Field Identification and Management Strategies of Common Diseases in Blackberry Production

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My Thanks

• Dr. Annemiek Schilder, Michigan State University
• Dr. Megan Kennelly, Kansas State University
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• Patricia Wallace, University of Missouri
• Today’s presentation:
  – Principles of disease management with small fruits
  – Field identification and management of diseases of primary concern
  – Blackberry spray program
Principles

• What causes plant disease?
  – Fungi
  – Bacteria
  – Viruses and virus-like organisms
  – Nematodes
  – Parasitic plants
Principles

• Realities of small fruits and organic disease management
  – Plants are perennials
  – Proper site selection and preparation are critical
  – Critical to foster good plant health
  – Several diseases have wide host ranges
  – Plantings can accumulate problems over time
  – Few organic fungicides available that have a high level of efficacy
Principles

• Integrated disease management practices
  – Avoidance/exclusion
    • Select sites with good soil drainage
    • Select sites with good air drainage
    • Plant only disease free planting stock
    • Mulches to prevent rain splash
    • Weed management
    • Remove alternate hosts
Principles

• Integrated disease management practices
  – Avoidance/exclusion
  – Eradication
  • Sanitation
Principles

• Integrated disease management practices
  – Avoidance/exclusion
  – Eradication
  – Protection
    • Plant resistant or tolerant cultivars
    • Avoid excessive nitrogen fertilization
    • Keep fruit from contacting soil
    • Harvest fruit promptly and store under refrigeration
    • Application of approved fungicides
Principles

• Approved organic fungicides for small fruit
  – Fungicides based on elements copper and sulfur
    • Copper fungicides
    • Bordeaux mixture
    • Fixed copper fungicides
    • Sulfur fungicides – dry or flowable
    • Liquid lime sulfur
  – Other organic fungicides
    • Armicarb and Kaligreen (potassium bircarbonate)
    • Nutrol (manopotassium phosphate)
    • Oxidate (hydrogen dioxide)
    • Trilogy (extract of neem oil)
Principles

- Approved non-organic fungicides for brambles
  - **FRAC 11** – Abound, Cabrio, Pristine, Quilt, Tanos
  - **FRAC 3** – Quilt, Rally, Tilt
  - **FRAC 33** – Phosphorous acid
  - **FRAC 7** – Pristine
  - **FRAC 2** – Rovral
  - **FRAC 17** – Elevate, CaptEvate
  - **FRAC 9+12** – Switch
  - **FRAC 19** – Tavano
  - **FRAC 4** – Ridomil
  - **FRAC M** – Captan, CaptEvate
Biological Disease Control

Nematicides

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

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

Fungicides and bactericides

Agri-Mycin, Firewall (*Streptomycin*)
Kasumin (*Kasugamycin*)
Mycoshield, Fireline (*Oxytetracycline*)

Antibiotics for control of bacterial diseases
Brambles

• Diseases of primary concern
  – Cane/twig diseases
    • Raspberry anthracnose
    • Cane blight
    • Spur blight
  – Crown/root diseases
    • Phytophthora
  – Fruit diseases
    • Botrytis rot/Gray mold
  – Rust diseases
Cane/Twig Diseases

• Common themes
  – Caused by fungi
  – Spread from last year’s canes (floricanes) to new canes (primocanes) in wet weather in late spring/early summer
  – Canker/girdling
Anthracnose

- Fungus – *Elsinoe veneta*
- Results in cane dieback, loss of fruit production
- Particularly severe on black and purple raspberries, also blackberry
- Small purple spots, enlarge to become oval and sunken
- Girdles the cane
- Fruit may fail/shrivel
- Fungus survives winter in lesions on the canes
- Spores germinate and spread to new tissue in spring, usually in between where the leaves attach (internodes)
Cane Blight

- Fungal pathogen (*Leptosphaeria coniothyrium*)
- More common on black raspberry, but also on red and purple raspberry and blackberry
- Damage
  - Shoot death, low yield
  - Often starts at wounds
Cane Blight

http://ipm.illinois.edu/fruits/diseases/spur_blight/index.html
Anthracnose, Cane Blight

• Management strategies
  – Pruning strategies
    • Avoid wounding primocanes
    • Pruning wounds are the primary site of infection, use pinch pruning especially during summer pruning
    • Prune and destroy infected plant material, especially floricanes following harvest
  – Refrain from overhead irrigation
  – Improve airflow with proper pruning and thinning
  – Avoid winter injury – appropriate fertility, especially avoid excessive nitrogen fertilization
  – Reduce or eliminate wild populations of brambles
  – Late dormant applications of lime-sulfur or copper hydroxide
  – Fungicide spray program
Phytophthora Root Rot

• Several *Phytophthora* species affect brambles
• The disease is most commonly associated with heavy soils or portions of the planting that are the slowest to drain (lower ends of rows, dips in the field, etc.).
• In fact, most declining plants that are considered to be suffering from “wet feet” may be suffering from Phytophthora root rot.
• Symptoms
  – general lack of vigor and a sparse plant stand.
  – Apparently healthy canes may suddenly decline and collapse during the late spring or summer.
  – leaves may initially take on a yellow, red, or orange color or may begin scorching along the edges.
  – affected canes wilt and die.
  – Infected plants frequently occur in patches, which may spread along the row if conditions remain favorable for disease development.
Phytophthora Root Rot

http://www.ipm.ucdavis.edu/PMG/P/D-CB-PSPP-FS.001.html
Phytophthora

• Management strategies
  – Use disease-free planting stock preferably maintained in a greenhouse without field soil;
  – Choose sites that drain well
  – Avoid heavy soils and manage irrigation carefully
  – Use raised beds
  – Resistant cultivars
  – Recent research has shown that soil solarization prior to planting reduced levels of the disease
  – Soil or foliar applied fungicides
Botrytis Rot/Gray Mold

- Causal agent – *Botrytis cinerea*; fungus – spreads by spores
- Overwinters in many plants, plant parts, debris in the soil
- Infects flower parts then spreads to fruit, often staying latent
- Fruit rot activates as it matures/ripenes
- Temps 70-80°F, moisture, and high humidity favor disease
- Rotting problems in the field and after harvest
Botrytis Rot/Gray Mold

http://www.berriesnw.com/BerryDisordersDetail.asp?id=72
Botrytis Rot/Gray Mold

• Management strategies
  – Pruning to promote faster drying
  – Avoid excess N
  – Fungicides – at bloom through petal fall
  – Discard rotting fruit
  – Careful handling at harvest and prompt refrigeration
Orange Rust

- Causal agent *Arthuriomyces peckianus* and *Gymnoconia nitens*
- Blackberry and black raspberry are susceptible; red raspberries are not susceptible
- **Systemic** fungal pathogen often introduced on infected planting material
- Variability in cultivar resistance
- Bright orange pustules form on bottom surface of leaves in spring
Rust Diseases

• Use healthy, disease-free planting material
• Select site with good air movement and sun
• Eradicate wild hosts
• Prune/canopy management for airflow
• Orange rust - rogue all infected plants as soon as they appear
• Resistance
  • Plant resistant cultivars
  • Orange rust – red raspberries immune
  • Late rust – black raspberries and blackberries immune
• Fungicide spray program
Midwest Fruit Pest Management Guide

- Who compiles the Guide?
  Fruit extension and research specialists from 13 universities
- The Guide is updated annually
- Locate the Guide at:
  - hard copy from local Extension office
- Check the online guide regularly – labels change and the online guide is updated accordingly
- Guides can be ordered from county Extension offices
Guide has sections...
- Tips on using the guide
- Handling pesticides and spraying
- Tree fruit spray schedules (apple, pear, cherry, peach, plum)
- Grape spray schedule
- Blueberry spray schedule
- **Raspberry and blackberry spray schedule**
- Strawberry spray schedule
- REI and PHI for fungicides
- REI and PHI for insecticides
- Weed control in fruit crops
- Record keeping requirements
- State specific information

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**Midwest Fruit Pest Management Guide 2016**

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**Foreword**

Commercial fruit production has become a highly skilled, technical profession. Concerns about pesticide residue, operator risk, and the environment dictate that all fruit growers exercise extreme caution in the use of all pesticides, and indeed, all chemicals. The Environmental Protection Agency (EPA) has designated a number of fruit pesticides as “restricted use.” Growers who plan to use these restricted materials must be certified as private applicators.

**Certification**

Certification requires that applicators understand the following labeling and labeling, safety factors, potential environmental concerns, identification of common pests encountered, pesticides and their use, proper equipment, application techniques, and applicable state and federal regulations. Training programs are offered to help you in certification.

Contact your county extension office for information.

**The pest management recommendations in this guide have been formulated to provide you up-to-date information about pesticides and their applicability to your problem. We suggest that you use this information to set up your own spray program. You should keep accurate records of materials used, application dates, areas treated, growth stages, and weather conditions. Sample record sheets are on pages 156-167. In case of questions, nothing beats a good set of records. The FIP requires records for Restricted Use Pesticide applications. Some states may require records for general use pesticides (e.g., Kentucky has this requirement).**

**Handling Pesticides**

1. Know the pesticide toxicity and act accordingly.
2. When applying pesticides, do not breathe the dust, powder, or vapor. Always mix outdoors.
3. Do not eat or drink while handling or applying pesticides.
4. Stay out of drift from spray or dust.
5. Return containers with water at least three times and pour into spray tank as it is being filled. Peach containers in metal and plastic containers and crush. Dispose of these and all other pesticide containers where there will be no contaminations of crops or water supply. Do not re-use pesticide containers.
6. Use adequate respirator and protective clothing, especially when mixing pesticides. Necessary protective equipment is listed on pesticide labels.
Midwest Small Fruit Pest Management Handbook

• Companion to the Midwest Fruit Pest Management Guide

• Available as a free download at:
  https://ag.purdue.edu/hla/Hort/Documents/Midwest%20Sm%20Fruit%20861%2024-11.pdf
Spray Program for Brambles

- Delayed dormant
  - **Anthracnose, cane blight**: Liquid lime sulfur, Sulforix, or copper hydroxide
  - **Phytophthora root rot**: Ridomil Gold, Phosphorus acid
Spray Program for Brambles

- Pre-Bloom
  - Anthracnose, cane blight, septoria leaf spot: Captan, Cabrio, Abound, Pristine, Quilt Xcel, Tanos
  - Rust diseases: Rally, Cabrio, Abound, Pristine, Quilt Xcel, Tilt
Spray Program for Brambles

• First Bloom – Petal Fall
  – Anthracnose, cane blight, septoria leaf spot, rust diseases, powdery mildew: same as pre-bloom sprays
  – *Botrytis fruit rot*: Rovral, Elevate, CaptEvate, Switch, Tavano, Pristine
Spray Program for Brambles

• Post Bloom - Harvest
  – Anthracnose, botrytis, cane blight, septoria leaf spot: same as pre-bloom sprays
  – Botrytis: same as first bloom – petal fall
  – Rust diseases: Rally, Cabrio, Pristine
  – Double blossom: Abound, Quilt Xcel
Spray Program for Brambles

• Post-Harvest
  – Anthracnose, botrytis, cane blight, septoria leaf spot, rust diseases, powdery mildew: same as pre-bloom sprays
  – Very important for leaf disease control
  – Wet years require more control
Any Questions?

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