Multi-Pronged Strategies for Efficient, Sustainable and Durable Control to Sclerotinia Stem Rot

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Principal Investigators

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Overview of project objectives

Sclerotinia stem rot, also known as SSR or white mold, is caused by *Sclerotinia sclerotiorum*. It consistently ranks in the top ten diseases affecting soybeans and is characterized by its challenging fungal promiscuity, longevity and devastating crop losses. Successful control requires multiple tools be used in an integrated management plan. Generally, a combination of cultural, chemical and biological control practices is needed, including crop rotation with non-host crops, reduced tillage, planting resistant cultivars, modifying the soybean canopy through seeding rate and row spacing and applying in-season chemicals. Many of the practices manipulate the host environment by increasing air flow in the canopy or reducing inoculum development and survival in the field so it is adverse for disease progression.

The overall goal of this project is to develop a modern and highly integrated management plan for white mold using these objectives:

- Evaluate current, standard soybean management practices, including irrigation, row spacing, population density and fungicide treatments using the Sporecaster risk prediction tool, for use in integrated Sclerotinia stem rot management.
- Identify new germplasm lines resistant to *Sclerotinia sclerotiorum* that can be added into soybean breeding programs for eventual release of new resistant cultivars for integrated management programs.
- Refine the existing soybean SSR advisory tool, Sporecaster, to incorporate model output for different forms of resistance.
- Exploit the transgenic soybean approach for silencing NADPH oxidases to achieve abiotic and biotic stress tolerance.
- Develop outreach tools outlining research results and disseminate through the national Crop Protection Network and Soybean Research and Information Network (SRIN) portals.

Key results

Overall, this study to date recommends use of wide rows and low seeding rates in fields with a history of SSR, while reserving narrow rows and higher seeding rates for fields without a history of SSR. Researchers have also identified four soybean genotypes, referred to as "check lines," which exhibit varying levels of resistance to white mold. Most recently, check lines from greenhouse studies were examined for physiological resistance levels to white mold. From these greenhouse studies, the soybean genotypes were given respective resistance rankings. Researchers are also seeking plant variety patents (PVP) on four new soybean lines from this work.

Some susceptible genotypes are responsive to fungicides, suggesting applications should be used even in low-risk conditions. However, genotypes exhibiting resistance can withstand higher risk levels before a fungicide application is necessary. Work continues to define action thresholds based on resistance type. Scientists are hopeful 2-3 stable lines resistant to white mold will be ready in the near-term.

Benefit to farmers

Results of this research will be used to not only increase understanding of the biology and epidemiology of SSR, but also to formulate updated and integrated management decisions for SSR control. Farmers can anticipate an improved understanding of these key, modern management strategies with subsequent better management decisions leading to greater yield and profitability. Improved timing of necessary fungicide applications through use of the Sporecaster tool will improve fungicide efficacy and disease control, while unnecessary fungicide inputs can be reduced when weather conditions are non-conducive to disease development.

USB National Soybean Checkoff Research Database link

Multi-Pronged Strategies for Efficient, Sustainable and Durable Control to Sclerotinia Root Rot