Use of Seed Treatment to Manage Rhizoctonia in Corn: Experiences from North America

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Introduction

Agenda

• Historical corn yields
• Early development of corn roots
• Resources needed for crop growth
• Disease triangle
• Nibblers vs. Killers
• Evolution of corn disease solutions
• Protecting against rhizoctonia to improve corn yields
Historical corn yields

Iowa Corn Yields
1866-2014

Prof. Kendall Lamkey, Iowa State University
Resources for crop growth and yield

• Nutrients
• Water
• Solar radiation
• Time
Early corn root and shoot development review

Protecting early growth and development improves yield potential and stability throughout the growing season. All leaf and ear shoots have already been initiated by V5.

Images: How a Corn Plant Develops
Special Report No. 48 Iowa State University
Early corn root and shoot development review

- Early crop establishment is critical to yield production
- Lost rooting potential may never be regained
- Protecting developing seedling roots from disease, insects and nematode pests vital to protecting maximum genetic potential
Tillage, Pathogen Activity and Disease

• Crop residue
  • Modify soil moisture and soil temperature
  • Greater pathogen survival in residue on soil surface
  • Greater pathogen density in upper soil profile

• Soil environment and tillage
  • Modify soil moisture and soil temperature
  • Modify plant growth and development
  • Modify pathogen activity and survival

Environment
Pathogen
Host
Problems with Cool and Wet Spring

• Early planting is important to achieve high yields
• Slower corn germination, emergence, and early growth
• Certain soil-borne pathogens are favored by no-tillage
  • Reducing temperature
  • Increasing soil moisture
  • Leaving soil and residue undisturbed
Nibblers vs. Killers

Problem pathogens:

- “Killers” such as Pythium (cereals, corn and soybean)
  - Effects of these pathogens are obvious and generally result in rapid plant decline

- “Nibblers” such as Pythium (cereals, corn and soybean), Rhizoctonia (wheat, corn and soybean) and Fusarium (cereals, corn and soybean)
  - Nibblers can result in 20–30 percent yield reduction
  - Awareness of these diseases is low and often underestimated
Rhizoctonia spp. – “root nibbler”

Low rhizoctonia infection

High rhizoctonia infection
Rhizoctonia spp. – “root nibbler”

• Often a “Top 3” corn disease

• Pre-emergence and post-emergence damping off

• Fine root system is the site the for the most efficient uptake moisture and nutrients, but also most susceptible to disease

• Improving root health through early-season protection offers improved crop performance and consistency
Leading the Evolution of Corn Fungicides

<table>
<thead>
<tr>
<th>Brand Name</th>
<th>Active ingredient</th>
<th>Introduction year</th>
<th>Benefits</th>
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<tbody>
<tr>
<td>Maxim® XL</td>
<td>Fludioxonil</td>
<td>1996</td>
<td>Market Leading Base Fungicide on 97+% corn acres.</td>
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<tr>
<td></td>
<td>Mefenoxam</td>
<td></td>
<td>Spike of Apron XL added to deliver additional <em>Pythium</em> protection.</td>
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<tr>
<td>Apron XL®</td>
<td>Mefenoxam</td>
<td>2000</td>
<td>Leading strobilurin co-fungicide for enhanced <em>Rhizoctonia</em> and <em>Pythium</em>.</td>
</tr>
<tr>
<td>Dynasty®</td>
<td>Azoxystrobin</td>
<td>2003</td>
<td></td>
</tr>
<tr>
<td>Maxim® Quattro</td>
<td>Fludioxonil</td>
<td>2010</td>
<td>Added <em>Fusarium</em> and seed borne disease activity with Thiabendazole.</td>
</tr>
<tr>
<td></td>
<td>Mefenoxam Azoxystrobin</td>
<td></td>
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<tr>
<td></td>
<td>Thiabendazole</td>
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Multi-Year Summary of Sedaxane on Corn

2010 - 2014
Sedaxane effects on corn grain yield

n=97 broad acre non-inoculated trials - 2010-2014

Yield (kg/ha)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Yield (kg/ha)</th>
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<tbody>
<tr>
<td>Untreated Check</td>
<td>11,324</td>
</tr>
<tr>
<td>Base</td>
<td>11,770</td>
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<tr>
<td>Base + Sedaxane 5g</td>
<td>11,901</td>
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</tbody>
</table>

Base = Fludioxonil, Mefenoxam, Azoxystrobin, Thiabendazole, Thiamethoxam
Sedaxane effects on corn grain yield

n=24 trials under high Rhizoctonia pressure (inoculated) 2010-2014

Base = Fludioxonil, Mefenoxam, Azoxystrobin, Thiabendazole, Thiamethoxam, +/- Abamectin
Corn Sedaxane Summary

- Lost rooting potential may never be regained
- Rhizoctonia is a “nibbler”; hidden menace; out of sight
- Impact of Rhizoctonia spp. depends on year and environment
- It takes a healthy root system to
  - protect genetic potential to maximize yield
  - improve yield stability

- Multi-year data shows Sedaxane delivers
  - +131 kg/ha across broad acre
    - 4 years n=97 locations
  - +301 kg/ha under heavy Rhizoctonia spp. pressure
    - 4 years n=24 locations
Thank you