INTEGRATED APPROACHES TO WHITE MOLD MANAGEMENT

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White mold is caused by the fungus, *Sclerotinia sclerotiorum* and frequently results in significant damage to soybeans in the upper Midwest. The white mold fungus has a notoriously wide host range, which can result in large reservoirs of inoculum in and near soybean fields. The primary inoculum (ascospores) are born on cup-shaped structures called apothecia. These apothecia form when the weather conditions are cool and wet, the soybean canopy is dense, and flowers are present. The presence of a susceptible host (e.g., flowering soybeans), active pathogen (e.g., sporulating), and conducive weather has to happen at the same time, in the field to result in infection. This can be difficult for farmers to anticipate for predicting if they might have white mold, or if they want to implement an in-season management strategy (Willbur et al., 2019a). To take some of the guess-work out of managing white mold, soybean farmers have been interested in learning more about resistant soybean cultivars, what fungicides might be available for controlling white mold, whether it is economical to spray fungicide under certain conditions, how to anticipate favorable weather to better time fungicide applications, and cultural practices such as row-spacing and planting population that lead to less white mold, but don't negatively affect yield. The Wisconsin Field Crops Pathology team in conjunction with the Wisconsin Soybean Team have been conducting research to address these questions.

One of the most elusive management strategies for white mold has been the deployment of highly resistant soybean cultivars. Resistance to the white mold fungus, in soybean, is highly quantitative. This means that many genes in soybean are responsible for resistance to the white mold fungus, with no one gene conferring a large amount of resistance. Thus, finding highly resistant cultivars for managing white mold has been challenging (McCaghey et al., 2019). However, a few do exist and will be highlighted in this presentation.

A white mold prediction tool has also been developed. This tool uses statistical models that were developed using data from Wisconsin and surrounding states (Willbur et al., 2018a). Weather information is inserted into the statistical models to form probabilistic predictions of risk of white mold development on any given day. The tool has been validated in multiple locations, including commercial fields (Willbur et al., 2018b). It is available as an electronic

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tool (Sporecaster) on the iPhone
(https://itunes.apple.com/us/app/sporecaster/id1379793823?mt=8) and Android
(https://play.google.com/store/apps/details?id=ipcm.soybeandiseasecalculator) platforms.
The primary use of this tool is to anticipate favorable weather events that may result in the presence of apothecia that can lead to successful infection if flowers are present in soybean fields. Fungicide application decisions can then be made based on these predictions.

An additional electronic smartphone application for determining if certain fungicide programs result in positive return on investment (ROI) under different soybean production scenarios, has also been developed. This is a research-based tool (Willbur et al., 2019b) that is available for both the iPhone (https://itunes.apple.com/us/app/sporebuster/id1438463112) and Android (https://play.google.com/store/apps/details?id=edu.wisc.ipcm.sporebuster) platforms. This tool can be used in conjunction with Sporecaster. Once you know if you need to spray, Sporebuster can help farmers to decide which fungicide program fits their operation.

Finally, current, ongoing research is focused on understanding how a truly integrated approach to managing white mold might work. Effort has been placed on understanding how row-spacing (15 in. vs. 30 in.), planting populations (110,000 to 200,000 seed per acre), and the application of fungicide using Sporecaster can be used in an integrated fashion to maximize yield and reduce white mold damage. Research is being done in Wisconsin, Minnesota, Iowa, Michigan, and Illinois. So far, row-spacing and planting population are most influential on yield and white mold level. Wider row spacing typically results in less white mold. However, slightly higher yields are achieved in narrow row spacings. In heavy white mold environments, the added yield achieved in narrow row spacings (such as 15 in.) is offset by higher white mold that can compromise that yield. Thus, in heavy white mold environments, wider row spacing would be preferred with planting population around 140,000 seed per acre. Application of fungicide using the Sporecaster smartphone app can then provide an additional level of control.

References

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