

## BiOWiSH<sup>®</sup> Crop Liquid

### Evaluation of BiOWiSH<sup>®</sup> Crop Liquid on Yield in Field Corn

#### Executive Summary

BiOWiSH Technologies, Inc. engaged Helena Agri-Enterprises, LLC as a third-party Contract Research Organization (CRO) to conduct a study to determine the effects of BiOWiSH<sup>®</sup> Crop Liquid on corn production in Iowa. The study compared the following two treatments.

- A regional liquid fertilizer program as the control (Control).
- The same fertilizer program with BiOWiSH<sup>®</sup> Crop Liquid added (Control + BiOWiSH<sup>®</sup> Crop Liquid).

The study determined that the Control + BiOWiSH<sup>®</sup> Crop Liquid program increased corn grain yield which led to higher profit.

#### Background

##### About BiOWiSH<sup>®</sup> Crop Liquid

BiOWiSH<sup>®</sup> Crop Liquid is a microbial additive 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<sup>®</sup> Crop Liquid enhances native microbial activity in the soil and root development, increasing nutrient availability and improving plant vigor. BiOWiSH<sup>®</sup> Crop Liquid is proven to enhance the effects of applied fertilizers by optimizing yield potential and soil productivity.

##### About Helena Chemical Company

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 their 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 effects of BiOWiSH<sup>®</sup> Crop Liquid technology on crop vigor, color, and yield in corn production.

#### Implementation Program

The comparison treatment plot size was 1,810 ft (552 m) x 2,640 ft (805 m). Applications were made using the grower's commercial fertilizer equipment. The grower's fertilizer program was 21 gallons per acre (169.4 L/ha) of UAN-32 (Control). The comparison treatment, (Control + BiOWiSH<sup>®</sup>), consisted of 21 gallons per acre (169.4 L/ha) of UAN and 1.33 gallons per acre (12.4 L/ha) of a humic acid product blended with BiOWiSH<sup>®</sup> Crop Liquid at the manufacturer's recommended rate. No blending issues were observed. The application was applied as a side dress at the V3 timing with 2-inch beside x 2 inch below (5 cm x 5 cm) placement.

### BiOWiSH<sup>®</sup> 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

- 50 gal/190 L
- 264 gal/1,000 L

**Table 1. Fertilizer Treatments and Application Timings**

Treatment	Fertilizer	Rate gal/ac [L/ha]	Timing
Control	UAN 32% N	21 [196.4]	V-3
Control + BiOWiSH® Crop Liquid*	UAN 32% N	21 [196.4]	V-3
	Hydra-Hume®**	1.33 [12.4]	

\* BiOWiSH® Crop Liquid used at manufacture’s recommended rate

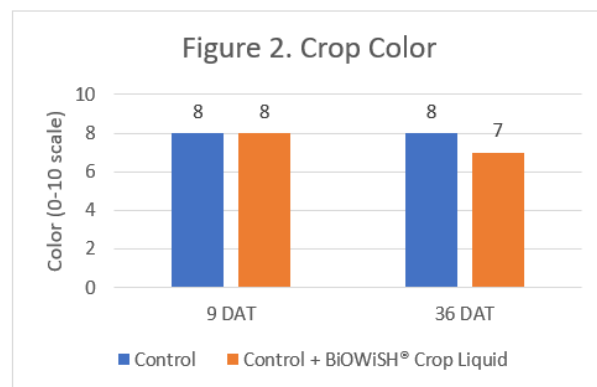
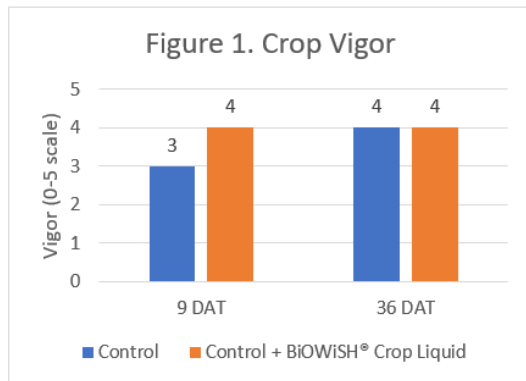
\*\*Hydra-Hume® is a registered trademark of Helena Holding Company

The efficacy of the fertilizer treatments was assessed by taking measurements of crop vigor (0-5 with 0=low vigor and 5=high vigor), crop color (0-10 with 0=no color and 10=dark green) and yield. Yield data, along with local commodity pricing, were used to calculate net income and profit change.

## Results

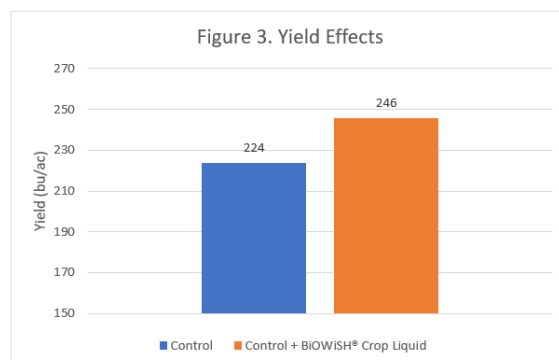
### Crop Health:

No phytotoxicity was observed with either of the treatments. Initial evaluation of BiOWiSH® enhanced fertilizer exhibited a greater level of vigor as compared to the grower standard treatment. However, color of the crop was not visibly different between the two treatments. At a later evaluation, no observable differences between treatments were noted (Figures 1 and 2).

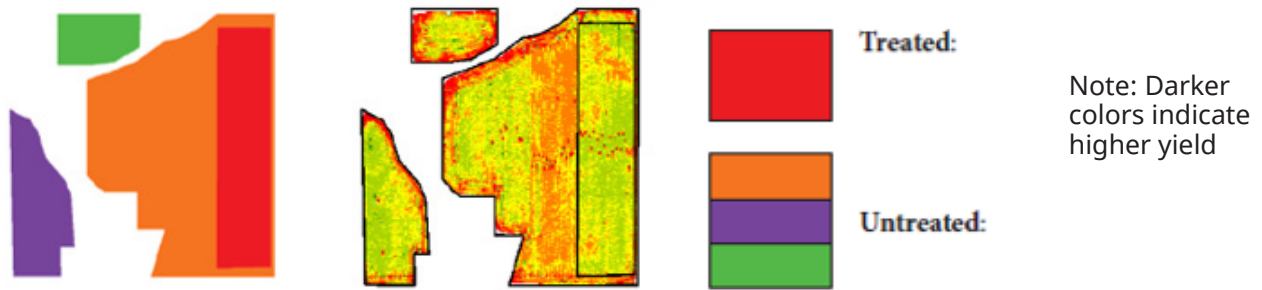


### Yield Effects:

Yield results showed a 22 bu/ac (1.3 MT/ha) increase in the block treated with BiOWiSH® enhanced fertilizer versus the grower practice. This equates to a 9.8% yield increase (Figure 3). Note: 53 lbs/bu was used for the conversion from bu/ac to MT/ha.



## Grain Yield by Management Zone:



## Economic Analysis

BiOWiSH® Crop Liquid enhanced fertilizer showed a 9.8% yield increase over the grower practice and this increase resulted in a \$68 USD per acre (\$168 per hectare) higher profit per acre.

**Table 2. Economic Effects of BiOWiSH® Crop Liquid Enhanced Fertilizer in Field Corn**

Treatment	Grain Yield* bu/ac [MT/ha]	Net Income USD/ac [USD/ha]	Profit Change** USD/ac [USD/ha]
Control (most common practice)	224 [13.3]	752 [1858]	-
Control + BiOWiSH® Crop Liquid	246 [14.6]	820 [2026]	68 [168]

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

\*\*Profit change is the difference between net income of the respective program and the Control.

\*\*\*53 lbs/bu was used for the conversion from bu/ac to MT/ha.

## Conclusion

BiOWiSH® Crop Liquid enhanced fertilizer had a positive effect on grain yield in corn in this large block trial. No observable differences in crop vigor or color between treatments were noted. The improved yield increased profitability and demonstrated that the addition of BiOWiSH® Crop Liquid to a corn grain production fertilizer program offers a significant return on investment opportunity to the farmer.



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