

Nebraska Soybean Board



11/8/2019

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 impact soybean production.

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

Project Title: Using pathogen effectors to improve the soybean immunity system

Principal Investigator: James R. Alfano

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 proteins called “effectors” expressed in plant pathogens which plant pathogens use to influence the plant’s response to the pathogen. Identifying the function and host targets of these effectors, will allow us to gain insight on how pathogens cause disease and in turn use this information to design genetic approaches to combat plant disease

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

The soybean protein designated GRP7 was found to be targeted by the effector hopU1, and the gene responsible for the expression of GFP7 was found to contribute to soybean immunity. Overexpressing GRP7 in soybean was found to improve immunity while not compromising yield, under the conditions tested. A plant protein designated Phot2 was found to be targeted by the effector hopK1. Phot2 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. This knowledge is being utilized to help inform us on genetic approaches to mitigate plant disease

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. Once identified, these targets can be genetically manipulated to further enhance soybean’s resistance response to pathogen ingress.

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.

Protection of soybean yield through improved disease resistance is a continuing battle. Understanding soybean pathogens and the mechanism they use to undermine soybean defense is the first step to design genetic strategies to combat these pathogens. Identifying the targets of soybean pathogen effectors is information that can be translated to application for novel disease resistance in soybean.

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.

This past July, a student of the Alfano research group presented research on effectors of Pseudomonas syringae pv. glycinea and Phytophthora sojae at the Molecular Plant-Microbe Interactions congress in Scotland which was attended by over 1500 scientists in the field. The Nebraska Soybean Board was acknowledged for its support. Research summarizing the effector hopK1, its target of Phot2, 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 Alfano laboratory recently received funding from the National Science Foundation that exploited preliminary data gathered on a specific bacterial effector and its known plant target with resources used from the Nebraska Soybean Board. This information is being tested directly in soybean as a means to enhance disease resistance in soybean to SCN and Phytophthora sojae

Please e-mail this report to the Agriculture Research Division (jmonagham2@unl.edu).