Highbush blueberry disease management

Updates on fungicide control for strawberry fruit rot

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What do blueberries want

Native conditions
Well drained soils, elevated above water
High organic matter: 5-7%
Acidic soils: pH 4.3-5

Cultivated
Plant on elevated rows
Grow in acidic soils or acidify soils
Pre-plant prep with green manure cover crops + mulch regularly
Site selection

- Light soils: (less than 10% clay)
  ➔ Silty or sandy loams ideal
  ➔ Mulch planting hole if in heavy soil

- Good drainage
  ➔ Can improve by preparing site to have even slopes

➔ Pathogens collect in pooled water
Site preparation

- Test soils for
  - pH
  - Organic matter
  - Nutrient profile

- Lower soil pH with sulfur:
  - Start 6 months to one year before planting
  - Use pelletized or granular sulfur (not powdered)
  - Target = 4.5 – 5
    - Do not go below 4 = harmful to the plant
    - Retest after 6 months; apply additional sulfur as needed

- If repeatedly tilled, disk or harrow to break up plow pan
Green manure cover cropping to build organic matter

MID MAY year one and two
Sorghum
Sudangrass
Buckwheat
Millet
→ To build organic matter and for week suppression

MID AUGUST year one
Rapeseed: Dwarf Essex variety
→ For nematode control (when combined with sulfur)
Plant selection

- Obtain from a clean source
- Based on diseases in the region, avoid susceptible or select more resistant varieties

<table>
<thead>
<tr>
<th>Disease/Pathogen</th>
<th>Resistance</th>
<th>Tolerance</th>
<th>Some susceptible varieties</th>
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</thead>
<tbody>
<tr>
<td>Mummy berry (Monilinia)</td>
<td>Northsky++, Bluejay++, Weymouth+, Reka +</td>
<td>Legacy, Duke, Bluecrop, Coville, Rancocas, Spartan,</td>
<td>Blueray, Earliblue, Elliot, Chandler, Darrow</td>
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<tr>
<td>Phomopsis twig blight</td>
<td>Elliot, Bluetta</td>
<td>Coville, Earliblue, Nelson, Rancocas, Rubel</td>
<td>Spartan, Bluejay, Emerald, Powderblue, Legacy, Hannah's Choice, Duke</td>
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<tr>
<td>Anthracnose (Colletotrichum)</td>
<td>Elliot, Little Giant, Legacy, Brigitta Blue, Hannah's Choice, Marrow, Murphy, Reville; Duke?</td>
<td></td>
<td>Berkely, Bluecrop, Bluetta, Bluerry, Chanticleer, Coville, Harriaon, Spartan</td>
</tr>
<tr>
<td>Botryosphaeria shoot blight</td>
<td>Weymouth</td>
<td></td>
<td>Ozarkblue, Bluecrop, Duke, Bluerry</td>
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<tr>
<td>Phytophthora</td>
<td>Gulf Coast</td>
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</tbody>
</table>
Planting

• Build raised beds:
  – 8-12” high
  – 4 ft wide

• Top dress beds with mulch: ~4-6”
  – Mulch in hole if soil is heavy
  – Mulching materials: pine bark, peat moss, compost, sawdust

• Install drip or sprinkler irrigation
Yearly maintenance: mulching

Improves plant health and buries inoculum in debris (mummy berries, etc)

→ Apply 4-6” right around the plants
  → Roots will grow up and out into mulch
→ Peat moss, pine bark, sawdust compost
  → Sawdust mulches also give good in-row weed control
→ Add N, since mulches cause nutrient leaching
Maintenance: Nutrients and water

Nutrient and water management will reduce plant stress and inhibit pathogen dispersal and infection opportunities

- Compost to maintain high organic matter
  - Composts slowly release N: good for growth
  - Caution: Animal manure composts have toxic salt levels and increase pH
- Avoid adding nutrients late in season
  - Discourage late season growth; encourage hardening off
    → Reduces susceptibility to pathogen infection
- Steady supply of water (1-2 in / week)
  - No wet feet
  - Drip or sprinkler irrigation
Maintenance: Pruning

- Prune out low old canes

→ 1 / 6 canes

→ Should have 1-2 canes for each of year 1, 2, 3, 4, and 5

→ Remove from the field

- Dormant spray with lime sulfur if disease severity was high

Pruning both promotes plant vigor and removes inoculum in canes
Some problem diseases in 2014
And some new diseases
Phytophthora root rot

- *Phytophthora cinnamomi*

- Source: either pre-established in nursery stock or from infested soil

- Disease most common in waterlogged soils

- Infects when temperatures above 68º F
  - Attacks weakened plants

- Symptoms
  - Early: yellow / reddening or leaves; little new growth
  - Late: roots turn brown – black; crown with dark streaking

- Reduces yields; rapidly kills new plantings; kills older bushes over several years
Managing Phytophthora

• Manage soil drainage
  – Site selection: Avoid planting in wet soils
  – Raised beds
  – Mulch amendments
  – Prepare sites to avoid water collection
• Avoid over irrigation
• If field is flooded / wet for several days: chemical control
  – Aliette
  – Phostrol or ProPhyt
Phomopsis twig blight and canker

- *Phomopsis vaccinii*
- Kills twigs; reduces vigor and yields
- Inoculum sources: infested wood in established plants and cane debris
Not the same as Phomopsis on grapes

- Phomopsis viticola
  - Different species
  - No cross contamination
Phomopsis twig blight and canker

Management:

• Resistant or less susceptible varieties
  • Weymouth, Earliblue, Berkeley most susceptible
• Avoid heat stress
• Harden canes off in fall
  • Don’t fertilize in late summer
• Remove infected canes
• Delayed dormant application of lime sulfur in late fall and/or early spring
  • Especially on susceptible varieties
New Diseases
Blueberry mosaic virus
SUMMER
FALL
What we know about BMV in the region

→ Present in highbush blueberry
→ Found in older plantings
  → Did not see it in first year plantings
  → Present in northern MD; Have not surveyed the southern region
→ 30% of bushes have BMV symptoms
→ 21% of bushes are in decline
→ Indicates that BMV may be an important cause of plant decline
BMV management

- Present in nursery material—clean stock in the future?
- Resistance unknown—again in the future this may be clear
- Site preparation: Avoid uneven slopes
  - 2X more plants infected in areas with water pooling
Why is it distributed this way?

→ Extrapolating from similar viruses: May be vectored by a soil borne fungus

→ Swimming spores containing the virus travel in water

→ Spores infect roots
→ Virus leaves spore and enters root
Exobasidium fruit and leaf spot

- Fungal pathogen
- Not yet found in MD
- Started becoming a problem in 2011 in the Southern US
- Makes fruit unmarketable
  → Can cause 60-70% yield loss
- Rabbit eye, northern and southern highbush varieties affected
- Certain varieties appear to be more affected
  → Eg, Legacy

- Presence in our region unknown, but the environment is conducive
- Reported in VA

Keep an eye out for it
Exobasidium fruit and leaf spot

Fruit with green spots—brown with age

Leaves with green spots; white underside
Not to be confused with mummy berry which has no green spots
Blueberries:
An option for organic (or minimal spray)

• The biggest problem in many regions is weed control
  – Sawdust mulches may be effective
• SWD may become the main problem in the near future
  – This would be problematic for organic production
• Most diseases can be managed primarily with a combination of cultural practices and resistant cultivars
• More people are starting to grow blueberries using organic methods in this region
Fruit rot management in strawberry: Fungicide resistance updates and new resources

Summary from the 2014 North Carolina Strawberry expo, Nov 17-19
Guido Schnabel, Clemson University and Natalia Perez, University of Florida
Highlights

New app for strawberry disease diagnosis:

http://diagnosis.ces.ncsu.edu/strawberry
Highlights

- Anthracnose fruit rot (*Colletotrichum acutatum*)
  - Brief review
    - Anthracnose fruit rot
      - Caused by *C. acutatum*
      - Comes in on nursery material and may be present in field soils
      - Results in fruit rot and petiole lesions
Highlights

• Anthracnose fruit rot (*Colletotrichum acutatum*)
  • Anthracnose fruit rot not the same as Anthracnose crown rot
  • Anthracnose crown rot
    – Caused by *C. gleosporioides*
    – Often comes in on infected nursery material
Highlights

• Anthracnose fruit rot (*Colletotrichum acutatum*)
  – Fungicide resistance reported for Abound and Cabrio
  – First report of any fungicide resistance
  – Found in Florida
    • Resistance status of *C. acutatum* in this area is not known
    • Resistance status of Anthranose crown rot pathogen is also no known
Botrytis fungicide resistance status

Based on surveys that included Maryland:

- **Captan and Thiram still work, with no resistance**
  - Use in rotation / tank mixes at bloom and for foliar protection

- **Topsin M, Pristine, Cabrio, Scala DO NOT WORK**
  - Continued use will ensure that efficacy of these products will not rebound

- Remaining single mode of action compounds still work, but are all at risk of resistance:
  - Elevate
  - Switch
    - Resistant to cyprodinil-- only fludioxonil still works
    - Switch is essentially now a single mode of action compound
  - Rovral (iprodione) FRAC group 2
  - Fontelis (Penthiopyrad) FRAC group 7

- Save for bloom-time sprays
- Apply once / year
Managing fungicide resistance for Botrytis control

Minimize use of single mode of action compounds: Elevate, Switch, Rovral, Fontelis

1. Rotate or tank mix with Captan and Thiram
2. Only use each compound once / year
   → Especially Switch
3. Save for bloom-time sprays
   → Rely on Captan and Thiram for foliar protection
   → Thirm 24/7 and Thiram Granuflo are registered for use in MD on strawberry
Rates for Botrytis control

- Roveral 50 W (iprodione): 1.5-2 lb / acre
- Switch 62.5 WG: 11-14 oz / acre
- Elevate 50 WDG: 1.5 lbs / acre
- Fontelis: 16-24 fl oz / acre
- Pristine WG: 18.5-23 oz / acre
- Captan 50 W or Captan 80 WDG: 1.5-3 lb ai / acre
- Thiram
  - Thiram 24/7: 2.6 qt / acre
  - Thiram Granuflo: 4.4 lbs / acre
2015 Southeast Regional Strawberry Integrated Pest Management Guide

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Recommendations are based on information from the manufacturer’s label and performance data from research and Extension field tests.

Because environmental conditions and grower application methods vary widely, suggested use does not imply that performance of the pesticide will always conform to the safety and pest control standards indicated by experimental data.

This publication is intended for use only as a guide. Specific rates and application methods are on the pesticide label, and these are subject to change at any time. Always refer to and read the pesticide label before making any application! The pesticide label supersedes any information contained in this guide, and it is the legal document referenced for application standards.
Managing fungicide resistance for Botrytis (and generally)

Additional approaches
- Reduce inoculum load and spray intensity by managing infested debris
  - Remove infected material in fall (fruit, leaves)
  - Thin plant density to promote air flow
  - Fall or spring mulch
    - Straw
    - Compost
  - Fall cover crop
  - Rotate out of strawberries 1-3 years
- Growing resistant cultivars
- Alternative non-synthetic products?
  - Regalia: Plant extract
Managing fungicide resistance

Strawberry Advisory System for fruit rot control: Model-based app
- Based on moisture, the app sends you a text telling you when a spray will be needed
- In Florida SAS has reduced the number of sprays by 30-60%
  - Pilot study underway to evaluate use in this region

Figure 2. Current risk level flag.
Figure 6. Short Message Service (SMS) with disease alert.
Thank you
Questions?

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