UNIVERSITY OF FLORIDA

Institute of Food and Agricultural Sciences
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The Effect of AmiSorb, A Nutrient Absorption Enhancing Polymer, on Watermelon Plant Nutrient Status and Yield 97-17

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Abstract
Polyaspartates, nutrient absorption enhancing polymers, when applied fertilizers are reported to enhance the availability of N, P, K, and other nutrients resulting in increased yields. This study was conducted to determine the effect of the polymer AmiSorb on watermelon N and K sap nutrient status as well as watermelon yield. Plant sap NO_3 and K concentrations were determined 36 and 63 days after seeding. Yields were determined for 2 harvests, June 19 and 26. there were no significant differences in sap NO_3 or K concentration levels or yields in the AmiSorb treatments versus the untreated plots.

Keywords: nutrient absorption enhancing polymers, polyaspartates, nutrient status

Introduction

Watermelons in Florida were harvested on 37,000 acres in the 1995-96 season (Anon., 1997) with total costs of $1300 per acre on bare ground and $2177 per acre on plastic for production and marketing (Smith and Taylor, 1996). New technologies have produced nutrient absorption enhancing polymers, polyaspartates. Polyaspartates were originally developed as water treatments for industrial applications. When these polymers are applied to fertilizer, they may enhance the availability of N, P, and K resulting in increased yields. These polymers are reported to artificially increase the root area where roots are located resulting in increased nutrient availability to plants (Anon., 1996). Past research has targeted agronomic crops such as corn, cotton, and soybeans. Research is needed to determine the effectiveness of AmiSorb in watermelons grown with drip irrigation and polyethylene mulch.

Materials and Methods

Experiments were conducted at the Suwannee Valley Research and Education Center near Live Oak, FL on a Lakeland fine sand during the spring of 1997 to test watermelon response to rates and methods of application of AmiSorb. Soil was prepared by

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plowing and rototilling. Total N of 150 lbs/A and K of 150 lbs/A were applied based on University of Florida recommendations (Hochmuth and Smajstrla, 1997). Preplant fertilizer 13-4-13 at the rate of 600 lbs/A was applied to all plots in a 24-inch wide band. Remaining N and K was injected at weekly intervals using ammonium nitrate and potassium nitrate as N and K sources. AmiSorb treatments were applied preplant incorporated (PPI) after fertilizer application and rototilled into soil with fertilizer. AmiSorb was mixed with water and applied via sprinkling can evenly to each plot. Untreated check plots received water only. Soil was bedded, pressed, and fumigated with methyl bromide: chloropicrin (98:2) at the rate of 400 lbs broadcast per acre. Final beds were 24 inches and across the top, 6 inches high, and were on 7 ft centers. Treatment plots requiring later injections of AmiSorb were treated via an injection of solution directly into drip tape. These injections were made by using CO_2 pressurized containers for each treatment. Injections were made on April 21 and May 23. AT the April 21 injection, watermelon runners were approximately 6 inches long with no blooms present. On the May 23 injection, the watermelon fruit weights ranged from 2 to 5 pounds.

Plots 20 ft in length were planted with 'Fiesta' watermelon on March 25, 1997. Seeds were placed in a single row on the bed with 7.5 between rows and 36 inches between plants. Experimental design was a randomized complete-block with six replicates.

Plants were irrigated by drip irrigation to maintain a tensiometer reading between 8 and 12 centibars at 12 inch depth in the bed. Pest control was by timely applications of labeled pesticides based on field scouting.

Twice in the spring (36 and 63 days after transplanting), a sample of most recently matured leaves were harvested from each plot. Petioles were excised from leaves, chopped, and sap expressed. Fresh sap nitrate-N and K concentrations were determined by battery operated, hand held ion specific electrodes (Cardy ion meters Horiba, LTX, Kyota, Japan). Watermelons were harvested on June 19 and 26. Fruits were counted and weighed, and all data were subjected to analysis of variance and regression techniques.

Results and Discussion

Watermelon Yield – Early marketable yields (first harvest) ranged from 288.2 to 422.5 cwt/A with no significant difference among treatments (Table 1). Average total season yield for watermelon in Florida was reported at 180 to 270 cwt/A in 1995-1996 (Anon, 1997). Total marketable yields in this study were 455.9 to 603.2 cwt/A with no significant differences among treatments. Average fruit weights ranged from 16.9 to 18.3 lbs per fruit. This would indicate whatever effects AmiSorb may have on root growth and/or root uptake of nutrients, the application of recommended fertilizer in

drip-irrigated watermelons (Hochmuth and Smajstria, 1997) was enough to ensure optimum yield in this study.

Watermelon Petiole Sap Analysis – Petiole sap concentrations for nitrate-N for all treatments (Table 2) were above the critical levels of 1200 ppm when vines are 6 inches in length and 800 ppm when fruits are one-half mature (Hochmuth, 1994). No significant differences were detected among sap N levels on either sampling date.

Petiole sap concentrations for K for all treatments except AmiSorb injected treatment of 2 quarts/A (Table 2) were below the critical levels of 4000 ppm when vines are 6 inches in length. Petiole sap concentrations for K for all treatments were below 3500 ppm when fruits were one-half mature (Hochmuth, 1994). No significant differences were detected between among K levels on either sampling date. Although K sap readings were below recommended minimum levels, it did not appear to affect watermelon yield. Current recommendations have a margin of safety build into them and even with the marginally lower K sap readings; the yields in this study were above current Florida averages indicating the plant had all the nutrition it required.

AmiSorb rate and timing of application had no effect on plant petiole sap N and K or watermelon yield. The last of response in this study may be due to the high nutrient availability of N and K in the weekly drip fertigated program.

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Table 1. The effect of AmiSorb on watermelon yield in the spring, 1997 season at Live Oak, FL

Treatment	Total Rate (qts/A)	Method[x] of Application	Early Yield (cwt/A)[y]	Total Yield (cwt/A)	Avg. Fruit Wt. (lbs)
Untreated check	0	None	382.6	514.7	17.0
AmiSorb	1	PPI	382.6	500.9	17.7
AmiSorb	2	PPI	314.4	513.3	16.9
AmiSorb	3	PPI	288.2	455.9	17.9
AmiSorb	2	PPI and INJ	409.5	575.0	16.9
AmiSorb	3	PPI and INJ	422.5	603.3	18.3
Significance (p=0.05)[z]			NS	NS	NS

[x] Applications of AmiSorb were preplant incorporated (PPI) or injected into the drip irrigation (INJ). Where PPI and INJ were used, the total rate was divided evenly over three applications, 1 PPI and 2 INJ.
[y] Early harvest was first harvest.
[z] Treatment effects were not significant (NS) at the 5% probability level.

Table 2. The effect of AmiSorb on watermelon plant sap N and K levels in the spring, 1997 season at Live Oak, FL.

Treatment	Total Rate (qts/A)	Method[x] of Application	Sap nitrate-N (ppm)[y]		Sap K (ppm)	
			1 May	28 May	1 May	28 May
Untreated check	0	None	1603	1055	3950	3125
AmiSorb	1	PPI	1507	869	3550	3075
AmiSorb	2	PPI	1574	920	3875	3125
AmiSorb	3	PPI	1439	948	3600	3075
AmiSorb	2	PPI and INJ	1631	1021	4100	3050
AmiSorb	3	PPI and INJ	1569	1117	3625	3025
Significance (p=0.05)[z]			NS	NS	NS	NS

[x] Applications of AmiSorb were preplant incorporated (PPI) or injected into the drip irrigation (INJ). Where PPI and INJ were used, the total rate was divided evenly over three applications, 1 PPI and 2 INJ.
[y] Stage of growth 1 May (vines 6 inches) and 28 May (fruits 2-5 lbs).
[z] Treatment effects were not significant (NS) at the 5% probability level.