

BiOWiSH® Crop Technology

Tomato Study Helena Agri-Enterprises, California, USA

Executive Summary

BiOWiSH Technologies, Inc. engaged Helena R&D as a third-party Contract Research Organization (CRO) to conduct a study to determine the effects of BiOWiSH® Crop on grape tomato production. The results reported in this study are from year one of the trial. The trial compared 3 treatments:

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

The study determined that the Control + BiOWiSH® Crop program increased fruit quality, and yields in tomatoes which led to higher profit.

Background

About BiOWiSH® Crop

BiOWiSH® Crop is a solid, water soluble advanced microbial solution for mixing and applying on-farm. BiOWiSH® Crop adds microbes to the soil, which helps increase micro-nutrient uptake in plants and stimulates microbial activity in the soil. BiOWiSH® Crop Technology is an advanced microbial solution that helps farmers sustainably increase crop production, without further depleting the soil or reducing the value of the crop. The unique composition stimulates the natural processes that improve yield and extend soil fertility, helping farmers produce more.

About Helena Agri-Enterprises

Helena Agri-Enterprises is a leading provider of crop production and crop protection products in the United States and worldwide. Headquartered in Collierville, Tennessee, the company has been in the agrosupply business for more than 50 years and has expanded their R&D, product development capability, and contract research services over the last decade. Helena R&D is an independent CRO with a team of highly trained and experienced study directors, field researchers, and support staff. They are one of several

independent CROs that BiOWiSH Technologies works with to independently evaluate our agronomy products.

Objectives

The objective of this research study was to determine the effects of BiOWiSH® Crop, manufactured in the USA by BiOWiSH Technologies, Inc, on grape tomato production when added to a fertility program common to the production area in California. The focus was on BiOWiSH® Crop's impact on fruit quality, yield, and the grower economics.

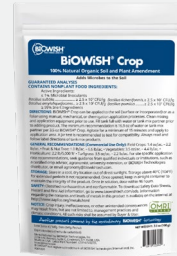
In this trial, the common regional grape tomato fertility program was compared to the same programs with BiOWiSH® Crop.

Implementation Program

The study was a randomized four replicate farm trial. The control plots were treated with the typical growers' program fertilizers, which contained UAN32 (8% N) at 85 gal/acre plus Nucleus 0-0-15 (15% K20) at 50.6 gal/acre. The first set of trial plots added one pound/acre of BiOWiSH® Crop to the growers' program fertilizers. The second set of trial plots added one pound/acre of BiOWiSH® Crop and reduced the growers' program fertilizers by 20%.

All treatments were applied via drip irrigation.

BiOWiSH® Crop Technology



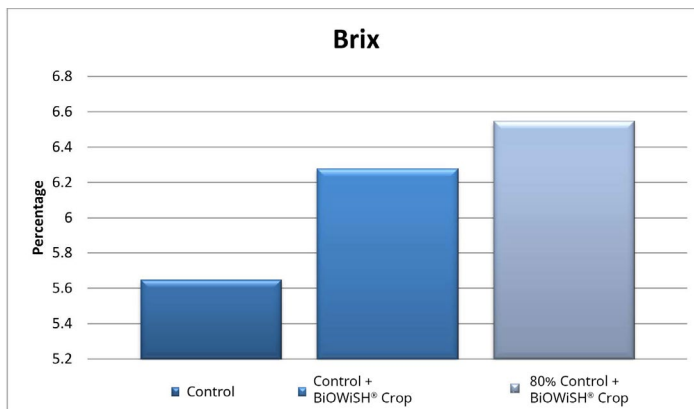
- Optimizes yield potential
- Increases nutrient availability
- Enhances root development
- Improves plant vigor
- Stimulates native microbial activity in the soil
- Improves soil productivity

Available Sizes

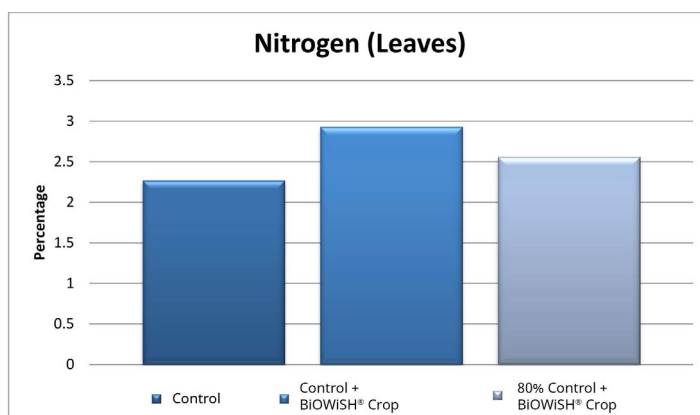
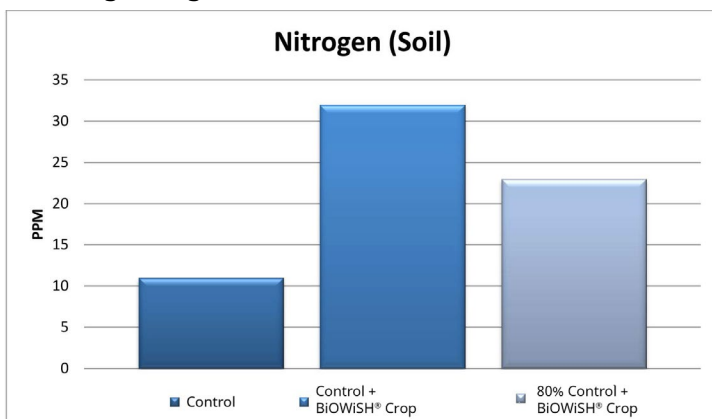
- 100 g/3.5 oz
- 1 kg/2.2 lbs
- 5 kg/11 lbs
- 10 kg/22 lbs

Results

Phytotoxicity, or the degree of toxicity in plants due to chemicals, was evaluated seven days after application of each treatment. In this study, no phytotoxicity was observed from any of the three programs. All programs exhibited good plant vigor and color. Fruit quality and yield measurements were taken at harvest. Plants treated with BiOWiSH® Crop showed increased Brix levels, which are tied to better tasting fruits and vegetables.



Without increasing chemical inputs, BiOWiSH® treated plots also showed improved levels of key nutrients, including nitrogen.



In addition to the attributes above, the BiOWiSH® programs had higher yields than the most common best management practice in the area.

Yield Increase

Treatment	Red Fruit	Green Fruit
Control Program + BiOWiSH® Crop	15.6%	30.1%
80% Control Program + BiOWiSH® Crop	4.1%	26.2%

Treatment	Yield [mT/ha] Ton/acre
Control	[60.6] 27.15
Control + BiOWiSH®	[70.23] 31.33
80% Control + BiOWiSH®	[64.67] 28.85

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

Fertility Cost

Treatment	Fertility Cost [US\$/Ha] US\$/acre	Difference [US\$/Ha] US\$/acre
Control Program	[\$1611.84] \$652.29	-
Control Program + BiOWiSH® Crop	[\$1721.41] \$696.63	[-\$109.57] -\$44.34
80% Control Program + BiOWiSH® Crop	[\$1399.04] \$566.17	[\$212.81] \$86.12

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

Using an average price of \$68 USD/ton for process tomatoes, the following calculations show the potential net profit increase in using BiOWiSH®. Plots treated with BiOWiSH® Crop showed increases in yields for red and green fruit. The red to green tomatoes ratio was similar for all treatments and therefore did not impact the economic value calculations or on farm economics. Based on a net average per hectare cost, the use of BiOWiSH® provided a return on investment of five to nearly seven times the cost to implement.

Cost Benefit Analysis: Red + Green Tomatoes

Treatment	Total Profit Increase Red [US\$/Ha] US\$/acre	Total Profit Increase Green [US\$/Ha] US\$/acre	Total Profit Increase [US\$/Ha] US\$/acre	ROI
Control Program + BiOWiSH® Crop	[\$495.94] \$200.70	[\$95.28] \$38.56	[\$591.22] \$239.26	530%
80% Control Program + BiOWiSH® Crop	[\$371.94] \$150.52	[\$391.09] \$158.27	[\$763.04] \$308.79	690%

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

Conclusion

As illustrated in this independent study, BiOWiSH® Crop offers tomato growers significant opportunity to increase their profitability. Adding the organic product supplement to the current program overwhelmingly demonstrated the ability to outcompete the traditional best management practice in the region. Continued independent third party testing is planned to illustrate the feedback that soil structure and overall fertility improves with each year of consecutive BiOWiSH® treatments.

According to the USDA, in 2011, there were about 258,000 acres of land dedicated to growing processing tomatoes in California alone. In a period of intense competition and rising costs, the increased yields, along with the reduced use of inorganic fertilizers, have the potential to save the California tomato industry millions of dollars per year. Reducing chemical fertilizers is also better for humans and the environment.

Adding BiOWiSH® Crop to the growers' program also increased available nutrients in the soil and resulting plant nutrient uptake, and Brix (sugar) levels in the fruit. Anecdotal evidence also reported that all programs exhibited good plant vigor and color.



BiOWiSH™ is a registered trademark of BiOWiSH Technologies International, Inc.

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