MSMC #04-258 / MU Project ID 00028333

Final Report – July 10, 2019

**I. Title:** **Microgenomics to Identify New Sources of Soybean Cyst Nematode Resistance in Soybean**

**II. Period Covered: January 10, 2019 – July 10, 2019 [THIS project WILL END JULY 31, 2019]**

**III. PRINCIPAL Investigator:**

Melissa G. Mitchum, Professor, Division of Plant Sciences, University of Missouri, 371H Christopher S. Bond Life Sciences Center, Columbia, MO 65211. Phone: (573) 882-6152; Fax: (573) 884-9676; E-mail: [goellnerm@missouri.edu](mailto:goellnerm@missouri.edu).

**IV. Progress of Work:**

The aim of MSMC project #258 has been to study the molecular basis of soybean resistance to SCN with the long-term goal of developing improved soybean resistance strategies. **The key to developing broader, more durable resistance in soybean cultivars hinges on understanding how resistance genes work on a molecular and biochemical level to help the plant defend itself against the nematode and then exploiting this information through novel or conventional plant breeding approaches. We hypothesize that disruption to the plant’s metabolic pathways are central to the resistance mechanism of soybean to SCN.** **The long-term applications of this research may include the identification of novel biomarkers for SCN resistance and the potential for metabolic pathway engineering to create new sources of resistance.** In this project, we are analyzing the ways this disease affects biochemical pathways and how these pathways are altered in SCN-resistant cultivars using well-defined genetic material coupled with global analyses to provide a library of SCN disease resistance-associated metabolites.

**Research Progress:**

Towards this goal, we continued the analysis of our metabolite profiling results for uninfected and SCN-infected soybean roots (resistant soybean, susceptible soybean, and resistant soybean with mutations in the *Rhg4* SCN resistance gene that renders the plants susceptible). We prepped an additional set of tissues to follow up on an observed difference in several defense related metabolites. We generated RNA sequencing results for another set of uninfected and SCN-infected soybean root samples using our backcrossed mutant lines. We continued additional seed advancements of mutant plants and carried out phenotyping in the greenhouse. In collaboration with a group in biochemistry we continued to resolve the crystal structures of the Rhg4 (SHMT) protein and we hope to submit this work for publication very soon [please keep confidential]. This is a significant advance forward.

**V. Work planned for next year:**

Results will be mapped to metabolic pathways and look for correlations between RNAseq and the identified metabolites to identify key genes and metabolites of interest. These will be targeted using CRISPR/Cas9 methodology to streamline testing of these genes/metabolites for evidence of a role in SCN resistance.

**VI. Funding requested for project continuation**

None

**VII. Publications/Press:**

TO BE DETERMINED, FUTURE PUBLICATIONS WILL RESULT FROM THIS WORK

**VIII. Equipment purchased with MSMC funds, identifying inventory and serial number.**

NONE