

BiOWiSH[®] Crop Liquid

Evaluation of BiOWiSH[®] Crop Liquid on Rice in Louisiana



Executive Summary

BiOWiSH Technologies engaged Precision Study Management as a third-party Contract Research Organization (CRO) to conduct a study to determine the effects of BiOWiSH[®] Crop Liquid coated onto urea to create an Enhanced Efficiency Fertilizer (EEF), as part of a rice fertility program in Louisiana.

The trial compared three treatments:

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

In this trial, a 11.3% yield increase was observed for the Control + BiOWiSH[®] Fertility Program and a 12.9% yield increase was observed 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 Size

- 264 gal/1000 L

About Precision Management

Precision Study Management LLC (PSM) is a privately held company focused on assisting the Ag Chem industry in the design and execution of field research programs to support regulatory and marketing objectives. The staff at PSM supports clients with their field and laboratory research needs and assists them with product registration requirements. PSM focuses on achieving regulatory objectives through the design and management of field research throughout the field phase, analytical phase and report phase of the study.

Objectives

The primary objective of this trial was to evaluate the performance of BiOWiSH® Crop Liquid coated onto urea as an Enhanced Efficiency Fertilizer (EEF) compared to the Control fertility practice on rice production in Louisiana. The evaluation focused on rice growth measurements, yield, and economic benefits for the farmer.

Implementation Program

In this trial, the standard regional fertility program for rice consisted of an application of granular urea pre-flooding at a rate of 300 lbs/acre (336 kg/ha) near Washington, Louisiana. This Control program was compared to a program that included the addition of BiOWiSH® Crop Liquid coated onto urea as an EEF at the manufacturer's recommended rate. A third treatment (N Optimized Fertility Program + BiOWiSH®) constituted a 15% reduction in applied nitrogen for a total of 255 lbs/acre (286 kg/ha) of urea applied. The Control program urea was coated with the urease inhibitor NBPT at a rate of 2qt/ton (2L/mT), while the urea in the BiOWiSH® treatments was not coated with NBPT. The trial consisted of three treatments with six replicates in a randomized complete block design (RCBD). At the trial site, the rice variety 'CL 111' was planted in accordance with local practices. The urea applications for all treatments were made post-emergence and prior to flooding. There was no significant disease or pest pressure at the trial location.

Table 1. Fertilizer, Treatments, and Application Timing

Treatment	Application Rate lbs/acre [kg/ha]	Application Phase
Control, Standard Urea Fertility Program	300 [336]	Pre-flooding
Control + BiOWiSH® Crop Liquid	300 [336]	Pre-flooding
N Optimized Fertility Program + BiOWiSH® Crop Liquid	255 [286]	Pre-flooding

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

Results

Vegetative Measurements

The table below contains the trial's assessment for color (measured qualitatively on a 1-10 scale), stand density, and plant height at multiple timepoints during the growing season. The values were similar or higher for the Control + BiOWiSH® treatments relative to the Control.

Table 2. Vegetation Analysis Table

Treatment	Color (1-10)	Plant Height in [cm]	Color (1-10)	Stand Density (%)	Plant Height in [cm]
	14 DAA	15 DAA	28 DAA	55 DAA	64 DAA
Control, Standard Urea Fertility Program	9	5.7 [14.4]	9	83.3	33.2 [84.4]
Control + BiOWiSH® Crop Liquid	9	7 [17.8]	9	88.3	32.8 [83.4]
N Optimized Fertility Program + BiOWiSH® Crop Liquid	9	6.8 [17.3]	9	88.3	32.4 [82.3]

* DAA: Days After Application

Yield Parameters

Measurements of yield are presented in the table below. The Control + BiOWiSH® treatment was observed to have a yield increase of 14 bu/acre (0.94 MT/ha) over the Control, while the N Optimized Fertility Program + BiOWiSH® treatment was observed to have a yield increase of 16 bu/acre (1.08 MT/ha).

Table 3. Yield Data Analysis Table

Parameter Range	Weight 10 Heads ounces [g]	Grain Moisture %	Yield bu/acre [MT/ha]
Control, Standard Urea Fertility Program	1.7 [47.1]	15.5	124 [8.34]
Control + BiOWiSH® Crop Liquid	1.7 [48.2]	15.4	138 [9.28]
N Optimized Fertility Program + BiOWiSH® Crop Liquid	1.6 [45.2]	15.7	140 [9.42]

Yield and Economics

Economic data on rice yield from the study is presented in the table below. The Control + BiOWiSH® treatment had a profit change of \$158 USD/acre (\$390 USD/ha) greater than the Control. The N Optimized Fertility Program + BiOWiSH® treatment had a profit change of \$190 USD/acre (\$469 USD/ha) greater than the Control.

Table 4. Yield and Net Income Table

Treatment	Yield bu/acre [MT/ha]	Yield Increase bu/acre [MT/ha]	Yield Increase %	Net Income USD/acre [USD/ha]	Profit Change USD/acre [USD/ha]
Control, Standard Urea Fertility Program	124 [8.34]	-	-	1294 [3198]	-
Control + BiOWiSH® Crop Liquid	138 [9.28]	14 [0.94]	11.3	1452 [3588]	158 [390]
N Optimized Fertility Program + BiOWiSH® Crop Liquid	140 [9.42]	16 [1.08]	12.9	1484 [3667]	190 [469]

*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. BiOWiSH® Crop Liquid, when added to a regional standard fertility program as an EEF, optimized yield potential by improved nutrient uptake in rice. The 11.3% overall yield increase of 14 bu/acre (0.94 MT/ha) over the Control increased profit to the grower by \$158 USD/acre (\$390 USD/ha) for the Control + BiOWiSH® treatment. For the N Optimized Fertility Program + BiOWiSH® treatment, the 12.9% overall yield increase of 16 bu/acre (1.08 MT/ha) over the Control increased profit to the grower by \$190 USD/acre (469 USD/ha).

The optimization of yield potential for both BiOWiSH® treatments, especially the N Optimized Fertility Program + BiOWiSH®, points to how the BiOWiSH® EEF increases nutrient use efficiency and supports nutrient uptake. Furthermore in light of the vegetative data assessment in Table 2, similar or higher values for the Control + BiOWiSH® treatments relative to the Control indicate improved soil conditions for increased plant vigor.



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