

## BiOWiSH® Crop Liquid

### Evaluation of BiOWiSH® Crop Liquid on Fruit Yield and Quality in Grape Tomatoes

#### Executive Summary

BiOWiSH Technologies, Inc. engaged a U.S. private third-party contract research organization (CRO) to conduct a study to determine the efficacy of BiOWiSH® Crop Liquid for grape tomato production in central Florida. The trial used the regional standard fertilizer program as the control and compared it to the same fertilizer program with BiOWiSH® Crop Liquid added. The study determined that adding BiOWiSH® Crop Liquid to grower standard fertilizers increased marketable grape tomato yield, leading to higher net income.

#### Objectives

The objective of this study was to determine the effects of BiOWiSH® Crop Liquid on yield, quality, and economics of grape tomato production under field conditions of central Florida.

#### Background

The U.S. private third-party CRO that conducted this trial is a team of highly trained and experienced study directors, field researchers, and support staff with diverse backgrounds in agronomy study management. They are one of several independent CROs that BiOWiSH Technologies, Inc. works with to independently evaluate our agronomy products.

BiOWiSH® Crop Liquid is a microbial biostimulant that can be coated onto dry fertilizer or mixed with liquid fertilizers to create an enhanced efficiency fertilizer with industry leading shelf-life and consistent results across a broad range of operating conditions and environments, all at a low cost to farmers. BiOWiSH® Crop Liquid stimulates native microbial activity and promotes root development, increasing nutrient uptake and improving plant vigor. BiOWiSH® Crop Liquid is proven to enhance the effects of applied fertilizers by increasing yield and soil health.

#### Implementation Program

The study was conducted on grape tomatoes (*Solanum lycopersicum*, variety BHN 785) in sandy soil in a research field near Winter Garden, Florida, USA. The treatments were organized as a randomized complete block design with 10 replications. The field was prepared with a field cultivator prior to planting. Hi-Cal Lime (0-0-0-35 Ca) was applied at a rate of 2,240 kg/ha [2,000 lb/ac.] preplant and incorporated 10 cm [4 in] into soil profile. Plot size was 1.5 m [5 ft] x 6.1 m [20 ft]. Grape tomato plants were hand transplanted into 76 cm [30 in] rows at 33 cm [13 in] plant spacing.

The study compared two fertilizer programs: **Control** and **Control + BiOWiSH® Crop Liquid**. The Control program was a standard grower fertilizer program and was chosen because it was the most common best management practice used by growers in the region, as defined by the independent third-party CRO. The details of each treatment program are defined below:

#### BiOWiSH® Crop Liquid



- Improves crop yields
- Increases nutrient availability
- Enhances root development
- Improves plant vigor
- Stimulates native microbial activity in the soil
- Improves soil health

#### Available Sizes

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

## Control

Fertilization Program*	Rate	Application Timing
Hi-Cal Lime 0-0-0-35 Ca (granular)	2,240 kg/ha [2,000 lb/ac.]	Pre-plant
DAP 21-53-0 (dry, water-soluble)	112 kg/ha [100 lb/ac.]	At planting, weeks 3, 5, and 7
Nucleus 0-0-21 13S (liquid)	18.7 L/ha [2 gal/ac.]	At planting, weeks 3, 5, and 7

## Control + BiOWiSH® Crop Liquid

Fertilization Program**	Rate	Application Timing
Hi-Cal Lime 0-0-0-35 Ca (granular)	2,240 kg/ha [2,000 lb/ac.]	Pre-plant
BiOWiSH® Crop Liquid + DAP 21-53-0 (dry, water-soluble)	112 kg/ha [100 lb/ac.]	At planting, weeks 3, 5, and 7
BiOWiSH® Crop Liquid + Nucleus 0-0-21 13S (liquid)	18.7 L/ha [2 gal/ac.]	At planting, weeks 3, 5, and 7

\*For the Control treatment, untreated DAP 21-53-0 and Nucleus 0-0-21 13S were dissolved into 7.57 L [2 gallons] of water and this fertilizer solution was applied to each control plot at each application.

\*\*For the Control + BiOWiSH® Crop Liquid treatment, DAP 21-53-0 was coated with BiOWiSH® Crop Liquid according to the label recommendations and dissolved in a tank-mix of Nucleus 0-0-21 13S which was treated with BiOWiSH® Crop Liquid according to the label recommendations. A final volume of 7.57 L [2 gallons] of this fertilizer solution was applied through the irrigation dripper line to each plot at each application.

The following characteristics were evaluated to determine the effects of the BiOWiSH® Crop Liquid on grape tomato production:

- 1. Plant Leaf Nutrient Composition:** measured in leaf tissue samples collected mid-season
- 2. Total Marketable Fruit:** measured as mT/ha [tons/ac.]
- 3. Total Number of Fruit:** measured as count/ha [count/ac.]
- 4. Fruit Quality:** measured as Brix level, 0-100 at harvest
- 5. Economic Evaluation:** Costs and net income were calculated for the different fertilizer programs based upon current market prices in the local region

## Results

### Plant Leaf Nutrient Composition

The Control + BiOWiSH® Crop Liquid treatment showed increased yield while maintaining plant nutrient levels.

Treatment	Nitrogen (%)	Phosphorus (%)	Potassium (%)
Control	1.62	0.36	1.19
Control + BiOWiSH® Crop Liquid	1.61	0.35	1.24

## Yield Parameters

Total number of fruit was higher (5.0%) in the Control + BiOWiSH® Crop Liquid treatment, which translated into a significant increase (13.3%) in the weight of total marketable fruit. Fruit quality (Brix) was similar between treatments.

Treatment	Total Marketable Yield	Increase in Total Marketable Yield (%)	Total Fruit Count	Fruit Quality (Brix)
Control	4.36 mT/ha [1.94 tons/ac.]	-	59,092/ha [146,020/ac.]	6.79
Control + BiOWiSH® Crop Liquid	4.94 mT/ha [2.20 tons/ac.]	13.3	62,074/ha [153,388/ac.]	6.88

Calculations for conversions between imperial and metric units are based on the original source data; slight rounding differences may occur within reported publication values.

## Economics

In the economic analysis, there was a significant increase in net income in the Control + BiOWiSH® treatment compared to the Control program, resulting in an increased profit of \$526 USD/ha (\$213 USD/ac.).

Treatment	Net Income*	Profit Change**
Control	\$3,589 USD/ha [\$1,452 USD/ac.]	-
Control + BiOWiSH® Crop Liquid	\$4,115 USD/ha [\$1,665 USD/ac.]	\$526 USD/ha [\$213 USD/ac.]

\*Net income is the crop value minus the fertility program cost and does not account for non-fertility expenses.

\*\*Profit change is the difference between the respective program and the control.

## Conclusion

This study demonstrates that BiOWiSH® Crop Liquid coated onto DAP 21-53-0 and blended with BiOWiSH® Crop Liquid treated Nucleus 0-0-21-13S improved grape tomato production with a 5% increase in total number of fruits and a 13.3% increase in weight of marketable fruit. These improved yield parameters increased profit by \$526 USD/ha [\$213 USD/ac.]. The ability of BiOWiSH® Crop Liquid to improve tomato production offers a significant return on investment opportunity to the grower.



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