Pests and Diseases in Corn and Soybean: Management in No-Till Systems

Empire Farm Days – Soil Health Workshop – 8/6/19

Jaime Cummings, NYS IPM
Pests and Diseases Prevalent in No-Till Systems

**Diseases**
- Foliar blights
- Stalk rots
- Ear rots and mycotoxins
- Soybean blights

**Pests**
- European Corn Borer
- Black Cutworm
- Slugs
Corn Foliar Diseases

- Gray leaf spot
- Anthracnose
- Eyespot
- N. Corn Leaf Blight
- N. Corn Leaf Spot
Foliar Diseases: Life Cycle and Epidemiology

- Overwinter on corn residues
- Spores transported on rain and wind, local or long-distance
- Severe epidemics in susceptible hybrids
- Severe infection may lead to stalk rots
Corn Foliar Diseases: Management

- Hybrids with partial resistance (race specific?)
- Crop rotation
- Residue management
- Foliar fungicides
Corn Fungicides:

- No firm thresholds
- **Guideline:** disease up to ear leaf at tasseling, on susceptible hybrids in continuous corn with reduced tillage with conducive weather
- At $35-$45/acre, economic return not guaranteed
Fungicides on Corn
When Does it Pay?

Nationwide, replicated university fungicide trials indicated that only 48% of fungicide applications met or exceeded the break-even point for yield increase to cover the cost of the fungicide application.

Results were most beneficial when disease pressure was at least greater than 5%.

Applications in the absence of disease had highly variable results in yield.

Based on 985 trials 4 yrs

Dr. Kiersten Wise, Purdue Univ.
Corn Stalk Rots

- Anthracnose stalk rot
- Diplodia stalk rot
- Gibberella stalk rot
- Fusarium stalk rot
• Pathogens overwinter in corn debris
• Spores disseminated in spring
• Infection through roots pre-tassel
• Late season stresses result in stalk rots and potential lodging
Corn Stalk Rots: Management

- Resistance
  - Foliar disease resistance too!
- Crop rotation
- Residue management
- Early harvest to avoid lodging

- Minimize stress and wounds:
  - Proper plant populations
  - Manage insect pests/damage
  - Adequate fertility
  - Good drainage/moisture

- Fungicides?
  - Only to reduce foliar diseases to minimize stress

Pinch and Push Tests
There are two basic tests to check for stalk rots: the pinch test and the push test.

For a **pinch test**, pinch the stalk somewhere between the lowest two internodes and check whether the stalk is strong enough to withstand the pressure of the pinch. If the stalk collapses, it fails the pinch test.

For a **push test**, push the corn stalk to a 30-degree angle from vertical (approximately 8 inches) at eye level. If the stalk does not spring back to upright when released, it fails the push test.

If 10 percent of the stalks tested in a field fail the pinch or push tests, consider harvesting at a higher moisture content and then drying the grain further after harvest to avoid yield losses due to late-season lodging.

Cornell Cooperative Extension
Integrated Pest Management
Corn Ear Rots

- Aspergillus
- Cladosporium
- Gibberella
- Diplodia
- Phomopsis
- Fusarium

Pioneer.com

Crop Protection Network

Iowa State University

Integrated Pest Management

Cornell Cooperative Extension
Why do we care about ear rots? 

**Mycotoxins**

- Fungal by-products from ear and stalk rot pathogens
- Cause health problems in livestock and humans
- Grain rejections or discount prices
- Heat/Cold stable, cannot be removed

### Breaking it Down

<table>
<thead>
<tr>
<th>Topic</th>
<th>Mycotoxin</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Aflatoxin</td>
</tr>
<tr>
<td>Information on mycotoxin concentration in feed</td>
<td>Lowest action level by FDA is 20 ppb in dairy animals and up to 300 ppb in finishing beef cattle diets</td>
</tr>
<tr>
<td>Source of toxin (fungal)</td>
<td>Aspergillus flavus</td>
</tr>
<tr>
<td></td>
<td>Fusarium graminearum</td>
</tr>
<tr>
<td></td>
<td>Fusarium graminearum</td>
</tr>
<tr>
<td></td>
<td>Fusarium moniliforme and Fusarium proliferatum</td>
</tr>
<tr>
<td>Common problems/symptoms</td>
<td>Liver disease, decreased production and immunosuppression</td>
</tr>
<tr>
<td></td>
<td>Gastric upset, feed refusal and decrease in weight gain</td>
</tr>
<tr>
<td></td>
<td>Estrogen mimic that causes reproductive problems in swine especially</td>
</tr>
<tr>
<td></td>
<td>Lung edema in swine, particularly toxic to horses and donkeys</td>
</tr>
</tbody>
</table>
Ear Rots: Life Cycle and Epidemiology

- Pathogens overwinter on corn debris
- Generally favored by high moisture
- Spread by wind, rain, insects
- Infections may occur through silks or ear damage (insects, hail), or from stalk rots
- Delayed harvest and wet conditions increase fungal growth and mycotoxin development
Ear Rots: Management

- Resistance
- Crop rotation
- Residue management
- Insect management
- Early harvest
- Combine adjustment
  - clean out fines and moldy kernels
- Harvest
  - Separate harvest of infected fields
- Post-harvest
  - Cool below 50F
  - Dry immediately 13-15% moisture
  - Store moldy grain separately
  - Test for mycotoxins

Fungicides? Gibb Ear Rot: Variable efficacy based on disease severity, coverage and weather
What about soybean diseases?

- Most corn pathogens do not infect soybeans
- Soy residues break down more quickly
- Not many yield-limiting soy foliar diseases in NY affected by tillage
Soybean diseases that overwinter in residues:

- Anthracnose
- Frogeye leaf spot
- Downy mildew
- Brown spot
- Phomopsis/Pod and stem blight
- Cercospora leaf blight
Management of Soybean Foliar Diseases

- Resistant varieties (FELS race specific)
- Pathogen-free seed
- Crop rotation
- Fungicides?
  - Often not economical but occasionally warranted
What about White Mold?

- Sclerotia long-lived in soil with or without residues
- Debate over effects of tillage
- **Management**: crop rotation, weed management, canopy, biocontrol, fungicides (R1-R3)
**Summary of Key Results:**

Within-column means followed by different letters are significantly different (P < 0.05; Tukey multiple comparison procedure).

**Fungicide Application Timing:**
- **A:** July 19 (R2 growth stage, just prior to canopy closure in soybeans seeded to rows 7 and 14 inches apart)
- **B:** July 25 (late R2 to early R3 growth stage, just prior to canopy closure in soybeans seeded to rows 21 inches apart)
- **C:** August 7 (R4 growth stage, at canopy closure in soybeans seeded to rows 28 inches apart)

Fungicides were applied with 800VS flat fan nozzles in 15 gallons of water per acre at 30 psi.

### Sclerotinia Incidence (Percent)

<table>
<thead>
<tr>
<th></th>
<th>Combined</th>
<th>7-inch Row</th>
<th>14-inch Row</th>
<th>21-inch Row</th>
<th>28-inch Row</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Non-treated check</strong></td>
<td>62 b</td>
<td>65 a</td>
<td>64 a</td>
<td>64 b</td>
<td>55 b</td>
</tr>
<tr>
<td><strong>Proline 3 fl oz/ac + Topsis 20 fl oz/ac</strong></td>
<td>53 ab</td>
<td>60 a</td>
<td>64 ab</td>
<td>39 a</td>
<td>49 a</td>
</tr>
<tr>
<td><strong>Aproach 9 fl oz/ac + NIS 0.25% v/v</strong></td>
<td>62 b</td>
<td>65 a</td>
<td>68 b</td>
<td>66 b</td>
<td>48 ab</td>
</tr>
<tr>
<td><strong>Endura 5.5 oz/ac</strong></td>
<td>54 ab</td>
<td>60 a</td>
<td>54 ab</td>
<td>52 ab</td>
<td>51 ab</td>
</tr>
<tr>
<td><strong>Endura 8 oz/ac</strong></td>
<td>44 a</td>
<td>52 a</td>
<td>55 a</td>
<td>37 ab</td>
<td>30 a</td>
</tr>
</tbody>
</table>

### Yield (Bushels/Acre)

<table>
<thead>
<tr>
<th></th>
<th>Combined</th>
<th>7-inch Row</th>
<th>14-inch Row</th>
<th>21-inch Row</th>
<th>28-inch Row</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Non-treated check</strong></td>
<td>37 b</td>
<td>36 a</td>
<td>37 a</td>
<td>38 ab</td>
<td>38 a</td>
</tr>
<tr>
<td><strong>Proline 3 fl oz/ac + Topsis 20 fl oz/ac</strong></td>
<td>42 ab</td>
<td>37 a</td>
<td>41 ab</td>
<td>48 ab</td>
<td>40 a</td>
</tr>
<tr>
<td><strong>Aproach 9 fl oz/ac + NIS 0.25% v/v</strong></td>
<td>37 a</td>
<td>38 a</td>
<td>34 a</td>
<td>39 b</td>
<td>39 a</td>
</tr>
<tr>
<td><strong>Endura 5.5 oz/ac</strong></td>
<td>43 a</td>
<td>41 a</td>
<td>42 a</td>
<td>47 ab</td>
<td>41 a</td>
</tr>
<tr>
<td><strong>Endura 8 oz/ac</strong></td>
<td>45 a</td>
<td>43 a</td>
<td>41 a</td>
<td>53 a</td>
<td>45 a</td>
</tr>
</tbody>
</table>

---

**Recommended boom height for 110 degree flat fan nozzles spaced 20 inches apart when applying fungicides in 30-inch tall soybeans.**

- **Boom:** Michigan State University
- **30”:** 16 – 18”
- **20” Target:** 10” Bottom Leaf

---

2013, M. Wunsch, NDSU
Yield difference produced by two white mold fungicides in 2017 & 2018

Omega application breakeven increase (6.1 bu/ac)
Propulse application breakeven increase (2.9 bu/ac)

Omega cost = $45.28 per acre (12oz rate)
Propulse cost = $16.40 per acre (6oz rate)
application cost = $7.50 per acre

*The yield difference between the fungicides and the control was statistically significant

*Slide courtesy of Mike Staton

Michigan Soybean Promotion Committee
www.michigansoybean.org

SMaRT Soybean Management and Research Technology

Michigan State University Extension

15.9
4.8
0.1
1.4
5.1
1.4
3.7
18.1
2.9
2.6
1.7
1.5
2.8
3.4
6.3
2.6
4.9

20
15
10
5
0

Yield difference (bu/ac)


Omega Propulse
Corn Insect Pests Enhanced by No-Till

European corn borer

Ohio State Univ.

Slugs

Univ. of KY

Ohio State Univ.

Cornell Cooperative Extension

Integrated Pest Management
European Corn Borer

- Overwinters as larvae in cornstalks/stubble
- Moths emerge late-May to early-July
  - 2nd generation moths late-July – early-September
- Lay eggs underside of leaves, like fish scales
- Larvae feed on leaves and then tunnel into all parts
- Damage to stalks and ears

Management:

- Resistance Bt Traits (Cry1F, Cry1Ab)
- Cut stalks low to minimize overwintering
- Tillage
- Insecticide - *timing: larvae <1/2”, before bore into plants
  - Rarely necessary

Threshold:

1st Generation
75% or more of the plants show larval feeding in the whorl

2nd Generation
100 egg masses per 100 plants
Slugs

• Mollusks, not insects
• Gray garden*, marsh, dusky and banded slugs
• Thrive in no-till, high-residue, cool/wet weather
• Mostly feed at night, hide during day
• Continuous mating and egg laying
• Overwinter in soil as eggs/adults/juveniles

Management:
• Tillage or residue management (disking)
• Early planting
• Row cleaners
• Ground beetles and other predators – use insecticides sparingly
• Slug baits, not economical
• Nitrogen solution sprays? – 30% urea 1:1 water @ 20 gal/A
A couple other things to mention....
WHY YOU NEED TO TEST YOUR FIELDS
to know your numbers.

Even with an attrition rate of 99% — meaning only 1% of eggs survive each generation — this is how quickly SCN egg populations can build up on a plant in three generations.

0.01 = 99% attrition

Let's start with 200 eggs

- After 1 generation:
  - Females: 100
  - Males: 100

- After 2 generations:
  - Females: 125
  - Males: 125

- After 3 generations:
  - Females: 156
  - Males: 156

Total: 39,062 eggs

Beginning of the season

There can be 5 or 6 generations per growing season in some areas.

End of the season

Cornell Cooperative Extension
Asian Long-Horned Tick

- Parthenogenic: no males necessary for reproduction
- Up to thousands of ticks per animal
- Significant risk to the dairy and livestock industry from tick-borne theileriosis, a malaria-like disease that results in anemia
Thank You!

Questions?

Jaime Cummings  
NYS IPM  
jc2246@cornell.edu