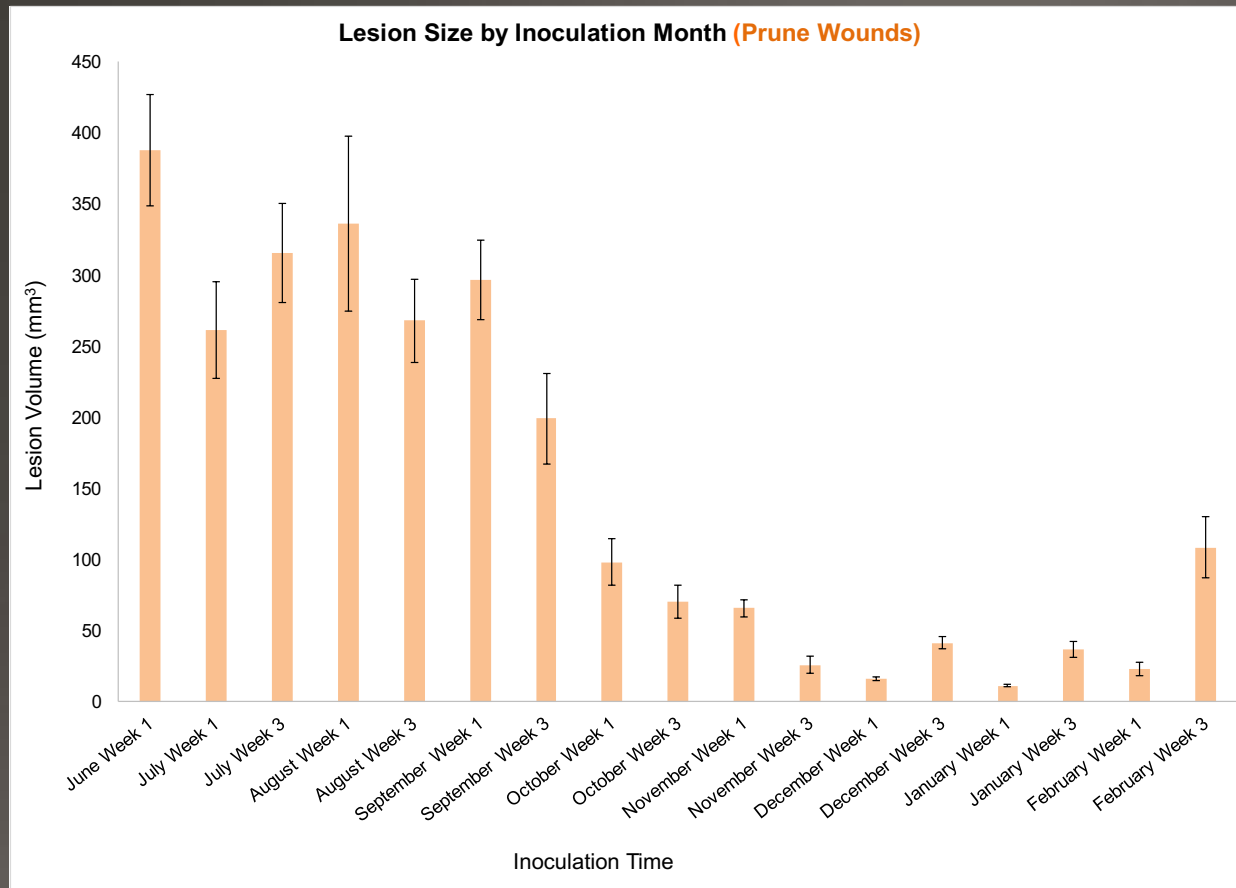
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- When is spore production highest throughout the year?
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Year-Round Tree Susceptibility

- Trees inoculated every two weeks
- Lesions measured 2 months after inoculation



Year-Round Tree Susceptibility



Future research plans

- Repeat of chemical sprays & paints in the spring
- Continue to monitor monthly spore production from cankers
 - Insect spore sampling
 - Aerial spore sampling
- Repeat of painting existing cankers with new chemical combinations
 - Organic options (oils)
- Cultivar sensitivity/tolerance to *Cytospora* and cold tolerance
 - 9 different varieties at 6 trees per variety

Conclusions

- What is the best chemical option for canopy sprays?
 - Conventional: Topsin and Captan (rotation to prevent pathogen resistance)
 - Organic: Lime Sulfur
- What chemicals work best for covering (painting) new and existing wounds?
 - Conventional: 50% Latex Solution with Topsin
 - Organic: Lime Sulfur with Surround

Conclusions

- When are spore inoculum levels the highest/lowest?
 - Signs of decreased spore production in November through February
 - Signs of increased spore production in July through October
 - Still need more data for an entire year picture
 - Need to incorporate variables such as precipitation, humidity, and temperature
- When are trees most susceptible to *Cytospora*?
 - Signs of decrease in susceptibility (lesions size) at the end of September as temperatures cool through October
 - Still need more data for an entire year picture

Acknowledgements \ Questions?



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