Managing Soybean Cyst Nematode (SCN) and Iron Deficiency Chlorosis (IDC)

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The Minnesota Challenge: Interactions between IDC and SCN

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IDC and SCN are major problems in MN

- Hard to manage
- Difficult to research
- Likely acting together in the field
Management issues and solutions

**IDC**
- Susceptible variety
- High soil pH
- Calcium carbonates
- Soil Nitrates
- Wet soil
- Tolerant Variety
- Fe chelates-Soygreen
- Companion Crops
- Calcium carbonates
- Reduce other stress

**SCN**
- Susceptible variety
- Presence of nematodes
- High soil pH
- Hot and dry
- Tolerant Variety
- Nonhost crops
- Seed treatments
- Cover crops?
- Reduce other stress
Challenge accepted!  
Teasing apart IDC and SCN

Project Goals:

• Identify in-field treatments that differentially affect IDC and SCN
• Investigate how IDC and SCN stress affects yield losses and SCN reproduction
  – Individually and together
• Quantify stress using remote sensing tools
Field Locations target high pH soils
Field locations target nematode presence
### Treatments we can introduce

<table>
<thead>
<tr>
<th>IDC</th>
<th>SCN</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Susceptible variety</strong>&lt;br&gt;- High soil pH&lt;br&gt;- Calcium carbonates&lt;br&gt;- <strong>Soil Nitrates</strong>&lt;br&gt;- Wet soil</td>
<td><strong>Tolerant Variety</strong>&lt;br&gt;- <strong>Soygreen</strong>&lt;br&gt;- Companion Crops&lt;br&gt;- Calcium carbonates&lt;br&gt;- Reduce other stress</td>
</tr>
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<td><strong>Susceptible variety</strong>&lt;br&gt;- Presence of nematodes&lt;br&gt;- High soil pH&lt;br&gt;- Hot and dry</td>
<td><strong>Tolerant Variety</strong>&lt;br&gt;- Nonhost crops&lt;br&gt;- Seed treatments&lt;br&gt;- Cover crops?&lt;br&gt;- Reduce other stress</td>
</tr>
</tbody>
</table>
Treatments arranged to study interactions

<table>
<thead>
<tr>
<th>SCN</th>
<th>Susceptible - PI 88788 - Peking</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDC</td>
<td>i. Nitrogen</td>
</tr>
<tr>
<td></td>
<td>ii. No treatment</td>
</tr>
<tr>
<td></td>
<td>iii. Soygreen</td>
</tr>
</tbody>
</table>

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Drone view of experimental design
Affect of IDC treatments on yield

<table>
<thead>
<tr>
<th>Treatment</th>
<th>IDC Resistant Varieties</th>
<th>IDC Susceptible Varieties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrate</td>
<td>45.5 bu/ac</td>
<td>15.7 bu/ac</td>
</tr>
<tr>
<td>Control</td>
<td>57.1 bu/ac</td>
<td>46.8 bu/ac</td>
</tr>
<tr>
<td>Soygreen</td>
<td>66.9 bu/ac</td>
<td>64.8 bu/ac</td>
</tr>
</tbody>
</table>
IDC resistant varieties out-yield susceptible under all treatments (Averaged across locations and years)
Affect of SCN treatments on yield

**Significant yield differences only found in 4/9 locations**
SCN variety impacted yield at 4 of 9 locations

* = significant at .05
*** = significant at .001
<table>
<thead>
<tr>
<th></th>
<th>Jay</th>
<th>Kevin</th>
<th>Otto</th>
<th>Kevin18</th>
<th>Palmer</th>
<th>Sunderland</th>
<th>Arlen</th>
<th>Kevin19</th>
<th>Loren</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial counts</strong></td>
<td>421</td>
<td>1,700</td>
<td>1,619</td>
<td>2,169</td>
<td>2,169</td>
<td>1,269</td>
<td>4,881</td>
<td>3,337.5</td>
<td>925</td>
</tr>
<tr>
<td><strong>Peking FI</strong></td>
<td>1.7</td>
<td>3.9</td>
<td>14.8</td>
<td>3.9</td>
<td>.6</td>
<td>2.1</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td><strong>PI 88788 FI</strong></td>
<td>18.7</td>
<td>6.3</td>
<td>13.6</td>
<td>10.9</td>
<td>8.4</td>
<td>22.7</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td><strong>HG Type</strong></td>
<td>2</td>
<td>-</td>
<td>1, 2</td>
<td>2</td>
<td>-</td>
<td>2</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
</tbody>
</table>

**27 bu/ac decrease**
Reproduction Factor (RF)

2019 data coming soon!
Yield data did not show an interaction

SCN
Susceptible - PI 88788 - Peking

<table>
<thead>
<tr>
<th>IDC</th>
<th>43.5</th>
<th>48.7</th>
<th>47.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>i. Nitrogen</td>
<td>50.6</td>
<td>56.3</td>
<td>55.2</td>
</tr>
<tr>
<td>ii. No treatment</td>
<td>54.8</td>
<td>59.7</td>
<td>61.1</td>
</tr>
<tr>
<td>iii. Soygreen</td>
<td></td>
<td></td>
<td></td>
</tr>
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</table>

What’s your number? Take the test. Beat the pest.
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No interaction between IDC and SCN

Nematodes reproduce on SCN susceptible plots regardless of IDC stress
Summary

• The good news is that it appears that we can manage IDC and SCN independently
• Start by identifying the problem
  – IDC will be obvious - but understand that many other issues can cause yellowing in soybean
  • SCN
  • Aphids
  • Other fertility issues
  – Soil sampling for SCN is a required first step.
    • Be certain of very low SCN numbers before planting a susceptible line
    • Medium to high populations (2000-10,000 eggs) require significant action
    • Beyond 10,000 one should consider more corn
Summary

• Manage IDC with genetic tolerance first, then add iron chelates
  – Variable Rate iron chelates if available
• Identify **good** SCN resistant varieties
  – Public Variety Trial reports
  – Seed company advise
  – Evaluate varieties on your own farm
  – It’s nearly impossible to ID varieties that allow low reproduction, on-farm
  – The best that you can do is continually monitor SCN levels
QUESTIONS?
What’s your number?
Take the test. Beat the pest.
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Thank you!
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Reproduction Factor

Reproduction Factor (RF) = \( \frac{\text{Beginning of season egg counts}}{\text{end of season egg counts}} \)

\[ RF = \text{Nematodes reproducing} \]
Nematodes are reproducing on susceptible soybean varieties.

2019 data coming soon!