EVALUATION OF AUXIGRO® FOR DRIP-IRRIGATED ONION PRODUCTION

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Introduction

Auxigro® is manufactured by Emerald BioAgriculture Corp. (Lansing, MI) and marketed as a plant growth enhancer. Auxigro is a wettable powder and the active ingredients are gamma aminobutyric acid (29.2 percent) and L-Glutamic acid (29.2 percent). Auxigro contains 0.6 lb ai/lb of product. Auxigro has typically been applied as a foliar spray. The objective of this trial was to evaluate the effect of Auxigro on onion yield, grade, and single centeredness when applied through drip irrigation.

Methods

The trials were conducted at three sites in the Oregon side of the Treasure Valley: Vale, Oregon Slope, and Ontario. The Vale and Oregon Slope trials were on growers fields. The Ontario trial was at the Malheur Experiment Station. The treatments were an untreated check and an Auxigro treatment. Onions in all three trials were drip irrigated. The Auxigro was applied at 1 oz ai/acre/week starting in late June and ending in mid to late August for a total of 8 oz ai/acre.

Vale procedures

Onion (cv. 'Granero', Nunhems, Parma, ID) was planted in six double rows on 84-inch beds on April 12. Each bed had a drip tape buried between each pair of onion double rows (3 drip tapes per bed). The drip tape (T-tape, T-systems International, San Diego, CA) had emitters spaced 6 inches apart and a flow rate of 0.22 gal/min/100 ft. Each plot was three beds wide (21 ft wide) by 650 ft long. The experimental design was a randomized complete block with five replicates.

The Auxigro solution was injected into the drip tape during 3 hours after the first hour of an irrigation and approximately 8 hours before the end of the irrigation. The Auxigro solution was injected at 2.2 gal/hour using a model C-600 diaphragm injector pump (Blue White Industries, Huntington Beach, CA) wired to the irrigation controller. A new Auxigro solution was prepared for each weekly application by dissolving 2.7 oz of Auxigro (1 oz ai/acre) in 6 gal of water for a 3-hour injection. The first application was made on July 3 and the last on August 22 for a total of eight applications. After lifting

on September 18, onions from four harvest areas down the length of each 650-ft plot were topped, bagged, and hauled to the Malheur Experiment Station on September 19. Each harvest area consisted of 20 ft of the middle bed in each three-bed plot. The harvest areas were located 65 and 165 ft from the top and from the bottom end of the field.

Oregon Slope procedures

Onion (cv. 'Vaquero', Nunhems, Parma, ID) was planted in two double rows, spaced 21 inches apart (center of double row to center of double row) on 42-inch beds on April 23. A drip tape (T-tape, T-systems International, San Diego, CA) was buried in each bed center between the two onion double rows. The drip tape had emitters spaced 8 inches apart and a flow rate of 0.17 gal/min/100 ft. Each plot was four beds wide (14 ft wide) by 1,250 ft long. The experimental design was a randomized complete block with five replicates.

The Auxigro solution was injected into the drip tape during 3 hours after the first hour of an irrigation and approximately 8 hours before the end of the irrigation. The Auxigro solution was injected at 2.2 gal/hour using a model C-600 diaphragm injector pump (Blue White Industries, Huntington Beach, CA) wired to the irrigation controller. A new Auxigro solution was prepared for each weekly application by dissolving 3.4 oz of Auxigro (1 oz ai/acre) in 6 gal of water for a 3-hour injection. The first application was made on July 3 and the last on August 22 for a total of eight applications. After lifting on September 25, onions from four harvest areas down the length of each 1,250-ft plot were topped, bagged, and hauled to the Malheur Experiment Station on September 27. Each harvest area consisted of 20 ft of the middle two beds in the four-bed plot. The harvest areas were located 65 ft and 165 ft from the top and bottom end of the field.

Ontario procedures

The onions were grown on a Owyhee silt loam previously planted to wheat. In the fall of 2005, the wheat stubble was shredded, and the field was irrigated and disked. Soil analysis on September 13, 2005 indicated the need for 100 lb phosphate/acre, 100 lb sulfur/acre, 2 lb copper/acre and 1 lb/acre of boron, which were broadcast in the fall of 2005 after disking. The field was then moldboard-plowed, groundhogged, roller-harrowed, and bedded.

Onion (cv. 'Vaquero', Nunhems, Parma, ID) was planted in two double rows spaced 22 inches apart (center of double row to center of double row) on 44-inch beds on March 28, 2006. The single rows within the double row were spaced 3 inches apart. Onion was planted at 150,000 seeds/acre. Drip tape (T-tape, T-systems International, San Diego, CA) was laid at 4-inch depth between the two double onion rows at the same time as planting. The distance between the tape and the double row was 11 inches. The drip tape had emitters spaced 12 inches apart and a flow rate of 0.22 gal/min/100 ft. Immediately after planting the onion rows received 3.7 oz of Lorsban 15G® per 1,000 ft of row (0.82 lb ai/acre), and the soil surface was rolled.

The plots were four beds wide (14.7 ft wide) by 175 ft long. The experimental design was a randomized complete block with six replicates.

The Auxigro was injected into the drip tape during 1 hour after the first hour of an irrigation and approximately 6 hours before the end of the irrigation. A new Auxigro solution was prepared for each weekly application by dissolving 0.62 oz of Auxigro (1 oz ai/acre) in 4 gal of water for a 1-hour injection. The Auxigro solution was injected at 4 gal/hour using a model A-30 2.5 proportional chemical injector (Dosmatic, Carrolton, TX). The first application was made on June 29 and the last on August 15 for a total of eight applications.

The field had 50 lb of N/acre as urea applied through the drip tape on June 8 and on June 22. An onion root tissue analysis on July 14 showed the need for potassium. On July 21, potassium at 20 lb/acre was applied through the drip tape.

The onions were managed to avoid yield reductions from weeds, pests, and diseases. Weeds were controlled with an application of Prowl® at 1 lb ai/acre on April 28. On May 9, Goal® at 0.1 lb ai/acre, Buctril® at 0.3 lb ai/acre, and Select® at 0.25 lb ai/acre were applied. On May 17, Goal at 0.2 lb ai/acre and Buctril at 0.3 lb ai/acre were applied. On May 30, Goal at 0.2 lb ai/acre, Buctril at 0.3 lb ai/acre, and Select at 0.25 lb ai/acre were applied. After lay-by the field was hand weeded as necessary. Thrips were controlled with aerial applications of the following insecticides: June 12, Warrior®; June 18, Warrior plus Lannate®; July 1, Carzol®; July 17, Warrior plus Mustang®; July 24, Carzol; July 29, Warrior plus MSR®; August 10, Warrior plus Lannate. Carzol was applied at 0.69 lb ai/acre, Warrior at 0.03 lb ai/acre, Lannate at 0.45 lb ai/acre, Mustang at 0.05 lb ai/acre, and MSR at 0.5 lb ai/acre.

The trial was irrigated when the soil water tension at 8-inch depth reached 20 cb (1 cb = 1 kPa). Soil water tension was monitored by six granular matrix sensors (GMS, Watermark Soil Moisture Sensors Model 200SS, Irrometer Co. Inc., Riverside, CA) installed in mid-June below the onion row centered at 8-inch depth (Shock et al. 2005). The sensors were automatically read hourly with an Irrometer monitor (Irrometer Co.). The last irrigation was on August 31.

After lifting on September 8, onions from four harvest areas in each 175-ft-long plot were topped, bagged, and hauled to storage. Each harvest area consisted of 20 ft of the middle two beds in the four-bed plot. The first harvest area was located 20 ft from the top of each plot and then the others were spaced 20 ft apart down the length of the plot.

All sites

On September 29 the onions from the three sites were graded. During grading, bulbs were separated according to quality: bulbs without blemishes (No. 1s), split bulbs (No. 2s), neck rot (bulbs infected with the fungus *Botrytis allii* in the neck or side), plate rot (bulbs infected with the fungus *Fusarium oxysporum*), and black mold (bulbs infected with the fungus *Aspergillus niger*). The No. 1 bulbs were graded according to diameter:

small (<2.25 inches), medium (2.25-3 inches), jumbo (3-4 inches), colossal (4-4.25 inches), and supercolossal (>4.25 inches). Bulb counts per 50 lb of supercolossal onions were determined for each plot of every variety by weighing and counting all supercolossal bulbs during grading.

After grading, 25 bulbs ranging in diameter from 3.5 to 4.25 inches from each subplot were rated for single centers. The onions were cut equatorially through the bulb middle and, if multiple centered, the long axis of the inside diameter of the first single ring was measured. These multiple-centered onions were ranked according to the diameter of the first single ring: "small double" had diameters less than 1.5 inches, "intermediate double" had diameters from 1.5 to 2.25 inches, and "blowout" had diameters greater than 2.25 inches. Single-centered onions were classed as a "bullet". Onions were considered functionally single centered for processing if they were a "bullet" or "small double".

The yield for each plot was calculated as the sum of the yields of the four harvest areas. The gross income was calculated using the F.O.B. onion prices for Malheur County on November 9, 2006 ($/50 lb: medium 5.00, jumbo 8.50, colossal 11.00, and super colossal 17.00) minus the packing cost of $3.00/50 lb. The gross income for the Auxigro treatment had the Auxigro cost subtracted. The cost of the Auxigro treatment was calculated assuming $79.00/lb of Auxigro (Simplot Soilbuilders) and an application cost of $2.33/acre (transportation, mixing, and loading, assuming a 40-acre field). Treatment differences were compared using ANOVA and least significant differences at the 5 percent probability level, LSD (0.05).

Results

The 2006 season was not favorable for onion production in the Treasure Valley. Cool and wet weather in March and April delayed planting at some locations and reduced early season plant growth at most locations. The Vale and Oregon Slope onions were planted later than normal. The Ontario onions suffered from a heavy infestation of iris yellow spot virus (IYSV).

Comparing the three sites, the Vale site had the highest marketable and colossal onion yields (Table 1). Comparing the three sites, the Ontario site had the highest percentages of bullet single centered and functionally single centered bulbs, possibly due to the irrigation criterion used, but also had the lowest yield possibly due to a heavy infestation of IYSV.

The Auxigro treatment at the Vale site had significantly higher yield of colossal bulbs than the untreated check (Table 1). There was no significant difference in colossal bulb yield between treatments at the other two sites. For the other bulb size categories measured, there was no significant difference in yield or grade between the Auxigro treatment and the untreated check in any of the sites (Tables 1 and 2).

The increased colossal bulb yield with the Auxigro treatment at the Vale site resulted in an increase in gross income of $962/acre using prevailing prices.

There are no research reports on Auxigro that we could find published in refereed scientific journals. The existing literature on Auxigro research can be found in extension reports available on the internet. A study done in Colorado with Auxigro foliar applied to onions showed no significant yield increase (Swift and Cooley 2002).

Despite only one site out of three showing a benefit from Auxigro use, the results of this study suggest that, in some situations, drip-applied Auxigro could be beneficial to onion production in the Treasure Valley. The difficult growing conditions experienced in 2006 could have influenced the onion response to Auxigro in these trials. Further research is warranted before definitive recommendations can be made.

References

Shock, C.C., R. Flock, E. Feibert, C.A. Shock, A. Pereira, and L. Jensen. 2005. Irrigation monitoring using soil water tension. Oregon State University Extension Service EM 8900.

Swift, C., and W.A. Cooley. 2002. Onion response to Auxigro applications at two locations in the Uncompahgre Valley in 2002. http://www.coopext.colostate.edu/TRA/PLANTS/2002auxigro.html

Table 1. Yield and grade for untreated onions and onions treated with Auxigro. Malheur Experiment Station, Oregon State University, Ontario, OR, 2006.

Location Treatment	Total yield	Marketable yield by grade					Bulb counts	Non-marketable yield			Gross income
		Total	>4¼ in	4-4¼ in	3-4 in	2¼-3 in	>4¼ in	Total rot	No. 2s	Small	
	---------- cwt/acre ----------						#/50 lb	% of total	-- cwt/acre --		$/acre
Vale											
Check	928.5	903.1	17.7	146.9	654.9	83.7	25.2	0.4	2.0	19.5	10,383
Auxigro	969.7	946.6	21.9	190.2	684.5	49.9	27.6	0.3	1.1	18.7	11,345
Average	949.1	924.9	19.8	168.6	669.7	66.8	26.4	0.4	1.6	19.1	10,864
Oregon Slope											
Check	919.3	883.0	2.9	59.7	707.3	113.0	20.2	0.5	2.7	29.2	9,269
Auxigro	869.2	839.4	3.3	41.5	705.4	89.2	28.0	0.6	2.1	22.6	8,830
Average	894.3	861.2	3.1	50.6	706.4	101.1	24.1	0.5	2.4	25.9	9,050
Ontario											
Check	699.1	676.8	0.0	21.6	578.9	76.3	0.0	0.3	2.7	17.6	7,018
Auxigro	665.2	640.6	0.4	10.6	548.9	80.8	5.0	0.6	3.7	17.1	6,500
Average	682.1	658.7	0.2	16.1	563.9	78.5	2.5	0.4	3.2	17.4	6,759
3-site average											
Check	839.6	811.9	6.4	72.6	642.8	90.1	14.2	0.4	2.5	21.8	8,773
Auxigro	824.1	798.4	8.0	76.4	640.2	73.8	19.3	0.5	2.4	19.3	8,742
Average	831.9	805.2	7.2	74.5	641.5	82.0	16.8	0.5	2.5	20.6	8,758
LSD (0.05) values											
Treatment	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Site	55.8	54.7	NS	20.9	65.7	NS	6.4	NS	NS	NS	614
Trt X site	NS	NS	NS	29.6	NS	NS	NS	NS	NS	NS	793

Table 2. Single-center rating for untreated onions and onions treated with Auxigro. Malheur Experiment Station, Oregon State University, Ontario, OR, 2006.

Location	Multiple center			Single center	
Treatment	Blowout	Intermediate double	Small double	Functional[a]	Bullet
	---------- % ----------				
Vale					
Check	3.4	16.6	28.2	80.0	51.8
Auxigro	5.5	16.7	24.6	77.8	53.2
Average	4.4	16.7	26.4	78.9	52.5
Oregon Slope					
Check	0.6	5.5	19.3	93.9	74.6
Auxigro	1.6	6.4	18.4	92.0	73.7
Average	1.1	5.9	18.8	93.0	74.1
Ontario					
Check	0.3	1.5	8.9	98.2	89.3
Auxigro	0.8	1.5	7.5	97.7	90.1
Average	0.6	1.5	8.2	97.9	89.7
3-site average					
Check	1.4	7.5	18.2	91.1	73.0
Auxigro	2.5	7.8	16.3	89.7	73.4
Average	2.0	7.6	17.2	90.4	73.2
LSD (0.05) values					
Treatment	NS	NS	NS	NS	NS
Site	NS	2.4	6.4	4.5	3.8
Trt X site	NS	NS	NS	NS	NS

[a]Bullet + small double.