**Objectives:**

**4th Quarterly report May 13, 2019**  
   
**Novel traits for soybean improvement through mutagenesis and germplasm collections**  
   
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**Objective 1.  Associate deletions with shoot architecture phenotypes.**  
As reported in the previous report, we are still working on each of the four mutants (Lps1, Christmas tree, short petiole, and reduced branch angle) and characterizing transgenic plants for mutations in the candidate gene and/or studying the phenotype of each mutant. Plants that are edited for a candidate gene for short petiole will be planted in the field in 2019 and characterized.  
**Objective 2. Identify novel genes controlling shoot architecture in germplasm collections.** Three hundred and eighty-four accessions were grown in the field in Rosemount and St. Paul in 2018 and shoot architecture phenotypes were scored. We used a combination of high-throughput (e.g., drone-based imaging, NDVI) and standard phenotyping approaches to score plants for height, petiole length, flowering time, growth habit, canopy closure, and light penetration through the canopy. Towards the end of the growing season we removed plants from each of the 384 accessions and obtained data for branch angle, branch number, node number, internode length, and plant shape on all of the accessions. Data analysis has been completed and interpretation of the results and manuscript preparation are underway. Our results show that branch angle is associated with canopy closure, and branch number, node number and internode length are associated with growth habit. These results provide tools and information to alter soybean canopy architecture with a goal towards increasing yield.  
**Objective 3. Examine shoot architecture in historical cultivars.** We planted 37 cultivars that represent cultivars grown in Minnesota from the 1930s – present. We phenotyped these cultivars with high- and low-throughput approaches as described in objective 2. Our preliminary data shows that branch angle increased over the decades and is weakly correlated with canopy closure. We are preparing seed for growing this experiment in two locations in the summer of 2019.  
   
**Presentations and Publications**  
   
No presentations or publications to report in the 4th quarter of this project.

**Achievements:**

**Objective 1. Associate deletions with shoot architecture phenotypes.**We have developed edited plants for genes potentially encoding lps1 and short petiole. This plants are being characterized.

**Objective 2. Identify novel genes controlling shoot architecture in germplasm collections.**

Data analysis of the large field experiments have been completed and interpretation of the results and manuscript preparation are underway. Our results show that branch angle is associated with canopy closure, and branch number, node number and internode length are associated with growth habit. These results provide tools and information to alter soybean canopy architecture with a goal towards increasing yield.

**Objective 3. Examine shoot architecture in historical cultivars.**  We have preliminary evidence that branch angle has gotten larger over the decades and this change is weakly associated with canopy closure.

**Challenges:**

None encountered.

**Publication(s)/Symposium:**

None in this quarter.

**Tech Transfer:**

None in this quarter.