**Annual Progress Report, June 2019**

**Advancing Varietal Resistance to Soybean Cyst Nematode in Minnesota**

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**Objectives**

The objectives of this project and related accomplishments were as follows:

*Objective 1. Develop and deploy new DNA markers linked to genes conferring SCN resistance in order to enhance the efficiency and efficacy of breeding for SCN resistance and thus expand the availability of superior SCN-resistant soybean germplasm.*

During the summer of 2018, 42 conventional crosses that included at least one parented specifically targeted for SCN resistance were made. Many other crosses just happened to have SCN resistance, amount to at least 60 total. We are moving towards a model where all crosses need to involve SCN resistance, and the markers were are using and the selections we are making are allowing us to do this. Among the RR crosses, all but 2 of the 22 planned crosses involved SCN resistance. All crosses were successfully made and F1 seed is being sent to Chile.

F2, F3, and F4 breeding populations previously targeted for SCN resistance were advanced successfully using winter and summer nurseries per standard operating procedures.

In the fall of 2018, we pulled over 5000 F4 plants specifically for SCN resistance. About 4800 of these F4:5 families were genotyped using our marker for Rhg1 on chromosome 18. Of these 4800, 1519 were found to be resistant and were advanced to plant rows. Discarding over 3000 families based on molecular markers for SCN susceptibility will greatly enhance our ability to breeding new SCN resistant varieties.

This evident by the frequency of SCN resistant varieties reaching the regional trial stage. In 2018, we entered 18 SCN resistant varieties into the SCN Regional Trials sponsored by NCSRP. All but three of these varieties were found to have a good degree of resistance according to greenhouse bioassays. In 2019, we are entering **43 such varieties into the SCN Regional Trials**, over twice as many as in 2018!! All preparations for 2019 planting of SCN breeding populations and yield trials plots were successful.

*Objective 2. Advance new sources of SCN resistance and expand the use of these new sources as parents for crossing in the breeding program*

During the summer of 2018, 21 successful crosses were made between adapted soybean varieties and breeding lines or exotic accessions carrying putative novel SCN resistance genes. New sources ranged from Peking sources to sources derived from *Glycine soja*, the wild ancestor of soybean, as well as some new sources from the germplasm collection that appear to be novel. The F1 seeds resulting from these crosses were sent to Chile for generational advance. Twenty F2 populations were successfully generated from these crosses and have been returned from Chile and planted in the St. Paul breeding nurseries for generation advancement.

F4 populations developed from crosses with novel sources of resistance back in 2017 have been advanced and will be planted in 2019. Seventeen such populations including novel SCN resistance sources have been advanced to this generation, and lines will be derived from these populations for planting in plant rows in 2020.

From crosses made in 2016, 1223 plant rows have been derived and will be planted in 2019. These plant rows will be selected visually and placed into yield trials starting in 2020.

*Objective 3. Conduct SCN bioassays on commercial varieties entering the 2018 UMN Variety Trials and publish the results through the MN Ag Experiment Station publications.*

Thirty-three commercial varieties were entered into our 2018 SCN variety trials. All entries were tested for resistance to HG Type 0 using a greenhouse bioassay at Waseca. Two entries were found to be susceptible even though they were labeled as being resistant. All entries were also tested for yield under SCN infested conditions. Results from these trials have been published at <https://www.maes.umn.edu/sites/maes.umn.edu/files/2018_soybean_final.pdf>.