

BiOWiSH® Crop

Evaluation of BiOWiSH® Crop on Early-Stage Sweet Corn



Sweet Corn

Executive Summary

BiOWiSH Technologies partnered with Arise Research & Discovery, Inc. to evaluate the performance of BiOWiSH® Crop when added to Urea Ammonium Nitrate (UAN) to create an Enhanced Efficiency Fertilizer (EEF) for sweet corn grown under greenhouse conditions. BiOWiSH® Crop was used as part of two N Optimized Fertility Programs and compared against the Control, Standard Full Fertility Program.

The trial compared three treatments:

- Control, Standard UAN Fertility Program
- 10% N Optimized Fertility Program + BiOWiSH® Crop
- 20% N Optimized Fertility Program + BiOWiSH® Crop

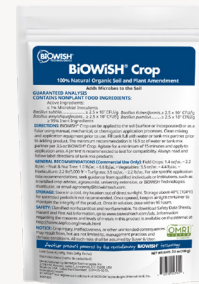
This greenhouse study determined that the addition of BiOWiSH® Crop improved soil conditions for increased plant vigor, increased nutrient use efficiency, and improved nutrient uptake in early-stage sweet corn.

Background

About BiOWiSH Technologies

BiOWiSH® Crop comes in a solid, soluble formulation for on-farm application, and when added to traditional fertilizer, it creates an EEF. Headquartered in Cincinnati, Ohio, BiOWiSH Technologies, Inc. is a global provider of biotechnology solutions. As a leader in the agricultural market, we help farmers increase crop production sustainably, safely, and cost effectively. BiOWiSH® endophytic *Bacillus* deliver soil nutrients to crops through the rhizophagy cycle creating a symbiotic relationship between the plant and soil microbes. This helps farmers achieve consistent results across a broad range of operating conditions, climates, and environments. By unifying nature and science, BiOWiSH reinvents the way food is grown. For more information, visit biowishtech.com.

BiOWiSH® Crop



- Optimizes yield potential by improved nutrient uptake
- Increases nutrient use efficiency and supports nutrient uptake
- Optimizes soil conditions for greater root mass
- Improves soil conditions for increased plant vigor
- Enhances beneficial microbes in the rhizosphere

Available Sizes

- 100 g/ 3.5 oz
- 1 kg/2.2 lbs
- 5 kg/11 lbs
- 10 kg/22 lbs

Objectives

The objective of this trial was to evaluate the performance of BiOWiSH® Crop when added to UAN to create an Enhanced Efficiency Fertilizer (EEF) used in two N Optimized treatments for sweet corn grown under greenhouse conditions, compared to the Control full fertility program. The focus of this study was on early-stage growth and nutrient use efficiency.

Implementation Program

The study was conducted on early-stage sweet corn in an Arise research greenhouse in Martinsville, Illinois, from April 21 through May 19, 2014. Plants were grown in single rows in 6.75" x 34.5" (17.2 cm x 87.6 cm) long plastic trays, which were placed on heavy, wire mesh tables, 38" (97 cm) above the concrete floor of the greenhouse. Seeds were spaced 6" (15 cm) apart. All trays received 58 lbs/acre (65 kg/ha) equivalent of 11-52-0 and 92 lbs/acre (103 kg/ha) equivalent of 0-0-60. Supplemental heat was added as needed with a kerosene space heater. Sweet corn seeds were planted April 8, and germination checked on April 14 and April 16. Plants were watered daily. Physical parameter measurements were conducted on May 12, at 34 days after planting. Each treatment had six plots, with each plot consisting of 18 trays with three treatments. The Control treatment mimicked field-level Nitrogen levels for the region by applying the equivalent of 130 lb Nitrogen/acre (7.8 g UAN per tray). The Control was compared to an N Optimized Fertility Program consisting of a 10% reduction in fertilizer (7.0 g UAN per tray) with the addition of BiOWiSH® Crop added to the fertilizer. The third treatment, also an N Optimized Fertility Program, consisted of a 20% reduction in fertilizer (6.2 g UAN per tray) with the addition of BiOWiSH® Crop.

Stem diameters were measured with a Performance Tool 6" Digital Caliper. Chlorophyll was measured with a Konica Minolta Spad meter. Root and plant mass weights were recorded with an Ohaus HH320 scale to the nearest 0.1 g. Soil tests and plant tissue analyses were conducted by Midwest Laboratories (MWL), Omaha, Nebraska.

Results

The top portion of the table below shows the measured nutrient levels in the tissue, while the bottom portion of the table shows the relative treatment differences in the measured nutrient levels from the Control treatment.

Table 1. Plant Analysis: Sweet Corn Year 2014

Treatment	N %	P %	K %	Mg %	Ca %	S %	Na %	Fe ppm	Mn ppm	B ppm	Cu ppm	Zn ppm	Average
Control	3.03	0.11	4.05	0.39	0.72	0.2	0.017	95	42	52	6	21	-
10% N Optimized Fertility Program + BiOWiSH® Crop	3.02	0.19	4.58	0.48	1.05	0.28	0.011	114	59	121	7	29	-
20% N Optimized Fertility Program + BiOWiSH® Crop	3.09	0.21	4.67	0.46	0.99	0.28	0.011	93	48	74	7	29	-

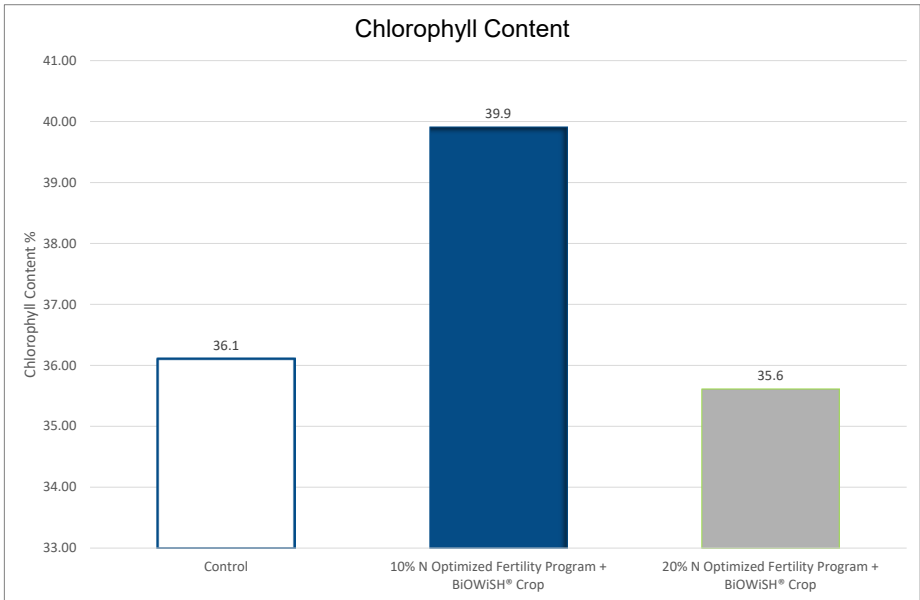
Treatment	N %	P %	K %	Mg %	Ca %	S %	Na %	Fe ppm	Mn ppm	B ppm	Cu ppm	Zn ppm	Average
Control	0	0	0	0	0	0	0	0	0	0	0	0	0
10% N Optimized Fertility Program + BiOWiSH® Crop	0	73	13	23	46	40	-35	20	40	133	17	38	34
20% N Optimized Fertility Program + BiOWiSH® Crop	2	91	15	18	38	40	-35	-2	14	42	17	38	23

The BiOWiSH® treatments averaged higher levels of P, K, Mg, Ca, S, Mn, B, Cu, and Zn versus the Control. Combined overall average nutrient percentages for the BiOWiSH® treatments were higher than the Control, and thus illustrated the microbes’ ability to increase nutrient use efficiency and support nutrient uptake. The average nutrient content for the 10% N Optimized Fertility Program + BiOWiSH was 34% higher than the Control. The average nutrient content for the 20% N Optimized Fertility Program + BiOWiSH was 23% higher than the Control.

Chlorophyll Content

The data showed a trend toward higher chlorophyll content (10.5%) for the 10% N Optimized Fertility Program + BiOWiSH® Crop versus the Control (Figure 1).

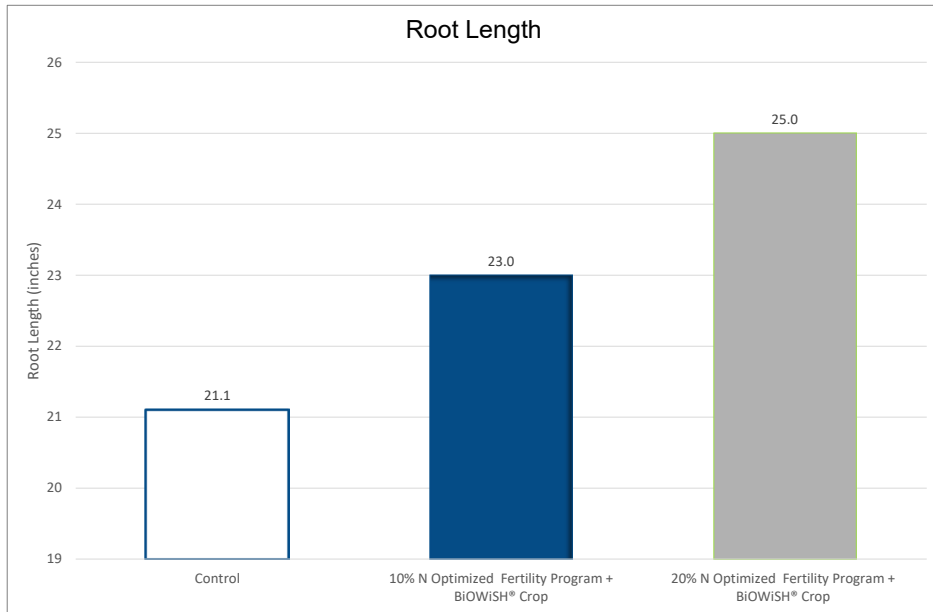
Figure 1. Chlorophyll Content



Root Length

Both BiOWiSH® treatments showed increased root lengths relative to the Control (Figure 2).

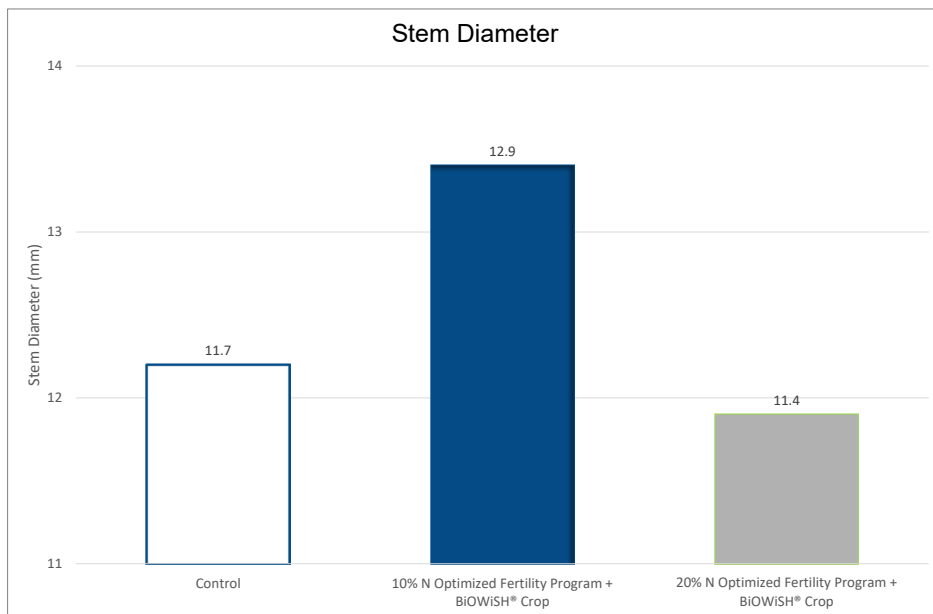
Figure 2. Root Length



Stem Diameter

The 10% N Optimized Fertility Program + BiOWiSH® Crop treatment showed increased stem diameter versus both the Control and the 20% N Optimized Fertility Program + BiOWiSH® Crop treatment.

Figure 3. Stem Diameter



Conclusion

BiOWiSH® endophytic *Bacillus* deliver soil nutrients to crops through the rhizophagy cycle creating a symbiotic relationship between the plant and soil microbes. Together, the cycle improved soil conditions for increased plant vigor in this study. At these early plant growth stages, the biology in BiOWiSH® Crop enabled increased nutrient use efficiency and improved nutrient uptake in sweet corn, despite a reduction in fertilizer.



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

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

1179-02-EN