Final Report 2019
Pennsylvania Soybean Board

Project:
Development of Best Management Guidelines for White Mold in Pennsylvania

Dr. Paul Esker, Penn State

Co-PIs: Dr. Alyssa Collins and Dr. Beth Gugino
Student Participants: Karen Luong, Tyler McFeaters, and Ryan Dunkelberger

This project aims to tackle issues related to white mold over several phases, whereby in phase one, we will conduct the following <u>research objectives</u>:

(1) conduct a soil survey to obtain isolates from different fields with different histories of white mold (established fields, new finds in fields with more recent history of the disease, and among other fields where concerns and questions have been raised),
(2) develop a paper-based survey to quantify the extent and perceived risk of white mold for soybean production, and
(3) conduct a case study on-farm assessment of best management practices that incorporates field history (independent study project), crop rotation, and cost of new equipment if rotation practices are changed.

During 2019 and the no-cost extension year of 2020, we were able to accomplish the following:

Karen Luong joined the Epidemiology Laboratory at Penn State to take the lead on objective one and combine the isolate collection for *Sclerotinia sclerotiorum* with isolates available from Cornell University for comparative studies. Tyler McFeaters, who was recruited to the program and began in Summery 2019 also developed a project focused on in-field aspects of *Sclerotinia sclerotiorum*. Both are also contributing to the developing of the farmer survey, which is a focus of Objective 3.

Objective 1: Sampling and identification of isolates of *Sclerotinia sclerotiorum*.
- Samples were collected from 17 different locations in Pennsylvania and New York (Figure 1).
- These samples yielded 191 putative isolates of *Sclerotinia sclerotiorum*.
- Work commenced to extract DNA from each sample and calibrate the molecular methods for identification.
- Extension output: request for field sites was provided in the following PSU Extension Field Crop News article: https://extension.psu.edu/factors-to-consider-for-understanding-white-mold-risk-in-soybean, which also described factors to consider for white mold in Pennsylvania in 2019.

2019 and 2020 White Mold Sampling Sites
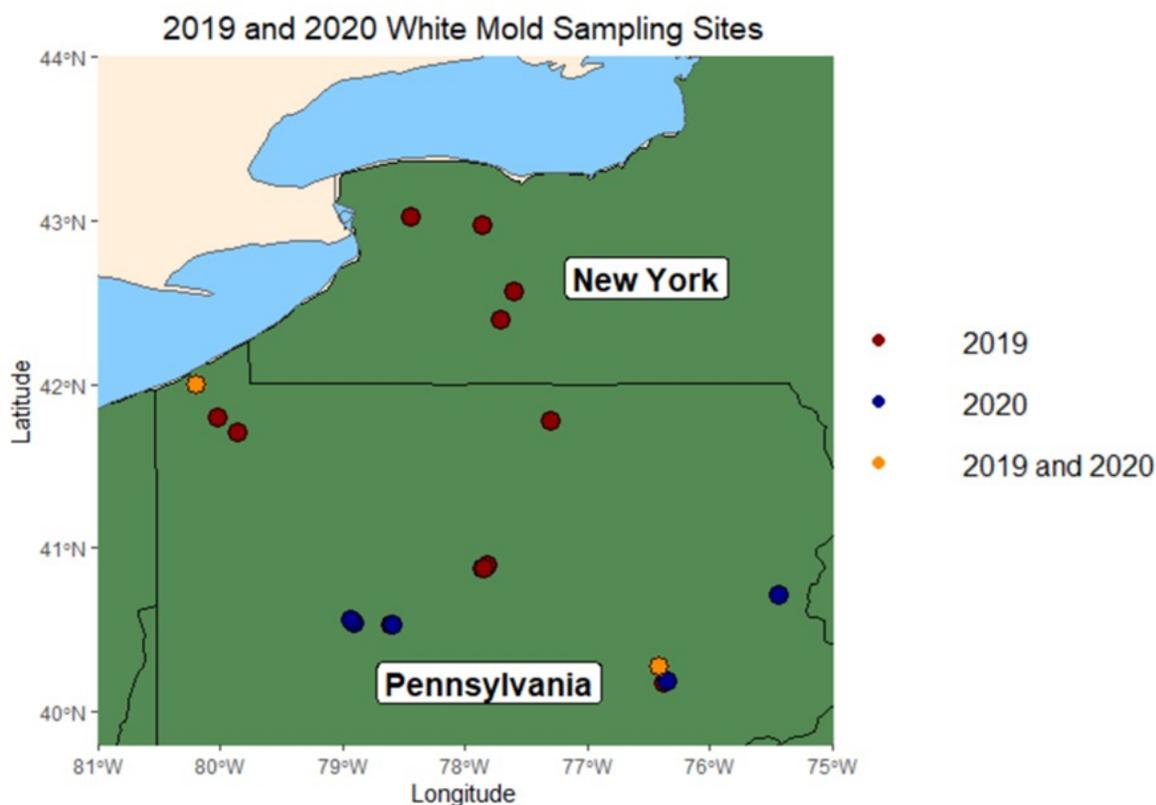
Figure 1. White mold sampling locations (2019, 20220, 2019 and 2020) in Pennsylvania and New York.

Objective 2. Quantification of the extent and frequency of white mold in Pennsylvania soybean
- Both students completed Institutional review board training, as required to conduct surveys (Figure 2, example survey question).
- We began with the development of the survey mechanism, which overlapped with part of the 2020 work (and will continue into 2021), which was approved and then finalized by December 2020.

What do you consider MOST important when making decisions for disease management?

Cost (to purchase, equipment, labor, etc.) **A**

Availability or accessibility of management tactics **B**

Efficacy of current compounds or other tactics **C**

Recommendation by extension educator, crop consultant, or other researcher **D**

Other growers who use the tactic or recommend it (e.g., fungicide, crop rotation,...) **E**

Compatibility with current equipment, production goals, etc. **F**

Figure 2. Example survey question used during 2020 winter meetings with different soybean stakeholder groups.

Objective 3. Case study on-farm assessment of best management practices that incorporates field history, crop rotation, and cost of new equipment if rotation practices are changed.

- Ryan Dunkelberger successfully completed an independent study (PPEM 496 was the course) project using his family's farm as a case study to describe the pro's and con's related to managing white mold. We are using this test case to build the relevant components for conducting more in-depth farm level analyses to identify best management options on individual farms that take into account the cost-benefit and feasibility of management options. For example, some of the highlights that we are taking into consideration from the work of Ryan's for working with other farmers include:
    - i. Breaking the inoculum cycle by using additional rotation crops, especially small grains.
    - ii. Considering sectioning fields to create novel rotations on smaller scales to reduce the risk of a field-scale epidemic of white mold.
    - iii. Under what scenario(s) does a fungicide spray provide an economic return on investment.
    - iv. Does the use of tools like the *Sporecaster* app work in Pennsylvania environments?
    - v. What does the incorporation of more wheat mean for production costs, including the purchase of a grain drill, among other changes?
- Information learned from Ryan's project was used as a baseline for building the survey as part of Objective 2, where results are expected to build new management programs as part of the current objective.

- We also developed a monitoring program for the *Sporecaster* app, a project which overlapped in the 2020 renewal and will be reported as part of that project.

Overall, our 2019 efforts established a baseline system for achieving our longer term goals for white mold management in Pennsylvania and the Northeast. Results during this first year were presented as part of the following abstracts, extension articles, and presentations:

1. Luong, K., T. McFeaters, S.J. Pethybridge, and P. Esker. 2020. Understanding the genotypic diversity of *Sclerotinia sclerotiorum* in Pennsylvania and New York. 2020 APS Annual Meeting Online.
2. McFeaters, T., K. Luong, A.A. Collins, A. Murillo-Williams, and P. Esker. 2020. Understanding white mold in Pennsylvania soybeans: Spatial distribution of *Sclerotinia sclerotiorum* at the field scale. 2020 APS Annual Meeting Online.
3. Esker, P. and A.A. Collins. 2019. Factors to consider for understanding white mold risk in soybean. Field Crop News - Penn State Extension. https://extension.psu.edu/factors-to-consider-for-understanding-white-mold-risk-in-soybean.
4. White mold management, Penn State Extension Workshops and Programs, On-Line, Penn State Extension, Bradford County, PA, 55 participants, Academic. (February 12, 2019).