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| Please use this form to clearly and concisely report on project progress. The information included should reflect quantifiable results that can be used to evaluate and measure project success. Comments should be limited to the designated boxes. Technical reports, no longer than 4 pages, may be attached to this summary report. |
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| Project Title:  | Spray Application of Double Stranded RNA for Simultaneous Management of Multiple Soybean Fungal and Insect Diseases |
| Organization:  | Louisiana State University Agricultural Center |
| Project Lead Name: | Zhi-Yuan Chen |
| Report Period: |  Dec 16, 2023 to Mar 15, 2024 |
| **National Soybean Checkoff Research Database** [**https://www.soybeanresearchdata.com/**](https://www.soybeanresearchdata.com/) **(public website funded by USB). Please include a non-technical project status along with your project status. The non-technical project status will be published to the website. If a non-technical project status is not provided, the contents of this entire report will be published.** |
| Project Status: |
| The objectives of this proposed study in the second year are to: 1) Continue the effort to fine-tune the conditions to effectively deliver dsRNA into soybean plants; 2) Examine the potential of nano-particles in enhancing dsRNA stability on leaf surface; and 3) Perform various greenhouse or field studies to determine the effectiveness of these dsRNAs in simultaneous management of CLB, FLS, and PSS through folia applications.In the fourth quarter of the second year, our project has been focusing on exploring ways to enhance the effectiveness of applied dsRNA on disease reduction (objective 1) and on examining the potential of nano-particles in enhancing dsRNA stability on leaf surface (objective 2). For objective 1, we have been testing several additional adjuvants to determine their potential in enhancing dsRNA delivery in this quarter. We collected the soybean leaf samples from different treatments, extracted total DNA from leaf samples. We are now quantifying fungal growth in these samples using quantitative real time PCR. For objective 2, we previously tried lignin-based nano particles, but itself was found to induce plant defense. Now, we are collaborating with scientist from USDA-ARS and starting synthesizing a new nanomaterial in house for our testing its ability in protecting our dsRNAs. The study for objective 3 was conducted in the field in 2023. |
| **Non-technical project status:** |
| We have produced nucleic acids with sequences matching those of soybean pathogens in a bacterial system. These nucleic acids showed ability to reduce FLS and CLB in our repeated growth chamber studies. The objectives of this study in the second year were to examine the abilities of nucleic acids for reducing several major fungal diseases of soybean under greenhouse conditions, and to find ways to reduce the amount of nucleic acids we need to spray to achieve successful control of soybean cercospora leaf blight (CLB), purple seed stains (PPS) and frogeye leaf spot (FLS) diseases under field conditions. These nucleic acids are non-toxic to none-targeted organism and are environmentally safe. Our preliminary assessment of small scale field study also indicated some suppression of FLS after three dsRNA applications with dsRNAs. We are currently exploring new ways to increase the uptake of these nucleic acids by either plants or the pathogens through the use of various chemical formulations and possibly coating them with nanoparticles in the future to prolong the protection offered by these nucleic acids.  |