Impact of Soybean Viruses on Yield and Seed Quality

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Soybean viruses in the Midwest

Soybean Mosaic Virus (SMV)
Soybean viruses in the Midwest

Bean Pod Mottle Virus (BPMV)
Soybean viruses in the Midwest

- Alfalfa Mosaic Virus (AMV)
<table>
<thead>
<tr>
<th>Source</th>
<th>Virus</th>
<th>Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed</td>
<td>SMV</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>AMV</td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td>BPMV</td>
<td>Moderate</td>
</tr>
<tr>
<td>Forage Legumes</td>
<td>AMV</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>BPMV</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

Forage photos courtesy of: [http://web.css.orst.edu](http://web.css.orst.edu)
Soybean virus vectors

Bean leaf beetle

Soybean aphid

BPMV

SMV

AMV
Symptoms caused by viruses

- Mosaic symptoms
  - BPMV
  - SMV
  - AMV

- Green stem
  - BPMV
  - SMV

- Seed mottle
  - BPMV
  - SMV
Agronomic importance of viruses

- Grain yield reduced
- Grain quality reduced
  - composition
  - seed appearance (mottled, moldy)
- Seed performance reduced
  - germination; seedling vigor
- Predisposition to other stresses?
- Confusion with chemical injury or nutrient deficiencies
Do I have a virus problem?

- Lower than expected yields
- Mottled seed
- Leaf symptoms not always obvious
  - Varieties differ in severity of leaf symptoms
  - Environmental conditions can mask symptoms
  - Growth stage influences presence or absence of symptoms
Early virus inoculum movement has greatest impact on yield
Soybean varieties differ in reaction to BPMV at a bean leaf beetle site.
Varieties differ in reaction to BPMV: yield, symptoms and seed mottling.

Spansoy 250 has a 5-10 bu/a greater yield potential.

<table>
<thead>
<tr>
<th>Year</th>
<th>Yield (bu/a)</th>
<th>Virus Symptoms (%)</th>
<th>Seed mottling (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Spansoy 250</td>
<td>Spansoy 201</td>
<td>Spansoy 250</td>
</tr>
<tr>
<td>2000</td>
<td>58.5</td>
<td>62.9</td>
<td>na</td>
</tr>
<tr>
<td>2001</td>
<td>58.9</td>
<td>63.8</td>
<td>61</td>
</tr>
<tr>
<td>2002</td>
<td>57.4</td>
<td>60.7</td>
<td>29</td>
</tr>
</tbody>
</table>

LSD 10%:
- 2000: 1.3
- 2001: 3.7
- 2002: 4.7
Bean leaf beetle/BPMV management

• Preventive
  • Planting date
  • Variety selection

• Responsive
  • Foliar applied insecticide
Reducing the risk of soybean viruses: approaches

• Seed
  - Plant virus free seed
  - Assume a low level of infected seed

• Planting date
  - Delayed planting
  - Increased risk of aphid activity

• Variety selection
  - Ability to yield in the presence of bean leaf beetle
  - Seed quality

• Inoculum management
  - Bean leaf beetle management
Early season actions

- Early season BPMV infection robs yield potential
- Insecticides reduce beetle numbers
  - Reduce BPMV transmission
  - No effect on pod damage
- Insecticide seed treatment being researched
  - Goal to reduce early BPMV transmission
  - Not registered
  - Studies conducted in 2002 showed no yield advantage or decrease in seed mottling
Strategy for 2003 planting season: what can you do?

• Control of seed transmitted viruses should be initiated at seed company level

• No standards or guidelines exist
Strategy for 2003 planting season: what can you do?

• Control tactics on a production level
  - Planting date
    • Delay planting to reduce BPMV/Bean leaf beetle damage
    • Late planting increases potential for aphid activity
  - Insecticide sprays to control vectors
    • For BPMV, spray early to combat overwintered beetles, and late to prevent pod damage
Strategy for 2003 planting season: what can you do?

• Control tactics on a production level
  - Variety selection
    • Select varieties that yield well and have low seed mottling in the presence of soybean viruses
    • No complete resistance to BPMV exists; soybean plant introductions, breeding lines and commercial varieties are being screened for reaction
  - Partial resistance is present
    • Yield
    • Seed quality
    • Leaf symptoms
    • Green stem
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