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.

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

Project # and Title: #713:Using data integration approach to break genetic ceilings of quality oil accumulation   **Principal Investigator:** Chi Zhang

Year of Multi Year: __1__ of __2__   (example: Year 1 of 3, Year 2 of 2)

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1. What was the focus of the research project?

We propose a study to apply the build-test-learn model to soybean events carrying transgenic alleles designed to increase quality oil accumulation in seeds, without compromising protein along with transgenic alleles designed for the ideotype soybean-based feedstock for aquaculture. After this "learn" step, we expected to discover a set of key genes and their interactions in the fatty acid synthesis and regulation pathways. Studies on these differential gene calls will help guide the build constructs to break the genetic ceiling that may be limiting omega-3 fatty acid accumulation.

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2. What are the major findings of the research?

In the past year, we collected existing RNA-seq datasets. Most of them were results from NE Soybean Board support. We also planted six transgenic soybean lines. We conducted RNA-seq experiment and data analysis for a total of 34 samples. We are still working on model development and data integration, but we already found several interesting genes and their pathways to respond to fatty acid synthesis in soybeans.

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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 the fatty acid synthesis and regulation pathways is important since it is a key step towards generating optimally-transgenic soybeans to break the genetic ceiling that may be limiting the omega-3 fatty acid accumulation and the new development targets the accumulation of EPA and DHA omega-3 fatty acid more than 9%.

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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.

We published two research articles in very good journals:
(1) C.L. Arias, T. Quach, T. Huynh, H. Nguyen, A. Moretti, Y. Shi, M. Guo, A. Rasoul, K. Van, L. McHale, T.E. Clemente, A. Paula Alonso, Chi Zhang*. Expression of AtWRI1 and AtDGAT1 during soybean embryo development influences oil and carbohydrate metabolism. Plant Biotechnology Journal (2022); 20(7):1327-1345.
(2) H. Yu, M. L, J. Sandhu, G. Sun, J.C. Schnable, W. Xie, B. Yu, J.P. Mower, Chi Zhang*. Pervasive misannotation of microexons that are evolutionarily conserved and crucial for gene function in plants. Nature Communications (2022); 13, 820.

We attended several scientific meetings to present our discoveries, such as a presentation for the ASPB conference.

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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 submit 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 Agricultural Research Division (402) 472-7082.

Please check your information before submitting the form.   [Submit by Email]