

# **Improving white mold management: epidemiology, fungicide timing and plant resistance**

Martin Chilvers – 2016

## **1. Study of white mold epidemiology for improved management:**

The main objective of this study was to improve knowledge of the timing for apothecia development and ascospores release in order to develop a predictive model and to determine optimal timing of fungicide application. The specific objectives were:

- Determine the relationship between apothecia germination and ascospore release and environmental variables (temperature and leaf wetness duration).
- Develop a weather-based predictive model to improve soybean white mold understanding, forecasting and management.

Spore traps and weather stations were placed in soybean plots at the Montcalm research station, to determine the timing of spore release and the corresponding environmental conditions. We also sampled plants and took notes on plant stage development and flowering period to determine when plants are becoming infected. Sampled plants and flowers were incubated, to determine when they become infected, ahead of visual disease symptoms.

Historical data from the MSU-MSPC soybean performance trial data from the Sanilac location was examined for environmental and cultivar factors that drive white mold disease. The following two figures are a summary of weather factors that correlated with disease severity. Temperature and precipitation were found to be the two major drivers of white mold disease. A manuscript describing this analysis has been submitted to Phytopathology and is currently being reviewed.

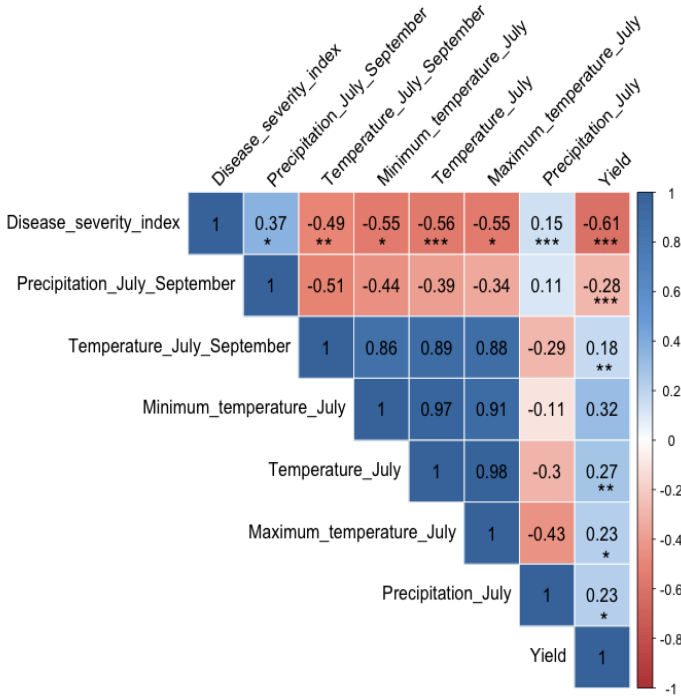


Figure 1. Correlation matrix of environmental parameters, white mold disease severity index and yield.

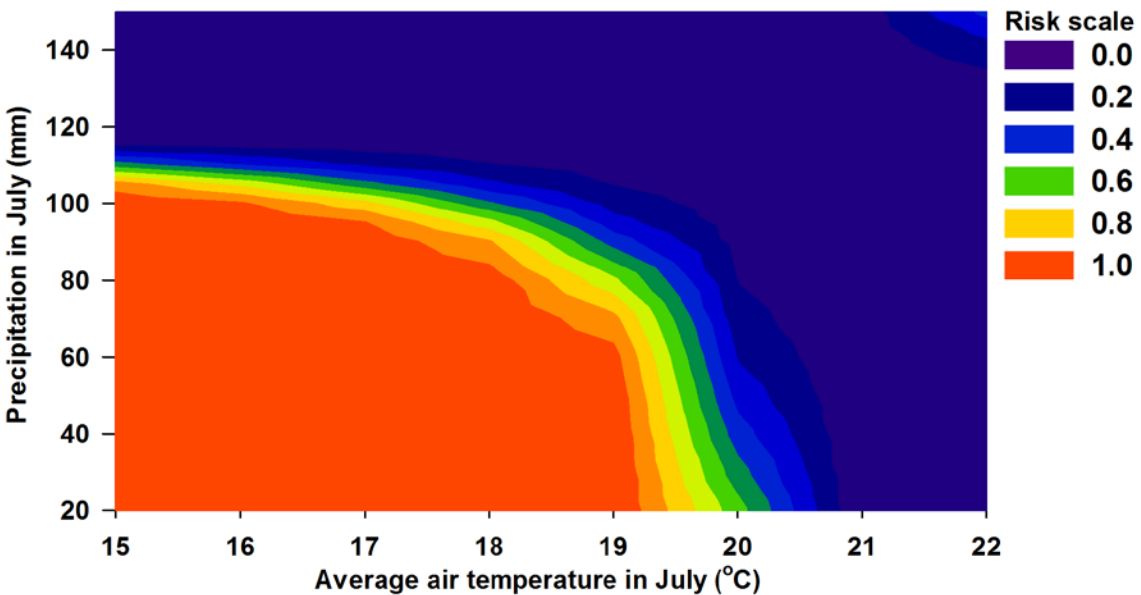


Figure 2. Heat map of white mold risk against precipitation and average air temperature during July.

A beta-version of the apothecia risk model was tested by conducting fungicide timing trials in both 15 and 30" row spacing trials, and taking notes on apothecia emergence. It was apparent that the model had to be tweaked for irrigated vs non-irrigated field

conditions. We did also demonstrate that a single application at R1 was superior to a single application at R3 under 2016 conditions.

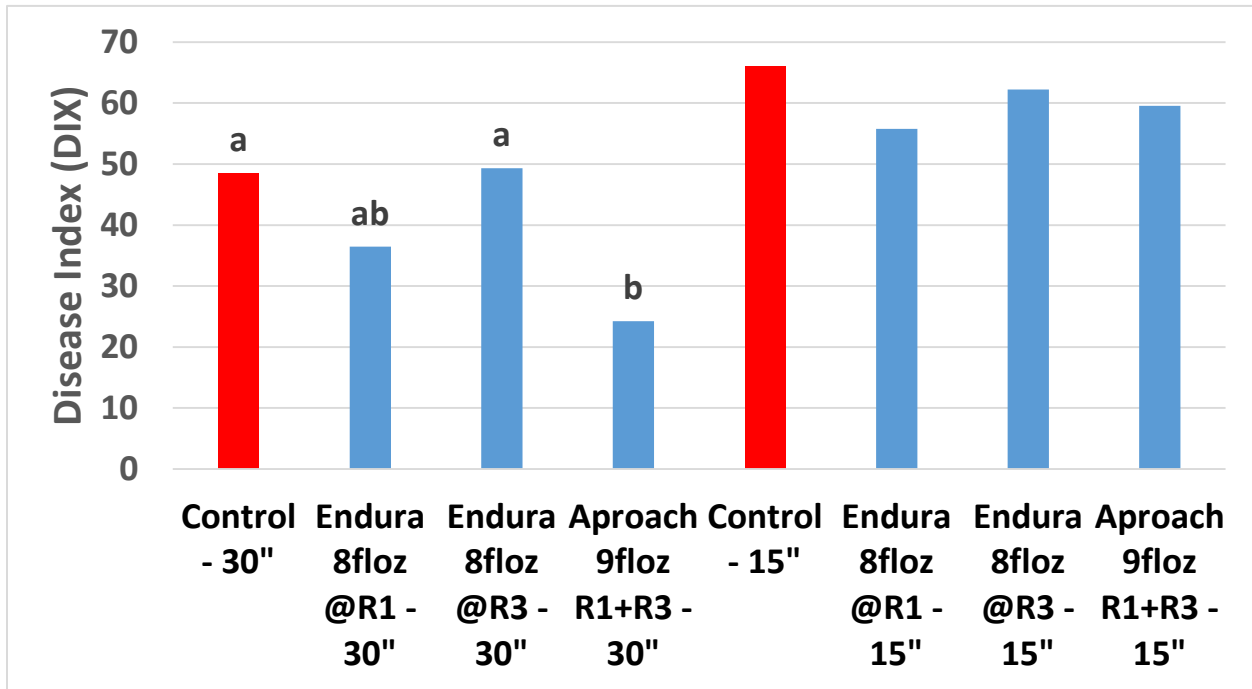


Figure 3: Apothecia risk assessment model validation, reporting white mold disease index relative to fungicide timing in both 15 and 30" row spacing

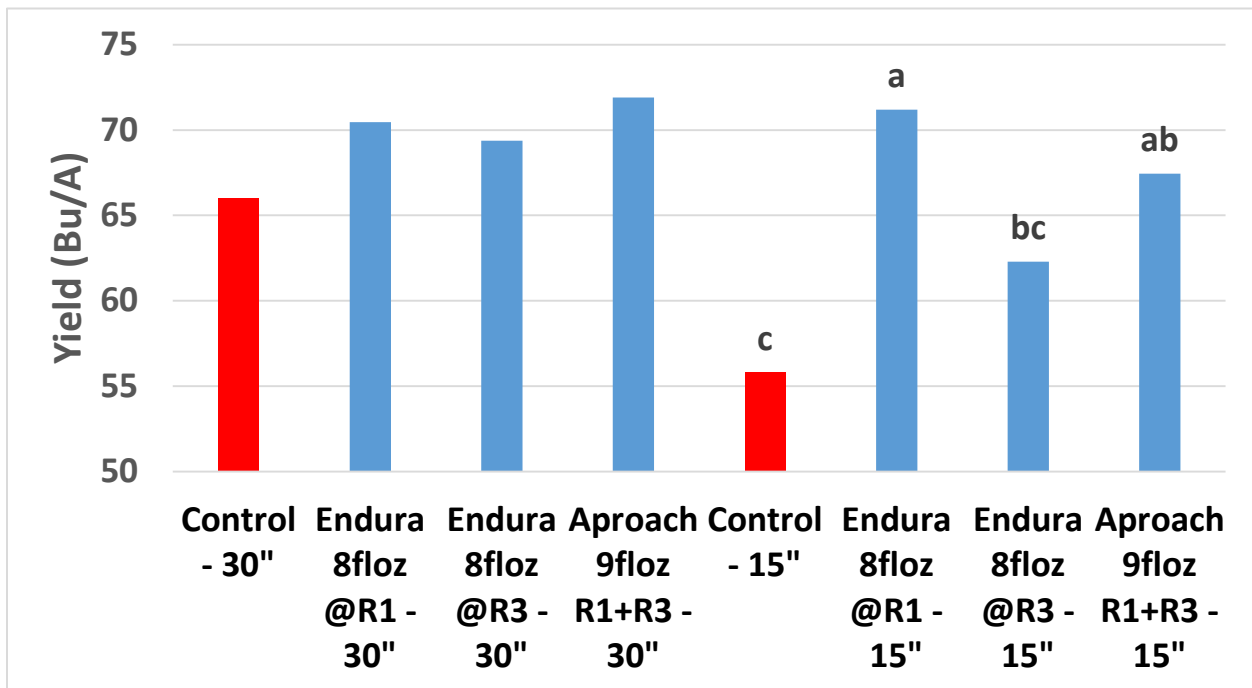


Figure 4: Apothecia risk assessment model validation, reporting yield relative to fungicide timing in both 15 and 30" row spacing

## 2. Evaluate foliar fungicide and biological products and application timing for improved white mold management:

Multiple fungicide trials were conducted at the Montcalm research station. Endura and Aproach were the chemistries that provided the best disease control and subsequent yield protection. Cobra at a V5 timing significantly reduced disease and protected yield. A combination of Cobra at V5 with a follow up Aproach treatment did provide a slight improvement in disease control and yield, but was not statistically different to the Cobra only treatment. These trials have been published as Plant Disease Management Reports and the data from these trials and others are being compiled as part of a multistate meta-analysis.

Byrne, A.M. Chilvers, M.I. 2017. Efficacy of foliar fungicides for white mold management of soybean in 2016a. Plant Disease Management Reports 11:FC030

Byrne, A.M. Chilvers, M.I. 2017. Efficacy of foliar fungicides for white mold management of soybean in 2016b. Plant Disease Management Reports 11:FC029

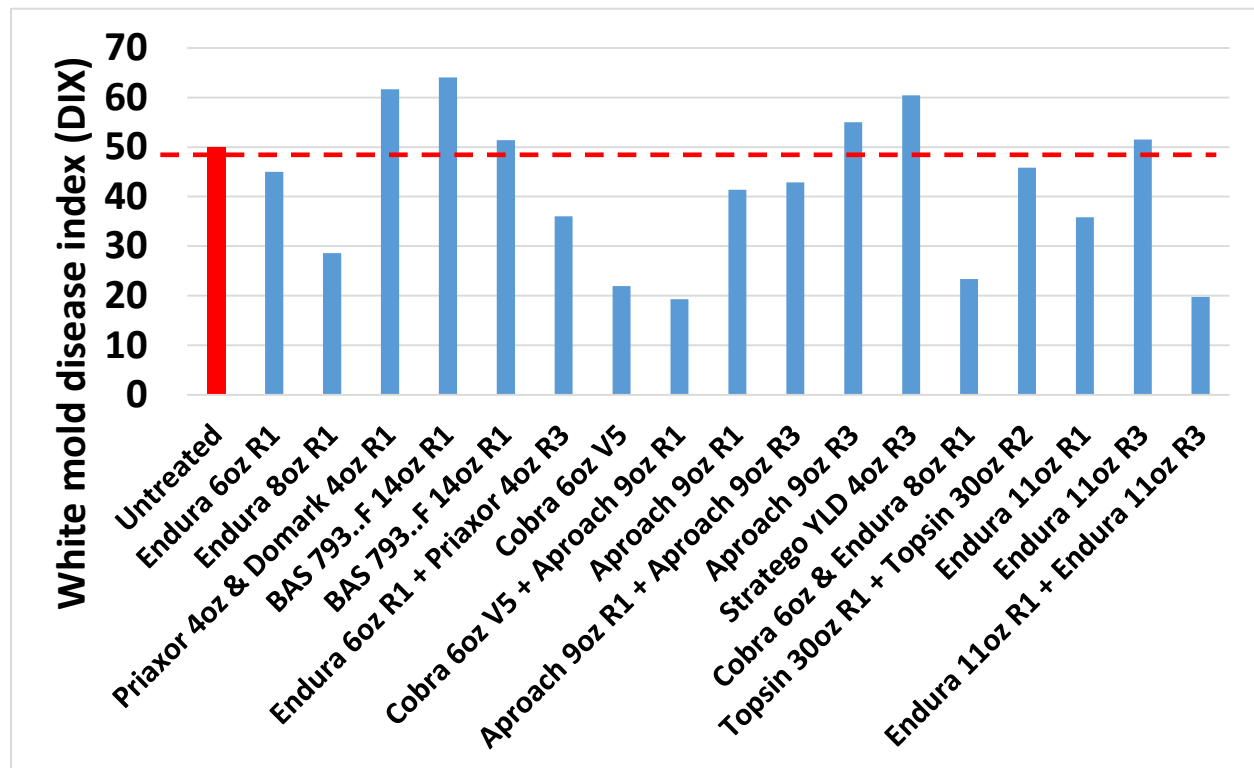


Figure 5: Fungicide trial 1, examining rate and timing of products on white mold disease index.



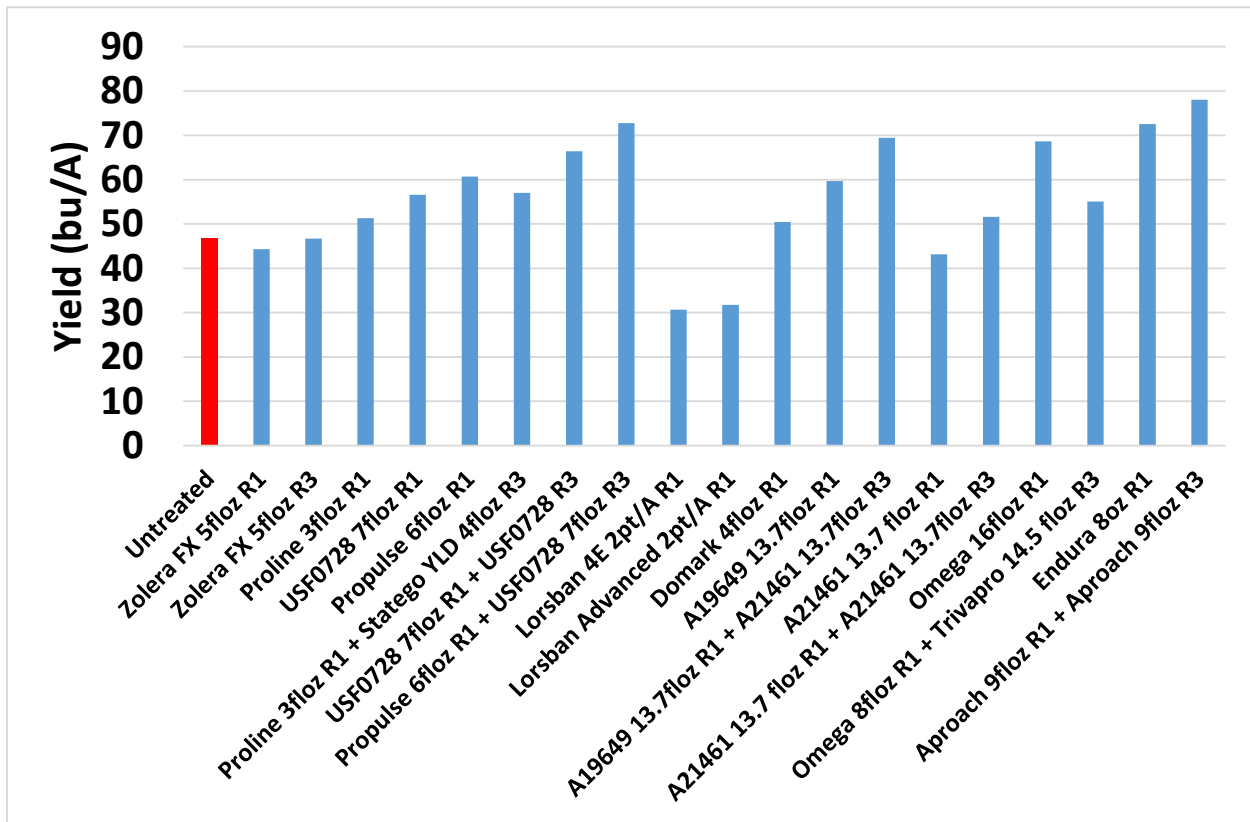


Figure 8: Fungicide trial 2, examining rate and timing of products on yield.

### 3. Screening of soybean germplasm for white mold resistance:

We screened white mold 'resistant' germplasm for Dr. Craig Grau at the Decatur location for SDS and SCN resistance, this data will assist the Wisconsin team in moving lines forward. It was found that the lines had acceptable to good SDS resistance. We also assisted John Boyse and Dr. Wang's lab in the set up and screening of germplasm for white mold resistance at the Montcalm research center.

### 4. Provide white mold management education to growers and CCA's:

Information collected regarding timing and conditions of spore release and plant infection and optimized fungicide timing was shared with Michigan growers and colleagues in the Midwest.

A YouTube video (MSU Field Crops Pathology) was developed describing the impacts of this project. Additional videos will follow:

<https://www.youtube.com/watch?v=BhD0tScR0uU>