Project Final Report for: Development and Expansion of Disease Management Decision-Making Tools Across Multiple Soybean Regions (January 31, 2024)

Uniform soybean foliar fungicide field trials were conducted in eleven different states, in which eleven treatments and a nontreated check were evaluated. Disease pressure varied from location to location, and data from locations were dived into two categories: low disease pressure and moderate-high disease pressure. Results from these trials are shown in Fig. 1., where the average yield response of all fungicide treatments relative to the nontreated check was 5.3 bu/A in the moderate-high disease pressure locations, compared to 1.8 bu/A in the low disease pressure locations. The data from the uniform fungicide trial were used to help revise the 2024 edition of the Crop Protection Network Soybean Foliar Fungicide Efficacy Guide. In addition, the data from these trials are being used to test, adjust, and optimize disease prediction models.

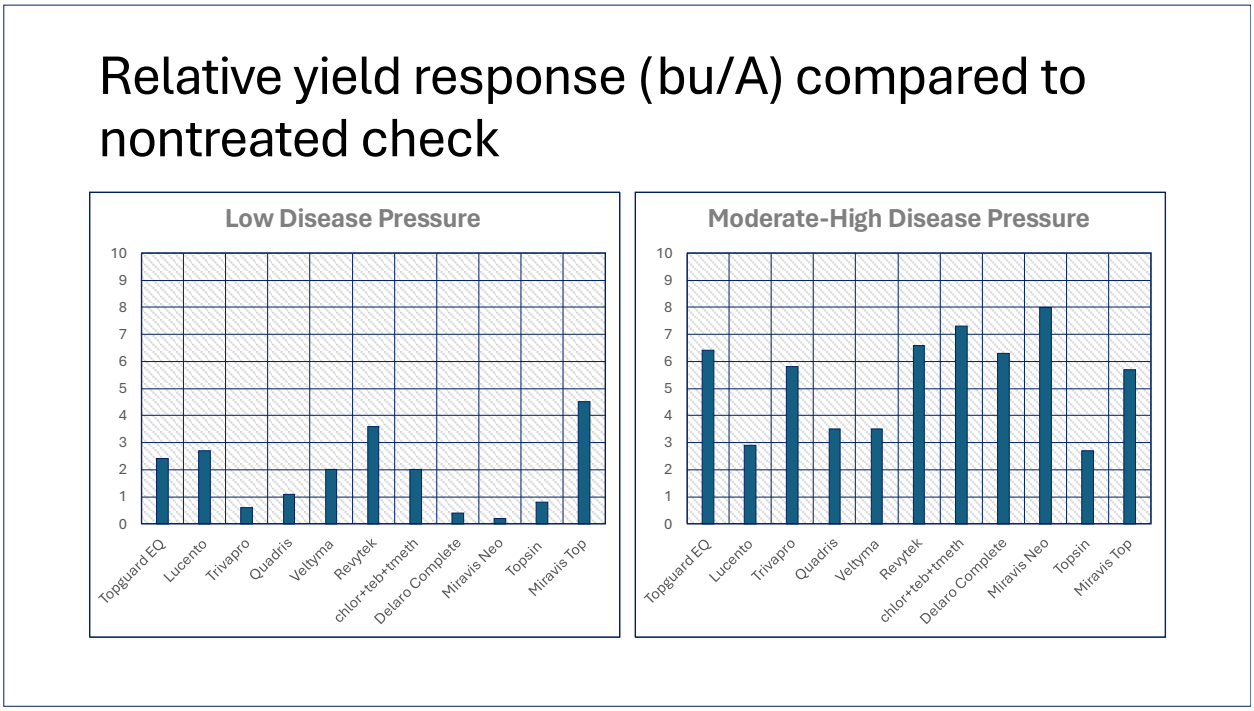

Figure 1. Relative yield response of fungicide treatments applied across soybean trials conducted across several states in 2023. Results are divided between locations that had low disease pressure and locations that had moderate-high disease pressure.

Spore traps were deployed in soybean fields across eleven different states. Spore samples were collected at two different heights weekly. The samples were sent in bulk to the Smith Laboratory (University of Wisconsin), where DNA currently is being extracted. Once extracted, the Smith and Thomas-Sharma (Louisiana State University) Labs will use quantitative-PCR (qPCR) assays to quantify foliar pathogens. Currently, qPCR protocols are being validated for the three *Cercospora* species that cause Cercospora leaf blight in the Thomas-Sharma Lab, and qPCR protocols are being developed in the Smith Lab for the frogeye leaf spot pathogen. Figure 2 shows an example of quantification of *Cercospora flagellaris* spores. These quantitative data will be used to better inform traditional disease forecasting models and machine-learning tools used to improve the accuracy of forecasting models.

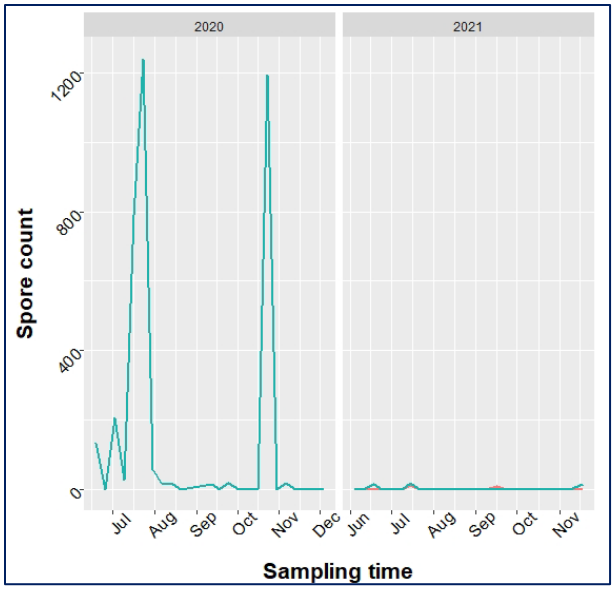

Figure 2. Quantification of *Cercospora flagellaris* spores from Baton Rouge, LA (courtesy S. Thomas-Sharma, LSU).

The Smith Lab continues to work on the "Frogspotter" app to forecast risk of frogeye leaf spot. A beta model was tested in 2023 (Fig. 3). The model currently uses a 21-day average of maximum air temperature and 10-day average of total daily hours with max relative humidity > 75% (wetting variable), and daily risk indices are calculated in the tool. The disease data collected from the uniform fungicide trials are currently being used to retrain the model, and further field validation will occur during the 2024 growing season.

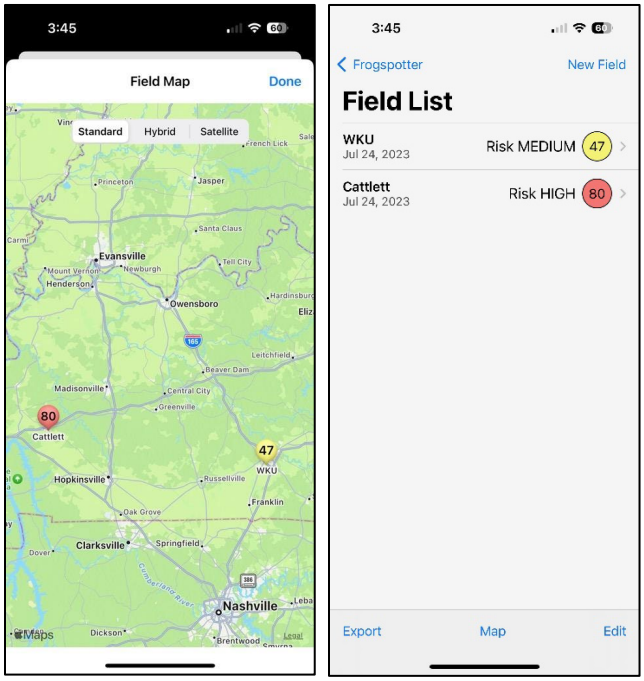

Figure 3. A look at the beta Frogspotter app being utilized to evaluate frogeye leaf spot risk during the 2023 growing season for two University of Kentucky field research trials.