

Nebraska Soybean Board



11/5/2018

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

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

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

This survey has provided novel information, which shows that Rhizoctonia zeae (Waitea circinata var. zeae) is an important pathogen of soybean, which has not been well studied. We have identified Rhizoctonia zeae and Rhizoctonia solani AG-4 as the two most prevalent groups in Nebraska, among a total of more than 100 Rhizoctonia isolates. 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. Different methods of isolation of Rhizoctonia and growth media were developed or evaluated, which will enable standardized approaches to future studies on this pathogen. Development of molecular markers (currently underway) will enable deeper insight into the mode of spread and biology of this pathogen.

Our current results show that Rhizoctonia zeae has a broad range of fungicide sensitivity to prothioconazole, sedaxane, and fludioxonil. However, results of our research to date suggest that Rhizoctonia zeae is completely insensitive to azoxystrobin fungicide, which is currently one of most common fungicides used due to the expected high specificity of action. 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 conduct a detailed investigation into seedling 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 and future studies should focus on these groups. Our work also shows that there is variability in fungicide sensitivity of Rhizoctonia zeae and our current results suggest it is insensitive to azoxystrobin (QoI fungicides). Development of molecular markers that is currently underway will provide deeper insight into the biology of this pathogen and how it may be spread, which are important for creating robust management recommendations.

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: Results of this research were presented by Extension Specialist, Dr. Adesemoye, to farmers at the Nebraska Crop Management Conference in Kearney, NE on January 24th and 25th. We published two very timely articles in CropWatch (May 3 and July 2) on seedling diseases that may be increased due to the delayed planting this year, and also published a more detailed article in the SoybeanNebraska magazine on Rhizoctonia diseases in soybean. Another article we published in SoybeanNebraska described how farmers can reduce the risk of fungicide resistance.

b) Public researchers: We were asked to give two invited presentations on this work at the International Rhizoctonia Workshop, which is a meeting held only once every five years and by invitation only. Our presentations included a presentation on Rhizoctonia zeae as a new soybean pathogen and a presentation on fungicide sensitivity. We also presented research as two poster presentations at the International Congress of Plant Pathology.

Publications and scientific presentations in 2018:

1. Adesemoye, A. O. 2018. Root and Soilborne Diseases Update. CropWatch July 2, 2018.

2. Adesemoye, A. O. 2018. Soilborne and early seedling pathogens and delayed planting in corn and soybean. CropWatch May 3, 2018.

3. Gambhir, N., S. Everhart, S. Kodati, & A. Adesemoye. 2018. Fungicide Resistance: Risk and Management. SoybeanNebraska Mag., Spring 2018, Page 22.

4. Kodati, S., A. Adesemoye, N. Gambhir, & S. Everhart. 2018. Rhizoctonia Diseases in Soybean. SoybeanNebraska Magazine, Spring 2018, Page 23.

Posters Presented in 2018:

5. Gambhir, N., Kodati, S., Adesemoye, A.O., and Everhart, S.E. 2018. Fungicide sensitivity of Rhizoctonia spp. isolated from soybean fields in Nebraska. Poster at ICPP Meeting in Boston, MA.

6. Kodati, S. and Adesemoye, A. O. 2018. Emerging understanding of the pathogenesis of Rhizoctonia zeae in row crops. ICPP-APS Joint Conference holding August 1 to 5 in Boston, MA.

5. Did the NE soybean checkoff funding of your project, leverage 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 a total amount of \$72,000 during the active dates: 10/1/2016 to present.

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

**Nebraska Soybean Board
Year-End Research Findings Report**

*Please use this form to summarize the practical benefits of your research project and what has been accomplished.
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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 3 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.

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****This form must be completed and submitted with the fourth quarter report.**

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Presentations in 2018:

7. Everhart, S.E. and Adesemoye, A.O. 2018. An update on the project presented during the 2018 Crop Production Clinics at the Sandhills Convention Center, North Platte, NE on January 11, 2018.

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8. Gambhir, N., Kodati, S., Adesemoye, A.O., and Everhart, S.E. 2018. Fungicide sensitivity of *Rhizoctonia zea* from soybean and corn in Nebraska. Presentation at International Rhizoctonia Workshop: *Rhizoctonia at crossroads: research advances and challenges*, Boston, MA.
9. Kodati, S. and Adesemoye, A.O. 2018. Diversity and pathogenicity of *Waitea circinata* on row crops. Presentation at International Rhizoctonia Workshop: *Rhizoctonia at crossroads: research advances and challenges*, Boston, MA.
10. Presentation during 2018 Nebraska Crop Management Conference at the Younes Conference Center, Kearney, NE on January 24 and 25, 2018.

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 \$72,000. Active dates: 10/1/2016 to present.

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