



UNIVERSITY OF WISCONSIN AGRONOMY, SOYBEAN RESEARCH, UNIVERSITY OF WISCONSIN-EXTENSION

Evaluating Yield Response of Biological Seed Treatments in Soybean 2023

Shawn P. Conley, State Soybean and Wheat Extension Specialist

John Gaska, Senior Research Agronomist

Spyros Mourtzinis, Research Assoc.

University of Wisconsin, Madison

Background

There are many biological seed treatments (e.g., fungi, amino acids, bacteria) marketed to growers under the premise that this practice will produce a positive ROI due to plant health promoting properties. Most of these biological products are applied as a seed treatment prior to planting, but others are applied in-furrow or broadcast or sprayed over the crop. Growers often purchase these products with the intention of maximizing seed yield to gain a competitive advantage. We evaluated 9 commonly marketed biological seed treatment products at 10 sites in Wisconsin in 2023. In addition, we were part of a national effort to evaluate biological seed treatments. Nine additional states participated in evaluation of these seed treatment products.

Methods

Small plots were established at 10 sites, corresponding to our soybean variety trial program sites, in WI in 2023 (Table 1). Plots were planted with a research plot planter and harvested with a research plot combine equipped with weighing and moisture sensors. All plots were seeded at 140,000 seeds/acre. Standard management practices for weed control and tillage (where used), were employed. Seed of appropriate zone maturity was selected for each region (Table 1). All seed was pre-treated by the seed company with a common fungicide and insecticide including fluxapyroxad, imidacloprid, metalaxyl, and pyraclostrobin. All biological seed treatments were applied to the seed according to the product label using a small batch seed treater on top of the fungicide and insecticide seed treatment. Grain yield and plant population at growth stage V2 were recorded. Seed treatment information is presented in Table 2.

Table 1. Site information for biological seed treatment trials in 2023.

Region	Location	Tillage	Soil texture	pH	OM (%)	P (ppm)	K (ppm)	Planted	Harvested	Asgrow variety	Seed RM	Average yield (bu/a)	Std. Err.
South	Arlington	no-till	Silt Loam	7.2	3.3	41	116	11-May	20-Oct	AG22XF2	2.2	79.1	0.9
	Clinton	no-till	Silt Loam	6.2	5	147	428	5-May	18-Oct	AG22XF2	2.2	71.6	1.0
	Platteville	no-till	Silt Loam	6.5	4.4	84	414	5-May	4-Oct	AG22XF2	2.2	90.1	1.0
Central	Fond du Lac	no-till	Silt Loam	6.0	3.8	55	187	12-May	12-Oct	AG20XF1	2.0	73.3	0.9
	Galesville	conventional	Silt Loam	6.4	3.9	117	206	4-May	10-Oct	AG20XF1	2.0	71.0	0.8
	Wautoma (Irr)	conventional	Sand	5.9	2.1	181	267	3-May	11-Oct	AG20XF1	2.0	83.1	0.9
North Central	Menomonie	no-till	Sandy Loam	6.4	2.3	53	135	4-May	10-Oct	AG11XF2	1.1	74.6	0.9
	Marshfield	no-till	Silt Loam	7.0	4.3	39	317	18-May	19-Oct	AG11XF2	1.1	59.8	0.4
	Seymour	conventional	Silt Loam	7.1	3.2	80	197	16-May	9-Oct	AG11XF2	1.1	66.7	1.0
North	Spooner (Irr)	conventional	Sandy Loam	6.5	2.3	41	164	8-May	11-Oct	AG11XF2	1.1	67.1	0.9

Table 2. Seed treatment information for biological seed treatment trials in 2023.

Treatment	Company	Product name	Main ingredients
1	Sunrise	BioBuild Soy Bio ST + R	<i>Azospirillum brasilense</i> , <i>Bacillus licheniformis</i> , <i>B. amyloliquefaciens</i> , <i>B. subtilis</i> , <i>Pseudomonas fluorescens</i> , <i>Rhizobium</i>
2	Indigo	Biotrinsic X19	<i>Kosakonia cowanii</i> strain SYM00028
3	ABM	Graph-EX	<i>Bradyrhizobium</i> spp.
4	Indigo	Biotrinsic M34 + N13 + E13(extender)	<i>Bacillus subtilis</i> + <i>Bradyrhizobium japonicum</i>
5	Valent	Aveo EZ	<i>Bacillus amyloliquefaciens</i> Strain PTA-4838
6	AMVAC	BioWake	<i>Methylobacterium hispanicum</i>
7	Lallemand	Proyield + Larise Start SC	<i>Bradyrhizobium elkanii</i> , <i>Delftia acidovorans</i> + <i>Bacillus velezensis</i>
8	Lallemand + Agrilead	Rise & Shine	<i>Bacillus velezensis</i>
9	Valent	Symvado	<i>Glomus intraradices</i> , <i>G. mosseae</i> , <i>G. aggregatum</i> , <i>G. etunicatum</i>
10	Control	Control	Nontreated control

Results

Plant population at the V2 stage and seed yield data were analyzed within and across sites. Across all 10 locations, there were no significant differences in yield and population between the treatments (P-value=0.0784). Additional analysis shown in Table 4 list probabilities of a yield difference from the control that is greater than zero.

Yields

Table 3 shows yields for all treatments at all locations along with a standard error. Standard error allows us to estimate how representative the results are compared to the whole population. A high standard error shows that sample means are widely spread around the population mean. A low standard error shows that sample means are closely distributed around the population mean.

Table 3. Combined yield data for all locations.

Treatment	ARL		CLN		PLT		FDL		GAL		WAU		MEN		MAR		SEY		SPO	
	mean	stderr	mean	stderr	mean	stderr	mean	stderr	mean	stderr	mean	stderr	mean	stderr	mean	stderr	mean	stderr	mean	stderr
BioBuild Soy Bio ST + R	76.1	3.4	76.3	2.6	88.2	3.7	77.1	2.4	73.9	3.3	85.7	3.1	75.0	3.2	59.0	1.1	65.5	3.9	67.5	1.2
Biotrinsic X19	77.0	2.4	72.3	2.9	87.1	3.2	72.9	1.8	71.6	2.6	80.3	3.5	72.6	3.3	59.9	0.7	67.3	2.7	68.5	1.5
Graph-EX	77.9	3.2	75.3	2.4	94.8	1.5	77.4	3.5	73.0	2.3	85.3	2.9	78.7	3.7	60.2	0.8	68.9	2.7	67.4	1.7
Biotrinsic M34 + N13 + E13(extender)	83.8	2.4	71.5	2.2	89.1	4.1	70.9	3.3	68.0	2.5	82.1	3.8	76.7	2.1	60.8	0.9	70.4	3.3	67.1	1.5
Aveo EZ	80.7	3.4	76.2	1.0	89.2	3.9	73.5	2.1	69.8	2.5	83.8	2.2	77.2	3.5	58.2	0.8	61.5	3.5	67.0	2.7
BioWake	79.0	2.9	72.7	2.6	90.3	3.9	77.3	2.9	73.3	2.4	79.5	3.3	72.0	2.8	60.1	2.3	68.2	4.4	66.6	1.8
Proyield + Larise Start SC	79.0	2.3	74.4	1.6	87.5	2.6	64.1	2.2	68.0	3.1	85.2	3.6	69.9	1.8	60.3	0.5	66.5	3.2	67.6	1.7
Rise & Shine	81.9	3.5	74.5	2.1	91.5	3.8	71.7	3.0	72.0	2.2	81.8	2.4	76.5	2.3	59.8	0.8	64.1	2.5	67.1	1.0
Symvado	80.7	3.7	63.6	2.4	89.5	2.3	73.1	2.2	70.5	3.2	84.2	1.5	73.4	2.2	60.0	1.6	67.1	3.3	65.4	1.7
Nontreated control	75.1	1.8	59.1	1.4	94.3	3.3	74.8	2.4	70.7	1.7	83.5	2.8	73.7	2.7	59.6	1.3	68.2	3.4	66.6	1.7

Bayesian analysis creates a distribution of the estimate instead of just point estimates. In Table 4 the yield difference of each treatment from the control across all locations is shown as the probability of a yield difference (treatment minus control > 0).

Table 4. Yield difference (treatment minus control) and probability for 10 biological seed treatments across nine locations in 2023. Bolded results had high probability and largest positive difference from the control.

Treatment	Yield difference	
	from control (bu/a)	Probability diff > 0 (%)
BioBuild Soy Bio ST + R	1.9	95
Biotrinsic X19	0.4	63
Graph-EX	3.4	100
Biotrinsic M34 + N13 + E13(extender)	1.5	92
Aveo EZ	1.2	86
BioWake	1.3	89
Proyield + Larise Start SC	-0.3	40
Rise & Shine	1.6	92
Symvado	0.2	57

This is a preliminary report meant to relay preliminary findings. More data will be released once the trial is complete. This data is not for publication.



Funding for this project was provided by the Wisconsin Soybean Marketing Board

www.coolbean.info