MinnesotaCorn
RESEARCH & PROMOTION COUNCIL

PROGRESS REPORT

PROJECT TITLE: Developing biocontrol against corn pathogens
PROJECT NUMBER:
REPORTING PERIOD:4th Quarter (Dec 2024- March 31)
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1.) PROJECT ACTIVITIES COMPLETED DURING THE REPORTING PERIOD. (*Describe project progress specific to goals, objectives, and deliverables identified in the project workplan.*)
To enhance biocontrol activity, we expanded the pre-existing community (C7) by incorporating S8, a free-living bacterial strain with pathogen suppression capabilities, forming a modified community (C8). Prior to its integration, we assessed S8's antagonistic activity against key corn root pathogens—*Pythium ultimum, Fusarium graminearum, Fusarium subglutinans,* and *Rhizoctonia solani*—using a plate assay. Based on these results, we further evaluated the biocontrol efficacy of the modified community through both plate and pot assay experiments against the same set of pathogens.

2.) IDENTIFY ANY SIGNIFICANT FINDINGS AND RESULTS OF THE PROJECT TO DATE.

The inhibitory potential of S8 was assessed individually against four major corn pathogens: *Rhizoctonia solani, Pythium ultimum, Fusarium graminearum*, and *Fusarium subglutinans*. S8 exhibited the strongest suppression against *P. ultimum*, followed by moderate inhibition of *F. graminearum* and *F. subglutinans*, while no significant inhibition was observed against *R. solani*.

Based on these findings, S8 was integrated into the pre-existing C7 community to form an extended community (C8). The biocontrol activity of C8 was evaluated against the same set of pathogens. The modified community exhibited significant inhibition of *P. ultimum* mycelial growth and moderately yet significantly suppressed *F. graminearum* and *F. subglutinans* compared to the control. However, no significant difference in growth inhibition was observed for *R. solani* between treated and control plates. Under growth chamber conditions, corn seeds pre-treated with the microbial consortium were sown in pathogen-inoculated soil to assess plant growth responses. At 14 days post-infection, a notable impact on plant growth parameters was observed. The C8 community significantly recovered root biomass in plants infected with *Pythium ultimum*, while a slight recovery was recorded in plants challenged with *Fusarium*

subglutinans. However, no significant differences in root biomass were detected between control and infected plants for *Fusarium graminearum* and *Rhizoctonia solani*. Consistent with plate and pot assay results, C8 demonstrated the highest biocontrol efficacy against the oomycete pathogen *P. ultimum*.

Figure 1

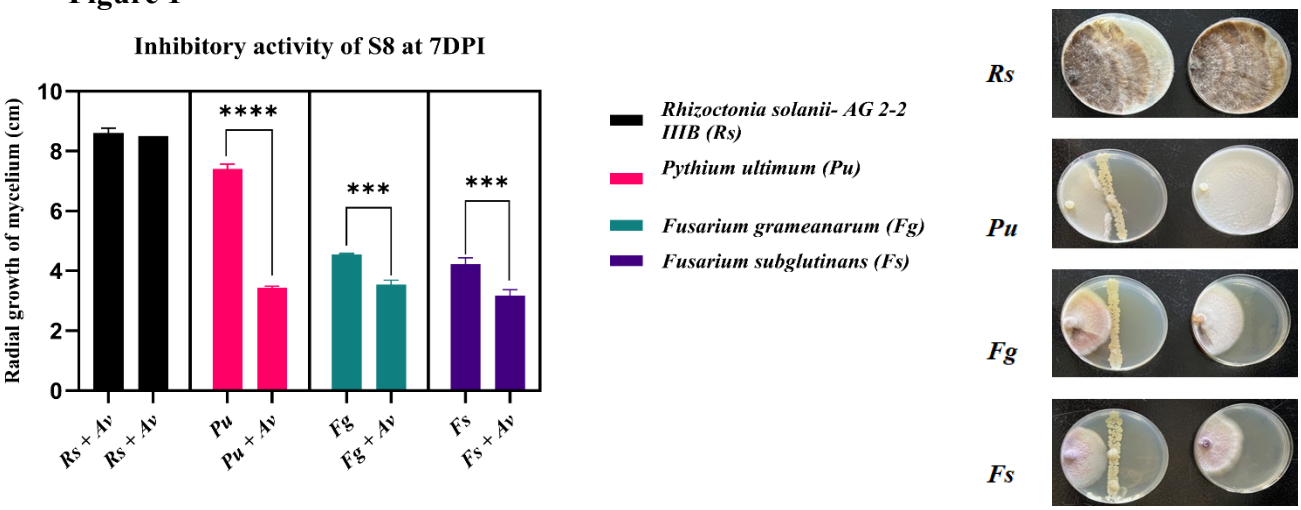

Figure 1: Growth inhibition of corn fungal and oomycete pathogens by *Azotobacter vinelandii* (S8). Measurements of radial growth of the pathogens in cm at seven days post-incubation. For statistical analysis, an unpaired t-test with Welch's correction (n = 5) was used. **** indicates *p-value* <0.0001*** indicates *p-value* <0.001.

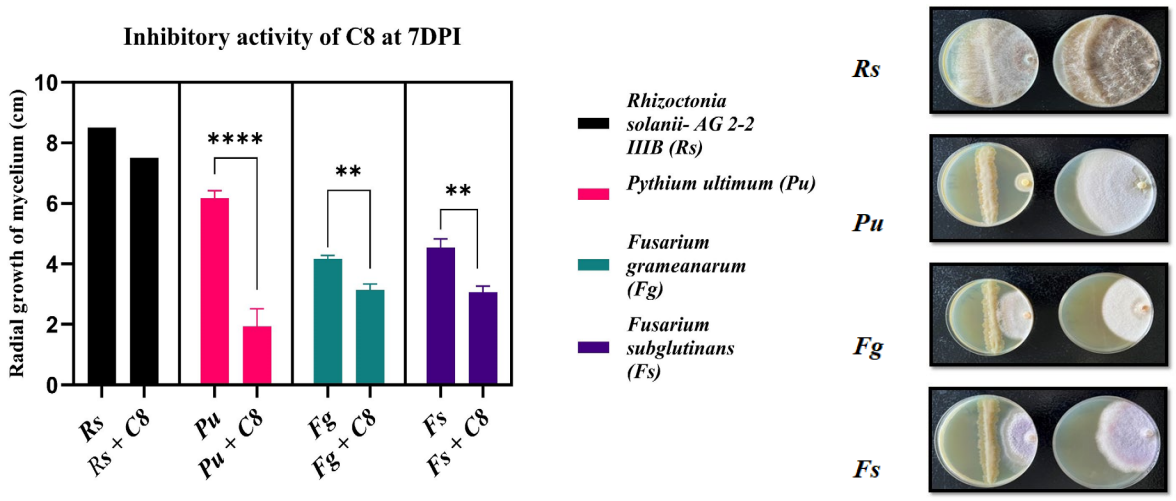

Figure 2A: Growth inhibition of corn fungal and oomycete pathogens by modified community (C8). Pathogen radial growth (cm) was measured seven days post-incubation. Statistical analysis was performed using an unpaired t-test with Welch's correction ($n = 5$). **** denotes $p < 0.0001$, and ** denotes $p < 0.01$.

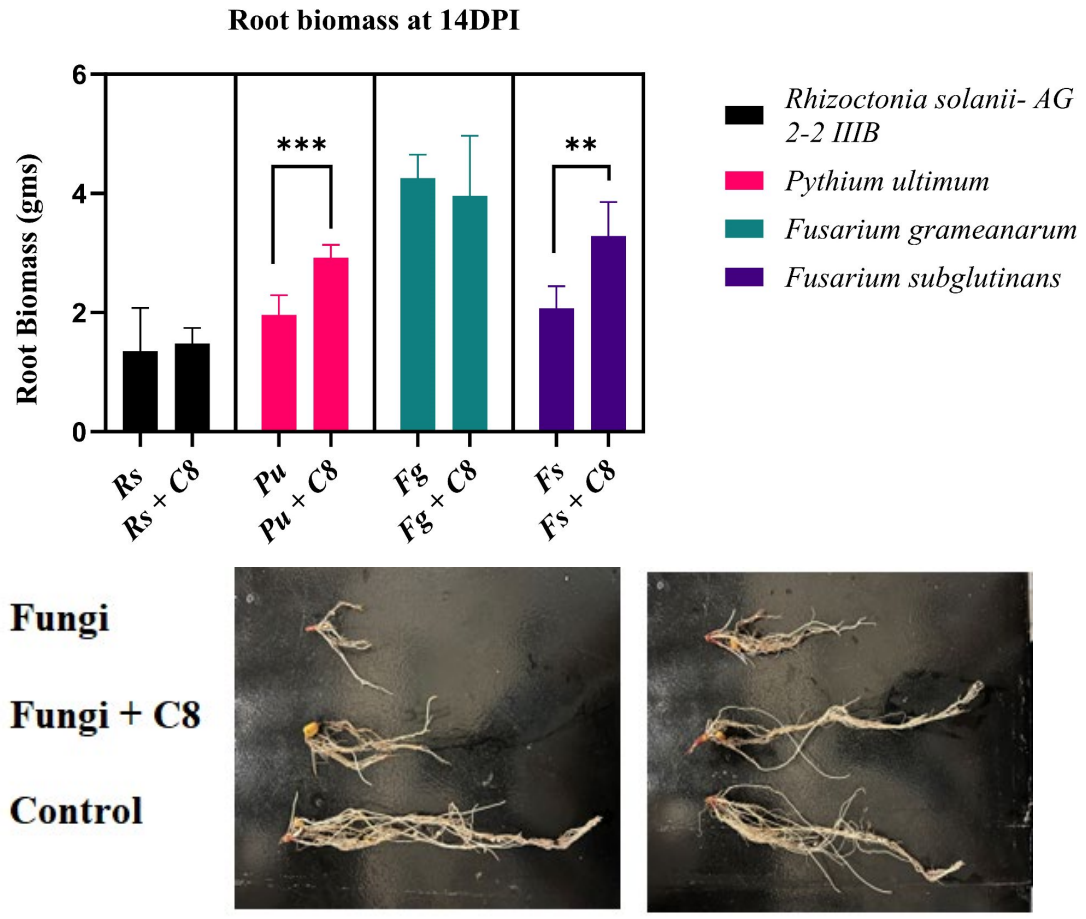

Figure 2B: Effect of modified community against corn pathogens under growth chamber conditions Root biomass at 14 days after sowing seeds previously soaked in either individual strain or community cell suspension into pots containing soil infected with pathogens. An unpaired t-test with Welch's correction (PRISM) was used for statistical analysis. ** <0.01, ***<0.001 when compared to pathogen treatment

3.) CHALLENGES ENCOUNTERED. (*Describe any challenges that you encountered related to project progress specific to goals, objectives, and deliverables identified in the project workplan.*)

We did not encounter any major challenges.

4.) FINANCIAL INFORMATION (*Describe any budget challenges and provide specific reasons for deviations from the projected project spending.*)

5.) EDUCATION AND OUTREACH ACTIVITES. *(Describe any conferences, workshops, field days, etc attended, number of contacts at each event, and/or publications developed to disseminate project results.)*

None in this quarter.