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EFFECT OF GLOMUS FASCICULATUM INOCULATION, WATER STRESS AND MINERAL NUTRITION ON GROWTH, STORAGE ROOT INITIATION AND PERCENT INFECTION OF 'TOPAZ' SWEET POTATO

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INTRODUCTION

Vesicular-arbuscular mycorrhizal fungi (VAM) are present worldwide in symbiotic association with most herbaceous crops and some trees. The fungi are provided with carbon from plant sugar and in exchange the VAM supply the plant with inorganic phosphate (Pi), water and other elements. Mycorrhizal fungi increase nutrient uptake primarily by increasing the volume of soil explored. Their value to agricultural crops is phenomenal, since the amount of plant tissue (roots) in the world infected by VAM species exceeds that infected by any other group of fungi. Infection of 5 varieties of field grown sweet potato in Texas with Glomus fasciculatum VAM varied from 10 to 70 percent. Greenhouse experiments at TAES-Overton indicate that G. fasciculatum VAM in combination with a 0.5 Steiner (St) nutrient solution decreases top growth and increases both number and fresh weight of 'Jewel' sweet potato storage roots.

MATERIALS AND METHODS

Twelve inch 'Topaz' vine tip cuttings were grown in sterilized blasting sand and subirrigated either one or 3 times per day with a 0.5 or 1.0 St solution. Half of the above treatments were inoculated with the vesicular-arbuscular mycorrhizal fungus (VAM) Glomus fasciculatum. The above 8 treatments were combined in a replicated 2x2x2 factorial experiment with 32 plants per treatment. Percent VAM infection was determined by the method of Phillips and Hayman. Spore numbers were determined by the wet-sieving and decanting procedure of Taber.

RESULTS AND DISCUSSION

The use of 1.0 St solution resulted in a highly significant increase in both fresh (FW) and dry weight (DW) of plant tops when compared to the 0.5 St solution (Table 1). Watering with St solution

3 times per day also resulted in a highly significant increase in plant DW over watering once/day (Table 1). The use of VAM inoculum resulted in a highly significant decrease in both FW and DW of 'Topaz' foliage. VAM inoculum in combination with the 0.5 St solution and 3 times per day subirrigation with the 0.5 St solution resulted in an increase in number and a significant increase in the FW of sweet potato storage roots when compared to other treatment combinations. With G. fasciculatum inoculation, the greatest percent of VAM infection occurred at the 0.5 St solution and 3 times per day subirrigation. The sweet potato is one of the few vegetable crops that is morphologically a root. Greenhouse and field research at TAES-Overton indicates that VAM play a significant role in the development and yield of sweet potato roots.

Table 1. Influence of mycorrhizal infection, water stress, mineral nutrition, and % VAM infection on growth, HOH use, and storage root initiation of 'Topaz' sweet potato.

VAM inoculum ml/plant	Times St solution applic./24h (TSTA)	Steiner solution conc.	HOH use liters (L)	wt (g)/4 plants FW	wt (g)/4 plants DW	Storage roots/ 4 plants No.	Storage roots/ 4 plants FW (g)	VAM infection %
0	1	0.5	8	262	41	6	126	0
0	1	1.0	9	364	53	9	149	0
0	3	0.5	11	263	42	10	188	0
0	3	1.0	15	423	72	8	161	0
			$\bar{x}$ 11	328	52	8	156	0
22	1	0.5	9	237	35	9	184	14
22	1	1.0	9	333	50	8	147	16
22	3	0.5	11	245	40	11	225	22
22	3	1.0	11	334	55	8	118	12
			$\bar{x}$ 10	288	45	9	169	14
		LSD						
	Steiner (ST)	5%		-	3		30	
		1%		36	6		-	
	VAM (V)	5%		-	3			
		1%		36	6			
	TSTA	5%	2		3	1		
		1%	-		6	-		
	ST X VAM	5%				-	43	5
		1%				2	-	7
	ST X TSTA	5%			6	-		
		1%			-	2		
	ST X VAM X TSTA	5%			9			
		1%			-			