

Evaluation of BiOWiSH™ Crop on Grain Yield in Rice

Background

The Helena Chemical Company is a leading provider of crop production and crop protection products to the agriculture community in the United States and worldwide. Headquartered in Collierville, Tennessee, the company has been in the business for more than 50 years and has been working on product development and providing research services for more than eight years.

Objective

The objective of this research study was to determine the effectiveness of BiOWiSH™ Crop, manufactured by BiOWiSH Technologies, Inc., in the USA, on growth and yield in a continuous flood rice-production system.

Solution

BiOWiSH™ Crop is a fertilizer additive that helps increase micronutrient uptake in plants, improves plant vigor and stimulates microbial activity in the soil. Growers, distributors and institutions have reported that using the BiOWiSH™ Crop technology improves crop yields and quality, adding directly to the farmer’s bottom line.

Implementation Program

The study was conducted on a grower field near Marysville, California, USA. The treatments were organized as a Randomized Complete Block Design with 4 replications. The field was prepared normally beginning with soil tillage, levelling and rolling. Then plots were delineated and a 6-foot wide levee plot was established to create a contiguous soil border between plots so as to maintain the integrity of the treatments. Two fertilizer application schemes were used in the study: a single pre-flood soil surface application with the fertilizer incorporated, and a sequential program with base fertilizer as previously described followed by a sequential fertilizer application into the flood water at panicle initiation.

| Treatment Name | Fertilization Program | Rate [Kg/Ha] | Application Timing [Stage] |
|-----------------------------------|------------------------------------|--------------|----------------------------|
| Control | Urea (46-0-0) | 339 | At planting |
| | MAP (11-52-0) | 108 | At planting |
| | MOP (0-0-60) | 112 | At planting |
| | Urea (46-0-0) | 73 | Panicle initiation |
| Reduced Control + BiOWiSH™ | BiOWiSH™ Crop Coated Urea (46-0-0) | 321 | At planting |
| | MAP (11-52-0) | 108 | At planting |
| | MOP (0-0-60) | 112 | At planting |
| | BiOWiSH™ Crop Coated Urea (46-0-0) | 69 | Panicle initiation |

BiOWiSH™ Crop Coated Urea (46-0-0) is urea coated with BiOWiSH™ Crop Liquid at 0.2% w/w.

| Treatment Name | Fertilization Program | Rate [Kg/Ha] | Application Timing [Stage] |
|--|---------------------------------|--------------|----------------------------|
| Stabilized Nitrogen Technology | Stabilized Nitrogen Coated Urea | 366 | At planting |
| | MAP (11-52-0) | 108 | At planting |
| | MOP (0-0-60) | 112 | At planting |
| Controlled Release Polymer Coated | Polymer Coated Urea | 147 | At planting |
| | Urea | 140 | At planting |
| | MAP (11-52-0) | 108 | At planting |
| | MOP (0-0-60) | 112 | At planting |

The control treatment is the most common best management practice used by growers in the region as defined by the independent third-party testing company. Observations of the following characteristics were made to represent the effect of the various nitrogen technologies on rice performance including:

1. Plant Growth: Height
2. Plant Health: Color and Vigor
3. Yield: Plant Stand and Grain Yield

Plant tissue samples were collected for plant nutrient composition analysis. An economic evaluation of the different fertilizer programs was performed based on current cost data for farmers in California.

Results

Crop Performance

There was a significant effect on yield in this study in treated plots versus the most common practice base fertilizer treatment, with the BiOWiSH™ treatment having the highest yield.

| Treatment Name | Plant Stand [pl/m ²] | Plant Height [cm] | Vigor [0-5] | Color [0-10] | Yield [Kg/Ha] |
|--|----------------------------------|-------------------|-------------|--------------|---------------|
| Control | 143 | 21 | 3.5 | 7.8 | 9286 |
| Reduced Control + BiOWiSH™ | 170 | 25 | 3.8 | 8.0 | 12665 |
| Stabilized Nitrogen Technology | 173 | 24 | 3.5 | 8.0 | 12132 |
| Controlled Release Polymer Coated | 160 | 21 | 3.5 | 7.5 | 11056 |

At day 28 of this study (after seeding), a trend for an increase in plant stand was observed in plots treated with nitrogen-enhancement technologies as compared to the control. Furthermore, plants treated with BiOWiSH™ showed the highest plant height, vigor and color values at this time.

Plant Analysis

The plant analysis revealed that BiOWiSH™ technology can increase yield while maintaining plant nutrient levels. In fact, the treatments showed sufficient Nitrogen, Phosphorous and Potassium levels for a high-quality plant.

| Treatment Name | Nitrogen [%] | Phosphorus [%] | Potassium [%] |
|-----------------------------------|--------------|----------------|---------------|
| Control | 4.64 | 0.49 | 2.62 |
| Reduced Control + BiOWiSH™ | 4.05 | 0.47 | 3.06 |
| Stabilized Nitrogen Technology | 4.32 | 0.39 | 2.85 |
| Controlled Release Polymer Coated | 3.77 | 0.43 | 2.93 |

Economics

BiOWiSH™ treatments resulted in a significant increase in the economic return as compared to the recommended best management practice fertilizer program (Control). The reduced urea plus BiOWiSH™ Crop treatment gave the best economic result: an additional \$1836 per hectare (\$743/acre) over the recommended most common fertilizer program.

| Treatment Name | Gross Income [US\$/Ha] | Profit [US\$/Ha]* |
|-----------------------------------|------------------------|-------------------|
| Control | 5048 | -- |
| Reduced Control + BiOWiSH™ | 6885 | 1836 |
| Stabilized Nitrogen Technology | 6591 | 1593 |
| Controlled Release Polymer Coated | 6363 | 1364 |

*Profit relative to control.

Conclusions

BiOWiSH™ Crop coated fertilizer had a significant effect on plant health and yield on rice grown in California. The BiOWiSH™ Crop treatment with reduced nitrogen resulted in the best overall plant characteristics and highest increase in grain yield. BiOWiSH™ was easy to apply and there were no deleterious effects on the handling ease, application of the treated fertilizer, or the crop itself. The ability to reduce fertilizer application combined with improving production offers a significant return on investment opportunity to the grower.

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