SoyRenSeq: A Novel Approach for Disease Resistance Gene Discovery and Application for Soybean Improvement

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Overview of Project Objectives

The goals of this collaborative, multi-state, and multi-disciplinary project are to develop, optimize, and apply the RenSeq (resistance gene sequencing) technology for accelerated identification of candidate genes conferring resistance to various soybean pathogens prevalent in the Midwest, and for development of disease-resistant soybean cultivars by precise resistance gene (R) selection. Specific objectives include: developing a high-quality RenSeq platform; sequencing and assembling gene clusters (nucleotide-binding site-leucine-rich repeats, or NBS-LRR) in major soybean lines to carry resistance to soybean pathogens; analyzing resistance gene expression and responses to various soybean pathogens; evaluating resistance to various pathogens and mapping major resistance genes and genetic regions (quantitative trait loci, or QTLs); and developing candidate R-gene-based molecular markers for precision breeding.

Key Results

The team has made progress on the five project objectives. The high-quality RenSeq platform has been achieved. The team has enriched NBS-LRR (NLR) genes in 96 soybean varieties, which include donor lines for genes and genetic regions (QTLs) for various soybean pest and disease resistance such as aphids, brown stem rot, Cercospora leaf blight and more. Assemblies of NLR genes from all 96 varieties have been completed. The team has been making progress on performing QTL mapping to complement the RenSeq analysis for resistance gene discovery, marker development, and integration of resistance QTLs into elite varieties.

Benefit to Farmers

This project will explore, apply and optimize the game-changing new gene identification and sequencing technique for rapid discovery of resistance genes to Midwest soybean pathogens. These enabling technologies and tools will facilitate adding disease resistance genes into soybean cultivars more quickly, precisely and accurately, to improve soybean protection from disease and increase profitability to soybean growers.

Links

SoyRenSeq: A Novel Approach for Disease Resistance Gene Discovery and Application for Soybean Improvement
USB National Soybean Checkoff Research Database