

FHB Prediction Models

Erick De Wolf, Denis Shah, Kansas State University

Pierce Paul, Larry Madden, The Ohio State University

Kyle Imhoff, Brian Bills, The Pennsylvania State University



Advancements in Forecasting Project

- Describe efforts to verify and apply improved models
- Share insights from new analytical approaches



Effort to Predict FHB in the U.S.

www.wheatcab.psu.edu

FUSARIUM HEAD BLIGHT Prediction Center

FUSARIUM RISK Assessment Tool

US Commentary last update 2015-05-16 Erik DeWolff.

Welcome to the Fusarium Head Blight Prediction Center. The Fusarium risk maps are best viewed with web the firefox, chrome and safari web browsers. Wheat in the IL, IN, KS, MO, KY, and VA is likely near or just past the flowering stages of growth that are critical for Fusarium infection. The winter wheat model is indicating the weather is not favorable for the development of Fusarium head blight in many areas of the US. However, there is an area in KS and NE that is now at moderate risk for infection. Conditions can change rapidly and it is important to check for frequent updates as the wheat crop in your area approaches the flowering stages of growth. Be sure to select states of interest from the menus on the left to zoom in to see detailed maps of disease risk and read helpful commentary from disease specialists. Note that gray areas of the risk map in the southern US indicate that wheat in this area is likely approaching maturity and is much less susceptible to Fusarium infection.

1. Choose a State
State:

2. Choose a Model
Wheat:
Susceptibility:
[Link to Spring Wheat Variety Information](#)

3. Weather Forecast Mode
Forecast (hrs):
Assessment Date:

Advanced: Save Model and Location
Name:
Saved Loc:

Legend
Blight Risk
High
Medium
Low
No Data
Weather Stations
FAA
AgNet
Inactive (for model)

Risk Map Opacity:

Introduction
Model Basics
User Guide
Fusarium
Developers
Login

PENN STATE
OHIO STATE UNIVERSITY EXTENSION
KSTATE
USWBSI

Disclaimer

Application of Research

- Replace the winter wheat model that had struggled in some environments
- Simplify interpretation of predictions
- Represent progress in breeding for FHB resistance in winter wheat



Final Verification of Candidate Models

- Four candidate models advance to final round of testing and verification
- Developed using 527 observations
- Model structure - logistic regression
- For more information
 - Shah et al. *Phytopathology* 103:906-919



A New Model Emerges

- Variables Considered
 - Genetic Resistance (VS, S, MS and MR)
 - Wheat Class (Winter vs. Spring)
 - Mean RH 15 days prior to flowering



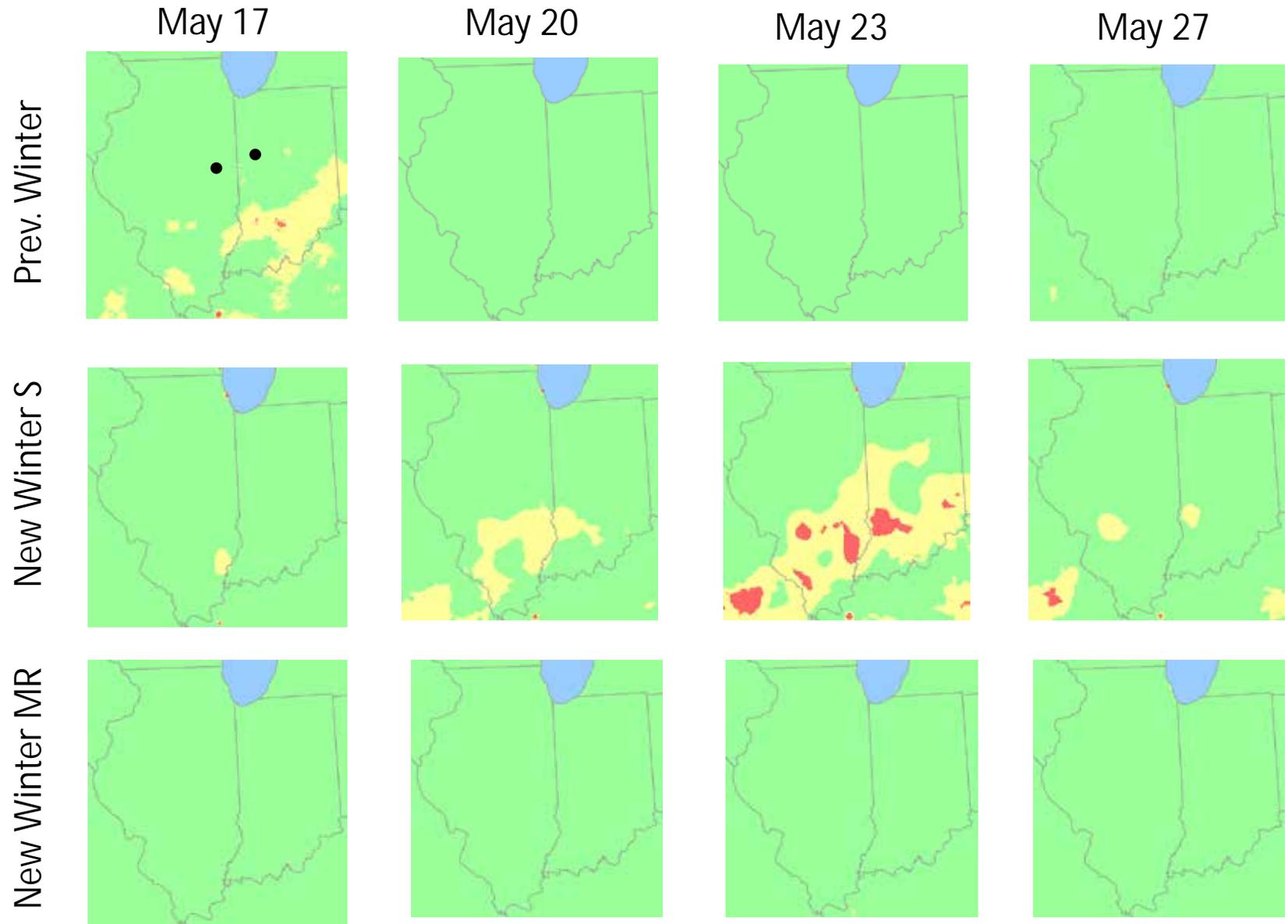
Case Studies for Final Verification

- Evaluating model performance based on 2013 and 2014
- Comparisons of model predictions vs. reports of disease from cooperators
- Verified with observations from Integrated Management Cooperative Project



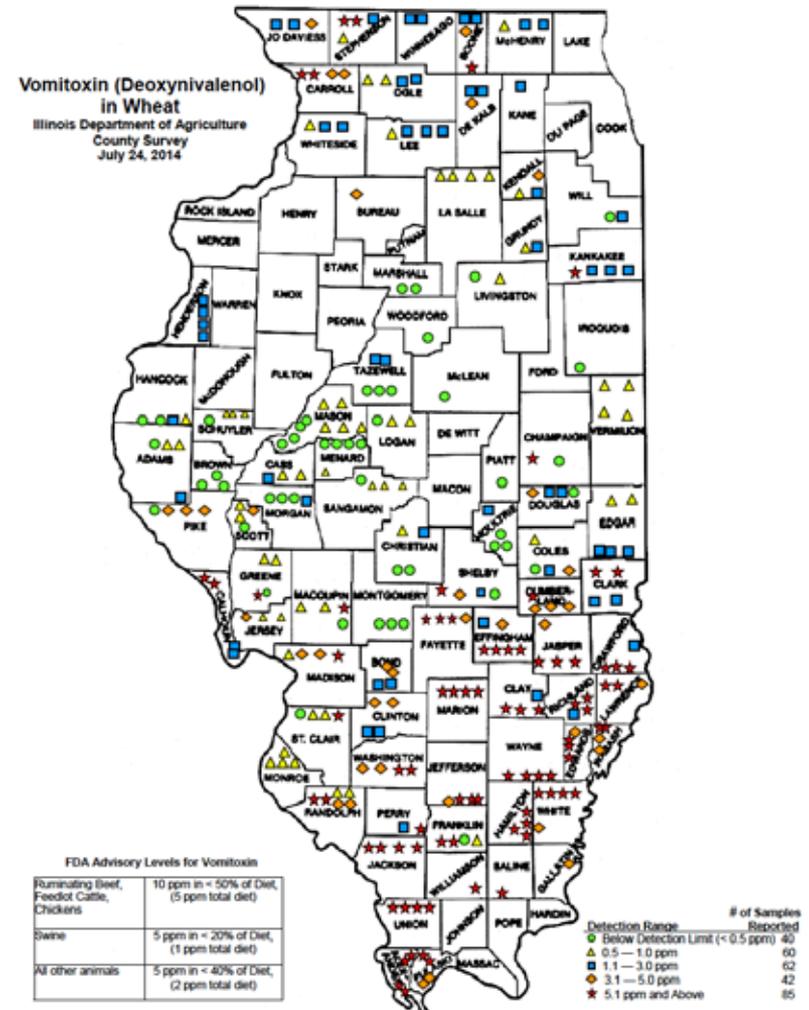
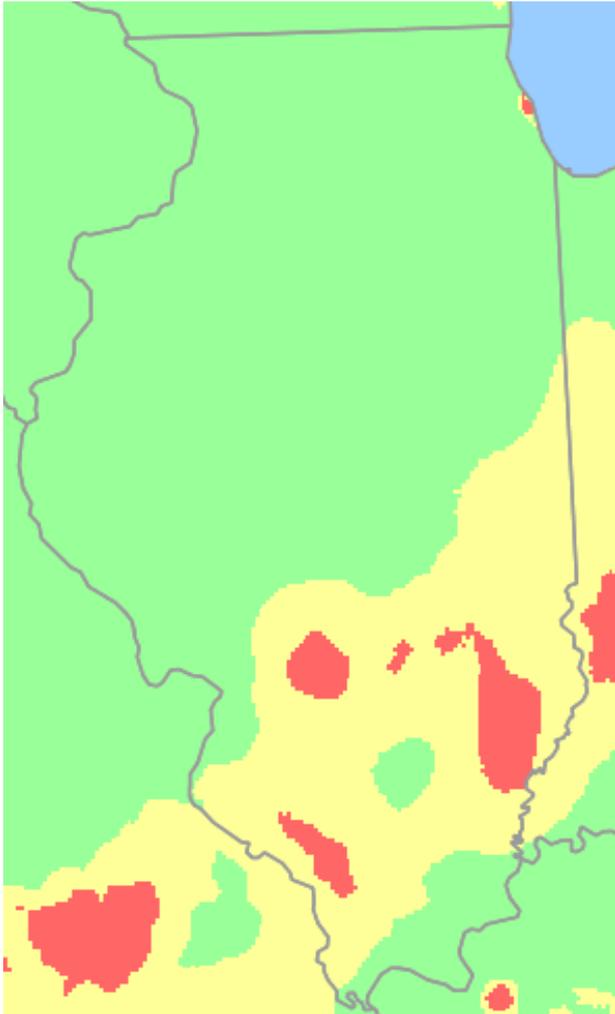
Urbana IL & W. Lafayette IN (May 20-28), 2014

FHB Epidemic Reported by Carl and Kiersten in Southern IL and IN



Comparison With IL DON Survey, 2014

FHB Risk New Winter Wheat Model - May 23



Source: Carl Bradley, University of Illinois (now Univ. Kentucky)

Case Study Summary

- 10 cases studies considered for 2013 & 2014
 - Improved accuracy most notably for winter wheat
 - Enhanced explanatory power for DON contamination
 - Maintains accuracy for spring wheat model
 - Potential to overestimate risk of disease in some environments



The Way Forward

- Continue to integrate new observations
 - More than 800 cases available for modeling
- Modeling priorities
 - Focus on prediction to aid management recommendations
 - Rebuilding weather database to consider more pre-anthesis weather conditions



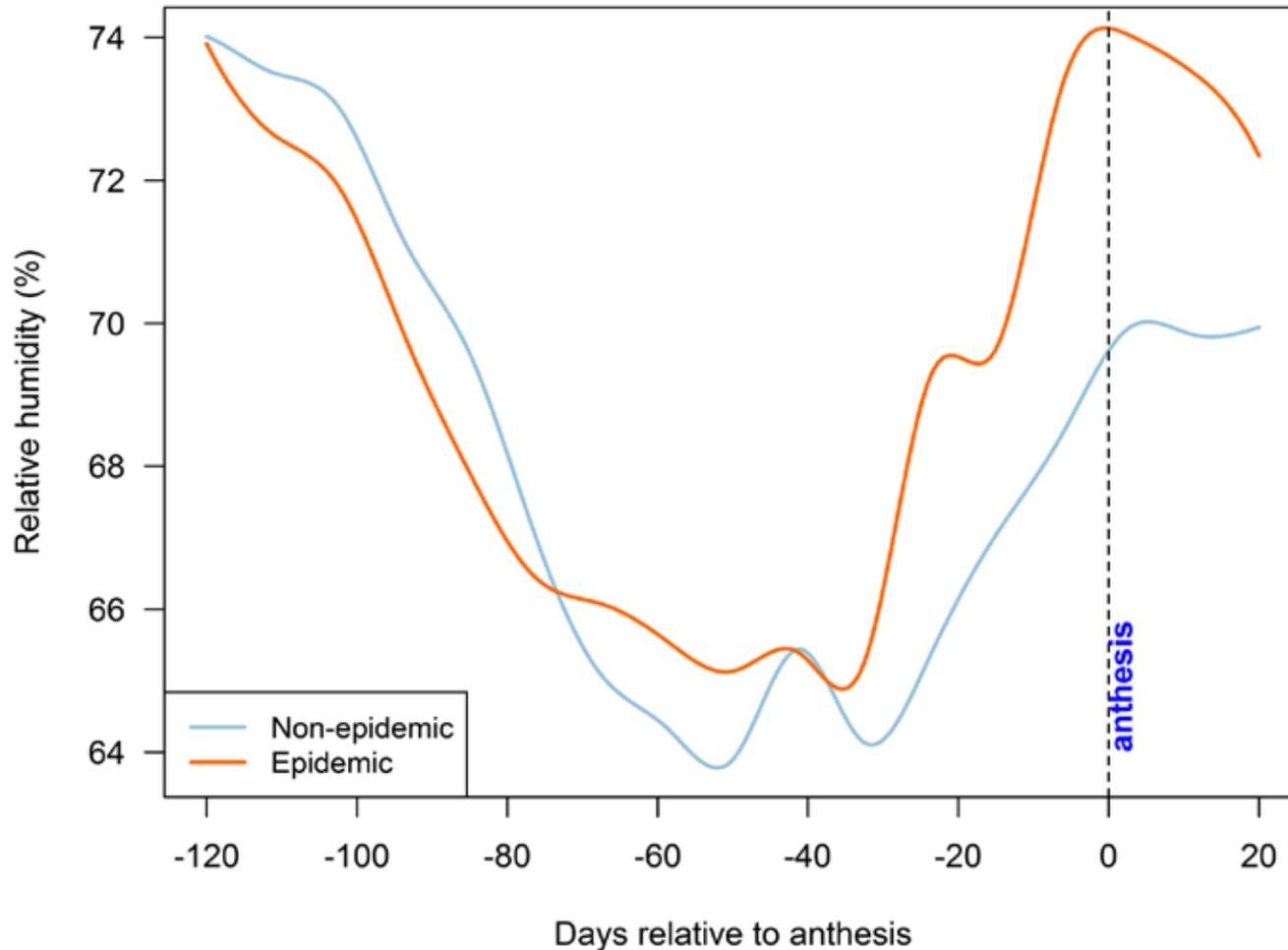
Functional Data Analysis

- Examine a time series of weather preceding anthesis and during early stages of grain fill
 - 120 pre-anthesis
 - 20 post-anthesis



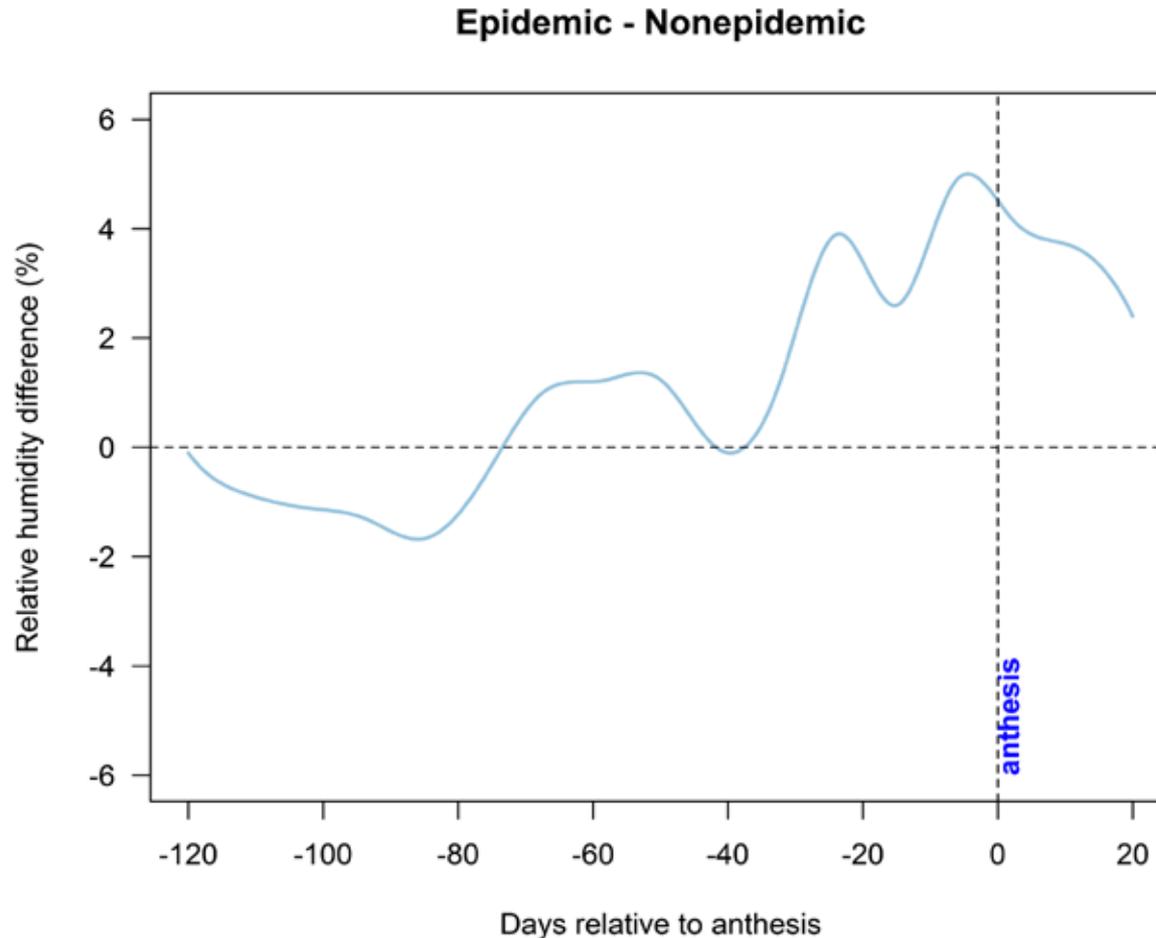
Functional Data Analysis

Comparison of smoothed mean RH



Functional Data Analysis

Difference between epidemics and non-epidemic years



Preliminary Conclusions

Functional Data Analysis (FDA)

- Novel insights into time series of pre-anthesis weather for multiple variables (RH, dew point, temperature, pressure)
- Differences between RH in epidemic and non-epidemic years >30 days prior to anthesis
- Additional modeling is needed to capitalize on these findings



Questions?



K-STATE
Research and Extension

*Knowledge
for Life*