

Technical report of the progresses on the MSSB project

(Quarter 4, March 12, 2024)

TITLE: Spray application of double stranded RNA (dsRNA) for simultaneous management of multiple soybean fungal and insect diseases

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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 nanoparticles 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 this quarter, we mainly focused our research on objectives 1 and 2. For objective 1, we have been testing different adjuvants to determine their potential in enhancing dsRNA delivery. In this quarter, we were performing molecular analysis on the samples we collected in last quarter that were treated with dsRNA and different adjuvants. We have extracted genomic DNA from treated and various control samples and are quantifying the fungal growth in soybean leaf samples that were treated with dsRNA with or without different adjuvants using real time PCR. For objective 2, soybean plants in pots were sprayed with dsRNA with or without nanoparticles and were exposed to direct sunlight for 0-15 days before being moved back to greenhouse and inoculated with soybean rust pathogen (Figure 1, top and bottom) .



Figure 1. Evaluating the effect of nanoparticles in protecting the dsRNA from UV damage and enhancing its uptake by soybean leaves. Top: soybean plants were sprayed with dsRNA with or without being coated with nanoparticles and exposed to sunlight for 0-15 days. Bottom: Soybean plants were moved back to greenhouse and inoculated with soybean rust pathogen. The difference in rust symptoms among soybean plants with different treatments were evaluated two weeks later.