BiOWiSH® TECHNOLOGIES

Research Study

BiOWiSH® Crop Liquid

The Evaluation of BiOWiSH® Crop Liquid on Winter Wheat in Northern Texas

Executive Summary

BiOWiSH Technologies, Inc. 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), for winter wheat production in the panhandle region of Texas, USA.

This trial compared two treatments:

• Control, Standard Urea Fertility Program
• Control + BiOWiSH® Crop Liquid

The study determined that the addition of BiOWiSH® Crop Liquid optimized yield potential by improved nutrient uptake in winter wheat. In this trial, a 5.8 bu/acre (0.39 MT/ha) increase was observed for the Control + 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 Study 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 purpose of this study was to evaluate the performance of BiOWiSH® Crop Liquid coated onto urea to create an Enhanced Efficiency Fertilizer (EEF) compared to the Control fertility practice for winter wheat production in Texas. The evaluation focused on winter wheat yield and economic benefits for the farmer.

Implementation Program

This study evaluated a regional standard fertility program for winter wheat in the panhandle of Texas, USA and compared it to the same program using urea coated with BiOWiSH® Crop Liquid at the manufacturer's recommended rate. The standard fertility program is a commonly used practice in the region for winter wheat production.

This trial was conducted as a replicated, large-strip trial design. It consisted of two treatments with three replicates. Urea was broadcasted in a preplant application on the day of planting at a rate of 272 lbs/acre (305 kg/ha).

The wheat was planted in accordance with local practices. Wheat emerged nine days post application and planting. There was no significant disease or pest pressure at the trial location.

Table 1: Fertilizers, Treatments, and Application Timing

Treatment	Application Rate lbs/acre [kg/ha]	Application Phase
Control, Standard Urea Fertility Program	272 [305]	Preplant
Control + BiOWiSH® Crop Liquid	272 [305]	Preplant

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

Results

BiOWiSH® endophytic *Bacillus* deliver soil nutrients to crops through the rhizophagy cycle creating a symbiotic relationship between the plant and soil microbes. This enabled optimized yield potential by improved nutrient update, which led to a profit increase of $29 USD/acre ($73 USD/ha) for the BiOWiSH® treatment in this study.

Table 2: 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	44.2 [2.97]	-	-	181 [447]	-
Control + BiOWiSH® Crop Liquid	50.0 [3.36]	5.8 [0.39]	13.1	210 [520]	29 [73]

**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

With the addition of BiOWiSH® Crop Liquid to the standard fertility program, grain yields increased by 5.8 bu/acre (0.39 MT/ha) or 13.1% compared to the Control in this study. By measuring replicated strip-plots, the trial was able to capture grower conditions for evaluating the BiOWiSH® treatment response. The profit change for the farmer was $29 USD/acre ($73 USD/ha) using BiOWiSH®.

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