Foliar Fungicides for Corn

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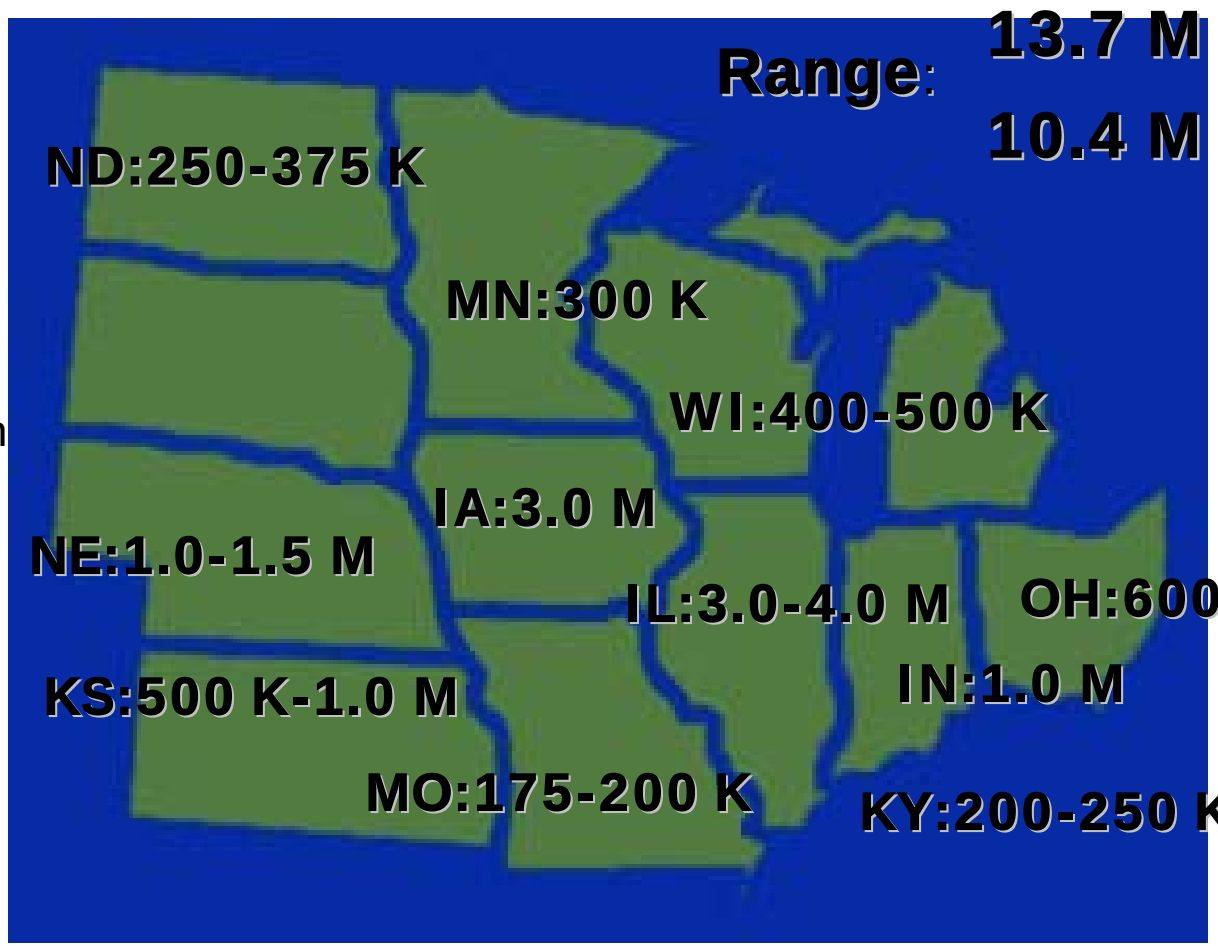
2007 - In Review

- Dramatic increase in the use of foliar fungicides on corn across the Corn Belt (next slide)
  - *"Plant Health"*
  - Ranges:
    - 175,000 - 200,000 acres (Missouri)
    - 3 - 4 million acres (Illinois)
- Estimated: ~ 10-15% of corn acres treated
  - 2007 U.S. Corn Production = 93.6 million acres
  - At **10%**, approximately 9-10 million acres
    - While fungicide cost is variable, at $20/acre (application + product) = **$180-200 million dollars**

Estimated Acres Receiving Fungicide Applications



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Slide Courtesy: Gary Munkvold

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2007 University Fungicide Trials

- Data collected and shared by Carl Bradley, University of Illinois
- Trial data obtained from:
  - Illinois, Indiana, Iowa, Kansas, Kentucky, Maryland, Minnesota, Missouri, Nebraska, North Dakota, Ohio, Ontario, **Wisconsin**
  - Total of 168 trials
    - 89 with Headline, 6 fl oz/A
    - 37 with Quilt, 14 fl oz/A
    - 42 with Stratego, 10 fl oz/A

Product Details - Pyraclostrobin

- Headline® (BASF)
- FRAC Group 11
- Check label regarding ground versus aerially applied recommendations
- Control of Diseases:
  - Common rust, Southern rust, Gray leaf spot: 6 to 9 fl oz/A
  - Anthracnose, Northern corn leaf blight, Northern corn leaf spot: 9 to 12 fl oz/A
- Restrictions:
  - Do not apply within 7 days of harvest
  - Do not exceed 72 fl oz/A or make > 2 applications per season

Product Details - Azoxystrobin and Propiconazole

- Quilt® (Syngenta)
- FRAC Group 3, 11
- Check label regarding ground versus aerially applied recommendations
- Control of Disease:
  - Northern corn leaf blight, Northern corn leaf spot, Rusts, Gray leaf spot, Eyespot: 7-14 fl oz/A
- Restrictions:
  - Do not apply within 30 days of harvest
  - Do not apply > 56 fl oz/A per season
  - Do not apply > 28 fl oz (0.224 lb a.i. propiconazole) for corn harvested for silage

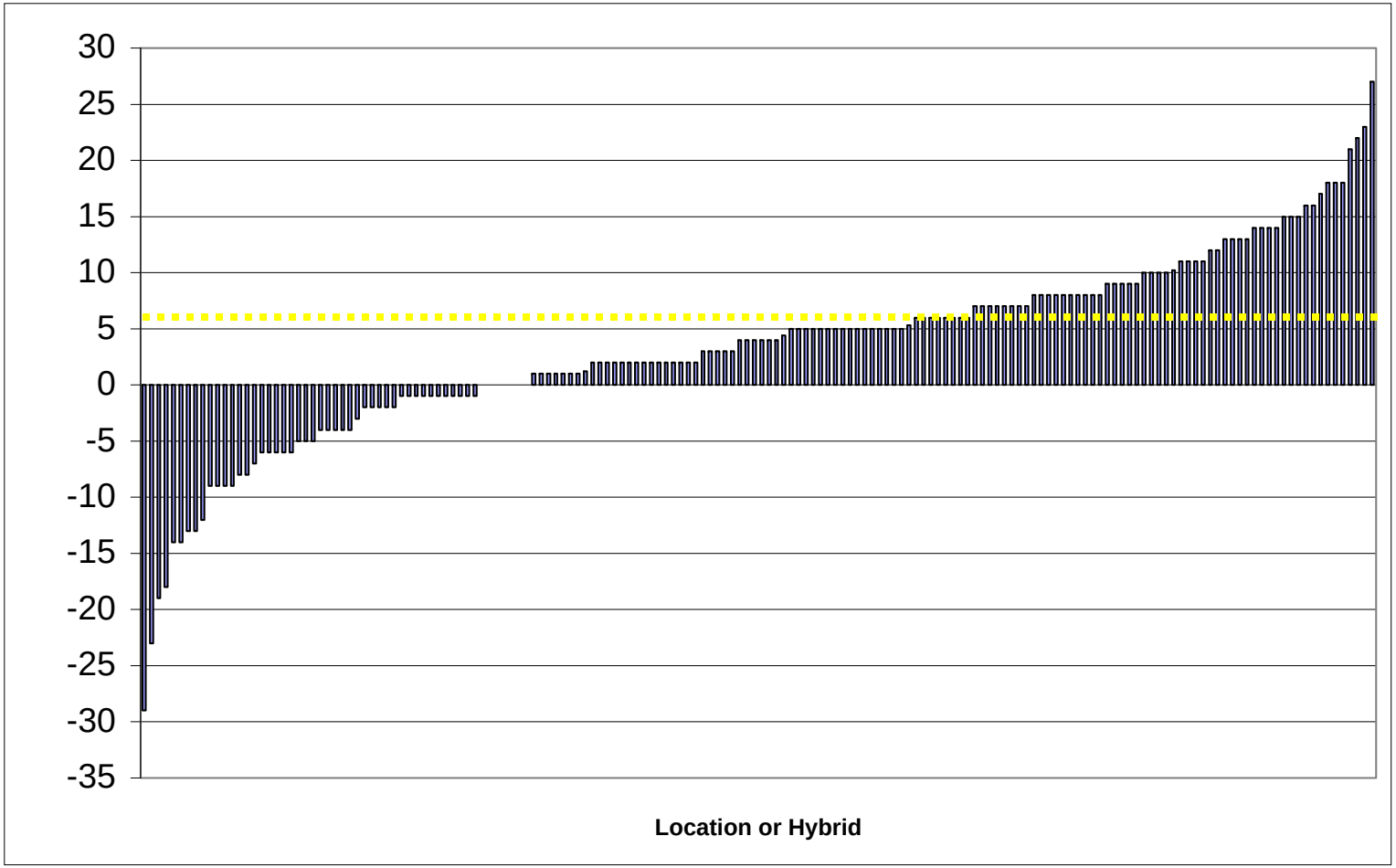
Product Details - Propiconazole and Trifloxystrobin

- Stratego® (Bayer CropScience)
- FRAC Group 3, 11
- Timing: Between V4 to after silking
- Control of Diseases:
  - Rust: 7-10 fl oz/A
  - Eye spot, Gray leaf spot, and Helminthosporium leaf blights: 10-12 fl oz/A
- Restrictions:
  - Do not apply > 36 fl oz/A per crop
  - Do not apply to field corn and field corn grown for seed after silking
  - Do not graze or harvest for forage within 30 days of application

Trial Requirements and Economic Assumptions

- Trial types: mixture of on-farm strip and small-plot trials
- Minimum number of replications per location: 3
- Majority ground-applied (three trials aerially applied)
- Fungicide applications between VT and R1
  - Not all products used in every trial
- Data represents unique location or unique hybrid
- Economic assumptions for analysis:
  - Fungicide treatment = $20/A
  - Market price = $3.50/bu
  - ***Breakeven point = 6 bu/A***

Combined Trials for Headline, Quilt, and Stratego



63 out of 168 = 38% of the time had a yield increase of 6 bu/A or greater.

Mean = 3 bu/A increase over the untreated

Slide Courtesy: Carl Bradley

Headline

- Yield range (+/- to untreated check): -18 to +23 bu/A
- Trials: 44% (39 of 89) trials had yield increase of 6 bu/A or greater
- States/Province: Illinois, Iowa, Kentucky, Maryland, Minnesota, Nebraska, North Dakota, Ohio, Ontario (Canada)

Quilt

- Yield range (+/- to untreated check): -23 to +27 bu/A
- Trials: 35% (13 of 37) had yield increase of 6 bu/A or greater
- States: Illinois, Indiana, Iowa, Nebraska, Wisconsin

Stratego

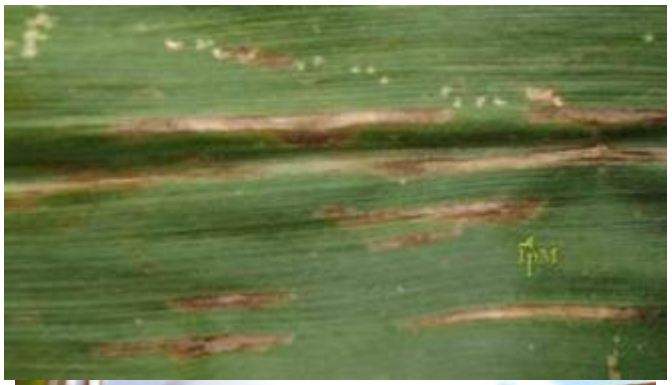
- Range (+/- to untreated check):
  -29 to +18 bu/A

- Trials: 26% (11 of 42) had yield increase of 6 bu/A or greater

- States: Illinois, Iowa, Kansas, Nebraska

Gray Leaf Spot (GLS)

- *Cercospora zeae-maydis*
- Yield losses can range from 5 to 40 bu/A
  - Even total field losses reported
- Increased under reduced and no-tillage systems
- Early infection = higher yield loss
- Environment:
  - High humidity (leaf wetness)
  - Warm temperatures



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Role of Resistance (GLS)

- Hybrids rated as “fair-to-poor”:
  - 52% of trials (16 of 31) had an increase of 6 bu/A or more
  - Mean increase = 6 bu/A (breakeven point)
- Hybrids rated as “good-to-excellent”:
  - 39% of trials (47 of 121) had an increase of 6 bu/A or more
  - Mean increase = 3 bu/A

Effect of Previous Crop

- Assumption: corn-following-corn leads to increased disease pressure
- Previous crop = corn
  - Range: -29 to +22 bu/A
  - 28% (19 of 68) had yield increase of 6 bu/A or greater
  - Mean = 1 bu/A
- Previous crop = soybean, sugarbeet, or wheat
  - Range: -5 to +27 bu/A
  - 41% (21 of 51) had yield increase of 6 bu/A or greater
  - Mean = 5 bu/A
- Other factors - Tillage? Previous disease pressure? Insects? Bt versus non-Bt? Fertility?

Fungicides Using an IPM Approach

- Consideration of Multiple Factors:
  - Knowledge of corn hybrid susceptibility
  - Disease pressure at or around VT?
    - Arkansas, 2007 (Scott Monfort, *Personal Communication*)
      - Applications weeks ahead of Southern rust
  - Previous cropping history
- Decision to apply - good farming practices:
  - Follow label recommendations for rates, timing and use of adjuvant
  - Mix and alternate different modes of action
  - Economics?

Resistance Management

- FRAC (www.frac.info) = Fungicide Resistance Action Committee
  - Works to reduce the risk of fungicide resistance through identifying potential problems, recommending methods for research studies, and information delivery through open collaboration across all levels from farm to market
- Group 3: DMI-fungicides, **Medium risk**
- Group 11: QoI-fungicides (Strobilurins), **High risk**
- All products discussed, labels have recommendations regarding application amount and frequency per season

Timing and Application Methods

Does it Pay - Breakeven Points

Application Cost	Fungicide Cost	Corn market value ($/bu)				
		2	2.5	3	3.5	4
6	10	8.0	6.4	5.3	4.6	**4.0**
	15	10.5	8.4	7.0	6.0	5.3
						6.5
						7.8
8						4.5
						5.8
						7.0
						8.3
10						5.0
						6.3
						7.5
	25	17.5	14.0	11.7	10.0	8.8
12	10	11.0	8.8	7.3	6.3	5.5
	15	13.5	10.8	9.0	7.7	6.8
	20	16.0	12.8	10.7	9.1	8.0
	25	**18.5**	14.8	12.3	10.6	9.3

Jan. 8, CBOT Price = $4.65/bu (Open)

At $15/acre for fungicide = 3.2 bu

At $20/acre for fungicide = 4.3 bu

At $25/acre for fungicide = 5.4 bu

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Summary

- Profitability for using a foliar fungicide was variable across the Corn Belt
  - Numerous factors involved
- To spray or not to spray? Consider:
  - Hybrid susceptibility, and to which diseases
  - Crop rotation
  - Growth stage
  - Application timing
  - Application method

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Further Information

- Boerboom, C., Cullen, E., Esker, P., Flashinski, R., Grau, C., Jensen, B., Renz, M. 2007. Pest Management in Wisconsin Field Crops-2008, UW-Extension (A3646)

Acknowledgements

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