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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 |
| Principal Investigator Name: | Zhi-Yuan Chen |
| Report Period: | March 16, 2024 to June 15, 2024 |
| Project Status: | |
| In the studies conducted in the previous two years, we produced nucleic acids called double stranded RNA (dsRNA) in bacteria with sequences matching several soybean pathogens, such as those causing cercospora leaf blight (CLB), frogeye leaf sport (FLS) as well as soybean rust. These dsRNAs are non-toxic to other organisms and are environmentally safe. They reduced FLS and CLB in our previous repeated growth chamber studies. In a small scale field study conducted last year, we observed some suppression of FLS after three dsRNA applications. We are currently exploring new ways to increase the uptake of these dsRNA by either plants or the pathogens through the use of various chemical formulations as well as coating them with nanoparticles to prolong their protection. The specific objectives of this proposed study in the third year are to: 1) Continue the effort to fine-tune the conditions to increase the efficacy of dsRNA in disease suppression; 2) Examine the potential of mixing different dsRNA to enhance their effectiveness in reducing disease symptoms under greenhouse conditions; and 3) Perform small scale field studies to determine the effectiveness of these dsRNAs in simultaneous management of CLB, FLS, and PSS through foliar applications. In the first quarter of the third 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 new adjuvants that were recently reported to enhance dsRNA uptake to determine their potential in enhancing dsRNA delivery. We collected the soybean leaf samples from different treatments, extracted total DNA from leaf samples. We have quantified fungal growth in these samples using quantitative real time PCR and observed clear reduction in fungal growth in the presence of dsRNA. For objective 2, we have established a procedure in synthesizing Fe/Mg nano particles, coated our dsRNA on these nano materials and applied them onto soybean plants before exposing them to direct sunlight for various durations to determine how long the dsRNA can remain effective in suppressing fungal disease under natural conditions. For objective 3, a field study has been planned. The first batch of 32 rows of soybean (Syngenta NK43-Y9XFS) was planted on May 22, 2024. These plants will be treated with dsRNAs with or without adjuvants or nanoparticles to determine the potential of dsRNA in managing soybean fungal diseases. There will be two more plantings so we can repeat the field study two more times. | |