Nebraska Soybean Board
Year-End Research Findings Report

DS
VB   10/31/2017

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.

Project Title: Fungicide Resistance in *Rhizoctonia solani* and Implications for Soybean Fields in Nebraska

Contractor & Principal Investigator: Sydney Everhart, Department of Plant Pathology, UNL

Please check/fill in appropriate box: ☐ *Continuation research project*
■ *Year _2_ of_ 3 _ research project (for example: Year 1 of 2)*

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

Our research focus is to characterize the soybean pathogen that causes Rhizoctonia root and stem rot, using molecular techniques and fungicide sensitivity assays in order to provide recommendations to growers on how to manage this pathogen. This is a collaborative research project between the Everhart and Adesemoye labs. Two doctoral students (S. Kodati and N. Gambhir) are being trained in soybean disease management using laboratory and molecular techniques. These projects are part of their dissertation research.

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

We have identified *Rhizoctonia zeae* and *Rhizoctonia solani* AG-4 as the two most prevalent groups, among a total of 52 *Rhizoctonia* isolated from soybean fields in Nebraska. We have an additional 31 *Rhizoctonia* isolated in the 2017 season that are currently being characterized. The number of isolates in different groups collected and DNA sequence-characterized thus far have identified *Rhizoctonia zeae (23)*, *R. solani* AG-4 (20), *R. solani* AG-3 (2), *R. solani* AG-2 (1), *R. solani* AG 1-IB (4), and AG-B (2).

Our work is further characterizing the level of pathogenicity of these isolates and has identified a surprising number of *Rhizoctonia zeae* that are pathogenic to soybean. We are investigating this further and if confirmed, it will be a major finding. Thus far, we have presented information to growers about conditions that may favor *Rhizoctonia* infection as well as information on disease management.

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.

Research in the Everhart and Adesemoye labs on Rhizoctonia are laying the foundation for improved soilborne pathogen disease management for Nebraska. This is the first research to robustly investigate diseases caused by *Rhizoctonia* on soybean in our state. The findings during this study that *Rhizoctonia zeae* and *Rhizoctonia solani* AG-4 are the two groups among *Rhizoctonia* that pose the highest risk to soybean production, indicate that management efforts should focus more on these two groups.

Identification of the *Rhizoctonia* causing root and stem rot and determining fungicides optimal for control, will allow recommendations tailored for optimal disease control in Nebraska, as opposed to recommendations from other states. Based on our findings, we need to further examine pathogenicity determinants in *R. zeae* using metabolomics methodologies. Determining sensitivity of the *Rhizoctonia* sub-groups will provide novel information regarding whether disease management recommendations need to be modified. These studies will provide additional information that will affect the design of integrated management systems for *Rhizoctonia* in Nebraska soybean.

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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.

a) Farmers: Dr. Adesemoye had an interview on Kody Radio AM 1240 on June 21, 2017 during which the impact of soilborne pathogens on soybean, including Rhizoctonia root and stem rot, and recommendations for an integrated management of the pathogens were discussed. In January 2017, we provided information to growers during the Crop Production Clinic on *Rhizoctonia* diseases as well as updates from this project. Additionally, we spoke about Rhizoctonia diseases in soybean during a tour of West Central Research and Extension Center, North Platte by leaders and administrators in the region on May 27, 2016, and during a university course visit on August 17, 2016. In addition to formal presentations, Dr. Adesemoye provided one-on-one consultation to farmers specifically regarding Rhizoctonia disease management.

b) Public researchers: Several presentations were made at local, regional, and national meetings. This included an oral presentation by graduate student S. Kodati at the North Central Division meeting of the American Phytopathological Society in Champaign, IL, poster authored by S. Kodati and presented by N. Gambhir at the National American Phytopathological Society meeting in San Antonio, TX, and seminar presented by Dr. Adesemoye in the Department of Agronomy and Horticulture Seminar Series in Lincoln, NE. This is in addition to one presentation and one publication in the prior year.

Publications and scientific presentations:

- Kodati, S., Eskelson, M. J., and Adesemoye, A. O. 2017. Cross-pathogenicity of *Rhizoctonia* spp. isolated from multiple hosts to corn, soybean, and wheat. A PowerPoint presentation made during the Annual Meeting of the North Central Division meeting of American Phytopathological Society, Champaign, IL. June 14-16, 2017.
- Kodati, S., Gambhir, N., Everhart, S., and Adesemoye, A. O. (2017). Prevalence and pathogenicity of *Rhizoctonia* spp. from soybean in Nebraska. A poster presentation during the American Phytopathological Society (APS) Annual meeting (poster #546-P), which held at San Antonio, Texas. August 5-9, 2017.
- Adesemoye, A. O. presented a seminar in Lincoln, NE on September 29, 2017 titled: "Harnessing components of the root microbiome for integrated management of soilborne plant diseases" and findings from this study was part of the discussion. The seminar was part of the UNL Department of Agronomy and Horticulture fall seminar series, which was well publicized.
- Adesemoye, A.O., S. Kodati, and R. Werle. 2016. Herbicide Injury and Pathogen Infection on Soybean Seedlings. *CropWatch* June 17, 2016
- Kodati, S., and A.O. Adesemoye. 2016. Characterization, Anastomosis Grouping and Pathogenicity of *Rhizoctonia solani* on Multiple Plant Hosts in Nebraska. *Department of Plant Pathology Seminar Series.* Nov. 7, 2016.

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5. Did the NE soybean checkoff funding support for your project leverage any additional state or Federal funding support?   (Please list sources and dollars approved.)

J. Bond, S. Everhart, et al. (15 CO-PI's; 9 states) – Title: **Seedling Diseases: Biology, Management and Education.** Funding agency: North Central Soybean Research Program (sub-award), #SIU Carbondale 16-13. Funding to Everhart and Adesemoye as equally contributing CO-PI's in the amount of $36,000. Active dates: 10/1/2016 to present.

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