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***Response of Snapbean, Carrot, and Sweet Corn to Monopotassium Phosphate-Based Starter Solutions 97-11***George J. Hochmuth<sup>1</sup>**Materials and Methods**

Research with starter solutions formulated from monopotassium phosphate was carried out at Gainesville, FL in the spring of 1997. The objectives were to evaluate effectiveness of starter solutions on snapbean, carrot, and sweet corn and to compare monopotassium phosphate-based starter solutions to conventional solutions.

The soil used for the research was Arrendondo fine sand that tested medium in Mechlich-1 K and high in P, Mg, Ca, and micronutrients with a pH of 6.2. The soil was plowed and disked in preparation for bedding and planting of snapbean, carrot, and sweet corn. Beds were raised on 4 ft centers with bedding disks. Soil in the prebeds was rototilled and pressed into finished beds that were 6 inches high and 24 inches wide at the top. During rototilling, 30 lbs per acre of each N and K<sub>2</sub>O were incorporated in the bed.

Starter solution treatments were:

1. 0 N - 10 P<sub>2</sub>O<sub>5</sub> - 7 K<sub>2</sub>O (monopotassium phosphate, MKP)
2. 10 N - 34 P<sub>2</sub>O<sub>5</sub> - 0 K<sub>2</sub>O (ammonium polyphosphate, APP)
3. 2 N - 14 P<sub>2</sub>O<sub>5</sub> - 3 K<sub>2</sub>O (1:2 ratio of monopotassium phosphate, MDP and monoammonium phosphate, MAP)
4. 3 N - 22 P<sub>2</sub>O<sub>5</sub> - 15 K<sub>2</sub>O (ammoniated MDP, AMKP)
5. Mixture of AMKP plus APP in 1:1 ratio

Starter solutions were applied either with the seed in the furrow or 2 inches to the side and 2 inches below the furrow. Solutions were applied in three formulations: undiluted, and either a 10:1 or 20:1 dilution with water.

Two grooves, each 2 inches deep, were pressed in the bed surface 12 inches apart and snapbean and sweet corn seeds were placed in the grooves. Snapbean cultivar 'Carlo' and sweet corn cultivar 'Endeavor', (both Asgrow Seed Co., Kalamazoo, MI) were used. Snapbean seeds were spaced at 3 inches in the row and sweet corn seeds were spaced 2 seeds per hill at 12 inches between hills, later thinned to one plant per hill. Plots were 20 feet in length containing 2 rows of plants.

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Following planting, the starter solutions for the “on-seed” placement were sprayed into the seed furrow and the seeds then were covered with soil. For the “side” placement, a second groove was cut 2 inches to side and 2 inches below the seed furrow into which the “side” placed starter solutions were sprayed, the seed furrow and the fertilizer furrow were then covered with soil. Overhead sprinkler irrigation was applied to moisten the soil.

For the carrots, only MKP (0-10-7), AMKP (3-22-15), MKP/MAP (2-14-3) and a control were used on the “on-seed” and “to side” placements, and the straight, 10:1, and 20:1 dilutions. Carrots were seeded in two rows on the pressed beds and starter solution application was handled same as with snapbean and sweet corn. ‘Choctaw’ carrots were seeded and thinned to 1-inch final plant stand.

Snapbeans were seeded on 27 March and sweet corn and carrot on 4 April 1997. The first sidedress application of N and K for all crops was made on 24 April. Snapbeans received 30 lbs/acre each N and K<sub>2</sub>O and sweet corn and carrot received 50 lbs/acre N and K<sub>2</sub>O. Fertilizer was applied in a wide band in center of bed between the crop rows. On 26 and 27 April, 8 inches of rainfall necessitated reapplication of the first sidedress fertilization and reconstruction of soil in beds. Sidedress applications at the same rates were also made on 12 and 20 May to all crops so that total N and K<sub>2</sub>O were 120 lbs/acre each for snapbean and 180 lbs/acre each for sweet corn and carrot.

On 22 April and 3 May, sweet corn and snapbean plants were rated for vigor with 1=small, stunted plants and 5=very vigorous, dark green plants. Irrigation was made from sprinklers to maintain soil moisture in the root zone at -10 centibars. Diseases and insects were controlled with timely applications of labeled pesticides. No pest problems were encountered in the season for any crop.

Snapbeans were harvested once-over on 29 May and sweet corn was harvested once-over on 25 June 1997. Carrot tops were harvested 25 May by cutting shoots at soil surface and drying in a forced-air drying oven, then recording dry weight as measure of early plant growth. Marketable snapbean and sweet corn yields were recorded. All data were analyzed by analysis of variance.

## **Results and Discussion**

There were no significant effects of starter solution on snapbean plant population in the 10-foot harvested area, no on snapbean early plant vigor or yield (Table 1). Vigor rating on 3 May were generally better with starter solution treatments that contained N. There were more plants in the plot with “side” solution placement compared to seed

placement, but yield and plant vigor were not affected. Starter solution dilution did not affect snapbean stand, vigor, or yield.

Starter solution and placement interacted in their effects on snapbean yield (Table 2). For most fertilizer, side placement resulted in better yields except with MDP where seed placement was as good as or slightly better than side placement.

These results with snapbean have similarities and differences with results in the previous season. In the present season, the overall benefit of starter solutions over no starter was not evident as in 1996. The 1997 test was planted late due to late delivery of fertilizer materials. Starter solution benefits might have been lost in the warmer and wet growing period in 1997. Like 1996, starter solutions containing N appeared to have a benefit over those without N, and like 1997, MDP based solutions were safer than others when placed with the seed.

Results with sweet corn were similar to those with snapbean. Whereas snapbean yields were excellent, yield of sweet corn was lower than desired. Plant vigor was improved on both dates with starter solutions containing N compared to the control and solutions with N (Table 3). Plant stand and yield was not affected by starter solutions. Placing starter solutions to the side of sweet corn seed was safer than seed placement, resulting in better stands with side placement (Table 3). However, the plant vigor and yields were not affected by starter solution placement. Fertilizer dilution had no effect on sweet corn yield.

Carrot shoot growth was enhanced by most starter solutions over growth with no starter fertilizer (Table 4). Best results were with 0-10-7 and side placement. Diluted fertilizers were more effective in enhancing early seedling growth than straight solutions.

**Table 1.** Response of snapbean to starter fertilizer solutions at Gainesville FL, Spring 1997.

Fertilizer <sup>z</sup>	Placement <sup>y</sup>	Dilution	No. Plants per Plot	Yield 30 lb ctn/A	Vigor Rating <sup>w</sup>	
					22 Apr	3 May
0-10-7			75	266	3.1	2.5
10-34-0			68	295	3.4	3.5
2-14-3			69	243	3.3	3.1
3-22-15			73	268	2.9	2.4
Mixture (AMKP/APP)			69	278	3.3	3.1
LSD (0.05) <sup>v</sup>			NS	NS	NS	0.8
	Seed		68	263	3.14	2.8
	Side		74	278	3.3	3.0
	Signif. <sup>v</sup>		*	NS	NS	NS
		10:1	71	282	3.3	2.9
		20:1	73	265	3.1	2.9
		Straight	69	264	3.3	3.0
		LSD (0.05) <sup>v</sup>	NS	NS	NS	NS
Control (no starter)			71	276	2.8	3.0

<sup>z</sup> Starter solution treatments were:

1. 0 N - 10 P<sub>2</sub>O<sub>5</sub> - 7 K<sub>2</sub>O (monopotassium phosphate, MKP)
2. 10 N - 34 P<sub>2</sub>O<sub>5</sub> - 0 K<sub>2</sub>O (ammonium polyphosphate, APP)
3. 2 N - 14 P<sub>2</sub>O<sub>5</sub> - 3 K<sub>2</sub>O (1:2 ratio of monopotassium phosphate, MDP and monoammonium phosphate, MAP)
4. 3 N - 22 P<sub>2</sub>O<sub>5</sub> - 15 K<sub>2</sub>O (ammoniated MDP, AMKP)
5. Mixture of AMKP plus APP in 1:1 ratio

<sup>y</sup> Placement was in furrow with seed or 2 inches to side of seed.

<sup>x</sup> Plot was 2 rows on a bed each 10 ft in length.

<sup>w</sup> Vigor rating 1=small, yellow plant; 5=dark green, vigorous.

<sup>v</sup> Treatments significant at 5% (\*) or 1% (\*\*).

**Table 2.** Interaction of fertilizer material and placement on yield of snapbean, Gainesville FL, Spring 1997.

Fertilizer Material	Placement	Yield 30-lb ctn/ acre <sup>z</sup>
0-10-7	Seed	278
	Side	256
10-34-0	Seed	288
	Side	301
2-14-3	Seed	196
	Side	285
3-22-15	Seed	275
	Side	261
Mixture (AMKP/APP)	Seed	271
	Side	287
Control		276
<sup>z</sup> LSD for comparing placement effects at each level of fertilizer is 21 and LSD for comparing fertilizers at each level of placement is 34.		

**Table 3.** Response of sweet corn to starter fertilizer solutions at Gainesville FL, Spring 1997.

Fertilizer <sup>z</sup>	Placement <sup>y</sup>	Dilution	No. Plants per Plot	Yield 30 lb ctn/A	Vigor Rating <sup>w</sup>	
					22 Apr	3 May
0-10-7			43	103	2.8	2.7
10-34-0			42	84	3.4	3.4
2-14-3			40	88	3.2	3.2
3-22-15			46	110	2.9	2.9
Mixture (AMKP/APP)			42	91	3.4	3.7
LSD (0.05) <sup>v</sup>			NS	NS	0.27	0.51
	Seed		41	89	3.0	3.0
	Side		45	102	3.2	3.3
	Signif. <sup>v</sup>		*	NS	NS	NS
		10:1	42	92	3.1	3.1
		20:1	43	100	3.0	3.0
		Straight	42	94	3.3	3.4
		LSD (0.05) <sup>v</sup>	NS	NS	NS	NS
Control (no starter)			41	106	3.3	3.3

<sup>z</sup> Starter solution treatments were:

6. 0 N - 10 P<sub>2</sub>O<sub>5</sub> - 7 K<sub>2</sub>O (monopotassium phosphate, MKP)
7. 10 N - 34 P<sub>2</sub>O<sub>5</sub> - 0 K<sub>2</sub>O (ammonium polyphosphate, APP)
8. 2 N - 14 P<sub>2</sub>O<sub>5</sub> - 3 K<sub>2</sub>O (1:2 ratio of monopotassium phosphate, MDP and monoammonium phosphate, MAP)
9. 3 N - 22 P<sub>2</sub>O<sub>5</sub> - 15 K<sub>2</sub>O (ammoniated MDP, AMKP)
10. Mixture of AMKP plus APP in 1:1 ratio

<sup>y</sup> Placement was in furrow with seed or 2 inches to side of seed.

<sup>x</sup> Plot was 2 rows on a bed each 10 ft in length.

<sup>w</sup> Vigor rating 1=small, yellow plant; 5=dark green, vigorous.

<sup>v</sup> Treatments significant at 5% (\*) or 1 % (\*\*).

**Table 4.** Response of carrot to starter fertilizer solutions at Gainesville FL, Spring 1997.

Fertilizer <sup>z</sup>	Placement <sup>y</sup>	Dilution	Shoot dry weight (g/20 ft plot) <sup>x</sup>
Control	--	--	58
0-10-7	Seed	Straight	63
		10:1	74
		20:1	64
0-10-7	Side	Straight	105
		10:1	126
		20:1	101
3-22-15	Seed	Straight	38
		10:1	37
		20:1	--
3-22-15	Side	Straight	91
		10:1	85
		20:1	152
2-14-3 (MDP/MAP)	Seed	Straight	46
		10:1	108
		20:1	45
2-14-3 (MDP/MAP)	Side	Straight	50
		10:1	222
		20:1	59
Averages	0-10-7		99
	3-22-15		81
	2-14-3 (MDP/MAP)		88
	Seed		59
	Side		110
	Straight		66
	10:1		109
20:1		84	

<sup>z</sup> Fertilizers were 0-10-7 (monopotassium phosphate - MKP), 3-22-15 (ammoniated MDP-AMKP), and MKP and monoammonium phosphate, MAP in a 1:2 mixture.  
<sup>y</sup> Placement was in furrow with seed or 2 inches to side and 2 inches below seed.  
<sup>x</sup> Averages of 3 replicates.