

BiOWiSH[®] Crop Liquid

Evaluation of BiOWiSH[®] Crop Liquid on Biomass Yield in Silage Corn Helena Agri-Enterprise, USA

Executive Summary

BiOWiSH Technologies, Inc. engaged Helena R&D as a third-party Contract Research Organization (CRO) to conduct a study to determine the effect of BiOWiSH[®] Crop Liquid on corn silage production. The trial compared four treatments:

- A regional fertilizer program as the control (Control)
- The same fertilizer program with BiOWiSH[®] Crop Liquid added (Control + BiOWiSH[®] Crop Liquid)
- Stabilized nitrogen technology
- Controlled release polymer coated

The study determined that the Control + BiOWiSH[®] program increased several growth parameters, yield, and soil fertility in silage corn which led to higher profit.

Background

About BiOWiSH[®] Crop Liquid

BiOWiSH[®] Crop Liquid is a microbial solution that can be coated onto dry fertilizer or mixed with liquid fertilizers to create an enhanced efficiency fertilizer with industry-leading shelf life and consistent results across a broad range of operating conditions and environments, all at a low cost to farmers. BiOWiSH[®] Crop Liquid stimulates native microbial activity and enhances root development, increasing nutrient availability and improving plant vigor. BiOWiSH[®] Crop Liquid is proven to enhance the effects of applied fertilizers by optimizing yield potential and soil productivity.

About Helena Agri-Enterprises

Helena Agri-Enterprises is a leading provider of crop production and crop protection products in the United States and worldwide. Headquartered in the USA, the company has been in the agronomic products supply business for more than 50 years and has expanded its contract research services over the last decade. As an independent CRO, Helena R&D is a team of highly trained and experienced study directors, field researchers, and support staff. They are one of several independent CROs that BiOWiSH Technologies, Inc. works with to independently evaluate our agronomy products.

Objectives

The objective of this research study was to determine the efficacy of BiOWiSH[®] Crop Liquid, manufactured in the USA by BiOWiSH Technologies, Inc., on silage corn production when added to a fertility program common to the production area in the USA. The focus was on BiOWiSH[®] Crop Liquid's impact on growth parameters, yield, soil productivity, and grower economics.

In addition, the Control and Control + BiOWiSH[®] programs were compared to a stabilized nitrogen technology and a controlled release polymer technology.

Implementation Program

The study was conducted on the Helena R&D Farm in Merced, California, on silage corn. Treatments were organized as a Randomized Complete Block Design with 4 replications. Plots were set up in adjacent rows with spacing. The following treatments were under evaluation:

BiOWiSH[®] Crop Liquid



- Optimizes yield potential
- Increases nutrient availability
- Enhances root development
- Improves plant vigor
- Enhances native microbial activity in the soil
- Improves soil productivity

Available Sizes

- 190 L/50 gal
- 1000 L/264 gal

Treatment Name	Fertilization Program	Rate [Kg/Ha] lb/acre	Application Timing [Stage]
Control	Urea (46-0-0)	[212] 189.1	Preplant
	MAP (11-52-0)	[56] 50	Preplant
	MOP (0-0-60)	[67] 59.8	Preplant
	Urea (46-0-0)	[56] 50	V9
	Urea (46-0-0)	[56] 50	VT
Control+BiOWiSH®	BiOWiSH® Coated Urea (46-0-0)*	[212] 189.1	Preplant
	MAP (11-52-0)	[56] 50	Preplant
	MOP (0-0-60)	[67] 59.8	Preplant
	BiOWiSH® Coated Urea (46-0-0)	[56] 50	V9
	BiOWiSH® Coated Urea (46-0-0)	[56] 50	VT
Stabilized Nitrogen Technology	Stabilized Nitrogen Coated Urea	[288] 256.9	Preplant
	MAP (11-52-0)	[56] 50	Preplant
	MOP (0-0-60)	[67] 59.8	Preplant
Controlled Release Polymer Coated	Urea (46-0-0)	[112] 99.9	Preplant
	Polymer Coated Urea	[106] 94.6	Preplant
	MAP (11-52-0)	[56] 50	Preplant
	MOP (0-0-60)	[67] 59.8	Preplant

Calculations for conversions between imperial and metric units are based on the original source data; slight rounding differences may occur within reported publication values.

*BiOWiSH® Coated Urea (46-0-0) is urea coated with BiOWiSH® Crop Liquid according to the label recommendations.

Observations of the following characteristics were made to represent the effect of BiOWiSH® Crop Liquid on silage corn performance:

1. Plant Growth: Height
2. Yield: Ear Length, Ear Diameter, and Biomass Yield

Soil samples were collected before planting (soil baseline) and after harvest. Plant tissue samples were collected at the early dough stage for each fertilization program. An economic evaluation of the different fertilizer programs was performed based on current cost data for farmers in California.

Results

Crop Performance

All nitrogen-enhancement technologies showed a higher plant height as compared to the most common practice base fertilizer treatment (control). Moreover, the BiOWiSH® treatment showed the highest ear length and diameter that resulted in the highest biomass yield.

Treatment Name	Plant Height [cm] inches	Ear Length [cm] inches	Ear Diameter [cm] inches	Biomass Yield [Ton/Ha] Ton/acre
Control	[256] 100.8	[35.1] 13.8	[4.71] 1.8	[85.5] 34.6
Control+BiOWiSH®	[262] 103.2	[37.3] 14.7	[5.11] 2.0	[108.9] 44.1
Stabilized Nitrogen Technology	[264] 103.9	[36.1] 14.2	[5.10] 2.0	[92.1] 37.3
Controlled Release Polymer Coated	[260] 102.4	[33.0] 12.9	[4.62] 1.8	[78.1] 31.6

Calculations for conversions between imperial and metric units are based on the original source data; slight rounding differences may occur within reported publication values.

Soil Analysis:

Baseline soil analysis revealed similar values for all treatments. The post-harvest soil analysis in the table below illustrates the BiOWiSH® program produces higher yields while maintaining soil productivity.

Treatment Name	N [ppm]	P [ppm]	K [ppm]	Mg [ppm]	Ca [ppm]	OM [%]	pH	CEC [%]
Soil Baseline	909	202	2365	8939	5249	1.2	7.2	25
Control	873	216	2187	7956	4580	0.9	6.9	24
Control+BiOWiSH®	985	240	2478	9401	4898	0.9	6.8	22
Stabilized Nitrogen Technology	923	244	2453	9316	6578	1.0	6.7	28
Controlled Release Polymer Coated	920	245	2321	9439	6848	1.0	6.7	26

Plant Tissue Analysis:

The plant tissue analysis also showed BiOWiSH® treatments can increase yield while maintaining plant nutrient levels. All treatments showed sufficient nitrogen, phosphorous and potassium levels for a high quality plant.

Treatment Name	Nitrogen [%]	Phosphorus [%]	Potassium [%]
Control	3.03	0.35	2.15
Control+BiOWiSH®	2.88	0.38	2.41
Stabilized Nitrogen Technology	3.12	0.29	2.13
Controlled Release Polymer Coated	3.45	0.36	2.38

Economics:

BiOWiSH® treatments resulted in a significant increase in the economic return as compared to the recommended best management practice fertilizer program. The urea plus BiOWiSH® Crop Liquid treatment gave the best economic results: an additional \$1153/ha (\$467/acre) over the recommended most common fertilizer program and \$819/ha higher than the best performing enhanced nitrogen treatment.

Treatment Name	Gross Income* [US\$/Ha] US\$/acre	Profit*** [US\$/Ha] US\$/acre
Control	[\$4273] \$1729	-
Control+BiOWiSH®	[\$5446] \$2204	[\$1153] \$468
Stabilized Nitrogen Technology	[\$4607] \$1864	[\$334] \$135
Controlled Release Polymer Coated	[\$3903] \$1579	[-\$371] -\$150

Calculations for conversions between imperial and metric units are based on the original source data, slight rounding differences may occur within reported publication values.

*Net income is the crop value minus the fertility program cost and does not account for non-fertility expenses.

**Profit change is the difference between the respective program and the control.

Conclusion

Helena Agri-Enterprises found that, when studied on silage corn, BiOWiSH® Crop Liquid outperformed competitive fertilizer additives and the common practice base fertilizer used as the control. BiOWiSH® Crop Liquid produced larger ear length and diameter resulting in a higher biomass yield - 27.37% increase over the control fertilizer. The increase in biomass resulted in an additional \$1153/ha over the control fertilizer. Even with these significant improvements, laboratory soil analysis showed BiOWiSH® Crop Liquid left soil fertile for future crops. Overall, Helena Agri-Enterprises measured that BiOWiSH® Crop Liquid had the highest ROI on silage corn when compared with the base fertilizer, enhanced nitrogen treatment, and controlled-release polymer coated additives.



Contact us:
 agronomy@biowishtech.com
 +1 312 572 6700
 biowishtech.com

BiOWiSH™ is a registered trademark of BiOWiSH Technologies International, Inc.

1178-08-EN