An Integrated Approach to Enhance Durability of SCN Resistance for Long-Term Strategic SCN Management (Phase III)

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Overview of project objectives
The soybean cyst nematode (SCN) is the most damaging pathogen to soybean production in North America. Although SCN-resistant soybean varieties are available to reduce yield loss, producers are faced with limited options for rotation once SCN develops in their fields. The lack of commercially available genetic diversity in SCN resistance has significantly increased its prevalence and reduced the effectiveness of current resistant sources. The project includes several objectives that would enable scientists to develop novel and more efficient SCN management practices for the long-term. The main challenge is to identify SCN virulence genes to understand how the nematode adapts to reproduce on resistant varieties, develop and use molecular markers to monitor nematode population shifts in the field, and work to develop new soybean breeding lines that block these nematode virulence genes for novel SCN resistance. Other objectives include testing of soybean germplasm and experimental lines developed by public breeders to continue to increase the genetic diversity of SCN resistance in commercially available soybean varieties. The final objective is to translate the results of the objectives so producers can increase their profitability using integrated SCN management strategies and effective crop rotations.

Key results
The researchers have made successful progress. They have annotated potential virulence genes across 15 populations of nematodes and have made strides in understanding male and female nematodes and their gene expression patterns. The team continued to evaluate how rotations of various gene combinations impact SCN field population densities. Plots in Iowa, Illinois, and Missouri were tested. They continued the field tests of experimental lines, growing seeds across the region. The Scaboo group has completed three backcrosses using PI90763 to develop new combinations of resistance genes. The Diers group is working to diversify SCN resistance away from the predominate commercial resistance source, PI88788, and tested more than 5,000 plants for selection. Finally, the group is sharing their progress with other nematologists, plant breeders and soybean producers through journal publications, conference presentations and ag media interviews.

Benefit to farmers
This research work will identify molecular mechanisms of SCN and soybean disease interactions, identify new targets and genetic sources of resistance, tremendously improve breeding efforts and will critically inform farmers' cultivar decisions. By creating a long-term strategy for SCN management and development of germplasm, farmers may have more alternatives in soybean cultivars that are SCN-resistant to combat this crop-devastating pest.

Links
An integrated approach to enhance durability of Soybean Cyst Nematode resistance for long-term strategic management
USB National Soybean Checkoff Research Database