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Integrated Crop Management for Vineyards

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Vineyard Pest Management

IPM/SVP/ICM Program Components
A “Whole Plant Health Care Plan”

• Cultural Practices
  • site selection
  • site preparation
  • soil management
  • cultivar selection
  • cultural practices
    • canopy management
    • nutrition

• Disease/Insect Management
  • monitoring/trapping
  • forecasting
  • control choices
    • pesticides/mating disruption

• Weed Management
  • cultivation
  • cover crops

• Other Pests
  • birds, deer
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Monitor/Scout Your Vineyard
Proximity to Woods

Increased pressure from:
- Wildlife
  - habitat
- Insects
  - wild vines
- Diseases
  - reduced air movement
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Cultural Practices to Minimize Disease

• Plant disease-free vines with no injuries to crown or roots
• Consider choosing hybrid or native grape varieties
  • New varieties from NY
• Sanitation (dormancy)
  – Remove dead or diseased wood, old rachises, dead leaves, and mummified fruit.
  – Remove, bury, or burn the debris
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Cultural Practices to Minimize Disease

• Canopy management (all season)
  – Thin, train, and hedge shoots to permit air, sunlight, and fungicides to penetrate
  – Thin clusters for a balanced fruit load to avoid vine stress

• Avoid injury to any part of the vine, especially the crown and fruit, during vineyard operations
Benefits of Proper Canopy Management

Decreased Disease

- Early drying of canopy
- Increased penetration and contact of pesticides
- Earlier ripening
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Open Canopy!
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Disease Management Principles

- Integrate sound cultural practices with effective fungicides for best results
- Manage for more than one disease at a time to minimize the number of sprays
- Be aware of the susceptibilities of your grape varieties and history of disease in your vineyard
Benefits of Proper Canopy Management

Decreased Disease

- Early drying of canopy – air movement
- Increased penetration of pesticides
- Improved coverage of pesticides
- Earlier ripening – early harvest!
Major Grapevine Diseases in the Mid-Atlantic

- Black Rot
- Powdery Mildew
- Downy Mildew
- Phomopsis
- *Botrytis*
- Late season fruit rots
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Phomopsis Cane and Leaf
Vineyard Pest Management

Phomopsis Cane and Leaf
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Phomopsis

- Over-winters on canes/rachises
- Spores spread by spring rain
- Infection can occur at low temps (<45F)
- Shoots/leaves susceptible from bud break until…?
- Rachises susceptible from 1st emergence of cluster until …early summer?
Phomopsis Management

Cultural

- New vineyards - disease-free cuttings
- Prune out dead and diseased wood/canes/rachises
- Shred, plow under, or bury prunings
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Black Rot
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Black Rot
Black Rot Management: Risk Factors/Control

- Over-wintering
  - disease level last season
- Rainfall, temperature
- Grape variety
Black Rot Management: Cultural Control

- **Good** - Remove clusters from trellis during dormant pruning
- **Even better** - Shred, plow under, or bury pruned clusters
- Remove diseased leaves
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Powdery Mildew
Powdery Mildew: Most Important Disease of Grapes

- Affects all cultivated grapes, every season, wherever they are grown
- Affects all green tissues of the vine
- Can cause severe economic damage
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Powdery Mildew: Management factors

- Tissues are susceptible **all season**
- Older tissue more resistant
- **Early season infections** provide inoculum to developing flowers/fruit.
- Mid-late season infections
  - Sensitive hybrids and *vinifera* may need protection until veraison
Look for leaf and rachis infections.

- the presence of powdery mildew just millimeters away from flowers and young berries places them at very high risk.
- Observable powdery mildew on cluster stems before bloom has been associated with severe fruit disease epidemics.
Powdery Mildew: Cultural Control

- Maximize air circulation and sun exposure:
  - trellis system
  - planting site
  - row orientation
  - canopy management
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Downy Mildew
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Downy Mildew
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Downy Mildew Management

- Improve air circulation to speed drying within canopies
  - appropriate trellis
  - site; good air drainage
  - row orientation to maximize air flow

- Spring cultivation to bury over-wintering sources of inoculum
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Botrytis

Botrytis lesion at node of young shoot in spring.
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Botrytis

Single infected berry. Inset shows sporulation on cap stem and infected berry.
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Botrytis Management

Wound Management

- Intact berry skin most important barrier to infection and rot
- Control wounds by controlling birds, insects, powdery mildew
- Latent infections may not activate if ripening berries remain intact
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Botrytis
Vineyard Pest Management

Late-Season Rots

Photos: James W. Travis, by permission
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Late-Season Rots

Bitter Rot

Photos: Turner B. Sutton, by permission
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Late-Season Rots

Macrophoma Rot

Sour Rot
Late Berry Rots

Management

• Minimize wounds
  – birds, insects
  – powdery mildew
  – tight cluster architecture
• Improve aeration in canopy
• Early harvest
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Grape Disease Management Season in Maryland

Risk Period for Disease

- Late-season rots
- Botrytis bunch rot
- Downy mildew
- Powdery mildew

Phenology

- Budbreak
- Pre-bloom
- Bloom
- Post-bloom
- Bunch closing
- Veraison
- Pre-harvest
### Vineyard Pest Management

**Early to Mid-Season Program**

<table>
<thead>
<tr>
<th>Timing</th>
<th>Target</th>
<th>Fungicide</th>
</tr>
</thead>
<tbody>
<tr>
<td>New shoots (start at ½ -1&quot;)</td>
<td>Black rot (BR), Phomopsis (Ph), PM, DM</td>
<td>Mancozeb plus a PM fungicide (sulfur, oil, an SI, Quintec, Endura)</td>
</tr>
<tr>
<td>3–4 sprays</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-bloom to post-bloom</td>
<td>BR, Ph, PM, DM Botrytis</td>
<td>Above program plus: Elevate or Vangard/Scala OR Pristine plus a DM fungicide*</td>
</tr>
<tr>
<td>3 sprays; 1 or 2 for Botrytis</td>
<td></td>
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</tbody>
</table>

*Captan or a phosphorous acid (phosphite)
## Vineyard Pest Management

### Mid- to Late-Season Program

<table>
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<tr>
<th>Timing</th>
<th>Target</th>
<th>Fungicide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cover sprays (every 10–14 days)</td>
<td>Ripe rot, bitter rot, &amp; macrophoma rot; PM, DM</td>
<td>Captan or a phosphorous acid, plus a PM fungicide</td>
</tr>
<tr>
<td>Bunch closing, veraison, pre-harvest</td>
<td>Botrytis (if needed)</td>
<td>Add Elevate or Vangard/Scala</td>
</tr>
</tbody>
</table>
Fungicide Guidelines

- Good spray intervals: 7–10 days through post-bloom, then 10–14 days
  - For sulfur, use 7-day and 10-day intervals
- Fungicide interactions
  - Do not mix sulfur or captan with oil or spray them within 14 days of each other
Fungicide Guidelines

• Sensitive grape varieties
  – Do not use sulfur on Conords, Norton (Cynthiana), most red-fruited French-American hybrids, and other varieties listed as sulfur-sensitive
  – Do not use Flint (strobilurin) on Conords
  – Do not use Abound near apples
    – Variety specific (Macs)
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Fungicide Resistance

• Powdery mildew
  – Resistance to strobilurins (Abound, Flint, Sovran, one component of Pristine)
  – Loss of sensitivity to SIs (sterol-inhibitors: Nova, Elite, Procure, Rubigan)

• Downy mildew
  – Resistance to strobilurins (including Pristine)
Reference Materials

• A Pocket Guide for Grape IPM Scouting in the North Central & Eastern U.S.

• Guidelines for Developing an Effective Fungicide Spray Program for Wine Grapes in Maryland, 2010

• Other University pest management guides (Cornell-Penn State, Virginia Tech)—commercial and home gardening

• Dr. Wayne Wilcox, Cornell—annual notes on disease control

• APS Compendium of Grape Diseases
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