HOW APPLICATION TECHNOLOGY FOR FHB HAS CHANGED OVER THE DECADE

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Discussion

- Methodology
- Spray Systems Evaluated
- Components of Spray Systems
- Adjuvants
- Chronology of Research

Quantification and Qualification Methods

- Fungicide Efficacy
  - FHB Incidence and Severity; DON

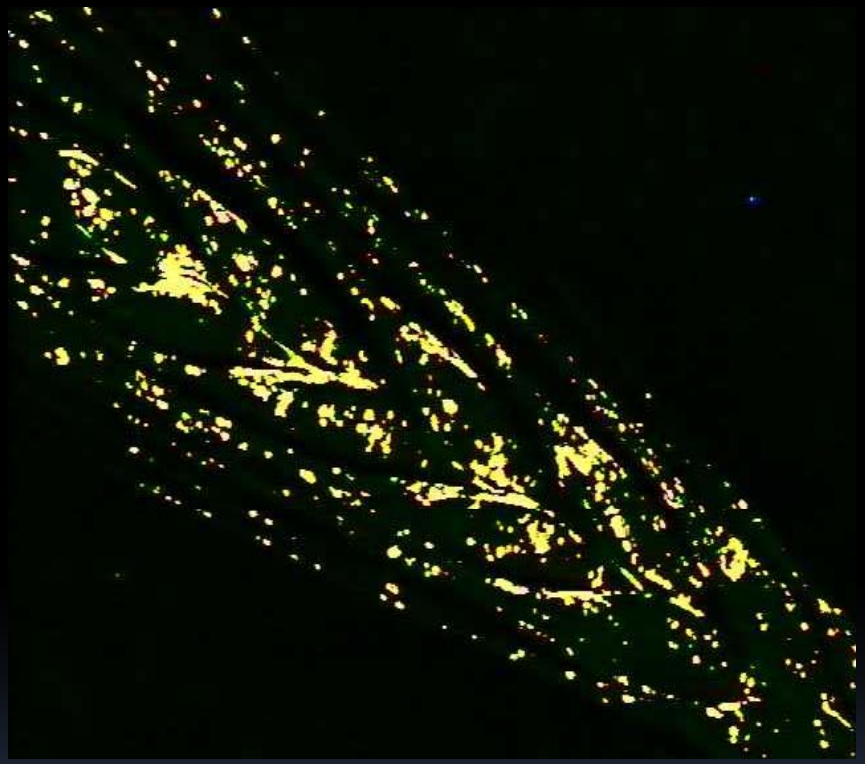
    Yield, Test Weight, Plump, 1000 Kernel Weight
- Secondary Measurements
  - Direct Fungicide (Bayer Method)
  - Area Coverage with Fluorescent Dye and Water and Oil Sensitive Paper
  - Deposition Approximation (Determined by removing a food grade dye included in the spray solution from the grain heads and quantifying with photospectrometer)

Application Technology Research in Dr. Marcia McMullen's Wheat and Barley Scab Greenhouse

Unsprayed Plants

Greenhouse Track Sprayer

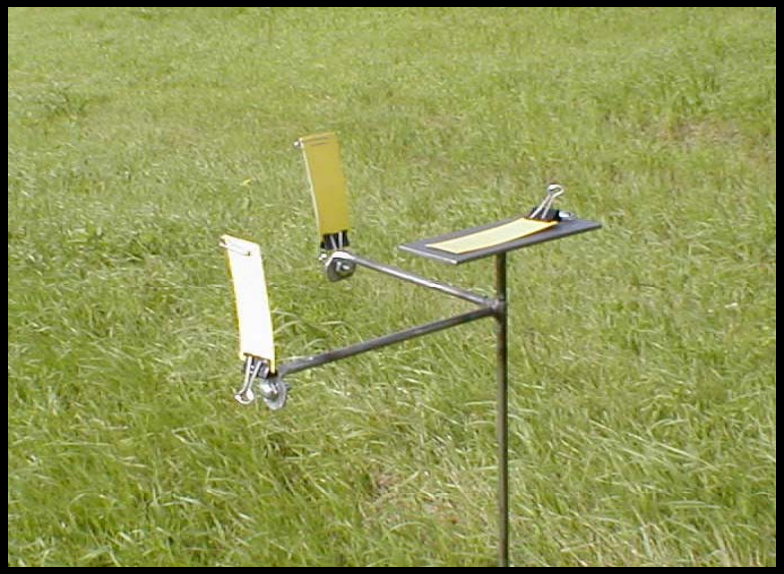
Incandescent Light



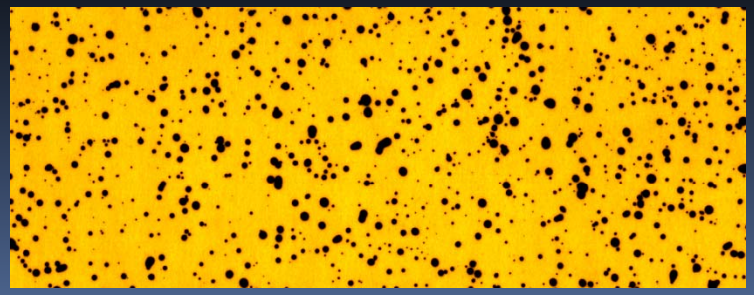
Fluorescent Light

Area of Coverage

Field Samplers



Water Sensitive Paper



Deposition Quantification

FHB Incidence, Severity, DON, Yield, Test Weight, Plump

Visual Disease Assessment

Plot Harvesting

Major Spray Systems Used for Applying Fungicide to Small Grains

- Spraying Systems
  - Ground Application
    - Hydraulic Delivery
    - Air Delivery
  - Aerial Application

Hardi Twin Air Delivery System

Aerial Application

Cessna Ag Truck

Air Tractor

Alternative Fungicide Application Spray Systems

Electrostatic

Rotary Atomizer

System Components

- Spray Volume
- Drop Size
- Orifice Delivery Angle (relative orientation to target)

  and Delivery Distance

Deoxynivalenol Concentration (PPM) in Barley, Durum, and Hard Red Spring Wheat after Prothioconazole Fungicide Application at Different Spray Volumes

Volume	Barley	Barley	Durum	HRSW
(GPA)	Early 2005	Late 2005	2004 & 2005	2005
5	1.2	2.2	2.4	0.8
10	1.4	1.4	2.3	1.1
20	1.9	1.6	2.7	1.5
Untreated	2.5	3.1	5.5	3.3
LSD (p>0.05)	0.4	1.3	1.7	0.8

Prothioconazole Fungicide Residue Collected on Hard Red Spring Wheat (HRSW) Heads Comparing Fine, "Large" Fine, and "Large" Medium Size Drops Applied With Forward and Backward Facing Nozzles

Drop Size	Spray Volume	Prothioconazole Residue
	GPA	(PPB)
Fine (<250)	10	6.2385
"Large" Fine (300-350)	10	7.4525
"Large" Medium (>400)	10	4.835

Nozzle Orientation

Vertical Nozzles

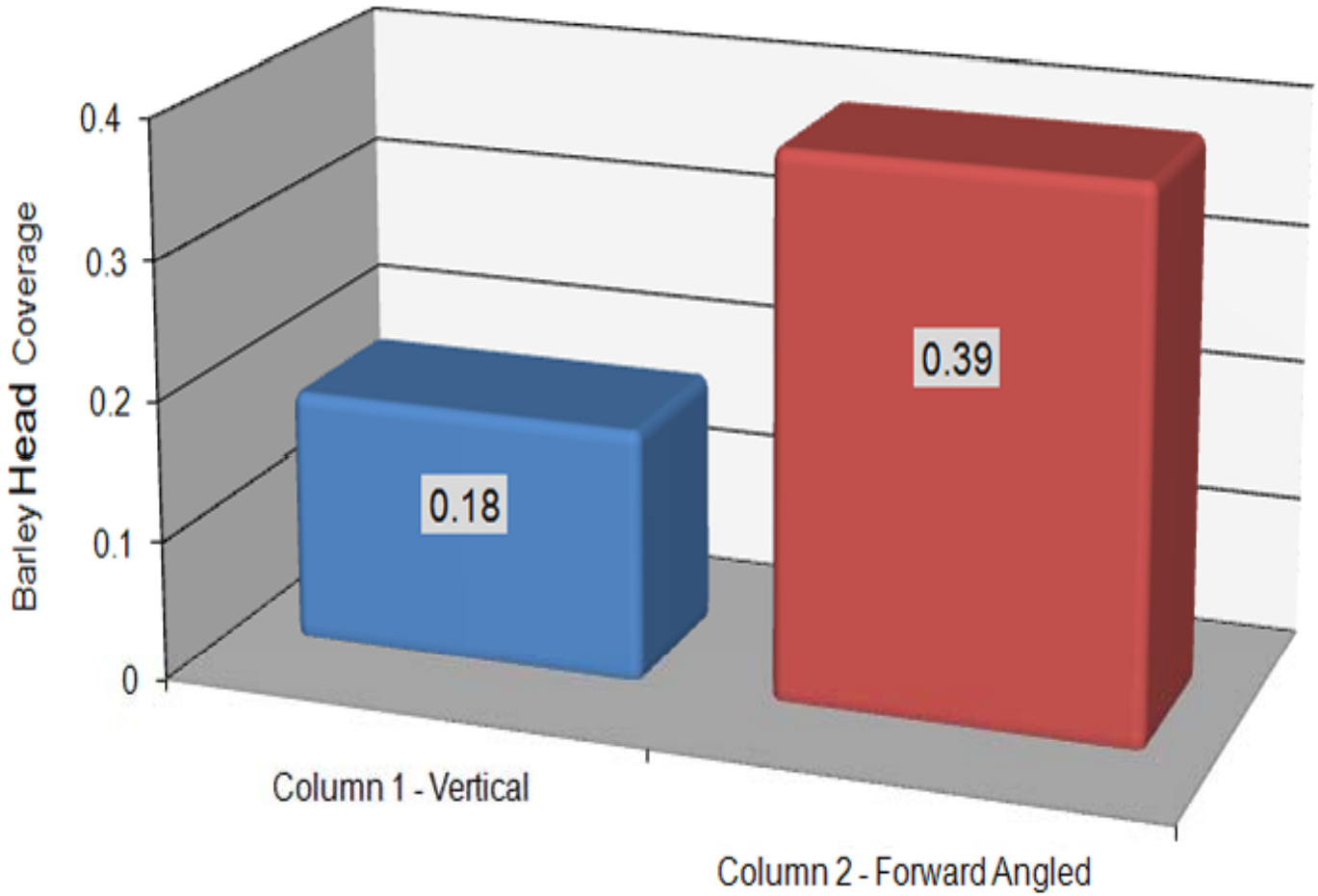
Forward Angled Nozzles

Prothioconazole Fungicide Residue Collected on Hard Red Spring Wheat (HRSW) and Barley Heads Comparing Forward and Forward and Backward Facing Nozzles

Crop	Nozzle Orientation	Prothioconazole Residue (ppb)
HRSW		
	Forward	9.744
	Forward + Backward	7.522
Barley		
	Forward	7.351
	Forward + Backward	7.406

Fungicide applied with fine drops in 10 GPA spray volume with a tractor mounted sprayer traveling at 6 MPH

Relation of Dye Coverage on Barley Heads with Forward Angled (30 Degrees down from horizontal) and Vertical Nozzles



Air Delivery System

Source of variation and confidence levels for significant differences among deoxynivalenol (DON) levels on barley and deposition on hard red spring wheat (HRSW)

	Barley DON		HRSW Deposition	
	'07	'08	'07	'08
Drop Size	0.6906	0.3822	<0.0001	<0.0001
Orifice Angle	0.2186	0.2806	0.1199	<0.0001
Air Stream Speed	0.1283	0.6610	0.1487	0.0057
Drop* Angle	0.1958	0.0283	<0.0001	0.0003
Drop*Air	0.5468	0.7271	0.4678	0.0374
Angle*Air	0.3722	0.1148	<0.0001	0.0006
Drop*Angle*Air	0.0295	0.5605	0.0293	<0.0001
% C.V.	53.8	62.4	26.0	18.9

Deposition and Deoxynivalenol Accumulation after Treatment with Prosaro Fungicide and Adjuvant

Treatment	Adjuvant Rate	Deposition	DON
		Absorbance	PPM
Untreated		0.042	1.14
No adjuvant		0.112	0.76
Interlock+ Preference	2 fl oz/a + 0.25% v/v	0.224	0.34
AG 6011	6 fl oz/a	0.231	0.00
Interlock + AG 3015	2 fl oz/a + 0.5% v/v	0.218	0.12
LSD (p>0.05)		0.046	0.31

Collaborating Teams

- NDSU
  - Marcia McMullen
  - Stephen Neate
  - Richard Horsley
  - Vern Hofman
  - Suranjan Panigrahi
- Michigan State University
  - Gary Van Ee
- University of Minnesota
  - Charla Hollingsworth
- USDA-ARS (College Station Texas)
  - Wes Hoffman and Brad Fritz
- Langdon
  - Kevin Misek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