



Technical Report Prepared for: Best Green Technologies

Final Report of Research on Strawberry with Bacstone Maximum 12-0-0

Protocol Number BGT18101-ST-US01

Trial Number BGT18101-ST-US01-FL01

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Table of Contents

Trial: BGT18101-ST-US01-FL01	3
Trial Products: Bacstone Maximum 12-0-0 Fertilizer	3
Abstract	3
Introduction	3
Objective	3
Materials and Methods	4
Results and Discussion	5
Conclusions and Recommendations	6
References	6
Embedded Raw Data File	7

List of Tables

Table 1: Treatment List	4
Table 2: Other Crop Maintenance Fungicide and Fertilizer Products Applied	5
Table 3: Plant Vigor, Plant Survival and Leaf Tissue N following Treatments with Bacstone Maximum on Strawberry	6

Trial: BGT18101-ST-US01-FL01

Trial Products: Bacstone Maximum 12-0-0 Fertilizer

Evaluations: Plant Vigor, Plant Stand, Leaf Tissue Nitrogen

When conducted: 2018-2019 Winter Season

Abstract

Bacstone Maximum 12-0-0 was evaluated as a component of the grower standard fertility program on strawberry. Bacstone Maximum was applied four times at 0.4 and 0.6 gallons per acre combined with the grower's standard fertility program at 75% of his standard nitrogen rate. These Bacstone Maximum treatments were compared with an untreated receiving no nitrogen applications during the trial and a standard receiving the grower's standard fertility program at 100% of the normal nitrogen rate. Data collected included vigor ratings, plant stand counts and leaf tissue nitrogen analysis. There were no differences between treatments in any of the growth measurements collected. No phytotoxicity was observed with any of the treatments. Mixing and handling problems were observed in the form of settling out of the spray mixtures containing Bacstone Maximum, even with agitation. For raw data, ANOVA table, site information and weather data, refer to the raw data file embedded at the end of this report.

Introduction

Bacstone Maximum 12-0-0 is a simple mineral fertilizer containing 12% ammoniacal nitrogen, 1% copper and 5% zinc. Its formulation delivers nutrients and micronutrients to the plant in a readily available form. As part of a development plan to introduce Bacstone Maximum into the US and based on known performance of the product ex US, it was determined to define activity as a foliar spray for early growth promotion on strawberries.

Objective

The objective of this trial was to evaluate the efficacy of Bacstone Maximum foliar spray treatment as a replacement for part of the nitrogen in the grower's standard fertility program. As a secondary objective, it was planned to evaluate disease incidence in Bacstone Maximum treatment programs compared to standard treatment programs to see if the product provided additional disease protection compared to the standard program. Disease incidence did not reach a level allowing evaluation during the trial.

Materials and Methods

A strawberry research trial was established at the Florida Pesticide Research Farm at 2650 Canal Street, 2.5 miles north of Oviedo, Florida. The research area was part of a commercial planting of 218,000 plants. The trial was established in a completely randomized design with 6 replications. Transplants of the Radiance variety were set October 26, 2018 in plastic mulch beds 8-10 inches high and 27 inches wide with 5 feet center to center spacing between beds. Drip irrigation tapes were installed under each bed with emitters every 12 inches. Two rows of strawberries were planted on each bed with 12 inches spacing between rows and 12-inch plant spacing in the row. Plots were 20 feet long and two beds (10 ft.)wide.

There were 4 treatments and 6 replicates in the completely randomized design. Refer to table 1 for treatment details. Bacstone Maximum treatments were applied at approximate two-week intervals on NOV 14, NOV 28, DEC 13 and DEC 28. Applications were made using a Weed Systems CO2 powered backpack sprayer equipped with 11003 nozzles, 20 inches apart on a 10-foot boom. The applications were made in a total volume of 40 gallons per acre at 40 psi.

Standard agronomic practices were used for soil preparation and post-transplanting crop management. Other crop maintenance fertilizer and fungicide products applied are presented in Table 2. Other fertilizer products applied included; Soar Bloom (4% calcium, 1% magnesium, 1% boron, and 0,02% molybdenum), calcium nitrate (4% nitrogen, 2% phosphate, 8% potash and 2.7% calcium) and Gantec Berry which is an adjuvant that increases the uptake of nutrients in berry crops.

Vigor assessments and stand count ratings were taken following the fourth application. On January 19, 2019, leaf samples were collected and sent to Midwest Labs for analysis for total nitrogen levels. Results were analyzed using analysis of variance and means separation was determined using least significant difference (lsd) calculated at a 95% confidence level. Analysis was done using ARM software from Gylling Data Management. Raw data, ANOVA tables and additional site description information is presented as an embedded file at the end of this report.

Table 1: Treatment List

Treatment	
1	Untreated Check
2	Standard Nitrogen Fertility Program*
3	Standard Fertility Program (75% of N)+Bacstone Maximum 0.4 gpa
4	Standard Fertility Program (75% of N)+Bacstone Maximum 0.6 gpa
*Standard Program included 3 applications of 5 lbs./acre to total 15 lbs/acre, Trt 3 & 4 received 3 applications of 3.75 lbs /acre to total 11.25 lbs/acre	

Table 2: Other Crop Maintenance Fungicide and Fertilizer Products Applied

No.	Date	Type	Maintenance Product Name	Rate	Rate Unit
1.	Oct-24-2018	FUNG	Quadris Top	12	OZ WT/A
2.	Oct-24-2018	FUNG	Switch 62.5 W	11	OZ WT/A
3.	Oct-30-2018	FUNG	Quadris Top	12	OZ WT/A
4.	Oct-30-2018	FUNG	Switch 62.5 W	11	OZ WT/A
5.	Nov-7-2018	FUNG	Switch 62.5 W	14	OZ WT/A
6.	Nov-7-2018	FERT	Soar Bloom	1	QT/A
7.	Nov-7-2018	FUNG	Topsin 4.5FL	20	FL OZ/A
8.	Nov-14-2018	FUNG	CAPTAN	2	QT/A
9.	Nov-14-2018	FERT	Soar Bloom	1	QT/A
10.	Nov-14-2018	FERT	Nitrogen	5	ILB/Acre
11.	Nov-18-2018	FUNG	Topsin 4.5FL	20	FL OZ/A
12.	Nov-18-2018	FERT	Soar Bloom	1	QT/A
13.	Nov-27-2018	FUNG	Switch 62.5 W	14	OZ WT/A
14.	Nov-27-2018	FERT	Gantec Berry	4	OZ WT/A
15.	Dec-2-2018	FUNG	Topsin 4.5FL	20	FL OZ/A
16.	Dec-2-2018	FERT	Soar Bloom	1	QT/A
17.	Dec-9-2018	FUNG	Quadris Top	10	OZ WT/A
18.	Dec-9-2018	FERT	Soar Bloom	1	QT/A
19.	Dec-9-2018	FERT	Gantec Berry	4	OZ WT/A
20.	Dec-9-2018	FERT	Nitrogen	5	ILB/Acre
21.	Dec-16-2018	FUNG	Topsin 4.5FL	20	FL OZ/A
22.	Dec-16-2018	FERT	Soar Bloom	1	QT/A
23.	Dec-16-2018	FERT	Gantec Berry	4	OZ WT/A
24.	Dec-16-2018	FERT	Nitrogen	5	ILB/Acre
25.	Dec-23-2018	FUNG	CAPTAN	1.5	QT/A
26.	Dec-23-2018	FERT	Calcium Nitrate	5	LB/A
27.	Dec-23-2018	FERT	Soar Bloom	1	QT/A
28.	Dec-30-2018	FUNG	Topsin 4.5FL	20	FL OZ/A
29.	Dec-30-2018	FERT	Calcium Nitrate	5	LB/A
30.	Jan-6-2019	FUNG	Quadris Top	10	OZ WT/A
31.	Jan-6-2019	FERT	Calcium Nitrate	5	LB/A
32.	Jan-6-2019	FERT	Soar Bloom	1	QT/A
33.	Jan-6-2019	FUNG	CAPTAN	1.5	QT/A
34.	Jan-13-2019	FUNG	Switch 62.5 W	14	OZ WT/A
35.	Jan-13-2019	FERT	Calcium Nitrate	5	LB/A
36.	Jan-6-2019	FERT	Soar Bloom	1.5	QT/A

Results and Discussion

Table 3 presents results of plant vigor and stand count ratings along with leaf tissue nitrogen analysis. Plant vigor ratings were not significantly different but trended higher for all treatments. Except for treatment 3, all stand counts were higher than the untreated. Drift from an herbicide treatment to row middles caused some plant injury in the plots. This injury is suspected to be responsible for the plant stand loss in treatment 3. Leaf tissue nitrogen was

numerically higher for all treatments compared to the untreated, but differences were minor and not statistically significant. All leaf samples were reported by the analytical lab as high in nitrogen while one sample was reported as sufficient. There was evidently enough residual nitrogen to prevent any differences between treatments from being measured in this trial. Minor settling out of the Bacstone Maximum formulation was observed during the applications. The researcher believes this is sufficient to require correction prior to commercialization.

Table 3: Plant Vigor, Plant Survival and Leaf Tissue N following Treatments with Bacstone Maximum on Strawberry

Description Rating Date	Vigor 0-10 Jan-19-2019	% Plant Survival Jan-19-2019	% Nitrogen Jan-19-2019
Trt Treatment No. Name	Rate Appl Rate Unit Code		
1 Untreated Check	6.17 -	98.54ab	2.93 -
2 Standard Fertility Program	6.67 -	99.38a	2.99 -
3 Standard Fertility Program + Bacstone Maximum	6.50 - 0.4gal/a ABCD	97.71b	3.01 -
4 Standard Fertility Program + Bacstone Maximum	6.33 - 0.6gal/a ABCD	98.33ab	2.96 -
Means in a column followed by the same letter are not significantly different			
LSD P=.05	1.174	1.666	0.132
Standard Deviation	0.975	1.383	0.109
CV	15.19	1.4	3.68
Treatment F	0.292	1.485	0.520
Treatment Prob(F)	0.8304	0.2488	0.6731

Conclusions and Recommendations

No phytotoxicity was observed in any treatments. Plant vigor ratings were not significantly different but trended higher for the treatments. Residual nitrogen levels were too high in these plots to allow measurement of differences between treatments. The minor settling, even with agitation, supports the need for formulation improvement before commercialization. Plant vigor ratings similar to the standard and lack of phytotoxicity suggest the product, if economically competitive, could be used as part of the fertilization program. Future tests should include yield data to further document commercial potential and testing as a drip irrigation application on strawberry.

References

University of Florida, 2019 Fungicides approved for management of diseases of strawberry in Florida, Strawberry Production Guide <https://gcrec.ifas.ufl.edu/strawberry-production-guide/>

University of Florida Extension, IFAS Standardized Fertilization Recommendations for Vegetable Crops, Circular 1152

Embedded Raw Data File



BGT18101-ST-US01-
FL01 Raw Data.xlsx

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A handwritten signature in black ink, appearing to read "Gary M. Bell".