

BiOWiSH® Crop Liquid

Evaluation of BiOWiSH® Crop Liquid on Waxy Corn Production in China



Executive Summary

BiOWiSH Technologies, Inc. conducted a study in collaboration with Heilongjiang Bayi Agricultural University to determine the efficacy of using fertilizer coated with BiOWiSH® Crop Liquid in waxy corn production at the second accumulated temperate zone of Heilongjiang Province. The experiment used a standard regional fertilizer program as a Control and compared it to the same fertilizer program coated with BiOWiSH® Crop Liquid.

The trial compared two treatments:

- Control, Standard Regional Fertility Program
- Control + BiOWiSH® Crop Liquid

The results of this study illustrate that the addition of BiOWiSH® Crop Liquid to the Control fertilizer program optimized yield potential by improved nutrient uptake in waxy corn, resulting in higher profit.

Background

About BiOWiSH Technologies

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. Our revolutionary BiOWiSH® Crop Liquid is a blend of proprietary microbial cultures that can be coated onto dry fertilizer or mixed with liquid fertilizers to create an enhanced efficiency fertilizer. 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 Liquid



- 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 Size

- 264 gal/1000 L

About Heilongjiang Bayi Agricultural University

The research team of Heilongjiang Bayi Agricultural University is an expert team composed of experienced scientific researchers and field personnel.

Objectives

The objective of this research study was to determine the efficacy of BiOWiSH® Crop Liquid coated onto DAP fertilizer to create an Enhanced Efficiency Fertilizer (EEF) for waxy corn production in Heilongjiang Province of China, compared to the Control. The focus was on BiOWiSH® Crop Liquid's impact on yield, quality, and grower economics.

Implementation Program

The study was conducted in Longjiang County, Qiqihar City, Heilongjiang Province on waxy corn (*Zea mays L. sinensis* Kulesh,) in loamy soil. The trial was set up using a randomized complete block design (RCBD) using two treatments with each treatment having three replicates. Each of the replicates were 30 m² (322.91 sq ft) in area and consisted of six rows of corn that were 0.65m (2.3 ft) wide by 7.7m (25.26 ft) long. The trial included two fertilizer treatments: Control and Control + BiOWiSH® Crop Liquid. The Control is a standard regional grower fertilizer program as defined by the third-party research institution, consisting of DAP (15-42-0) and Urea (46-0-0) at planting and topdress, KCl (0-0-60-45Cl) applied at planting. DAP was coated with BiOWiSH® Crop Liquid for the Control + BiOWiSH® treatment. Pest and disease management techniques were implemented on site when required. The trial measured plant growth metrics such as plant height and ear location, root length, kernel rows, and kernels per row. In addition to the plant metrics, fresh yield was collected in order to determine the economic return from the individual treatments.

Table 1. Treatments, Fertilizers, and Application Timings

Treatment	Fertilizer	Application Rate kg/ha [lbs/acre]	Application Timing
Control	Urea	375 [335]	Preplant 30% + Topdress 70%
	KCl	120 [107]	Preplant
	DAP	300 [268]	Preplant
Control + BiOWiSH® Crop Liquid	Urea	375 [335]	Preplant 30% + Topdress 70%
	KCl	120 [107]	Preplant
	DAP + BiOWiSH® Crop Liquid	300 [268]	Preplant

*BiOWiSH® Crop Liquid was added at the manufacturer's recommended rate.

Results

Plant Height and Ear Location

Plant height is an important indicator of crop growth and biomass. It shows that plants are able to access soil moisture and soil nutrients for carbohydrate production and subsequent development at early growth stages, which has been correlated with better potential crop productivity.

Table 2. Plant Height and Ear Location

Treatment	Plant Height cm [in]	Increase %	Ear Location cm [in]	Increase %
Control	236 [93.1]	-	96 [37.9]	-
Control + BiOWiSH® Crop Liquid	243 [95.6]	3.0	98 [38.4]	2.0

Ear Traits

Various ear traits are an important indicator of crop's growth, viability, and yield. The data collected shows the Control + BiOWiSH® treatment had more kernels per ear, signaling an increase in yield over the Control.

Table 3. Ear Traits

Treatment	Rows	Kernels in Row	Total Kernels per Ear
Control	15.3	38.57	587.87
Control + BiOWiSH®Crop Liquid	15.5	39.03	602.60

**Rows, kernels in rows, and total kernels per ear were all collected and counted independently, not calculated. Kernel rows and total kernel numbers are major determinations of yield in corn. Increased numbers of both are the most direct way of achieving higher yields in corn production.*

Root Length

Root length is an important indicator of a crop's ability to adsorb nutrients. When a root system is more developed, it has greater surface area contact with the soil and is more advantageous for nutrient absorption.

Table 4. Root Length

Treatment	Root Length cm [in]	Increase %
Control	33 [13.0]	-
Control +BiOWiSH® Crop Liquid	34 [13.3]	2

Economic Analysis

BiOWiSH® Crop Liquid, when coated onto fertilizer, showed a 5.2% yield increase over the Control. This resulted in a \$235 USA/ha (\$95 USD/acre) increase in profit.

Table 5. Economic Analysis

Treatment	Yield MT/ha [tons/acre]	Yield Increase MT/ha [tons/acre]	Yield Increase %	Net Income USD/ha [USD/acre]	Profit Change USD/ha [USD/acre]
Control	20.09 [8.96]	-		4,270 [1,728]	-
Control + BiOWiSH® Crop Liquid	21.14 [9.43]	1.05 [0.47]	5.2	4,505 [1,823]	235 [95]

*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. It does not account for non-fertility expenses.

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

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. This enabled optimized yield potential by improved nutrient uptake, which led to profit changes of \$235 USD/ha (\$95 USD/acre) for the Control + BiOWiSH® Crop Liquid treatment in this study.



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