

Nebraska Soybean Board
Year-End Summary Research Report Form for Multi-Year Projects

REVIEWED
By Lois Ronhovde at 9:17 am, Nov 09, 2022

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: Project # 750: Enhancing soybean germplasm through biotechnology **Principal Investigator:** Tom Elmo Clemente

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

1. What was the focus of the research project?

This research program is evaluating novel genetic variation in soybean through the addition of transgenic and/or edited alleles. The introduced novel genetic variation is being assessed for both input and output traits.

2. What are the major findings of the research?

The key findings include the successful over accumulation of a vegetative storage protein in source leaves that is being evaluated as a means to positively impact harvest index. Second, this program has built a platform to assemble modular based genetic elements that permits the introduction of biochemical pathways in soybean. We have used this platform to introduce biochemical pathways that lead towards the synthesis of key ingredients in aquafeeds. Namely ketocarotenoids, very long chain omega 3 fatty acids EPA and DHA, along with a form of vitE, tocotrienol. The third key finding is the exploitation of genome editing tools to create null mutations in members of the major seed storage reserves to manifest a proteome rebalanced soybean. This outcome is being assessed for changes in protein digestibility, and investigations being addressed that look at novel transgenic allele stacks with the edited alleles for complementary output trait development.

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.

This program is developing, testing and learning from the introduction of novel genetic variation in soybean. This genetic variation is targeting both input (benefit producer) and output traits (benefit the consumer). In regards to the former we are testing genetic designs for improvement in harvest index, and resistance to soybean gall midge, and the latter for genetic approaches leading to improved protein digestibility and other quality traits for both the food and feed markets.

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.

Outcomes from this program are being communicated through various avenues, including oral presentations (ex Soybean Think Tank Indianapolis, IN July 12-14, 2022), peer reviewed publications (ex Arias et al 2022 Plant Biotechnology J. entitled Expression of AtWri1 and AtDGAT1 during soybean embryo development influences oil and carbohydrate metabolism), and patent applications (Herbicide resistant plants and methods of making and using, US application number 17763134)

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

The support from the Nebraska Soybean Board helped leveraged funding from the United Soybean Board and provided the scientific foundation for a multi-institutional grant submission being considered for funding by the National Science Foundation, that is funded will allow for a deep investigation into the genetic underpinnings that govern oil/protein reserves in soybean.

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.

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