

BiOWiSH® Crop Liquid

Evaluation of BiOWiSH® Crop Liquid on Yield in Processing Tomatoes

Executive Summary

BiOWiSH Technologies, Inc. engaged Helena Agri-Enterprises, LLC as a third-party Contract Research Organization (CRO) to conduct a study to determine the effects of BiOWiSH® Crop Liquid on processing tomato production located in California. The study compared 2 treatments:

- A regional fertilizer program as the control (Control)
- The same fertilizer program with BiOWiSH® Crop Liquid added (Control + BiOWiSH® Crop Liquid)

The study determined that the Control + BiOWiSH® Crop Liquid program increased yield in processing tomatoes which led to higher profit.

Background

About BiOWiSH® Crop Liquid

BiOWiSH® Crop Liquid is a microbial additive 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 enhances native microbial activity in the soil and root development, increasing nutrient availability and improving plant vigor. BiOWiSH® Crop Liquid is proven to enhance the effects of applied fertilizers by optimizing yield potential and soil productivity.

About Helena Chemical Company

Helena Agri-Enterprises is a leading provider of crop production and crop protection products in the United States and worldwide. Headquartered in the USA, the company has been in the agronomic products supply business for more than 50 years and has expanded their contract research services over the last decade. As an independent CRO, Helena R&D is a team of highly trained and experienced study directors, field researchers, and support staff. They are one of several independent CROs that BiOWiSH Technologies, Inc. works with to evaluate our agronomy products.

Objectives

The objective of this research was to determine the potential of BiOWiSH® Crop Liquid enhanced fertilizer to increase yield of processing tomatoes grown under irrigation in California.

Implementation Program

This trial was conducted on 'Heinz 1662' processing tomatoes near Los Banos, CA. The trial was setup as a split block and the BiOWiSH® Crop Liquid enhanced fertilizer applied to one section of the field by injection into the irrigation riser valve during irrigation. The adjacent section to the East serviced by the next valve was used as the grower standard for data collection. The field was planted on 80 inch (203 cm) beds with two plants lines 16 inches (40.6 cm) apart on the center of each bed with 20 inch (50.8 cm) in-line spacing and the plant lines in an offset pattern from each other. The grower program utilized UAN-32 as the nitrogen source early in the season and then switched to CAN-17 later in the crop cycle.

BiOWiSH® Crop Liquid



- Optimizes yield potential
- Increases nutrient availability
- Enhances root development
- Improves plant vigor
- Enhances native microbial activity in the soil
- Improves soil productivity

Available Sizes

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

The first application in June was made during a 5 gal/ac (46.8 L/ha) fertigation of UAN-32. The BiOWiSH® Crop Liquid was mixed at the manufacturer's recommended rate with the liquid fertilizer. The BiOWiSH enhanced fertilizer was added to water in a three-gallon canister (11.36 L) and injected at 200 mL per minute for approximately a one-hour injection time. A second injection was conducted in the same fashion in July during fertigation with 7.5 gal/ac (70.2 L/ha) of CAN-17.

Yield data was collected as sub-sample data from ten locations throughout each treatment. Total fruit weight from ten plants was collected. In addition to the total fruit weight, the weight per hundred fruit and percent green fruit was measured from five individual fruit at each location.

Table 1. Fertilizers Treatments and Applications Timings*

Treatments	Fertilizer	Rate gal/ac [L/ha]	Timing*
Control	UAN 32% N	5.0 [46.8]	June
	CAN-17	7.5 [70.2]	July
Control + BiOWiSH® Crop Liquid	UAN 32% N	5.0 [46.8]	June
	CAN -17	7.5 [70.2]	July

CAN-17 is Calcium Ammonium Nitrate (17-0-0)

BiOWiSH® Crop Liquid added at manufacturers recommended use rate and was applied only at the June and July timings

*Total seasonal fertilizer program also included additional blanket applications at later timings across treatments of UAN, CAN 17 and KTS (Potassium Thiosulfate. 0-0-22-17S)

Results

Laboratory Soil Analysis:

Pre-treatment (baseline) soil analysis results are presented in Table 2.

Table 2. Pre-Treatment Laboratory Soil Analysis

Treatment	Sample Timing	Nitrate-N ppm	Phosphorus ppm	K Ppm	Mg Ppm	Ca Ppm	OM %
Composite of Test Site	Pre-treatment	56	86	177	692	2838	1.9
	Rating*	-	VH	M	VH	M	L

* Note: Ratings levels are based on ranges selected by the specific testing lab and are only valid for comparisons among tests analyzed by this specific lab

Post-harvest soil analysis showed that the Control and Control + BiOWiSH® Crop Liquid treatment had comparable levels and ratings of major nutrients and organic matter (Table 3.)

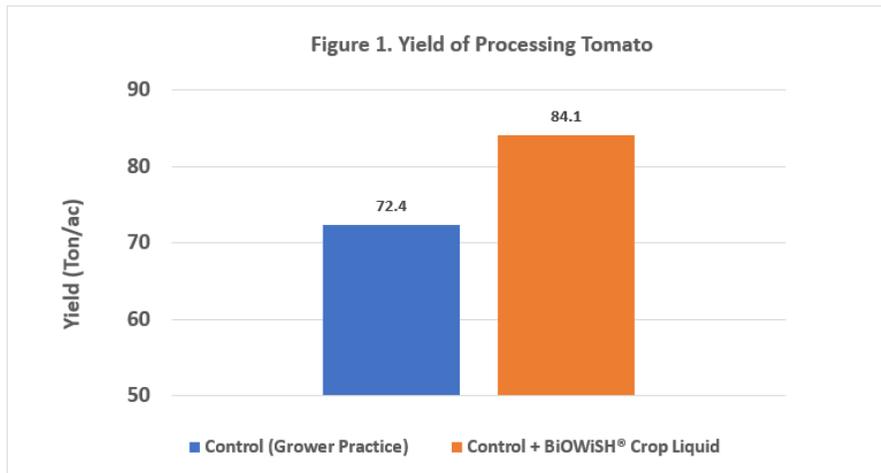
Table 3. Post-Harvest Laboratory Soil Analysis

Treatment	Sample Timing	Nitrate-N ppm	Phosphorus ppm	K Ppm	Mg Ppm	Ca Ppm	OM %
Control (Grower Practice)	Post-Harvest	24	74	141	640	2517	1.9
	Rating*	-	VH	M	VH	M	L
Control + BiOWiSH® Crop Liquid	Post-Harvest	22	63	134	685	2525	2.0
	Rating	-	VH	L	VH	M	L

* Note: Ratings levels are based on ranges selected by the specific testing lab and are only valid for comparisons among tests analyzed by this specific lab

Yield

Analysis of yield data showed that the BiOWiSH® enhanced fertilizer program resulted in an increase of 11.7 Tons/ ac (26.2 MT/ha) over the Control treatment. In addition to the 16.2% increase over the standard grower practice program the BiOWiSH® treatment had 1.3% less green fruit (8.6% versus 7.3%). Additionally, there was a numerical trend towards larger fruit size reflected in the weight/100 fruit data with the BiOWiSH® enhanced fertilizer program yielding 17.0 lbs whereas the Control program was 16.6 lbs.



1 Ton/ac = 2.24 MT /ha

1 lb = 0.454 kg

Economic Analysis

Economic analysis data is shown in Table 4. Based upon the yield increase of 16.2% in the Control + BiOWiSH® Crop Liquid, net income increased by 17%, resulting in an increased profit of \$813 USD/ac (\$2010 USD/ha).

Table 4. Economic Effects of BiOWiSH® Crop Liquid Enhanced Fertilizer Application in Processing Tomato*

Treatments	Yield Ton/ac [MT/ha]	Yield Increase %	Net Income** USD/ac [USD/ha]	Net Income Gain %	Profit Change*** USD/ac [USD/ha]
Control	72.4 [162.3]	-	\$4,866 [\$12,023]	-	-
Control + BiOWiSH® Crop Liquid	84.1 [188.5]	16.2	\$5679 [\$14,033]	17	\$813 [\$2,010]

*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 gain 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

This study demonstrated that BiOWiSH® Crop Liquid added to the grower standard fertilizer improved processing tomato yield by 16.2% and had a lower percentage of green tomatoes. The BiOWiSH® treatment increased net profit over the Control treatment by \$813 USD/ac (\$2,010 USD/ha). The BiOWiSH® enhanced fertilizer program had the same nutrient inputs as the Control treatment while maintaining similar soil analysis nutrient levels with more yield. The ability of BiOWiSH® Crop Liquid enhanced fertilizer to improve processing tomato production offers a significant return on investment opportunity to the grower.



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