A Disease Management Plan for Blueberries

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A correct diagnosis is essential for effective disease control.

Send the sample to a diagnostic lab.
Susceptible cultivar

Conducive environment

Virulent pathogen
Integrated disease management

- Involves the use of multiple disease control strategies
- Generally achieves better disease control than using a single method
- Reduces the need for emergency intervention strategies (e.g., fungicides)
Site selection

- Surrounding landscape
- Soil type and pH
- Drainage
- Air flow
- Proximity to other fields
Site sampling and preparation

- Improve drainage
- Soil nutrient analysis
- Nematode sampling
- Nepovirus assessment?
- Adjust pH
- Cover crops and/or organic matter
Nematode sampling
Planting material

- Buy virus-free plants
- Choose disease-resistant cultivars or at least avoid susceptible cultivars
- Plant correctly
- Apply mulch
Discourage fungal diseases by reducing humidity

- Avoid narrow row and plant spacing
- Prune regularly to create open canopy
- Use drip irrigation
- Time overhead irrigation to minimize wetness
- Control tall weeds
Sanitation

- Prune out diseased twigs and canes
- Remove and destroy virus-infected plants
- Rake up or bury mummy berry mummies
Disposal of prunings

- Burning
- Shredding
- Composting
Monitoring for diseases

- Monitor planting regularly and know what to look for
- Correct disease diagnosis
- Understand disease biology to improve control
General disease cycle

- Initial foliage infection
- Spread
- Overwintering
Mummy berry nurseries
Apothecial development
Disease risk during the growing season

Mummy berry

Botrytis blight/fruit rot

Anthracnose fruit rot

Alternaria fruit rot

Phomopsis, Botryosphaeria

Leaf rust, leaf spots

Virus diseases and stunt
Fungicides

Protectant
• Stays on surface
• Can be washed off
• Apply before infection

Systemic
• Absorbed by leaf
• More rainfast
• Curative activity
Curative activity

- Germ tube growth
- Formation of appressorium and penetration peg
- Beginning of mycelial growth and colonization
- Total colonization of tissue resulting in cell death and necrosis (irreparable tissue damage)

Systemic fungicide
Fruit infection process by *Colletotrichum*

1. Spore lands on leaf surface
2. Spore germinates in water
3. Appressorium forms
4. Penetration peg forms
5. Secondary hyphae form
6. Colonization and cell death
7. Sporulation
Classification of blueberry fungicides

Protectant: Captan, Ziram, Bravo, Copper, Sulfur, Lime sulfur, Oils, Salts, Omega, Biocontrols

Systemic: Abound, Pristine, Quash, Orbit, Indar, Ridomil, Elevate, Aliette, Phostrol, ProPhyt, QuiltXcel

Both: Switch, Captevate
Michigan Fruit Management Guide 2012

FOR COMMERCIAL FRUIT GROWERS

MICHIGAN STATE UNIVERSITY Extension

Extension Bulletin E-154, Information Current as of November 1, 2011, Revised Annually. DESTROY PREVIOUS EDITIONS.
<table>
<thead>
<tr>
<th>Fungicide</th>
<th>Mummy berry</th>
<th>Phomopsis twig blight and canker</th>
<th>Fusarium canker</th>
<th>Alternaria fruit rot</th>
<th>Anthracnose fruit rot</th>
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Fungicide resistance

• Can develop after repeated use of the same chemical over time

• More likely with systemic products (Abound, Pristine, Indar, Orbit)

• Avoid or delay by reducing the number of sprays and alternating with products in a different chemical class
Dormant sprays

- Usually lime sulfur or Sulforix, but sulfur and copper may also be effective and less expensive
- Choose formulation that sticks to plant
- Apply after leaf drop in the fall or before bud break in the spring
- Used to eradicate pathogens surviving and sporulating on dead canes and twigs
Efficacy of dormant sprays

Number of shoot strikes per bush

- Untreated
- Sulfur 6L 15 pt Dorm
- Cuprofix 3lb Dorm
- Sulforix 1 gal Dorm
- Bravo/Indar/Top+Cap

Mummy berry, blueberries

- a
- b
- b
- b
Anthracnose

*Colletotrichum acutatum*

Rotting berries in the field
Anthracnose spore dispersal over the season

Total number of spores recovered

Date

From twigs

From berries

Green Tip
Bloom
Petal fall
Pea-size green fruit
Blue fruit

Average rainfall (inches)

Total no. spores

Date

15,812,202
Determining timing of infection by single sprays

Number of sprays (2009, TNRC)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Sprays</th>
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<td>Bloom + blue fruit</td>
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</table>

Most bang for buck

% Latent Anthracnose
Use disease prediction models

\[ R^2 = 0.90 \]
\[ P < 0.000 \]

Gaussian
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ORGANIC PRODUCTION
Healthy soil, healthy plants?
Mycorrhizae
Disease control in organic plantings

- Site selection and preparation
- Disease-free planting material
- Resistant or tolerant cultivars
- Sanitation/pruning
- Reduce humidity/wetness
- Soil amendments
- Preventive OMRI-approved fungicides
Biological disease control

BioNem (*Bacillus firmus*)
DiTera (*Myrothecium verrucaria*)

Serenade, Kodiak (*Bacillus subtilis*)
Sonata, Yield Shield (*Bacillus pumilis*)
Contans (*Coniothyrium minitans*)
Mycostop Biofungicide (*Streptomyces griseoviridis*)
SoilGard (*Gliocladium virens*)
Blight Ban (*Pseudomonas fluorescens*)
PlantShield (*Trichoderma harzianum*)

Agri-Mycin (Streptomycin)
Firewall (Streptomycin)
Mycoshield (Oxytetracycline)

Nematicides
Fungicides and bactericides
Antibiotics for control of bacterial diseases
Fungicide efficacy trial, Grand Junction, 2002

Mummy berry shoot strikes in blueberry

Number of shoot strikes per bush

- Untreated
- Indar
- Serenade
Compost tea

• Watery extract of compost (with or without additives)
• Aerated or non-aerated
• Brewed or soaked for 1 to 14 days
• Contains bacteria, fungi, protozoa, nutrients, etc.
• Applied to crops as foliar spray or soil drench
• Disease control variable; possible mechanisms:
  - Competition for space/nutrients
  - Antibiosis
  - Induced resistance
List of products allowed for use in organic crop production:

Organic Materials Review Institute
http://www.omri.org

...but local certifier ultimately decides what may or may not be used
AND HOW WERE YOU PLANNING ON PAYING FOR THIS VISIT?