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| Project Number:  |  |
| Project Title:  | Development of climate-smart high-yield practices associated with high-end biological treatments and soybean-related microbiome resiliency |
| Organization:  | University of Texas-Arlington |
| Project Lead Name: | Woo-Suk Chang |
| Reporting Period:*Please select the appropriate reporting period for this report.* |  [x]  December [ ]  March [ ]  June [ ]  September [ ]  Final |
| The information included in this detailed report should reflect quantifiable results that can be used to evaluate and measure project success.If Progress Report – What key activities were undertaken and what were the key accomplishments during this reporting period? List each key deliverable from the proposal and describe progress made (or not made) toward achieving it, including metrics were appropriate.If Final Report – What were the key accomplishments during the life of the project? List each deliverable from the proposal and describe progress made (or not made) toward achieving it, including metrics where appropriate. |
| For all conventionally tilled and no till research fields, we used three inoculant conditions: i) TXVA strain (drought-tolerant inoculant), ii) TagTeam (a commercial inoculant), and iii) no inoculant (control). Below is a summary of the 2024 field work, including locations, collaborators, planting dates, mid-sampling dates, harvest dates, and cultivar information (**Table 1**). **Table 1**. Summary of the 2024 field work.

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| Location | Collaborators | Planting Date | Mid-Harvest Sample | Pre-Harvest Sample | Harvest Date | Cultivar Used | Maturity Group |
| Port Lavaca, TX | Dr. James Grichar | 3/28 | 5/21 | 8/19 | 8/26 | Lynda-GT, Pamela-GT | INDT, IDNT |
| Winnsboro, LA | Dr. Trey Price | 5/16 | 7/11 | 8/8 | 10/9 | Ellis | 4L |
| Portageville, MO | Dr. Feng Lin | 5/30 | 7/12 | 8/9 | 11/15 | Ellis | 4L |
| Colt, AR | Dr. Shawn Clark | 6/13 | 8/1 | 8/9 | 11/18 | Ellis, S11-2024C | 4L, 5 |
| Leland, MS | Dr. Tessie Wilkerson | 6/14 | 8/2 | 8/9 | 11/19 | P49Z02E | 4.9 |

\* drought-tolerant cultivar.Since September 15th, we have analyzed physicochemical properties of rhizosphere soils for all samples collected from conventionally tilled and no-till fields in Port Lavaca (TX), Winnsboro (LA), Portageville (MO), Colt (AR), and Leland (MS). Results of soil properties are shown in **Figures 1-5**. The harvest has been completed; however, we are still in the process of calculating the final yield.Additionally, on October 18, we collected rhizosphere and bulk soils from high-yield (>100 bushels/acre) and low-yield (~35 bushels/acre) soybean fields in Arkansas. The rhizosphere soils were collected after the harvest for the high-yield field and just before the harvest for the low-yield field. The bulk soils were collected from an adjacent location (with no plants growing) at the same time the rhizosphere soils were sampled. We have analyzed physicochemical properties of the rhizosphere and bulk soils (**Figs. 6-7**). We are in the process of extracting DNA from the soils to identify key microorganisms and microbial communities that contribute to high soybean yields in Arkansas.**Figure 1.** Soil physiochemical properties for cultivars Lynda-GT and Pamela-GT in convential till and no-till fields in Port Lavaca, TX. The initial sample represents soil properties before any inoculant treatment was applied. TXVA, drought-tolerant N-fixing inoculant; TAG, TagTeam commercial inoculant; Contorl, no inoculant. Organic matter (OM%) is measured as a percent, and all nutrients are measured as parts per million (ppm).**Figure 2.** Soil physiochemical properties for cultivar Ellis in convential till and no-till fields in Winnsboro, LA. The initial sample represents soil properties before any inoculant treatment was applied. TXVA, drought-tolerant N-fixing inoculant; TAG, TagTeam commercial inoculant; Contorl, no inoculant. Organic matter (OM%) is measured as a percent, and all nutrients are measured as parts per million (ppm).**Figure 3.** Soil physiochemical properties for cultivar Ellis in convential till and no-till fields in Portageville, MO. The initial sample represents soil properties before any inoculant treatment was applied. TXVA, drought-tolerant N-fixing inoculant; TAG, TagTeam commercial inoculant; Contorl, no inoculant. Organic matter (OM%) is measured as a percent, and all nutrients are measured as parts per million (ppm).**Figure 4.** Soil physiochemical properties for cultivars Ellis and S11-20242C (drought-tolerant cultivar) in convential till and no-till fields in Colt, AR. The initial sample represents soil properties before any inoculant treatment was applied. TXVA, drought-tolerant N-fixing inoculant; TAG, TagTeam commercial inoculant; Contorl, no inoculant. Organic matter (OM%) is measured as a percent, and all nutrients are measured as parts per million (ppm).**Figure 5.** Soil physiochemical properties for cultivar P49Z02E in convential till and no-till fields in Leland, MS. The initial sample represents soil properties before any inoculant treatment was applied. TXVA, drought-tolerant N-fixing inoculant; TAG, TagTeam commercial inoculant; Contorl, no inoculant. Organic matter (OM%) is measured as a percent, and all nutrients are measured as parts per million (ppm).**Figure 6.** Physiochemical properties of the rhizosphere and bulk soils collected from high-yield (> 100 Bu/A) soybean filelds in AR. **H1R**, high-yield rhizosphere soil replicate 1; **H2R**, high-yield rhizosphere soil replicate 2; **H3R**, high-yield rhizosphere soil replicate 3; **H1B**, high-yield bulk soil replicate 1; **H2B**, high-yield bulk soil replicate 2; **H3B**, high-yield bulk soil replicate 3. Organic matter (OM%) is measured as a percent, and all nutrients are measured as parts per million (ppm).**Figure 7.** Physiochemical properties of the rhizosphere and bulk soils collected from low-yield (35 Bu/A) soybean filelds in AR. **L1R**, low-yield rhizosphere soil replicate 1; **L2R**, low-yield rhizosphere soil replicate 2; **L3R**, low-yield rhizosphere soil replicate 3; **L1B**, low-yield bulk soil replicate 1; **L2B**, low-yield bulk soil replicate 2; **L3B**, low-yield bulk soil replicate 3. Organic matter (OM%) is measured as a percent, and all nutrients are measured as parts per million (ppm). |