Corn Rootworm Management, Nitrogen Management, and Tips in/for Corn following Corn

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Product Consistency - 2003 - 2005

Corn Rootworm Management

[Diagram showing product consistency over 2003-2005 with different treatments indicated]
Urbana, IL Herculex Corn

Urbana, IL Agrisure

Monmouth, IL 2006

Treatment

Consistency
Rootworm larval injury to Agrisure™, Ames, 2004

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Rate</th>
<th>Placement</th>
<th>Injury</th>
<th>Consistency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agrisure</td>
<td>Bt</td>
<td>Bt</td>
<td>0.008</td>
<td>100</td>
</tr>
<tr>
<td>Agrisure + Cruiser</td>
<td>Bt + 0.125</td>
<td>Bt + ST</td>
<td>0.013</td>
<td>100</td>
</tr>
<tr>
<td>Agrisure + Cruiser</td>
<td>Bt + 0.25</td>
<td>Bt + ST</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Force 3G</td>
<td>0.12</td>
<td>T-band</td>
<td>0.023</td>
<td>100</td>
</tr>
<tr>
<td>Lorsban 15G</td>
<td>1.22</td>
<td>T-band</td>
<td>0.030</td>
<td>100</td>
</tr>
<tr>
<td>Aztec 2.1G</td>
<td>0.14</td>
<td>T-band</td>
<td>0.132</td>
<td>88</td>
</tr>
<tr>
<td>Poncho 1250</td>
<td>11.25</td>
<td>ST</td>
<td>0.282</td>
<td>63</td>
</tr>
<tr>
<td>Cruiser SFS</td>
<td>0.25</td>
<td>ST</td>
<td>0.390</td>
<td>63</td>
</tr>
<tr>
<td>CHECK</td>
<td></td>
<td></td>
<td>0.810</td>
<td>50</td>
</tr>
</tbody>
</table>

* Granules listed as ounces a.i. per 1,000 row-ft; Seed treatments as mg a.i. per seed.
* Placement: T-band = insecticide applied at planting as band over row; ST = seed treatment.
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* Means that are not followed by lower-case letters are not statistically different.

Rootworm larval injury to Agrisure™, Ames, 2005

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<td>Bt</td>
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<td>0.11 a</td>
<td>88 a</td>
</tr>
<tr>
<td>Agrisure + Cruiser</td>
<td>Bt + 0.125</td>
<td>Bt + ST</td>
<td>0.03 a</td>
<td>100 a</td>
</tr>
<tr>
<td>Agrisure + Cruiser</td>
<td>Bt + 0.25</td>
<td>Bt + ST</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Force 3G</td>
<td>0.12</td>
<td>T-band</td>
<td>0.02 a</td>
<td>100 a</td>
</tr>
<tr>
<td>Lorsban 15G</td>
<td>1.22</td>
<td>T-band</td>
<td></td>
<td></td>
</tr>
<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>Poncho 1250</td>
<td>11.25</td>
<td>ST</td>
<td></td>
<td></td>
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<tr>
<td>Cruiser SFS</td>
<td>0.25</td>
<td>ST</td>
<td>0.47 b</td>
<td>54 b</td>
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<tr>
<td>Cruiser SFS</td>
<td>1.25</td>
<td>ST</td>
<td>0.45 b</td>
<td>50 b</td>
</tr>
<tr>
<td>CHECK</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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### Rootworm larval injury to Agrisure™. Ames, 2006

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Ratea</th>
<th>Placementb</th>
<th>Injuryc</th>
<th>Consistencyd,e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agrisatum</td>
<td>Bt</td>
<td>Bt</td>
<td>0.01 a</td>
<td>100 a</td>
</tr>
<tr>
<td>Agrisatum + Cruiser</td>
<td>Bt + 0.125</td>
<td>Bt + ST</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agrisatum + Cruiser</td>
<td>Bt + 0.25</td>
<td>Bt + ST</td>
<td>0.01 a</td>
<td>100 a</td>
</tr>
<tr>
<td>Force 3G</td>
<td>0.12</td>
<td>T-band</td>
<td>0.08 a</td>
<td>100 a</td>
</tr>
<tr>
<td>Lorsban 15G</td>
<td>1.22</td>
<td>T-band</td>
<td>0.06 a</td>
<td>100 a</td>
</tr>
<tr>
<td>Aztec 21G</td>
<td>0.14</td>
<td>T-band</td>
<td>0.04 a</td>
<td>100 a</td>
</tr>
<tr>
<td>Poncho 1250</td>
<td>11.25</td>
<td>ST</td>
<td>0.08 a</td>
<td>100 a</td>
</tr>
<tr>
<td>Cruiser 5FS</td>
<td>0.25</td>
<td>ST</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cruiser 5FS</td>
<td>1.25</td>
<td>ST</td>
<td>0.09 a</td>
<td>100 a</td>
</tr>
<tr>
<td>CHECK</td>
<td></td>
<td></td>
<td>0.29 b</td>
<td>71 b</td>
</tr>
</tbody>
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### Rootworm larval injury to Agrisure™. Sutherland, 2005

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<th>Injuryc</th>
<th>Consistencyd,e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agrisatum</td>
<td>Bt</td>
<td>Bt</td>
<td>0.72 a</td>
<td>58</td>
</tr>
<tr>
<td>Agrisatum + Cruiser</td>
<td>Bt + 0.125</td>
<td>Bt + ST</td>
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<td></td>
</tr>
<tr>
<td>Agrisatum + Cruiser</td>
<td>Bt + 0.25</td>
<td>Bt + ST</td>
<td>0.53 a</td>
<td>50</td>
</tr>
<tr>
<td>Force 3G</td>
<td>0.12</td>
<td>T-band</td>
<td>0.56 a</td>
<td>29</td>
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<tr>
<td>Lorsban 15G</td>
<td>1.22</td>
<td>T-band</td>
<td>0.86 a</td>
<td>46</td>
</tr>
<tr>
<td>Aztec 21G</td>
<td>0.14</td>
<td>T-band</td>
<td>0.34 a</td>
<td>62</td>
</tr>
<tr>
<td>Poncho 1250</td>
<td>11.25</td>
<td>ST</td>
<td>2.00 b</td>
<td>0</td>
</tr>
<tr>
<td>Cruiser 5FS</td>
<td>0.25</td>
<td>ST</td>
<td>1.91 b</td>
<td>0</td>
</tr>
<tr>
<td>Cruiser 5FS</td>
<td>1.25</td>
<td>ST</td>
<td>1.80 b</td>
<td>0</td>
</tr>
<tr>
<td>CHECK</td>
<td></td>
<td></td>
<td>2.23 b</td>
<td>0</td>
</tr>
</tbody>
</table>

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### Table 2. MRB664 corn rootworm efficacy experiment, University of Illinois, Urbana, 2006.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Mean node injury rating (July 10th)</th>
<th>Percentage consistencya</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRB 664 + Cruiser 5FS (0.25 mg a.i. per seed)</td>
<td>1.90 bc 25</td>
<td></td>
</tr>
<tr>
<td>Cruiser 5FS (0.25 mg a.i. per seed)</td>
<td>1.79 fc 19</td>
<td></td>
</tr>
<tr>
<td>Force 3G (4 oz of product per 1,000 ft of row)</td>
<td>0.94 cd 69</td>
<td></td>
</tr>
<tr>
<td>Aztec 2.1G (6.7 oz of product per 1,000 ft of row)</td>
<td>0.26 a 100</td>
<td></td>
</tr>
<tr>
<td>Lorsban (155 lbs of product per 1,000 ft of row)</td>
<td>0.55 d 50</td>
<td></td>
</tr>
<tr>
<td>Poncho 1250</td>
<td>1.06 a 49</td>
<td></td>
</tr>
<tr>
<td>Check</td>
<td>3.00 a 0</td>
<td></td>
</tr>
</tbody>
</table>

- Plating date was May 23, 2006. Corn was planted (2006) into an area that had been planted to a trap crop (late-planted corn interplanted with pumpkins) the previous season (2005).
- Inoculation injuries are based on the 0 to 3 node injury scale developed by Ollisson et al. (2006): 0.0 = no feeding damage, 1.0 = one node broken or dead, 2.0 = two or more complete nodes pruned, 3.0 = three or more complete nodes pruned, and the highest rating that can be given. Five root systems were evaluated from each of four replicates (n = 20 per mean).
- Percentage consistency is the percentage of nodes with a node injury rating ≤ 1.0.
Corn Yield following Corn and Soybeans 2005

<table>
<thead>
<tr>
<th>Location</th>
<th>Hybrids Tested</th>
<th>Corn after Corn</th>
<th>Corn after Soybean</th>
<th>Yield Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urbana</td>
<td>35</td>
<td>157</td>
<td>179</td>
<td>-12%</td>
</tr>
<tr>
<td>DeKalb</td>
<td>35</td>
<td>173</td>
<td>225</td>
<td>-23%</td>
</tr>
<tr>
<td>Monmouth</td>
<td>33</td>
<td>157</td>
<td>211</td>
<td>-26%</td>
</tr>
</tbody>
</table>

Corn Yield following Corn and Soybeans Univ. of IL (2006)

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<thead>
<tr>
<th>Location</th>
<th>Hybrids Tested</th>
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<th>Corn after Soybean</th>
<th>Yield Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urbana</td>
<td>30</td>
<td>197</td>
<td>193</td>
<td>+2%</td>
</tr>
<tr>
<td>DeKalb</td>
<td>50</td>
<td>201</td>
<td>212</td>
<td>-5%</td>
</tr>
<tr>
<td>Monmouth</td>
<td>36</td>
<td>140</td>
<td>210</td>
<td>-33%</td>
</tr>
</tbody>
</table>

Yield Increase with C-SB vs. C-C Monmouth, IL (2005)
**Corn - Corn vs. Corn - Soybean**  
Urbana, IL (2006)

- R² = 0.76
- R² = 0.01

**Corn - Corn vs. Corn - Soybean**  
Sutherland, IA (2006)

- R² = 0.9412
- R² = 0.3694

**Yields for Corn Rootworm Treatments***

- Following Corn
- Following Soybeans
- Root Injury: 0.01, 0.08, 1.55
- Bu/acre: 160, 170, 180, 190, 200

*Summary of three Iowa locations, 2006

Jim Olson, Iowa State University
Corn-Soybean vs. Corn-Corn
Ames, IA (2004)  [P. Pedersen]

Lower yields in C-C than C-SB.
No difference between hybrids

LSD (0.05) Variety = NS
LSD (0.05) Rotation = 21.6 bu/a
LSD (0.05) Variety = NS

Corn-Soybean vs. Corn-Corn
Ames, IA (2005)  [P. Pedersen]

Again...
Lower yields in C-C than C-SB.
No difference between hybrids

LSD (0.05) Variety = NS
LSD (0.05) Rotation = NS
LSD (0.05) Variety = NS

Corn-Soybean vs. Corn-Corn
Ames, IA (2006)  [P. Pedersen]

Yields are the SAME in C-C and C-SB.
No difference between hybrids

LSD (0.05) Variety = NS
LSD (0.05) Rotation = NS
LSD (0.05) Variety = NS
Yields for Corn Rootworm Treatments*

<table>
<thead>
<tr>
<th>Root Injury</th>
<th>Following Soybeans</th>
<th>Following Corn</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.03</td>
<td>150</td>
<td>160</td>
</tr>
<tr>
<td>0.16</td>
<td>170</td>
<td>180</td>
</tr>
<tr>
<td>1.71</td>
<td>190</td>
<td>200</td>
</tr>
<tr>
<td>0.01</td>
<td>210</td>
<td>220</td>
</tr>
<tr>
<td>0.01</td>
<td>230</td>
<td>240</td>
</tr>
<tr>
<td>0.02</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Summary of three Iowa locations, 2006

Summary/Conclusions

• Corn yields are LOWER with C-C relative to C-SB (Range 2 to 23%, 9% average loss). This will affect average yields across the state.

• Continuous corn yields DO NOT ATTAIN the yield level of corn following soybeans.
• Bt Rootworm Hybrids may help reduce these yield penalties.
• Management can help MITIGATE these expected losses.
Nitrogen Management

Apply nitrogen before corn emergence and...

Category: not use the LSNT

Corn on recently manured soils 0-90
Corn after established alfalfa 0-30
Corn after corn 150-200
Corn after soybean (no manure) 100-150

Average Economic Optimum N Rate

Six Nitrogen Rate by Crop Rotation Sites
2000-2004 C-S and C-C Rotations

C-S Economic Yield: 161 bu/acre
C-S Economic N Rate: 108 lb N/acre
C-C Economic Yield: 137 bu/acre
C-C Economic N Rate: 167 lb N/acre
C-C 15% Lower Yield
C-C 59 lb N/acre Higher N Need
Corn Nitrogen Rate Calculator

- http://extension.agron.iastate.edu/soilfertility/nrate.aspx

General Tips
Select the Right Genetics

• Proven ability to perform following a corn crop
  – Bt gene boost in yield?
• Good disease package
  – Northern Corn Leaf Blight
  – Gray Leaf Spot

Manage Corn Rootworms

• Bt and granular insecticides are most consistent

Work With your Soil

• Avoid the soil terrible too’s
  – Hot
  – Cold
  – Wet
  – Dry
  – Firm
  – Loose
Soil Temperature

• Wait for warm soil temperatures or until about April 20.
  - Cold soils slow root growth.
  - Cold soils promote seed / seedling diseases.
  - Cold soils allow more time for insect activity.
• In heavy residue, use row cleaners to allow sunshine to hit the soil.

Soil Density

• Avoid compacting operations, especially when the soil is wet.
  - Fertilizer
  - Lime
  - Manure
• Watch for “sidewall compaction.”
• Be sure there is good seed-to-soil contact at planting.

Deep and Sidewall Compaction
Nitrogen

• Use enough, but not too much

Remember your Planter’s Goals

• Unit penetrates the soil and residue
• Unit makes a firm seed trench
• Unit places the seed at the proper depth and spacing
• Unit closes the trench to give proper seed-soil contact

More Residue to Manage

• Tillage
• Residue Managers
  – Just “tickle” the soil
Are the openers properly adjusted?

- 2 – 2.5 inches?

- “Pinch point” usually 1.5 inches deep
- “Pinch point” should be at or slightly above seed
• Be sure closing assembly straddles the row
• Adjust “Pinch point” with shims

Know the Limitations of Spider Wheel Closers
• Is there adequate seed-soil contact for a dry spring?
• May urge us to run when it is too wet
  – We may be causing severe compaction.
  – We may throw kernels on the surface.

Is the planter sidewall crumbling in?
• Use a spade or trowel at planting
If the sidewall is not crumbling in
- Adjust the down pressure on the closing wheels
- Wait until it is drier

Uniform Plant Spacing
- Non-uniform spacing (Doubles, Skips, etc)
  - Lack of or improper maintenance on metering device
  - Driving at the wrong speed (usually too fast)
  - Planter not level
    - Seeds not move down chute properly
    - Markers perpendicular to soil (most planters)
Planter Suggestions

• Maintain and adjust planter
  - Metering device
  - Residue managers
  - Furrow openers
  - Furrow closers
  - Planter level
  - Coulters at or slightly above planting depth
• Shoot for a corn planting depth at least 1.5 inches deep.
• Watch your speed.

Be Timely

• Planting
• Fertilizing
• Pest Management
• Harvest

Questions? Thank You!!