

## **Soybean Response to Biological Products, 03-2023**

### **Annual Report**

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### **Rationale/ Justification for Research**

Modern biologicals and biostimulants are purported to increase nutrient availability in the soil, nutrient uptake by plants, root growth and development, and yield while reducing biotic and abiotic stressors. While several of the individual components of these products have proven beneficial there is very limited data regarding the current formulations. At an average application cost of approximately \$8/acre there is not much room in today's budgets for Mississippi soybean producers to do their own testing on farm. Therefore, we submit this project as a means of aiding Mississippi soybean growers in selecting biological and biostimulant products that will bring a realized agronomic and economic benefit to their farms.

### **Objectives**

Objective 1: Field Evaluation of Commercially Available Biological and Biostimulant Products for Agronomic and Economic Benefits.

Objective 2: Field Evaluation of Commercially Available Biological and Biostimulant Products for Disease Prevention Benefits.

### **Report of Progress/Activity**

#### **Objective 1:**

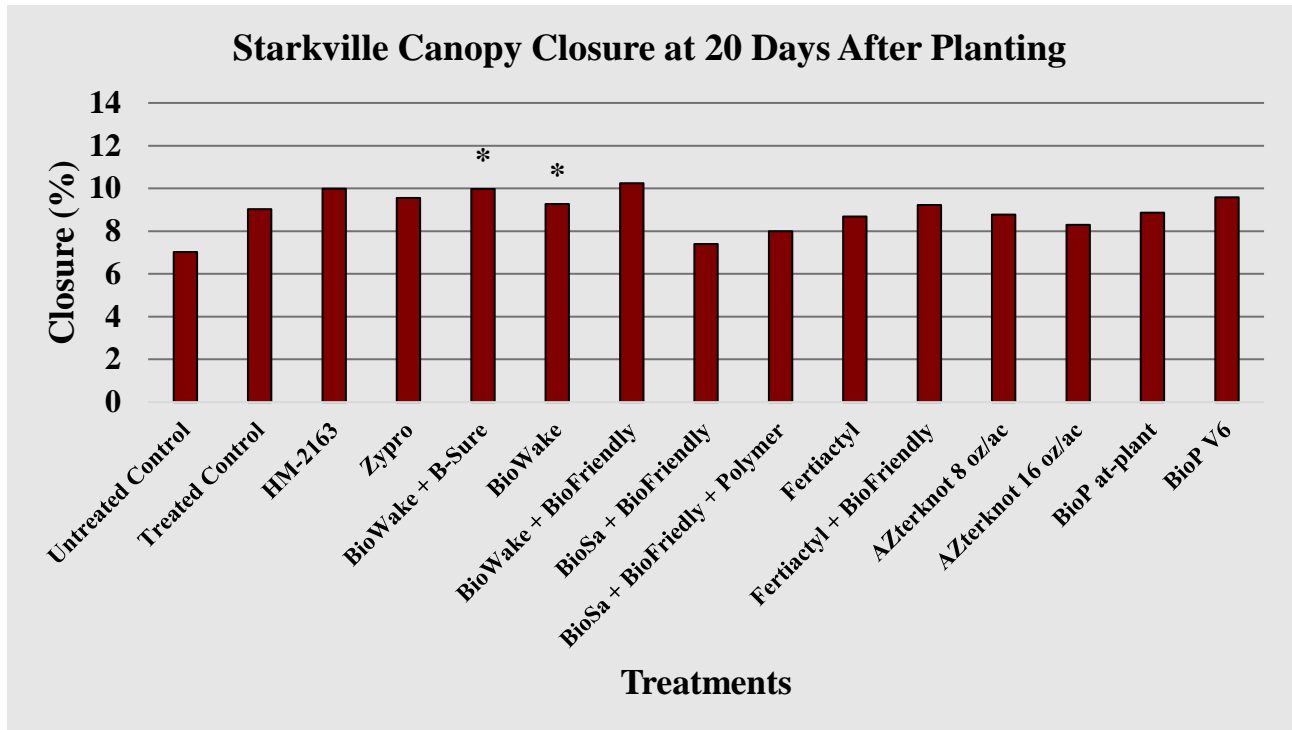
Trails were planted at 3 locations: Stoneville (planting date May 4, 2023), Verona (planting date May 10, 2023), Starkville (planting date May 16, 2023) at 130,000 seeds per acre with AG45XF3. Plots were planted with an Alamco cone planter in a randomized block design with 4 replications, 4-rows wide by 35 feet long.

Seed treatments were applied prior to planting according to manufacturers' directions. Zypro in-furrow applications were applied during planting. BioP at-plant applications were made at plantings dates for all locations. The last vegetative application of BioP was made on June 1, 2023, at the Stoneville at the V4 stage, on June 9, 2023 at Verona at the V4 stage, and on June 23, 2023 at Starkville at the V6 stage. The B-Sure R1 application was made on June 5, 2023 at Stoneville and on June 20, 2023 at Verona. All foliar application were made with a backpack sprayer calibrated at 15 GPA.

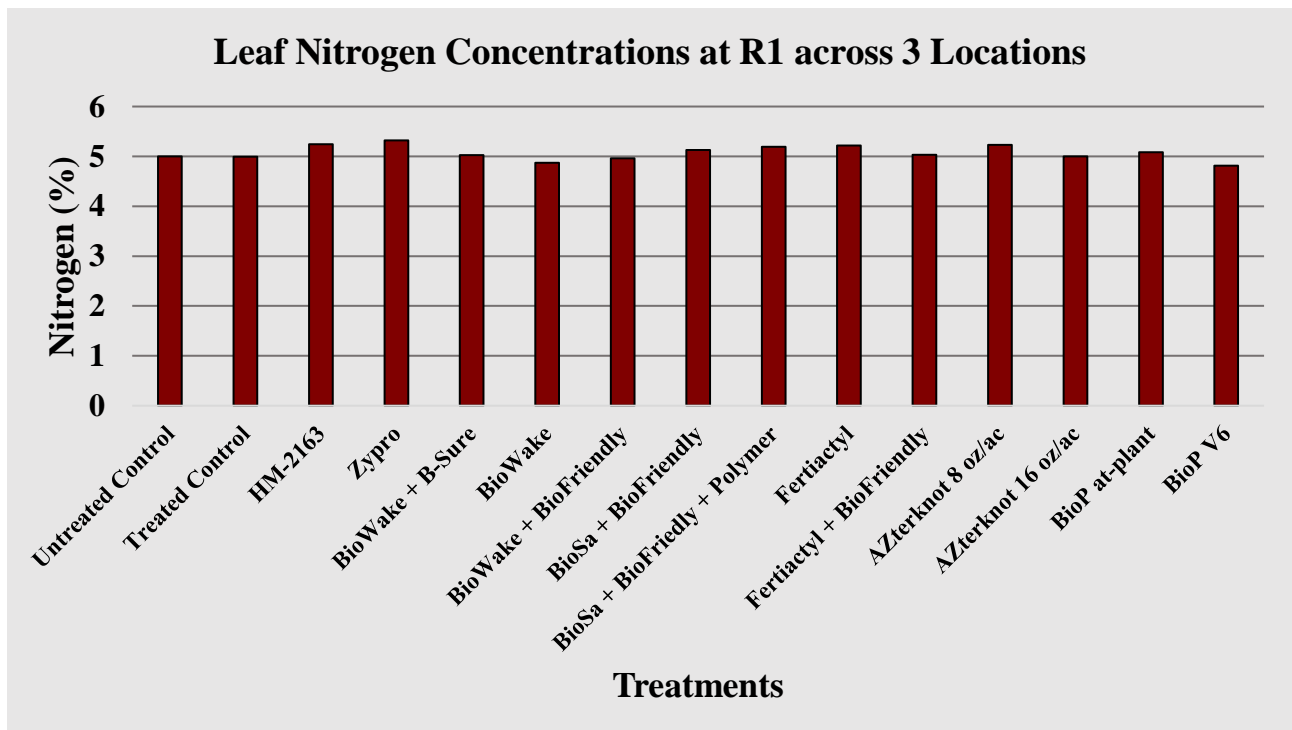
Preliminary agronomic data show no significant differences in stand count, nodulation, and R5 leaf tissue nutrient concentrations, and yield (Table 1), but do show some differences in canopy closure at 20 days after planting at Starkville (Fig 1) R1 & R3 tissue nutrient concentration (Fig 2-5) and some differences in whole plant phosphorus and potassium concentration (Fig 6 & 7).

**Table 1. P-values from ANOVA on agronomic data point. P-values  $\leq 0.1$  are highlighted in blue and p-values  $\leq 0.05$  are highlighted in yellow.**

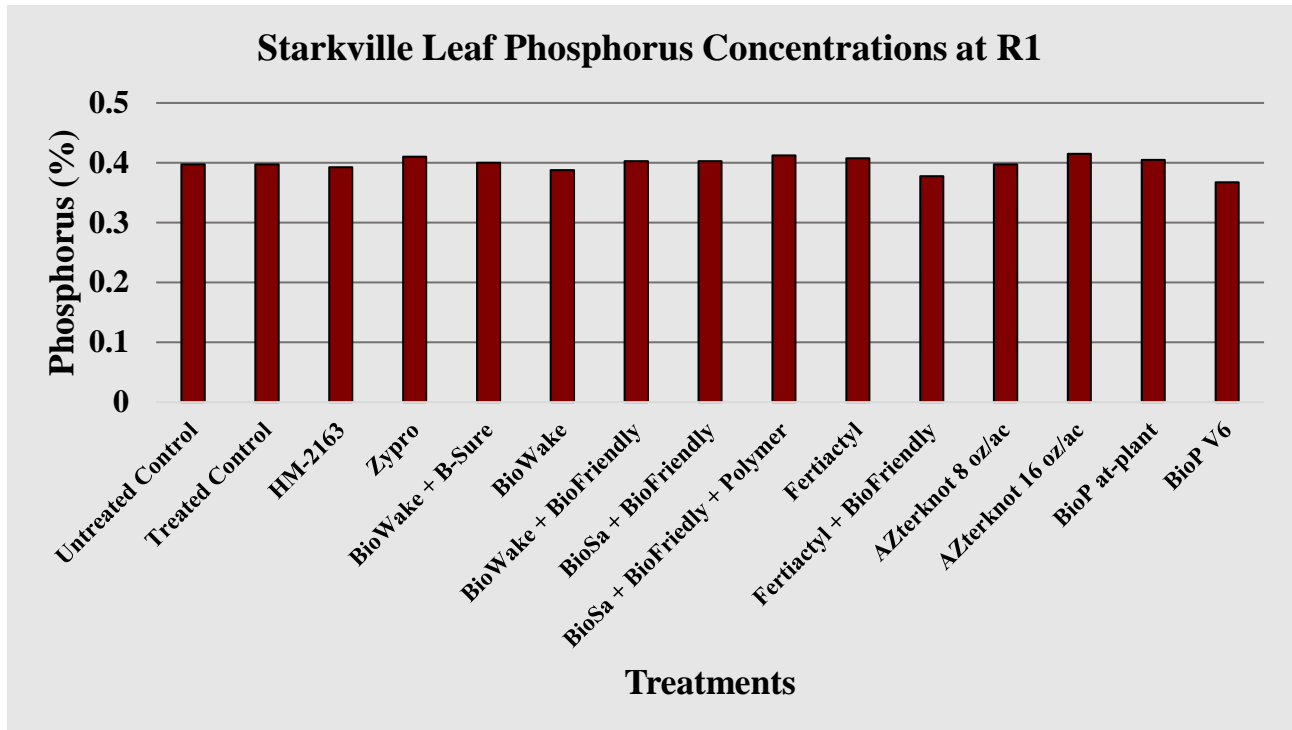
Variable	Pooled location P-value	Stoneville P-value	Verona P-value	Starkville P-value
Stand Count	0.1673	0.7859	0.4844	0.1365
20 DAP Closure	0.3183	1	0.5484	0.0144
30 DAP Closure	0.4621	0.4	0.3365	0.1723
40 DAP Closure	0.4265	0.2659	0.2468	0.2304
Nodule Count	0.2285	0.1545	0.9427	0.1335
R1 N	0.0502	0.4404	0.4687	0.3507
R1 P	0.9963	0.3246	0.7318	0.0619
R1 K	0.7573	0.3553	0.6387	0.3186
R3 N	0.81	0.2917	0.2907	0.5373
R3 P	0.964	0.0459	0.2425	0.542
R3 K	0.4813	0.1597	0.486	0.0162
R5 N	0.946	0.9771	0.9887	0.5085
R5 P	0.4993	0.3721	0.5588	0.525
R5 K	0.719	0.9204	0.262	0.4013
Whole Plant N	0.2755	0.1976	0.512	0.2247
Whole Plant P	0.2245	0.635	0.0573	0.1195
Whole Plant K	0.539	0.87	0.0351	0.7183
Yield	0.5997	0.3953	0.966	0.9082



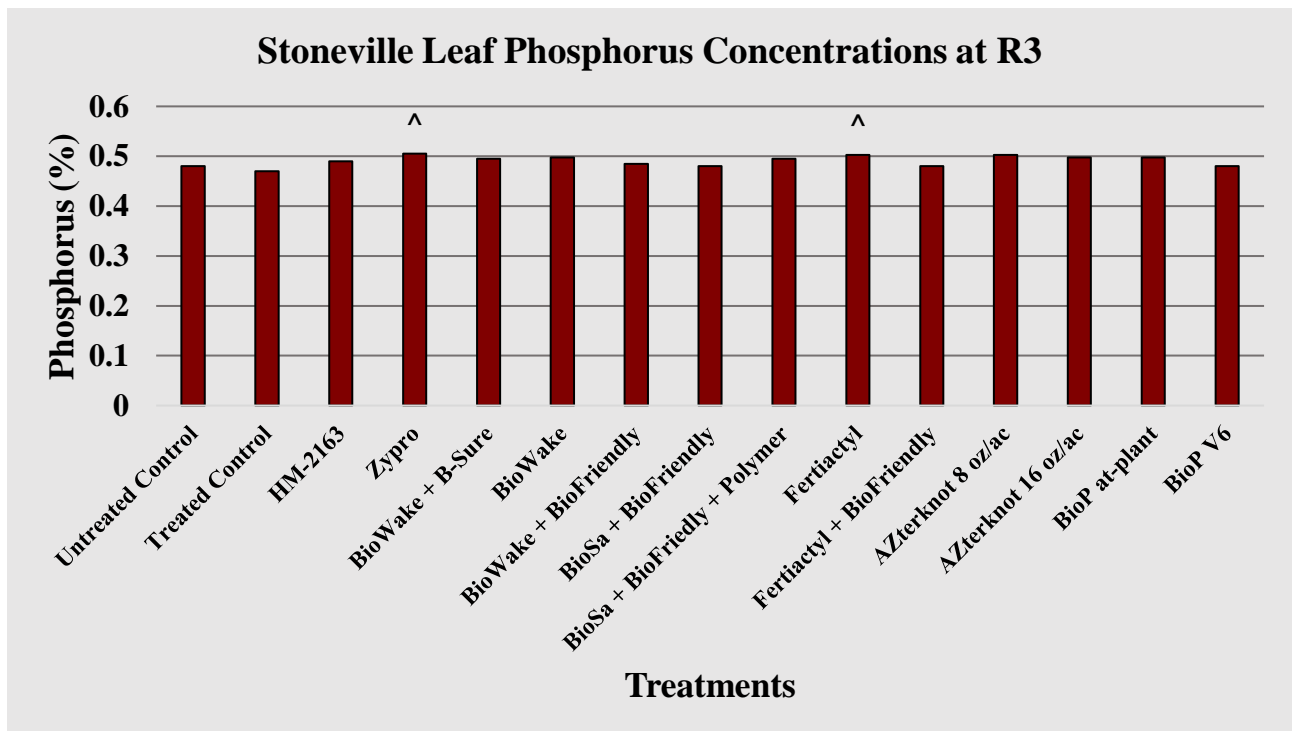
**Figure 1.** Canopy closure ratings at 20 days after planting at Starkville. \* = sig. diff. compared to UTC.



**Figure 2.** Leaf nitrogen concentrations at R1 across all sites. Note that there were no differences compared to the controls.



**Figure 3.** Leaf phosphorus concentrations for Starkville at R1, Note that there were no differences compared to the controls.



**Figure 4.** Leaf phosphorus concentrations for Stoneville at R3. ^ = sig. diff. compared to TC.

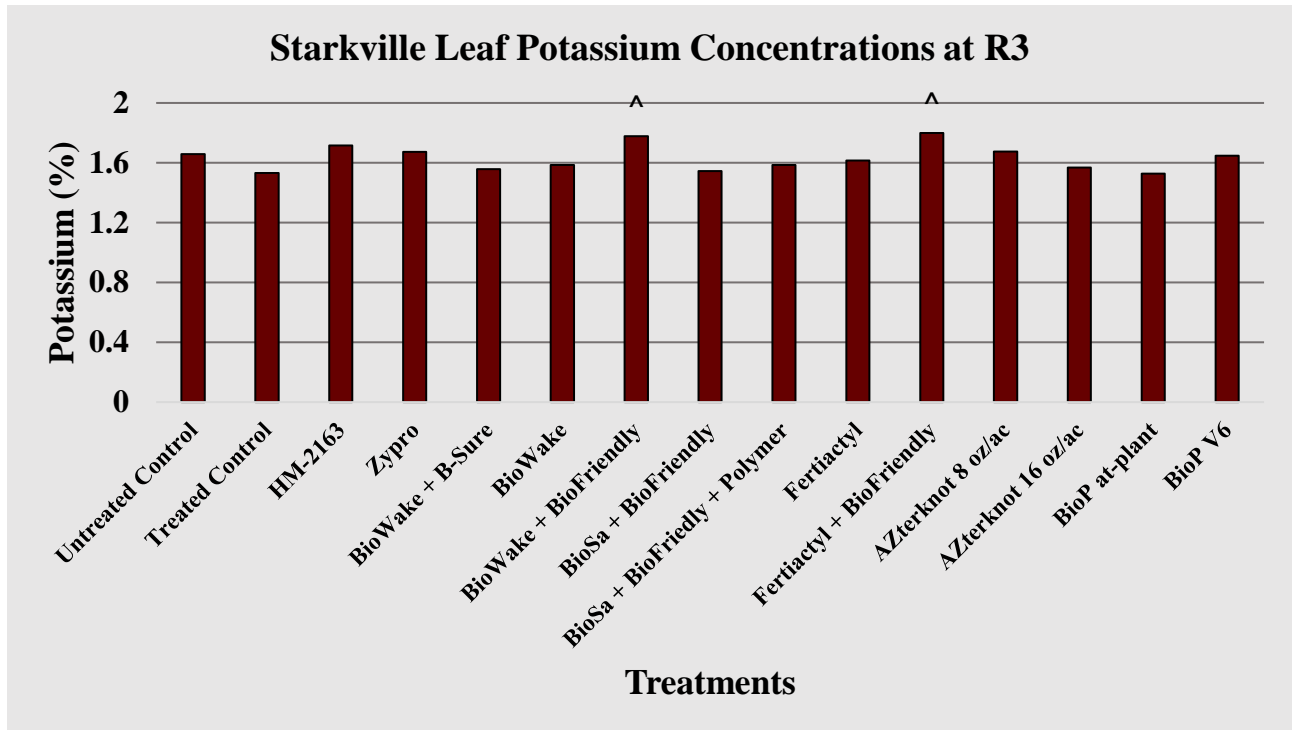


Figure 5. Leaf potassium concentrations for Starkville at R3. ^ = sig. diff. compared to TC.

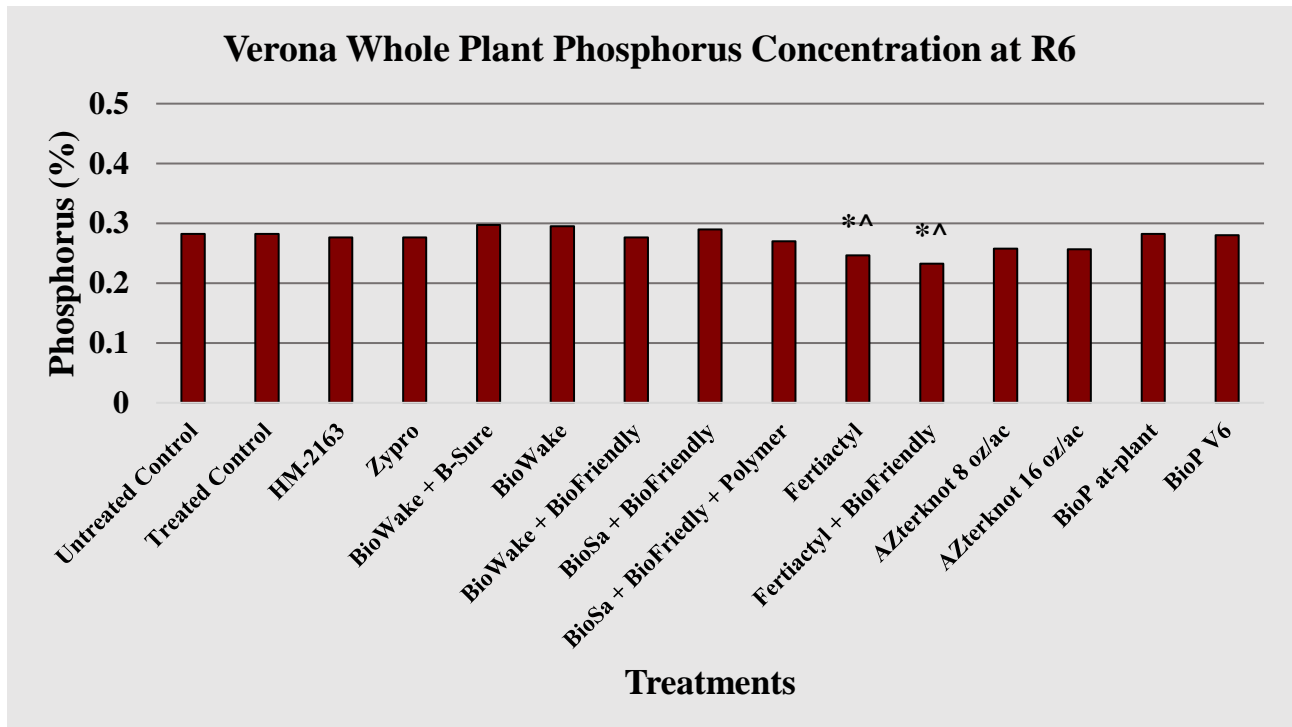
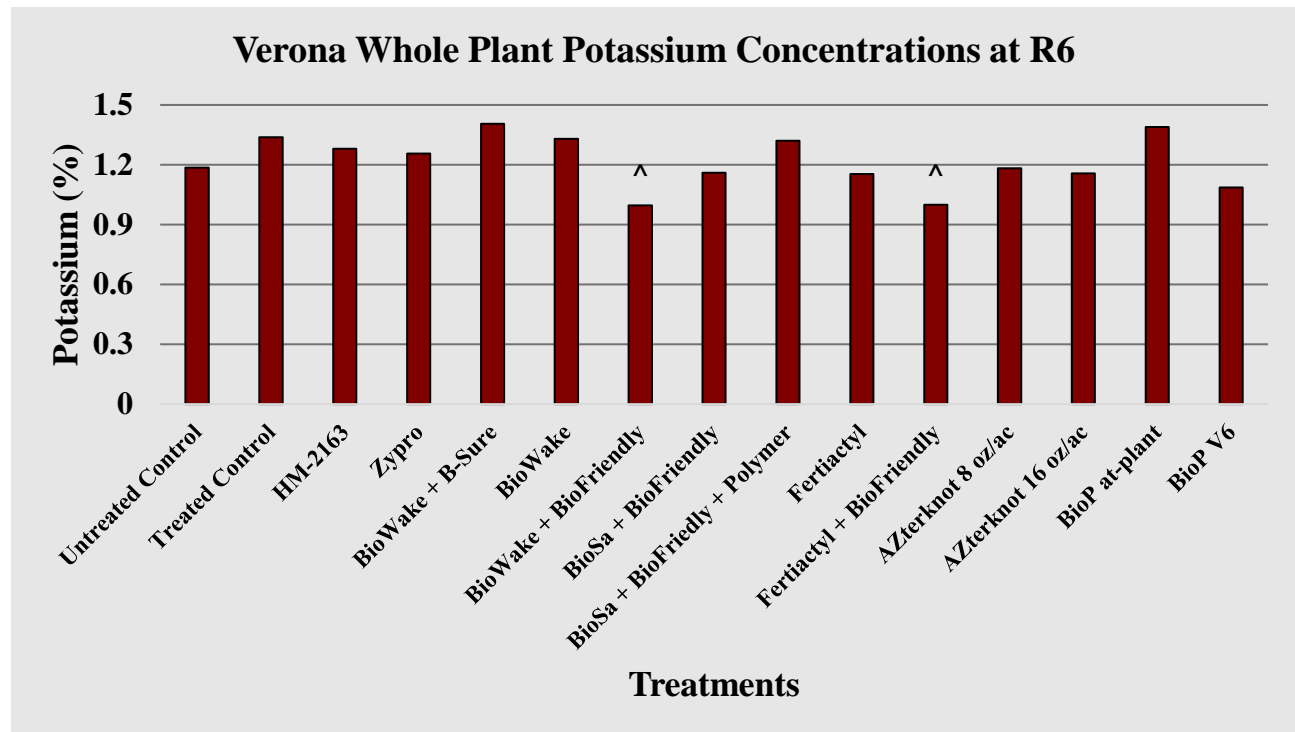


Figure 6. Whole plant phosphorus concentrations for Verona at R6. \* = sig. diff. compared to UTC, ^ = sig. diff. compared to TC.

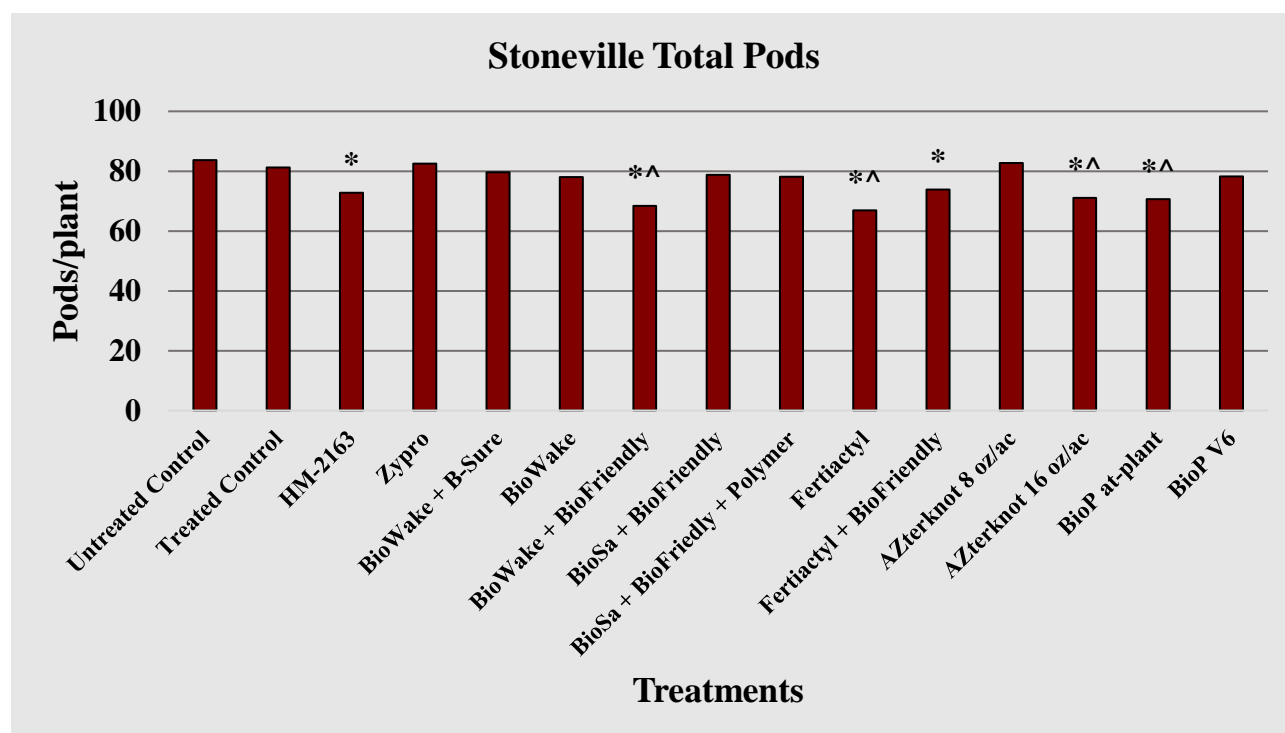


**Figure 7. Whole plant potassium concentrations for Verona at R6. ^ = sig. diff. compared to the TC.**

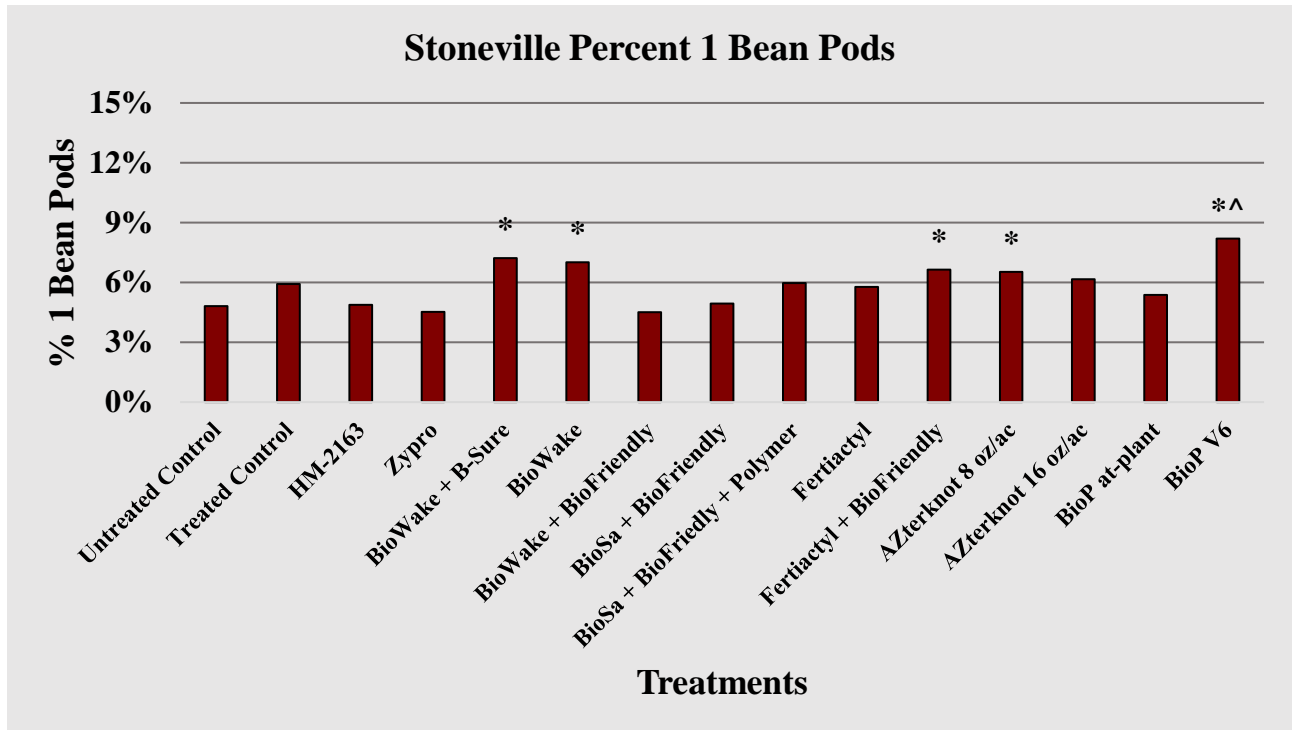
Preliminary plant mapping data shows no significant differences in plant height, branches, pods on branches, nodes, pods on main stem node, pods per node, percent 4-bean pod, and seed weight (Table 2). There were significant differences in total pods (Fig 8), percent 1-, 2-, and 3-bean pods Fig (9-11), and pods in the terminal (Fig 12). While there may have been significant effects on plant architecture and yield components, it ultimately did not translate into yield.

**Table 2. P-values from ANOVA of plant mapping data points. P-values  $\leq .1$  are highlighted in blue and p-values  $\leq 0.05$  are highlighted in yellow.**

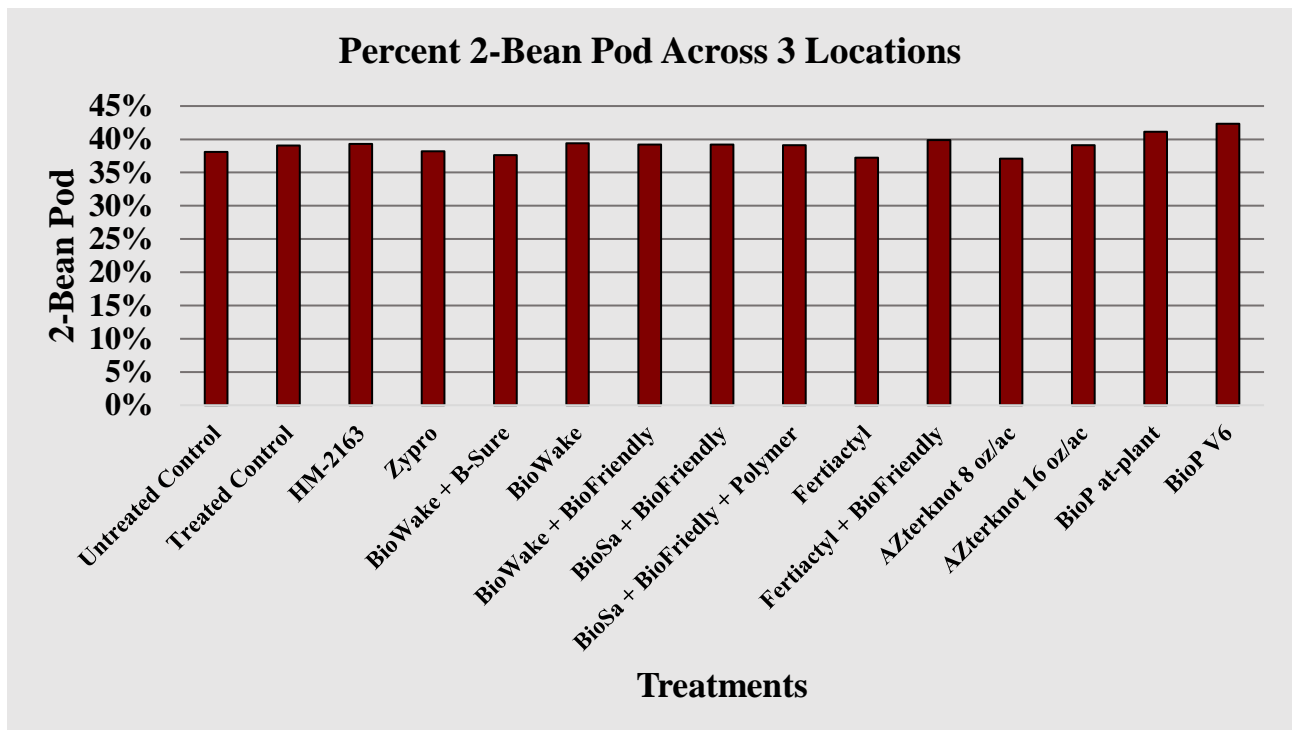
Variable	Pooled Location p-value	Stoneville p-value	Verona p-value	Starkville p-value
Height	0.608	0.1918	0.553	0.5511
Branches	0.6602	0.3411	0.1392	0.9709
Pods on Branches	0.5945	0.1065	0.1528	0.8126
Nodes	0.7628	0.47	0.1911	0.1871
Pods on Main Stem	0.3233	0.8402	0.3699	0.2153
Pods per Node	0.2083	0.9181	0.1601	0.1129
Total Pods	0.3567	0.0531	0.2764	0.718
% 1-bean pod	0.4152	0.0113	0.2589	0.537
% 2-bean pod	0.0558	0.1352	0.1551	0.1137
% 3-bean pod	0.0527	0.2197	0.1196	0.6332
% 4-bean pod	0.2082	0.3143	0.5791	0.3789
Pods in terminal node	0.0224	0.4677	0.7556	0.1242
Terminal seed weight	0.3776	0.8212	0.6409	0.1306
Thousand seed weight	0.5336	0.8442	0.561	0.9655



**Figure 8. Total pods for Stoneville. \* = different compared to the untreated control, ^ = different compared to the treated control.**



**Figure 9.** Percent 1 bean pods for Stoneville. \* = different compared to the untreated control, ^ = different compared to the treated control.



**Figure 10.** Percent bean pod across all sites, note that there were no differences to controls rather that there are differences between treatments.



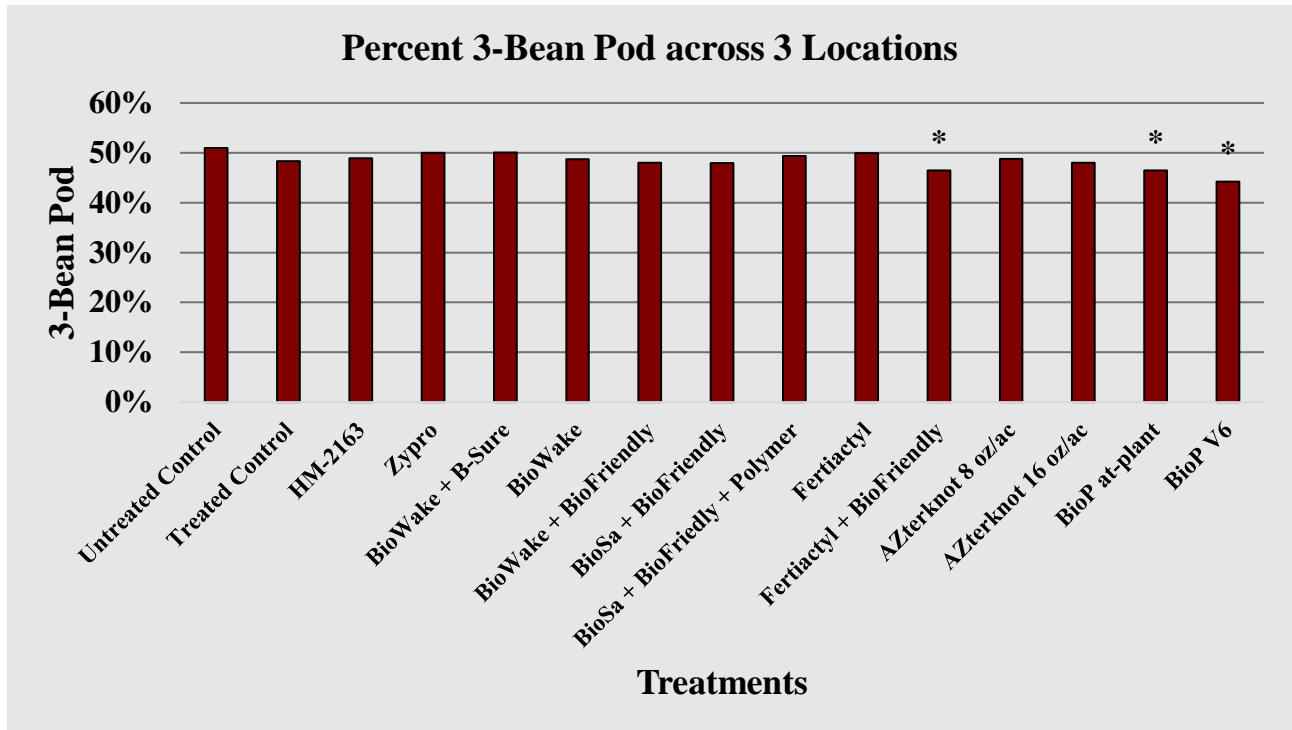


Figure 11. Percent 3 bean pods across locations. \* = different compared to the untreated control.

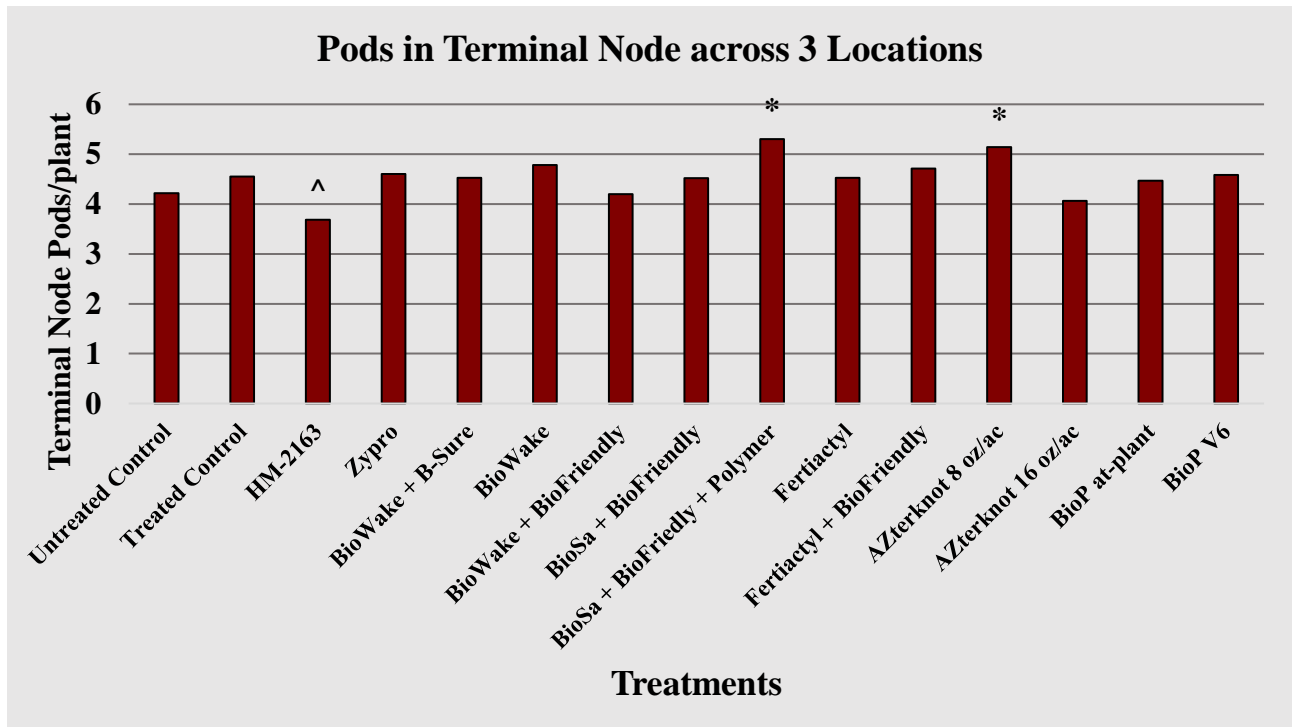


Figure 12. Pods in terminal node across locations. \* = sig. diff. compared to UTC, ^ = sig. diff. compared to TC.

Objective 2:

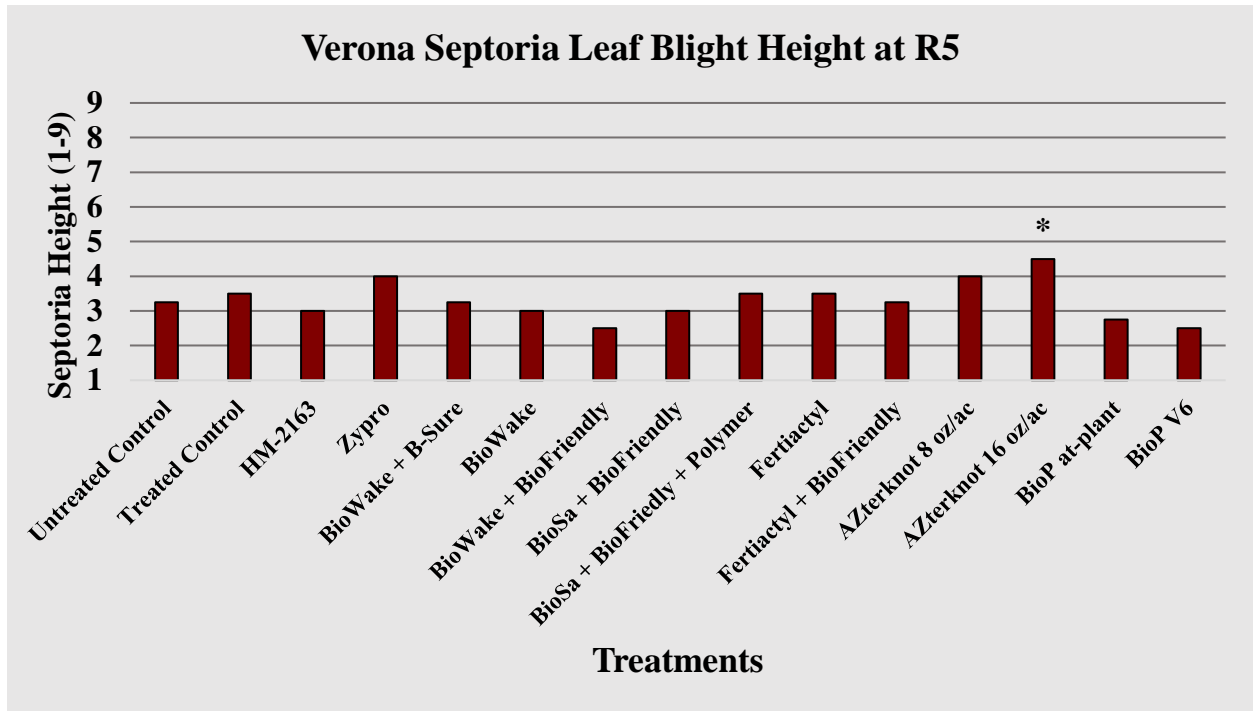
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Preliminary data includes foliar disease ratings for Stoneville, Verona, and Starkville starting at R5 and concluding at R6.5 for Verona and Starkville, defoliation ratings for Stoneville, and greenstem ratings for Stoneville. There were no significant differences in foliar disease severity (Table 3), but there was a significant difference for Septoria leaf blight height at Verona at R5 with (Fig 13).

**Table 3. P-values from ANOVA of disease data points. P-values  $\leq .1$  are highlighted in blue and p-values  $\leq 0.05$  are highlighted in yellow.**

Variable	Stoneville	Verona	Starkville
R5 Frogeye Leaf Spot	.	0.6555	0.5367
R5 Cercospora Leaf Blight Severity	.	.	.
R5 Cercospora Leaf Blight Incidence	.	.	.
R5 Target Spot Severity	0.3224	.	.
R5 Target Spot Height	0.6122	.	.
R5 Septoria Leaf Blight Height	0.1276	0.0683	0.7822
R5 Septoria Leaf Blight Severity	0.8144	0.2660	0.8144
R5 Taproot Decline	0.4100	0.4557	.
R5 Defoliation	0.6401	.	.
R6 Frogeye Leaf Spot	.	0.6377	0.7509
R6 Cercospora Leaf Blight Severity	0.8898	0.7118	0.3532
R6 Cercospora Leaf Blight Incidence	0.6176	0.6265	0.2875
R6 Target Spot Severity	0.1846	.	.
R6 Target Spot Height	0.6176	.	.
R6 Septoria Leaf Blight Height	.	0.5513	0.9712
R6 Septoria Leaf Blight Severity	.	0.4251	0.8145
R6 Southern Blight	.	.	0.587
R6 Defoliation	0.3038	.	.
R8 Greenstem	0.2340	.	.



*Figure 13.* Septoria leaf blight height at Verona at R5. \* = sig diff compared to the UTC.