

BiOWiSH® Crop Liquid

Evaluation of BiOWiSH® Crop Liquid on Safrinha Maize Production in Brazil



Maize

Executive Summary

BiOWiSH Technologies partnered with the Fundação MT as a third-party Contract Research Organization (CRO) to conduct a research trial. The study tested the effects of BiOWiSH® Crop Liquid coated onto urea as an Enhanced Efficiency Fertilizer (EEF) on maize production in Mato Grosso, Brazil.

The study compared three treatments:

- Control, Standard Urea Fertility Program
- Control + BiOWiSH® Crop Liquid
- N Optimized Fertility Program + BiOWiSH® Crop Liquid

The study determined that the addition of BiOWiSH® Crop Liquid optimized yield potential by improved nutrient uptake in maize grown under Safrinha conditions in Brazil. In this trial, a 12.2% increase was observed for the Control + BiOWiSH® Fertility Program and a 2.7% increase for the N Optimized + BiOWiSH® Fertility Program, which led to 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 Sizes

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

About the Fundação MT

The Foundation for Support for Agricultural Research of Mato Grosso (Fundação MT) plays a very important role in supporting agricultural research to promote the success and expansion of agriculture in Mato Grosso. The organization was founded in 1993 by 23 seed and soybean producers in the state concerned about the future of agriculture.

The Fundação MT was built on principles and values, such as economic and socio-environmental sustainability. Their agronomic research was developed to promote good land use and increase crop productivity. The Foundation currently assists Mato Grosso farmers in different study areas such as Entomology, Crop Protection, Genetics, Nutrition, and many other aspects for important crops in the region such as soybean, corn, and cotton.

Objectives

The purpose of this trial was to evaluate the performance of BiOWiSH® Crop Liquid coated onto urea as an Enhanced Efficiency Fertilizer (EEF) for corn, as a full standard fertility program and an optimized fertility program, compared to the Control under dryland, Safrinha maize production conditions.

Implementation Program

Fundacao MT conducted the trial consisting of three treatments in a randomized complete block design (RCBD) study. The site was a no-till dryland field planted with maize following an earlier soybean crop. The maize variety was P3858 PWY and it was treated with a fungicide/insecticide seed treatment standard for the area.

The Control program is the most commonly used fertilizing practice in the region for corn and consisted of sidedressed urea (46-0-0) at a rate of 200 kg/ha (178 lbs/acre). The addition of BiOWiSH® Crop Liquid (coated onto the urea) was applied at the manufacturer's recommended rate to both the Control and the N Optimized Fertility Program. For the N Optimized Program the urea was applied at a rate of 180 kg/ha (161 lbs/acre).

Safrinha production of maize in Brazil is gaining in importance. However, the risk of unfavorable growing conditions increases risk for the growers. This was true for the 2021 crop season, which presented very atypical weather conditions as compared to previous years. The seasonal rainfall began late and delayed the soybean planting, which pushed the "Safrinha" window to outside what is considered ideal. Consequently, the timing and conditions for corn ear development (V7-VT) were adversely affected, thus impacting the number of kernels per ear. Another important factor worth mentioning was a high pest population at the trial site, which also contributed to the stress of the crop.

The application timing was at the V3 crop stage. The urea was applied using a mechanical fertilizer spreader and was not incorporated into the soil. No phosphorous or potassium fertilizer were applied.

Disease and insect control was performed as needed based upon local recommendations and thresholds.



Table 1. Fertilizer, Treatments, and Application Timing

| Treatment | Application Rate kg/ha [lbs/acre] | Application Phase |
|--|---|-------------------|
| Control, Standard Urea Fertility Program | 200 [178] | Sidedress |
| Control + BiOWiSH® Crop Liquid | 200 [178] | Sidedress |
| N Optimized Fertility Program + BiOWiSH® Crop Liquid | 180 [161] | Sidedress |

*BiOWiSH® Crop Liquid used at manufacturer's recommended rate.

Results

BiOWiSH® Crop Liquid, when added to a regional standard fertility program as a fertility enhancement coated onto urea by the fertilizer supplier for corn grown in Mato Grosso Brazil, increased yield by 12.2% over the Control, resulting in a profit change of \$110 USD/ha (\$45 USD/acre). In addition, with a 10% reduction in fertilizer for the N Optimized Fertility Program, the BiOWiSH® treatment outperformed the Control by 2.7%, leading to a profit change of \$34 USD/ha (\$14 USD/acre). Profit change is based on input costs and grain values at the time of the study.

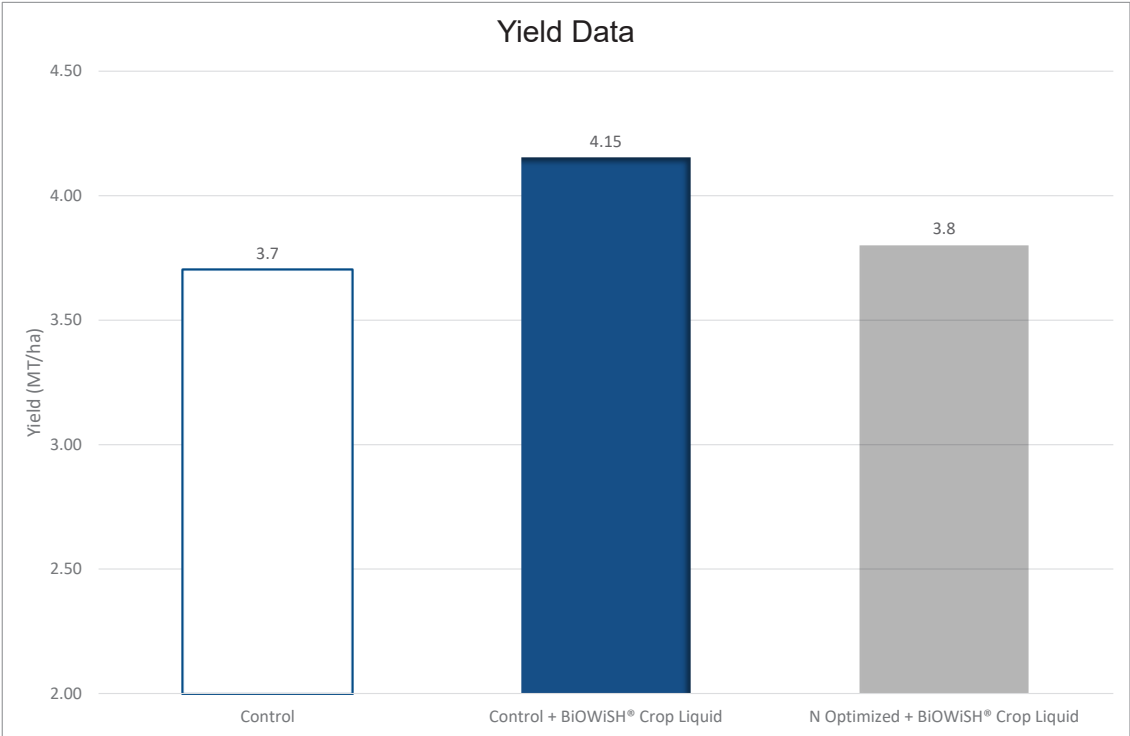


Table 2: Yield and Net Income Table

| 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 | 3.70 [1.65] | - | - | 834 [382] | - |
| Control + BiOWiSH® Crop Liquid | 4.15 [1.85] | 0.45 [0.20] | 12.2 | 944 [382] | 110 [45] |
| N Optimized Fertility Program + BiOWiSH® Crop Liquid | 3.80 [1.70] | 0.10 [0.05] | 2.7 | 868 [351] | 34 [14] |

*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

The results from this study show increased yields in maize for the both the 100% Control + BiOWiSH® and the N Optimized Fertility Program + BiOWiSH®. BiOWiSH® endophytic *Bacillus* deliver soil nutrients to crops through the rhizophagy cycle creating a symbiotic relationship between the plant and soil microbes. This enables optimized yield potential by improved nutrient uptake. This increased profitability of maize in this study by \$110 USD/ha (\$45 USD/acre) over the Control in the 100% BiOWiSH® treatment and by \$34 USD/ha (\$14 USD/acre) in the N Optimized Fertility Program treatment. This provides growers with options for how to manage their crop in high risk climate seasons, such as Safrinha conditions, while increasing their economic return. Furthermore, reduced nitrogen fertilizer allows the grower to take less financial risk growing maize in the harsher conditions following the earlier soybean crop. BiOWiSH® Crop Liquid is a useful management tool that shows positive results.



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