

## Nebraska Soybean Board

### Year-End Summary Research Report Form For Multi-Year Projects

Please use this form to summarize the practical benefits of your research project and what has been accomplished.

Your answers need to convey why the project is important and how the results will impact soybean production.

**Note that this form must be submitted with the 4th Quarter Report in all multi-year projects.**

**Project # and Title:** #1739: Dissect Carbon Capture and Partitioning in Soybean with a Systems Approach for Yield and Oil Content Improvement

**Principal Investigator:** Chi Zhang

**Year of Multi Year:** 1 of 2 (For example: Year 1 of 3, Year 2 of 2)

**1. What was the focus of the research project or educational activity?**

We propose a study to apply a systems approach by analyzing transcriptomic sequencing data for variant transgenic lines to uncover the intricate interactions among the genes involved in carbon capture and partitioning pathways. We will develop a predictive model by constructing a gene co-expression network to link them to the corresponding phenotypes, such as seed size and oil content.

**2. What are the major findings of the research or impacts of the educational activity?**

In the past one year, we planted six transgenic soybean lines, carrying AtWri1, AtWri1/AtDGAT1, AtDGAT1/AtKasII, a five-transgene stack, Gm20p RNAi line, and one wild type soybean. RNA samples for eight transgenic soybean lines at three time points were collected and sequenced. We conducted data analysis to the total of 72 RNA-seq dataset. We are still working on the statistical model construction, but we already found several key genes and pathways to respond to the phenotype.

**3. Briefly summarize, in lay terms, the impact your findings have had, or will have, on improving the productivity of soybeans in Nebraska and the U.S.**

Uncovering the intricate interactions among the genes involved in carbon capture and partitioning pathways is important since it is a key step towards generating optimally-transgenic soybeans with enhanced capture and partitioning ability for seed development to further increase the yield and the oil content.

**4. Describe how your findings have been (or soon will be) distributed to (a) farmers and (b) public researchers. List specific publications, websites, press releases, etc.**

Based on our research, in this funding period, we are working on our manuscript to our discovery, and we also published a database paper: . G. Moissejev, K. Park, A. Cui, D. Freitas, D. Rajagopal, A.R. Konda, M. Martin-Olenski, M. Mcham§, K. Liu, Q. Du, J. C. Schnable, E.N. Moriyama, E. B. Cahoon, Chi Zhang. RGPDB: Database of root-associated genes and promoters in maize, soybean, and sorghum. DATABASE (2020); baaa038;

We attended several scientific meetings to present our discoveries. Dr. Clemente reported our discovery about GP20m on a National Soybean Board conference.

**5. Did the NE soybean checkoff funding of your project, leverage additional State or Federal funding support? Please list sources and dollars approved.**

No

Please email this completed form to the Agriculture Research Division (jmcMahon10@unl.edu) based on the reporting schedule given to you. If you have any questions, please call Jen McMahon at the ARD 2-7082.