North Central Soybean Research Program

Evaluation and development of a biological control product to control SDS and white mold

X.B. Yang (Project Leader) and Shrishall Navi (Iowa State University), Youfu Zhao (University of Illinois) and David Schisler (USDA) (xbyang@iastate.edu)

Progress Report March 2016

Sudden death syndrome (SDS) and white mold are two of the most important fungal diseases in soybean production in the US, affecting 40 to 50 million acres in the north-central region. Yield losses can be as high as 50% in fields having severe infestation. Outbreaks of the two diseases occur in seasons with different temperatures. Therefore, these two diseases threaten the sustainable production of soybean in the North Central Region.

Biological control products are the future for disease management in row crops, evident by numerous acquisitions of companies specializing in biological control by multi-national chemical companies. Private industry has made significant progress in development of biological fungicides for row crops. These agents are effective in reducing fungi causing white mold and SDS as they are easy to reproduce and can be sprayed to soil as a bio-fungicide before planting. In this study, we propose to conduct regional field tests in different production environment (Iowa, Illinois, and Minnesota) for the effectiveness of products or products in pipelines.

Project Objectives
- Conduct multi-state field evaluation for fungal biological control agents those are found effective in reducing soybean sudden death syndrome and white mold;
- Investigate a wide-host-range bacterial bio-control agent that is effective in killing SDS and white mold pathogens for management of SDS and white mold in Illinois;
- Collect data of prototype product of the biological control agent for commercialization; and
- Determine if application of the biocontrol agent to crop residues of corn, alfalfa, or soybean can reduce inoculums production, infection, and disease caused by *F. virguliforme* and *Sclerotinia.*

Reporting Period Accomplishments
We have made progress to summarize our regional data by increasing data size. We are close to the goal of developing an effective and economic method to control soybean sudden death syndrome.

We evaluated four biological control products in the market or in the pipeline. HeadsUp® appears to stand out. By pooling the data from universities of several states and from historical tests, we found that HeadsUp® has the potential to increase soybean yield by suppressing soybean sudden death syndrome and white mold. The results of regional tests are in Figure 1.

The current seed treatment for control of SDS with ILeVO® costs about $17/acre. The alternative treatment with Headsup® (a plant powder product) costs less than $2/ac. Heads-

Up® is a plant protectant that induces systematic acquired resistance in plants when applied as seed treatments or foliar spray.

Eleven-year Iowa data together with data from other mid-west soybean productions states were pooled and analyzed. Results show that in average seed treatments with Heads-Up® improved soybean yields by 2.08 bushes per acre. Seed treatments effectively reduced the occurrence of SDS and white mold in soybean. In 85 trials (location-years), the yield response to treatments were 62% resulted in a yield increase, 9% resulted in no change and 29% resulted in slight yield decreases compared to the untreated control.

Compared with synthetic chemicals, there is a slightly larger number of low responsive trials for Heads-Up® compared with synthetic chemicals, which is often seen in field trials with biological control products. However, the low cost ($1-$2 per acre) and environmental friendliness make Heads-Up® a good candidate for soybean disease management.

We found there are environmental factors that are likely responsible for little or no response to treatment with HeadsUp®. These factors appear to be manageable -- future experiments should be planned to improve the consistency of this seed treatment.