
Response of Mulched Pepper to Meister Controlled-Release Fertilizers 97-9

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Materials and Methods

Research with pepper response to Meister controlled-release fertilizer was carried out at the University of Florida's Horticultural Research Unit in Gainesville, Florida during the spring season of 1997. The objectives were to field test polymer-coated Meister fertilizer, to determine if rates of fertilizer for pepper could be reduced through use of controlled-release fertilizer, and to determine best placement for the fertilizer.

The soil used for the research was an Arrendondo fine sand that tested medium-low in K, high in P, Mg, Ca, and micronutrients, and with a pH of 6.2. The soil was plowed and disked in preparation for fertilization and bedding for the pepper trial. Beds were formed on 4-ft centers with a combination rototiller and bed press. Final beds were 6 inches in height and 24 inches across the top.

Fertilizer treatments were formulated by weighing out the appropriate amount of fertilizer to be manually applied to the soil. Fertilizer treatments were either Meister (19-5-14; N-P²O⁵-K²O) or a mixture of ammonium nitrate and potassium chloride (soluble). Three rates of fertilizer, based on N rate were used, 75, 125, and 175 (recommended rate) lbs/acre. Two placement options, broadcast-incorporated in the bed and banded in a wide band on the surface of the bed and rototilled into the soil. For the band treatment, the fertilizer was spread in a 4-inch wide band on the surface in the middle of the bed and rolled (pressed) into the surface of the soil so the granules would not be moved by the mulch laying machine.

Two additional fertilizer treatments, zero N and zero K, were formulated from potassium chloride and ammonium nitrate only, respectively. The fertilizer for these treatments was broadcast and incorporated.

Following fertilization, the beds were covered with black polyethylene mulch (Sonoco, Mt. Olive, NC) 0.75 mil. thick. During the mulching operation, drip irrigation tubing (Chapin Watermatics, Watertown, NY) with 12-inch emitters, 0.5 gal/100 ft/min and 10 mil. thick walls, was placed on the center surface of the bed.

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Experimental plots were 20 ft in length. On 22 March 'Camelot X3R' (Peto Seed co., Saticoy, CA) pepper plants were transplanted through the mulch in twin rows on the bed with 12 inches between the rows and 12 inches between plants in the row.

Peppers were irrigated by drip irrigation to maintain soil moisture tension at -10 cb on a tensiometer with the ceramic tip placed 6 inches deep in the soil in the root zone. Diseases and insects were controlled by timely applications of labeled pesticides. Peppers were free of diseases and insect problems throughout the season.

Pepper fruits were harvested when the fruit size had maximized and fruits were firm. Fruits were graded by size on a Kerian roller sizer into extra larger, large, and medium sizes, counted and weighed. All data were analyzed by analysis of variance.

Results

Main effect for fertilizer, placement, and N rate are presented in Table 1. However, some factors interacted in their effects on certain fruit yield variables for some harvests and these interaction effects are presented in Table 2, Table 3, Table 4, Table 5 and Table 6.

First (early) harvest. Yields of large and medium fruits were not affected by fertilizer material, placement, or N rate (Table 1). Extra large and total season yields also were not affected by placement. Fertilizer material and N rate interacted in their effects on yields of extra large and total marketable fruits (Table 2). With soluble fertilizer, yields of extra large and total marketable fruits did not respond to fertilizer rate. With Meister fertilizer, yields of extra large and total marketable fruits increased as N rate increased from 75 to 125 lbs/acre but the difference between 125 lbs/acre and the recommended 175 lbs/acre was not significant. Optimum yields of early peppers were achieved with less fertilizer than recommended when using Meister controlled-release fertilizer.

Second harvest. Yields of extra large, medium, culls, and total marketable fruits, but not large fruits, were better with Meister fertilizer compared to soluble fertilizers (Table 1). Total marketable fruit yields were better with broadcast fertilizer compared to banded. N rate had no effect on pepper yield.

Third harvest. Treatments interacted for effects on several variables in the third harvest (Table 1). Extra large fruit yield was better with Meister compared to soluble fertilizer and was better with band placement compared to broadcast (Table 1). Extra large fruit yield was not affected by N rate.

Yields of large fruits were affected by the interaction of fertilizer material and N rate (Table 3) and by the interaction of fertilizer placement (Table 4). Yield of large fruits was best with the highest rate of soluble fertilizer but best with the lowest rate of

Meister (Table 3). This same response was true for total marketable fruits (Table 3). Meister fertilization was, therefore, more efficient than with soluble fertilizer during the third harvest. It took the highest rate of soluble fertilizer to result in the same total marketable fruit yield as with the lowest rate of Meister. Heavy rain in April would have leached some of the soluble fertilizer. Yields of large fruits were not affected by placement of soluble fertilizer but better with band placement of Meister (Table 4).

Fertilizer and placement interacted in their effects on medium and cull fruit yield (Table 4). With soluble fertilizer, placement had no effect on medium or cull fruit yield. With Meister fertilizer, yields of medium and cull fruits were better with band placement compared with broadcast placement (Table 1).

Seasonal yield. Yield of extra large fruits was better with broadcast than band placement (Table 1). Fertilizer material and N rate interacted in their effects on yield of extra large fruits (Table 1). With soluble fertilizer, N rate had no effect on seasonal yields of extra large fruits. With Meister, extra large fruit yield was greater with 125 or 175 lbs N/acre compared to 75 lbs N/acre (Table 5). Meister fertilizer resulted in dramatic increases in extra large fruit yield compared to soluble fertilizer and with less N required. For example, 831 cartons of extra large peppers were produced with 125 lbs N/acre but only 217 cartons resulted with 175 lbs N/acre with soluble fertilizer. Only 127 and 99 cartons of extra large fruit resulted with no N or K fertilizer, respectively (Table 1).

Large fruit yields were affected by the interaction of fertilizer and N rate and by fertilizer and placement (Table 1). With soluble fertilizer, yield of large fruits was best with the highest N rate (Table 5) but with Meister, yield of large fruits was better with lowest N rate. With soluble fertilizer, large fruit yields were better with broadcast fertilization, whereas with Meister, yields of large fruits were better with band placement (Table 6).

Yield of medium fruits was not affected by N rate (Table 1) but was affected by the interaction of fertilizer and placement. With soluble fertilizer yield of medium fruits was not affected by placement, but with Meister, medium fruit yield was better with band placement (Table 6).

Total seasonal marketable yield was not affected by N rate (Table 1). Average yields were twice those from plants receiving no N or no K. Marketable fruit yields were affected by the interaction of fertilizer and placement (Table 1). With soluble fertilizer, yields were better with broadcast versus band placement (Table 6). With Meister, total seasonal yields were similar with band or broadcast placement.

Summary

The results of this research documented several aspects regarding fertilization of pepper with a polymer-coated fertilizer.

1. Yields with Meister were better than with soluble fertilizer, perhaps due either to reduced leaching with Meister or to reduced soluble salt injury with Meister.
 2. With Meister, optimum pepper yields were achieved with less fertilizer compared to soluble fertilizer. Yields with 125 lbs N were similar to yields with 175 lbs N, the recommended rate.
 3. Generally, yields with Meister were better when fertilizer was banded, but with soluble fertilizer, yields were often better with broadcast, supporting the idea that soluble salt injury was a problem with soluble fertilizer.
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Table 1. Response of pepper to rate and placement of Meister controlled-release fertilizer and soluble fertilizer, Gainesville, FL. Spring 1997.

Fertilizer ^z	Placement ^v	N rate lbs/acre ^x	Yield 28-lb ctn/acre				
			Ex Lg	Lg	Med	Cull	Mkt
----- First Harvest -----							
Soluble			120	26	3	14	148
Meister			372	22	0	76	394
Significance ^w			**v	NS	NS	**	**v
	Band		215	23	1	38	240
	Broadcast		276	25	1	52	302
	Significance		NS	NS	NS	NS	NS
		75	203	23	2	50	228
		125	249	23	2	31	275
		175	286	25	0	53	311
		Significance	NS ^v	NS	NS	NS	NS ^v
Zero N			43	13	0	0	56
Zero K			52	12	6	5	70
----- Second Harvest -----							
Soluble			101	41	17	4	158
Meister			364	36	5	45	405
Significance ^w			**	NS	*	**	**
	Band		196	33	10	26	240
	Broadcast		269	43	12	23	324
	Significance		NS	NS	NS	NS	*
		75	220	41	14	31	277
		125	243	37	15	22	294
		175	234	36	4	20	274
		Significance	NS	NS	NS	NS	NS
Zero N			84	20	2	1	107
Zero K			36	0	9	0	44
----- Third Harvest -----							
Soluble			8	165	134	25	308
Meister			31	225	54	41	310
Significance ^w			**	**v	**v	**v	NS ^v
	Band		28	225	100	39	352

	Broadcast		12	166	89	27	266
	Significance		*	**v	NS ^v	*v	**
		75	16	213	99	39	328
		125	25	178	95	36	298
		175	18	194	88	24	300
		Significance	NS	NS ^v	NS	NS	NS ^v
Zero N			0	106	142	22	247
Zero K			12	133	200	33	345
----- Season Harvest -----							
Soluble			228	232	154	42	614
Meister			767	283	59	162	1109
Significance ^w			**v	*v	**v	**v	**v
	Band		439	281	111	103	831
	Broadcast		556	234	102	102	892
	Significance		*	*v	NS ^v	NS ^v	NS ^v
		75	440	278	115	120	833
		125	516	237	113	90	867
		175	537	257	92	98	886
		Significance	NS ^v	NS ^v	NS	NS	NS
Zero N			127	139	144	23	410
Zero K			99	145	215	38	460
^z Soluble fertilizer was a mixture of ammonium nitrate and potassium chloride. ^y Placement was band in a wide band on surface of bed in middle of two pepper rows. ^x Fertilizer rates calculated on basis of 6-foot bed centers. ^w Treatment effects were significant at 1% (**) or 5% (*) probability level or not significant (NS). ^v Interaction was significant. Refer to tables of interaction (simple) effects.							

Table 2. Simple effects of fertilizer material and N rate on yields of extra large pepper fruit and total marketable fruit yield, first harvest.

Fertilizer ^y	N rate lbs/acre ^x	Yield (28-lb ctn/acre)	
		Ex Lg	Mkt
Soluble	75	170	270
	125	86	113
	175	102	123
	LSD (.05) ^z	NS	NS
Meister	75	235	248
	125	410	435
	175	469	499
	LSD (.05)	110	118

^z Least significant difference for comparing N rates within each fertilizer treatment.
^y Soluble fertilizer mixture of ammonium nitrate and potassium chloride. Meister was 19-5-14.
^x Fertilizer rate calculated on basis of 6-foot bed centers.

Table 3. Simple effects of fertilizer material and N rate on yields of large pepper fruit and total marketable fruit yield, third harvest.

Fertilizer	N rate lbs/acre	Yield (28-lb ctn/acre)	
		Lg	Mkt
Soluble	75	157	296
	125	132	268
	175	209	361
	LSD (.05)	40	61
Meister	75	270	360
	125	224	328
	175	181	240
	LSD (.05)	40	61

Table 4. Interaction of fertilizer material and placement for tomato yield variable for season harvest totals.

Fertilizer	Placement	Yield (28-lb ctn/acre)			
		Lg	Med	Cull	Mkt
Soluble	Band	155	126	24	293
	Broadcast	176	143	26	324
	Significance	NS	NS	NS	*
Meister	Band	294	73	55	411
	Broadcast	155	35	28	209
	Significance	*	*	*	*

Table 5. Simple effects of fertilizer material and N rate on yields of extra large and large pepper fruits from seasonal (3 harvests) yield.

Fertilizer	N rate lbs/acre	Yield (28-lb ctn/acre)	
		Ex Lg	Lg
Soluble	75	266	236
	125	202	189
	175	217	270
	LSD (.05)	NS	48
Meister	75	613	320
	125	831	285
	175	857	243
	LSD (.05)	135	48

Table 6. Simple effects of fertilizer material and placement on yields of large, medium, and total marketable pepper fruit yield from season (3 harvests) yield.

Fertilizer	N rate lbs/acre	Yield (28-lb ctn/acre)		
		Lg	Med	Mkt
Soluble	Band	204	143	532
	Broadcast	260	166	697
	Significance	*	NS	*
Meister	Band	358	79	1131
	Broadcast	208	39	1086
	Significance	*	*	NS