Detection of fungicide resistance in populations of *Venturia pirina* in California pear orchards

Identification and control of pear canker diseases in California

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Pear Scab: *Venturia pirina*
Venturia pirina Disease Cycle
OBJECTIVE 1: Fungicide Resistance: Determine fungicide resistance in *Venturia pirina* populations.
**Procedure**

- Isolates of *Venturia pirina* were collected in 2012.
- The isolates were sub-cultured on PDA-tet and fungicide EC50’s determined using Autoplate 400.
- A solution of 50ppm of fungicide was spiral plated onto 150mm agar plate.
- The plate was radially streaked with a conidial suspension of isolates.
- After one week, EC 50 values are measured.
EC 50 Values

- EC 50 is determined by the point on the plate where the fungal growth is inhibited 50% by the fungicide.
Fungicides Tested

- Actinovate (*Streptomyces lydicus*)
- Companion (*Bacillus subtilis*)
- Flint (trifloxystrobin)
- Fontellis (pentiopyrad)
- Luna Experience (fluopyram)
- Manzate (zinc, manganese and ethylenebisdithiocarbamate)
- Phyton 27 Ag (copper sulphate pentahydrate)
- Procure (triflumizole)
- Serenade Max (*Bacillus subitlis*)
- Syllit (dodine)
- Vintage (fenarimol)
- Topguard (flutriafol)
- Yucca Ag Aide (steroid saponins)
Results

2012 Autoplate 400 Spiral Gradient Experiment Results
Resistance Results

- Pear scab resistance was seen to Flint, and fungicide inactivity or possible resistance was shown to Manzate, Luna Experience, Phyton 27 Ag and Topguard.
- The most effective fungicides against *Venturia pirina* were Syllit, Fontellis, Companion and Serenade Max.
2012 Autoplate 400 Spiral Gradient Experiment Results
Luna Experience

Fungicide Efficacy

Site 2   Site 11   Site 1   Site 6   Site 9   Site 8   Site 4   Site 5   Site 3   Site 7   Site 10

2012 Autoplate 400 Spiral Gradient Experiment Results
Manzate

Fungicide Efficacy

Site 6  Site 5  Site 7  Site 1  Site 8  Site 9  Site 3  Site 11  Site 2  Site 10  Site 4

0.000
0.100
0.200
0.300
0.400
0.500
0.600

Fungicide Efficacy
Phyton 27 Ag

Fungicide Efficacy

Site 6
Site 5
Site 7
Site 1
Site 8
Site 9
Site 3
Site 1
Site 11
Site 10
Site 4
OBJECTIVE 1. Pear Canker: Determine the geographical distribution and incidence of *Botryosphaeria* spp. and *Eutypa lata* in pear cankers in Northern California.
Pear Canker Lifecycle

DIEBACK-INFECTED GRAPEVINE

CANKER

DEAD INFECTED WOOD

FUNGUS FRUITS (PERITHECIA) PRODUCED IN OLD DEAD WOOD

SPORES PRODUCED IN SPRING, SUMMER, AUTUMN

SPORES DISCHARGED IN WET WEATHER

FRESH PRUNING WOUND

SPORES GERMINATE IN WOOD CELLS
Procedure

- Pear orchards in Mendocino and Lake counties were visited and fungi were isolated from branches showing dieback and disease symptoms.
- Spore trapping studies were conducted in different orchards in Mendocino County with severe canker disease problems.
Results

Several pathogenic fungi were recovered from cankers in stems and branches of Bartlett pears. *Botryosphaeria obtusa*, *B. dothidea*, *B. iberica*, *Eutypa lata*, *Potebniamyces pyri*, *Cytospora austromontana*, *Phaeoacromonium* spp., *Sphaeropsis sapina*, *Diplodia seriata*, *Cryptosporiopsis* sp., *Bionectria* sp., and *Leucostoma persoonii*. 
Spore Trapping in Pear Orchards

Spore traps have shown the presence of the following pathogens and 2ºbasidiomycetes:

*Sphaeropsis sapinea*

*Phaeoacremonium rubrigenum*

*Botryosphaeria obtusa*

*Cryptovalsa ampelina*

*Eutypa lata Trametes versicolor*

*Stereum species*

*Ganoderma lobatum.*
OBJECTIVE 2. Identification and characterization of *Botryosphaeria* spp. associated with pear dieback in California.
Results

- *Botryosphaeria obtusa*
- *Botryosphaeria dothidea*
- *Botryosphaeria iberica*
OBJECTIVE 3. Determine the pathogenicity and symptoms of *Botryosphaeria* and *Eutypa lata* associated with pear canker disease.
## Results

<table>
<thead>
<tr>
<th>Species</th>
<th>Isolate #</th>
<th>Re-isolated</th>
<th>Avg Lesion Length*</th>
<th>Re-isolated</th>
<th>Avg Lesion Length*</th>
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<tbody>
<tr>
<td>Bionectria sp.</td>
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<td>YES</td>
<td>0.2</td>
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<tr>
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<td>1.3</td>
<td>YES</td>
<td>0.2</td>
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<tr>
<td>Phaeoacremonium angustis</td>
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<td>---</td>
<td>nt</td>
<td>---</td>
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<td>Potebniamyces pyri</td>
<td>UCDX122</td>
<td>NO</td>
<td>---</td>
<td>nt</td>
<td>---</td>
</tr>
</tbody>
</table>

* Measured in cm

nt = not tested
OBJECTIVE 4. Develop and implement control methods against fungi involved in pear dieback and decline.
Control

Fungi: *Botryosphaeria dothidea, Botryosphaeria iberica, Sphaeropsis sapinae, Cryptosporopsis species, and Botryosphaeria obtusa*

Fungicides tested:
- Vitiseal (1:10 dilution),
- Mertect,
- Orbit,
- Rally+Topsin M+Vitiseal (1:10 dilution),
- Rally+Topsin M,
- Scholar,
- Luna Experience.
Results

Control

B. dothidea
B. iberica
S. sapinae
Cryptosporopsis
B. obtusa

Rally, Topsin M and Vitiseal

B. dothidea
B. iberica
S. sapinae
Cryptosporopsis
B. obtusa

Rally and Topsin M

B. dothidea
B. iberica
S. sapinae
Cryptosporopsis
B. obtusa

Scholar

B. dothidea
B. iberica
S. sapinae
Cryptosporopsis
B. obtusa

Luna Experience

B. dothidea
B. iberica
S. sapinae
Cryptosporopsis
B. obtusa
Rally, Topsin M and Vitiseal

0

0.002

0.004

0.006

0.008

0.01

0.012

B. dothidea

B. iberica

S. sapinae

Cryptosporopsis

B. obtusa

Rally and Topsin M

0

0.01

0.02

0.03

0.04

0.05

0.06

B. dothidea

B. iberica

S. sapinae

Cryptosporopsis

B. obtusa

Scholar

0

0.01

0.02

0.03

0.04

0.05

0.06

B. dothidea

B. iberica

S. sapinae

Cryptosporopsis

B. obtusa

Luna Experience

0

0.01

0.02

0.03

0.04

0.05

0.06

B. dothidea

B. iberica

S. sapinae

Cryptosporopsis

B. obtusa

Rally and Topsin M

0
Thank you!!