|  |  |
| --- | --- |
| 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. | |
|  |  |
| 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: | Sep 16, 2023 to Dec 15, 2023 |
| **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 third 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 evaluating the effect of different dsRNA in reducing soybean frogeye leaf spot (FLS) disease under greenhouse and field conditions (objective 3). For objective 1, we have been testing different adjuvants to determine their potential in enhancing dsRNA delivery. In last quarter, a couple of them were found to enhance the efficacy of applied dsRNA by about 2 fold. In this quarter, we are testing several more adjuvants and we are still analyzing the data for their effectiveness. For objective 3, besides repeating the dsRNA treatments in greenhouse, we setup a field study in 2023. The field was treated with different dsRNAs three times (one week apart between each spray) to suppress FLS from July 28 to Aug 24 at Ben Hur Research Station. Their effects on FLS disease development under natural infection were evaluated at the early October for difference in FLS disease symptoms. Please see the attached technical report for more details. | |
| **Non-technical project status:** | |
| The objectives of this study in the second year were to examine the abilities of nucleic acids we previously produced in bacteria 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 so it can be practical and economical to use this novel approach to manage 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. We have produced these nucleic acids in bacteria that have shown ability to reduce FLS and CLB in our repeated growth chamber and greenhouse studies. Our preliminary assessment of small scale field study also indicated some suppression of FLS after three dsRNA applications with dsRNAs. We are also trying to find 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. | |