

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: #1734: Using Pathogen Effectors to Improve the Soybean Immune System

Principal Investigator: Tom Elmo Clemente

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

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

The research project is focused on identifying effector proteins from plant pathogens, identifying the function and host targets of these effectors, and utilizing the knowledge gained to generate improved disease-resistant soybeans.

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

The plant protein Photo2 was found to be targeted by the bacterial effector hopK1. Photo2 was found to be involved in the recognition of blue light by plant cells. Blue light was found to be important in activating resistance to bacterial plant pathogens. We are testing if altering levels of this protein (Photo2) in plant cells impacts resistance to disease.

Transgenic soybeans expressing the plant proteins AtMAP65-1 and GmMAP65-1 were generated and found to have improved resistance to *Pseudomonas syringae*. AtMAP65-1 expressing plants showed improved resistance to *Phytophthora sojae*. Like Photo2, MAP65-1 protein was found to be a target for a bacterial pathogen effector protein, which the outcome of the effector protein/MAP65-1 interaction was an altered plant response to disease, and changing the level of MAP65-1 in plants cells impacted the resistance response.

The *Pseudomonas* effector hopAW1 was found to suppress the plant hypersensitive immune response. Pathogen mutated in this effector were found to be less virulent on soybean. The targets of this effector are not yet known but are being investigated.

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.

The outcome of this research program is designed to help inform genetic approaches to address protection of soybean yields from plant pathogens. Understanding the mechanism(s) plant pathogens use to undermine soybean immunity, and learning from this information on how to combat disease, is the approach this program is undertaking. In other words, identifying the protein target(s) in soybean that pathogen effector proteins interact with, offers new opportunities to generate novel genetic variation in soybean that leads to enhanced resistance to disease.

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.

Research summarizing the effector hopK1, its target of Photo2, and the contribution of blue light to plant immunity will soon be submitted for publication with prominent science journals.

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

The research group currently has support from the National Science Foundation, which is being used to further characterize pathogen effector proteins and their mechanism of action during disease. The information gathered from these studies offer insight for into creating durable resistance to soybean and other crop diseases

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.