Tracking Released Clones of *Gibberella zeae* within Wheat and Barley Fields

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Research Purpose

- Knowledge of movement of *G. zeae* from local sources of inoculum is critical to FHB management decisions

Research Objective

- To understand dissemination of *G. zeae* from area sources of inoculum
Previous Research

• Fernando et al., 1997
  – 50% decline in FHB infection within 1 to 10 m
  – 90% decline within 5 to 22 m

• Stack, 1997
  – 50% decline within 2 to 3 m from small area source
  – 50% decline within 20 to 50 m from large area source


How do we unambiguously distinguish between known sources of *Gibberella zeae* and other background sources to track the movement of a released isolate in a field?

**Amplified fragment length polymorphisms (AFLPs)**
New York and Virginia Field Information
Inoculum Production

3-ADON

15-ADON
Inoculation/Collection of Fields

300 g of inocula

Weeks after flowering
Preparation of G. zeae Isolates

Collection → Disinfect → Selective Media

DNA Extraction → Single-Spore
Amplified Fragment Length Polymorphisms (AFLPs)

AFLP Analysis
AFLPs

• Polymorphic bands (alleles) scored from 100 to 500 bp

• Nine alleles scored for each isolate for both VA and NY

• Recovery of the released clone was determined for each field plot
What we found...

- 15% (314/2160)
- 2% (35/2160)
- 1% (26/2160)
- <1% (3/715)

15% (314/2160) decline

P < 0.001

< 1% 

≥24 m

3 m

6 m

87% decline
What we found…

- Spike infection attributable to released clones decreased an average 90% within 3 to 6 m
  - Steeper gradient than previous research

- Incidence of spike infection caused by released clones averaged 15% directly above source plots

- No significance between plots of 3-ADON and 15-ADON clones ($P = 0.96$)

Impact of Results

• Separation of research plots 3 m and, if possible, 6 m to avoid interplot interference

Current Research Question

• How does the amount of inocula affect dissemination from a released source?
Virginia Fields – Plots with Varying Amounts of Corn Residue

Winter Barley 2008 and 2009

Winter Wheat 2009 and 2010
45 grams (5 stalk pieces)

410 grams (50 stalk pieces)

- 45, 200, and 410 g of corn residue were placed into plots.
- Only one *G. zeae* clone used for infestation.

Winter Barley Fields
Winter Wheat Fields

- 45 grams (5 stalk pieces)
- 410 grams (50 stalk pieces)

- 45 g and 410 g of corn residue were placed into plots
- Only one *G. zeae* clone used for infestation
Barley - Moderate FHB Epidemic

2008 Recovery of Clone - Barley

- Recovery of clone decreased from 0 to 3 m for all inoculum amounts
Barley - Low FHB Epidemic

- Recovery of clone decreased from 0 to 3 m except for 200 g plots
Wheat - High FHB Epidemic

- Recovery of clone decreased for all with the exception of the cultivar Tribute (410 g plots)
Wheat - Low/Moderate FHB Epidemic

2010 Recovery of Clone - Wheat

- Recovery of clone decreased from source with the exception of Vigoro (45 g plots)

• = Significance
% Decline from Source to 3 m

• All years:
  – 45 g – Average 78%
  – 410 g – Average 58%

• Low Epidemic Year (Barley 2009)
  – 45 g – 100%
  – 410 g – 79%

• Moderate Epidemic Year (Barley 2008, Wheat 2010)
  – 45 g – Average 76%
  – 410 g – Average 81%

• High Epidemic Year (Wheat 2009)
  – 45 g – 77%
  – 410 g – 24%
Next important epidemiological question is whether or not the same trends are seen with naturally inoculated corn residue.
Natural Corn Debris Research

• Research led by Dr. Gary Bergstrom – Cornell University
  – Ms. Katrina Waxman

• Poster at Fusarium Head Blight Forum (2008)
G.C. Bergstrom and K.D. Waxman
Natural Corn Debris Research

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• Current research in 21 different environments (2010 Poster)
  – Illinois – Dr. Carl Bradley
  – Missouri – Dr. Laura Sweets
  – Nebraska – Dr. Steven Wegulo
  – New York – Dr. Gary Bergstrom/Ms. Katrina Waxman
  – Virginia – Dr. David Schmale/Ms. Melissa Keller
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