2008 Agronomy Update Meetings

Waunakee, Platteville, Janesville, Sparta, Eau Claire, Wausau, Kimberly, and Fond du Lac

Joe Lauer
University of Wisconsin

Cooperating with Rock, Fond du Lac, Outagamie, Grant, Marathon, Eau Claire, Monroe, and Dane Counties

January 3 - 9, 2008
Rationale and Situation

- A one bushel increase by WI corn farmers increases farm income $8 to $16 million dollars annually.
- In 2007, 534 corn hybrids were tested at 15 WI locations.

Objective

- To provide unbiased performance comparisons of hybrid seed corn available in Wisconsin.
Highlights for corn production during 2007

• Records
  ✓ Four locations had a 10-yr average > 200 bu/A

• Growing season
  ✓ Lost grain trials at 1 site
    ❑ Third year of drought in NW WI
  ✓ Significant Anthracnose in southern WI

• New things in the Hybrid Trials
  ✓ Expanded organic hybrid testing
  ✓ Maturity based on company ratings
    ❑ MN rating system sunset in 2006
## 2007 Wisconsin Corn Performance Trials
### Grain Summary

<table>
<thead>
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<td>120</td>
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## 2007 Wisconsin Corn Performance Trials

### Silage Summary

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<th>Location</th>
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<th>2007 N</th>
<th>Yield</th>
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<td>7.1</td>
<td>66</td>
<td>6.5</td>
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</table>
Frequency of ‘Non-Transgenic’ Corn Hybrids Yielding Above and Below the Trial Average in UW Trials

- **Frequency above average**
- **Frequency below average**
Continuous corn? Or rotate in 2008? Wisconsin Corn Acreage

Crop Acres

- Corn For Grain
- Corn For Silage
- Soybeans
- Forage Alfalfa
- Hay Other
- Oats
- Wheat All
- Total

Total Acres


Source: USDA-NASS
Continuous corn, or rotate in 2008?
Wisconsin Corn Use

Sources: USDA-NASS
NCGA: The World of Corn

Ending stocks
Residual/Exports
Feed
Ethanol
Corn production

Million Bushels

-100 0 100 200 300 400 500


http://corn.agronomy.wisc.edu

University of Wisconsin - Agronomy

Lauer © 1994-2008
The rotation effect lasts two years increasing corn grain yield 10 to 19% for 1C and 0 to 7% for 2C ...

Corn Yield Response Following Five Years of Soybean

Grain Yield (bushels/acre)

1987-2006

Control treatments averaged across tillage treatments at Arlington, WI.

Cropping Sequence
C= Corn, S= Soybean, Number = consecutive year of corn

Source: Lauer

http://corn.agronomy.wisc.edu

13
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University of Wisconsin - Agronomy
If there is only a one year break in the rotation, then the second corn phase is equivalent to continuous corn ...

Corn Yield Response to Crop Rotation

Control treatments averaged across tillage treatments at Arlington, WI.

Cropping Sequence
C= Corn, S= Soybean, Number = consecutive year of corn

Source: Lauer

http://corn.agronomy.wisc.edu

Lauer © 1994-2008
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At least two break years are needed to measure a response in the second corn phase (compared to CC) ...
Adding a third crop does not increase corn grain yield, but does improve soybean grain yield ...

Source: Lauer

Corn and Soybean Yield Response to Crop Rotation

Cropping Sequence
C= Corn, S= Soybean, W=Wheat
2004-2006: Values averaged across seed fungicide treatments at Arlington, WI.
Modern corn hybrids and management practices have the same rotation response as older hybrids and practices ...

**Corn Yield Response Following Five Years of Soybean**

Control treatments averaged across tillage treatments at Arlington, WI. Transgenic hybrids used since 1998.

Source: Lauer

C= Corn, S= Soybean, Number = consecutive year of corn
Conclusions

• Mechanism for rotation effect is unknown

✓ Hypothesis #1: One factor causes effect.

✓ Hypothesis #2: Multiple factors cause effect and risk of expression depends upon the environment.

• The rotation effect lasts at most two years increasing grain yield 10 to 19% for 1C and 0 to 7% for 2C.

• At least two break years are needed to measure a response in the second continuous cropping year.

✓ A one year break using soybean reduces the rotation effect in the second continuous year.

• Adding a third crop does not improve corn yield, but does improve soybean yield.

• Modern corn hybrids and management practices have the same rotation response as older hybrids and practices.
Using the Bt-CR Transgene on the Farm
Field Symptoms of Corn Rootworm (*Diabrotica sp.*)

- CRW is the most serious insect pest complex in the major corn producing regions of the north central U.S. and Canada (Levine and Oloymi-Sadeghi, 1991)
- Crop rotation with soybean is estimated to be used on 80% of the north central U.S. acreage and is the most common pest management practice for corn rootworm control. (Ellis et al., 2002 and USDA-NASS)
Corn Rootworm Behavioral Adaptations

- Northern corn rootworm (Diabrotica barberi Smith and Lawrence biotype)
  ✓ Extended diapause where eggs remain in the soil an extra year and hatching is delayed until corn is planted again.

- Western corn rootworm (Diabrotica virgifera virgifera LeConte)
  ✓ Lay eggs in soybean fields. Eggs are ready to hatch next year when planted to corn
  ✓ First year corn rootworm damage observed after:

Photos by Rice (Iowa)

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University of Wisconsin - Agronomy
Mon863 (n=940) advantage to non-transgenic (n=1116) corn hybrids

All hybrids
Top 20% of hybrids

<table>
<thead>
<tr>
<th>Year</th>
<th>Transgenic</th>
<th>Non-Transgenic</th>
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<tbody>
<tr>
<td>2003 (n=11)</td>
<td>7</td>
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<tr>
<td>2004 (n=39)</td>
<td>-7</td>
<td>-10</td>
</tr>
<tr>
<td>2005 (n=59)</td>
<td>11</td>
<td>-10</td>
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<tr>
<td>2006 (n=364)</td>
<td>8</td>
<td>-7</td>
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<tr>
<td>2007 (n=467)</td>
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<td>-7</td>
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<tr>
<td>Average</td>
<td>5</td>
<td>-5</td>
</tr>
</tbody>
</table>

Source: Lauer

Grain yield (bu/ A) advantage

Mon863 (n=36)
-9
-15

Mon863+ Mon810 (n=81)
-15
-20

Mon863+ Nk603 (n=165)
-10

Mon863+ Mon810+ Nk603 (n=655)
10

Source: Lauer

Lauer © 1994-2008
University of Wisconsin - Agronomy
http://corn.agronomy.wisc.edu
Corn rootworm control method is not affected by rotation phase …

**Corn Yield Response Following Five Years of Soybean**

- **DAS591227**
- **Force3G**
- **Mon863**

Averaged across tillage treatments during 2006-2007 at Arlington, WI.

**Source:** Lauer

C= Corn, S= Soybean, Number = consecutive year of corn
Corn rootworm control method is affected by corn rootworm pressure ...

Source: Lauer and Cullen

Corn Rootworm Pressure on UTC Isoline = Iowa Root Rating (0-3)

$\text{LSD}(0.05) = 5$

2004-2006
Average yield = 227 bu/A

$\text{Low} = 0.03$

$\text{Medium} = 1.17$

$\text{High} = 1.62$

\[\text{Force3G Bt-CR} \quad \text{Force3G Isoline} \quad \text{UTC Bt-CR} \quad \text{UTC Isoline}\]
Guidelines

Controlling Corn Rootworm

- **Transgenic hybrids**
  - ✓ Early reports indicate equivalent control to chemical methods

- **Chemical control**
  - ✓ Numerous products are labeled.

- **Resistant hybrids**
  - ✓ No hybrids are resistant. Some are tolerant and have the ability to outgrow rootworm damage and regenerate roots better than other hybrids.

- **Crop rotation**
  - ✓ Need good weed control to prevent CRW adult attraction to weed flowers.

- **Management**
  - ✓ Plant late to starve larvae, but not practical due to yield penalty.

- **Natural control**
  - ✓ Ground beetles and predacious mites feed on corn rootworm eggs, larvae and pupae

Advantages of Bt-CR

- **Reduces reliance on insecticide applications**
- **Consistent performance under variable field conditions**
- **Excellent safety profile**
  - ✓ Human health
  - ✓ Non-target organisms
  - ✓ Environmental

- **Laboratory and field studies demonstrate high level of control**

- **One generation of selection per year**
  - ✓ Not active against adult rootworm or other root / seed feeding insects. No acute toxicity to adult WCR observed
  - ✓ No long term effects observed on beetle survival or fecundity
To spray or not to spray - Will foliar fungicides be routine in the new corn production economics?

- Fungicide use on corn in 2007
  - IA & IL: > 6 million acres sprayed
- Most acres applied had little or no disease at the time of application
- Results of trials mixed
- Some damage reported, some of it severe. NO confirmed correlation between damage and fungicide.
## Corn and Fungicide in Wisconsin

<table>
<thead>
<tr>
<th>Year</th>
<th>Previous Crop</th>
<th>Tillage</th>
<th>No Fungicide</th>
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<th>Fungicide Increase</th>
<th>Did it pay?</th>
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**Source:** Lauer

Headline @ VT - Arlington
## Corn and Fungicide in Illinois (Nafziger, 2007)

<table>
<thead>
<tr>
<th>Location</th>
<th>Previous crop</th>
<th>Grain yield</th>
<th>Did it pay?</th>
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<tr>
<td></td>
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*Statistically significant at P=0.1.*
Corn and Fungicide in Iowa (Elmore, 2007)

- A 3.3 bu/acre advantage is below the yield necessary to cover fungicide and application costs.

- Fungicides decreased foliar disease severity and stalk rot severity but did not always result in a positive or profitable yield response.
Fungicides on Corn in 2008?

• Fungicide damage was related to weather and crop conditions in 2007, but it could happen again - may not want to apply pre-tassel.

• The 2008 growing season is several months away, but decisions are already being made regarding purchase of fungicides.
  ✓ Fungicides should be used as a “tool” (along with other IPM practices) – to control diseases that are present and/or almost certain to be a problem.

• Consider the following factors before spraying in 2008:
  ✓ hybrid susceptibility,
  ✓ disease pressure at VT,
  ✓ weather conditions at VT and during grain fill,
  ✓ previous crop,
  ✓ the amount of crop residue present in the field,
  ✓ fungicide and application cost,
  ✓ grain price, and
  ✓ directions and restrictions on product label

• There’s no real evidence that CC (no-and strip-till), routinely needs fungicide more often, but Anthracnose and Gray Leaf Spot inoculant potential is higher.
Guidelines for Using a Fungicide on Hybrid Corn

- In general, a fungicide application is not recommended on resistant hybrids.
- On susceptible hybrids, a fungicide application may be warranted if disease is present on the third leaf below the ear leaf or higher on 50 percent of the plants at tasseling.
- With intermediate hybrids, a fungicide need only be applied if conditions are favorable for disease development
  - Spray if disease is present on the third leaf below the ear leaf or higher on 50 percent of the plants at tasseling, and
  - the weather is warm and humid, and
  - the field has a history of Gray Leaf Spot and/or Anthracnose, and
  - >35 percent corn residue is present.
Thanks for your attention!
Questions?

2008 Corn Conferences

- Rice Lake
  - January 10

- Richland Center
  - January 22

- Johnson Creek
  - January 21

January 24-25, 2008
Kalahari Resort
Wisconsin Dells, WI