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## *Response of Pepper to Meister Controlled-Release Fertilizers 97-02*

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### **Abstract**

Peppers were grown in Gainesville, Florida with two Meister (Helena Chemical Co.) polymer-coated controlled-release fertilizers providing N at 75, 125, 175, 225, and 275 lbs per acre. Results showed that pepper fancy and total marketable yields leveled off after 125 lbs N per acre provided from controlled-release N, and that this response was equivalent to N from soluble N at 175 lbs per acre. Controlled-release N could be applied either banded in a wide band on the bed surface or incorporated in the soil in the bed.

### **Introduction**

Peppers are grown in 22,000 acres in Florida with a crop value of \$190 million. Fertilizer is a major cost input accounting for about 5% of total costs of production. Current University of Florida nitrogen recommendations are 175 lbs N and K<sub>2</sub>O per acre for each crop. Both N and K can leach in the sandy soils of Florida. Methods to control the amount of N risked to leaching during the season are of benefit to the grower's profitability and to minimize groundwater contamination with N. One method to manage N and K availability to the crop is with controlled-release fertilizers. Most work with controlled-release fertilizers has been done with tomato, pepper, melons, and strawberry. The objective of this study was to evaluate pepper response to Meister polymer-coated fertilizers.

### **Materials and Methods**

Peppers were grown at Gainesville, Florida to evaluate yield response to Meister controlled-release fertilizer products. The soil, an Arrendondo fine sand, was plowed and disced, and preplant fertilizer was applied in a 10-inch wide band on the surface of the bed; then the beds were fumigated with methyl bromide and re-pressed with a minimal disturbance of the fertilizer band. Following bedding, white-on-black polyethylene mulch was applied to the beds and a drip irrigation tube was laid on the bed surface for irrigation.

Fertilizer treatments consisted of a factorial arrangement of two Meister (Helena Chemical Co., Memphis, TN) products, a 15-5-15 (N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O) and a 19-5-14 fertilizer,

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each material applied at 75, 125, 175, 225, and 275 lbs N per acre. All Meister fertilizer was applied in a 10-inch wide band on the surface of the bed. In addition, a zero-fertilizer check, a soluble (ammonium nitrate) fertilizer at 175 lbs N per acre, and a Meister 15-5-15 at 175 lbs per acre but incorporated in the bed, were included among the treatments. Fertilizer rates were calculated based on beds on six-foot centers even though beds were spaced on four-foot centers. Fertilization and bedding was completed on 15 August 1996.

On 22 August, transplants of 'Camelot X3R' pepper were planted through holes punched in the mulch in two rows on each bed. Rows were 12 inches apart on the bed and plants were 12 inches apart in the row. Beds were on four-foot centers. Hills were thinned to one plant per hill on 3 September 1996. Crop culture was according to recommended practices (Hochmuth and Maynard, 1996). Irrigation was applied by drip irrigation to keep a tensiometer at -10 cb at six inches deep in the soil.

Peppers were harvested four times beginning 29 October 1996 and continuing through 26 November 1996. Fruits were graded into US Extra Large, US Large, US Medium, and cull fruits by US Department of Agriculture grade standards for cucumber (USDA, 1963).

Yield data were analyzed by analysis of variance and means compared by least significant difference. Main effects of N rate were further tested with regression analysis.

## **Results**

Extra large fruits. Fertilizer treatments significantly affected yield of extra large pepper fruits (Table 1). Best early yields of pepper were with lowest rates of controlled-release N and with soluble N. Total season yields of extra large pepper also were best with reduced rates of N and with soluble N or N from controlled-release N broadcast in the soil. There were no differences between the two sources of controlled-release fertilizer.

Large fruits. Yields of large pepper fruits were increased by N rate to 175 lbs N per acre for early yields and to 125 lbs N per acre for total season large fruit yields (Table 2). There were no differences between the two Meister products for yields of large pepper fruits throughout the season. Best yields of large pepper fruits were obtained with 125 to 225 lb N per acre or with Meister 15-5-15 broadcast in the bed at 175 lbs N per acre. Yields with all soluble N were poorer than yields with Meister fertilizer at 125 lbs N per acre.

Medium fruits. Portion of total season marketable fruits as medium were small about 10 to 15%. Yields of medium fruits were higher with higher N (Table 3). This might indicate a reduction in average fruit size with highest rates of N.

Cull fruits. Yield of cull (non-marketable) fruits was not affected by fertilizer treatment (Table 4). Cull fruits made up less than 5% of total fruit yield.

Total marketable yield. Yield of total marketable fruits were acceptable for a fall crop. Yield of marketable fruits was maximized with 175 lbs N per acre from controlled-release N (Table 5). There were no differences in yield response between the two Meister fertilizers. Best yields were obtained with at least 125 lbs N per acre with some Meister fertilizer treatments or with Meister fertilizer broadcast in the bed at 175 lbs N per acre. Yields with 175 lbs N from soluble N were reduced by 25% compared to yields with the better Meister treatments.

Leaf N concentrations during the season were higher with 15-5-15 compared to 19-5-14 (Table 6). Leaf P and K on the second sample date were higher with 19-5-14. Yield, however, was not affected by fertilizer material. Yield responses to rate of fertilizer were due to nitrogen nutrition (Table 6).

## **Summary**

Results of this research showed that peppers responded positively to controlled-release fertilization as follows:

1. Response of pepper fruit yield leveled off after 125 lbs N per acre, less than the recommended rate of 175 lbs N per acre.
2. There were no differences for yield of pepper with the two Meister fertilizer products.
3. Yields with controlled-release fertilizer were best with 125 to 175 lbs N per acre when banded but reduced with higher than 225 lbs N per acre.
4. Yields with controlled-release N were better than yields with soluble N.
5. With 175 lbs N per acre, yields with broadcast controlled-release N were similar to those of plants with controlled-release N banded on the surface of the bed.

## **Literature Cited**

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Hochmuth, G. (ed.) 1998. *Pepper Production Guide for Florida*. Fla. Coop. Ext. Serv. Circ. 102E.

Hochmuth, G. J. and E. A. Hanlon. 1995. *IFAS Standardized Fertilization Recommendations for Vegetable Crops*. Fla. Coop. Ext. Serv. Circ. 1152

USDA. 1963. *United States Standards for Grades of Sweet Peppers*. US Department of Agriculture. Washington, DC.

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**Table 1.** Response of pepper to Meister controlled-release fertilizer, Gainesville, FL, Fall 1996.

Trtmt	Fertilizer	N Rate lb/acre <sup>y</sup>	Extra Large <sup>z</sup> fruit yield (28 lb ctn/A by harvest)				
			1	2	3	4	Season
1	15-5-15	75	50	23	11	58	142
2		125	43	25	69	22	159
3		175	21	39	21	19	100
4		225	32	27	22	38	119
5		275	27	22	22	29	101
6	19-5-14	75	38	43	7	24	111
7		125	130	36	40	5	211
8		175	83	32	78	55	249
9		225	44	7	29	87	167
10		275	7	24	25	81	138
11	Check	0	0	0	0	0	0
12	Soluble <sup>x</sup>	175	75	21	68	24	188
13	15-5-15 BC <sup>w</sup>	175	56	63	34	89	242
LSD.05 <sup>w</sup>			59	40	44	NS	127
Main effects:							
	15-5-15		34	27	29	33	124
	19-5-14		60	29	36	51	175
	Signif. <sup>v</sup>		NS	NS	NS	NS	NS
		75	44	33	9	41	126
		125	86	31	54	14	185
		175	52	36	49	37	174
		225	38	17	26	63	143
		275	17	23	24	55	119
	Regression <sup>v</sup>		Q*	NS	Q*	NS	NS

<sup>z</sup> Fruit graded by USDA grade standards for pepper.  
<sup>y</sup> Acre was considered to consist of beds on 6-ft. centers for fertilizer calculations.  
<sup>x</sup> Soluble fertilizer was mixture of ammonium nitrate and potassium nitrate.  
<sup>w</sup> Treatment 13 was 15-5-15 Meister fertilizer broadcast and incorporated in bed. Remaining treatments were a wide-band application on surface of bed as prescribed by Meister manufacturer.  
<sup>v</sup> Treatment effects were significant at 1% (\*) or 5% (\*\*) probability level or were not significant (NS). Regression equations contained linear (L) or quadratic (Q) terms.

**Table 2.** Response of pepper to Meister controlled-release fertilizer, Gainesville, FL. Fall 1996.

Trtmt	Fertilizer	N Rate lb/acre <sup>y</sup>	Large <sup>z</sup> fruit yield (28 lb ctn/A by harvest)				
			1	2	3	4	Season
1	15-5-15	75	22	98	195	208	523
2		125	52	142	217	269	680
3		175	67	100	204	297	668
4		225	72	100	134	292	600
5		275	63	118	139	268	589
6	19-5-14	75	44	36	221	153	454
7		125	24	171	250	293	738
8		175	101	145	160	394	800
9		225	52	148	185	456	842
10		275	50	86	97	252	486
11	Check	0	0	0	24	36	61
12	Soluble <sup>x</sup>	175	22	46	100	273	440
13	15-5-15 BC <sup>w</sup>	175	153	153	122	397	825
LSD.05 <sup>w</sup>			50	77	120	156	244

Main effects:

	15-5-15		55	111	178	267	612
	19-5-14		54	117	183	310	664
	Signif. <sup>v</sup>		NS	NS	NS	NS	NS
		75	33	67	208	180	489
		125	38	156	233	281	709
		175	84	122	182	346	734
	225	63	124	160	374	721	
	275	57	102	119	260	537	
	Regression <sup>v</sup>		NS	Q*	NS	L**Q**	Q**

<sup>z</sup> Fruit graded by USDA grade standards for pepper.

<sup>y</sup> Acre was considered to consist of beds on 6-ft. centers for fertilizer calculations.

<sup>x</sup> Soluble fertilizer was mixture of ammonium nitrate and potassium nitrate.

<sup>w</sup> Treatment 13 was 15-5-15 Meister fertilizer broadcast and incorporated in bed. Remaining treatments were a wide-band application on surface of bed as prescribed by Meister manufacturer.

<sup>v</sup> Treatment effects were significant at 1% (\*) or 5% (\*\*) probability level or were not significant (NS).

Regression equations contained linear (L) or quadratic (Q) terms.

**Table 3.** Response of pepper to Meister controlled-release fertilizer, Gainesville, FL. Fall 1996.

Trtmt	Fertilizer	N Rate lb/acre <sup>y</sup>	Medium <sup>z</sup> fruit yield (28 lb ctn/A by harvest)				
			1	2	3	4	Season
1	15-5-15	75	0	8	36	96	140
2		125	0	0	20	86	106
3		175	0	0	35	101	137
4		225	0	0	33	64	97
5		275	0	0	21	67	88
6	19-5-14	75	0	18	16	42	74
7		125	4	0	19	54	77
8		175	4	0	70	138	211
9		225	0	0	65	76	141
10		275	0	0	12	87	98
11	Check	0	0	0	0	33	33
12	Soluble <sup>x</sup>	175	0	4	9	91	104
13	15-5-15 BC <sup>w</sup>	175	5	0	5	127	137
LSD.05 <sup>w</sup>			NS	NS	NS	57	75
Main effects:							
	15-5-15		0	2	29	83	114
	19-5-14		1	4	36	79	120
	Signif. <sup>v</sup>		NS	NS	NS	NS	NS
		75	0	13	26	69	107
		125	2	0	20	70	92
		175	2	0	53	120	174
		225	0	0	49	70	119
		275	0	0	16	77	93
	Regression <sup>v</sup>		NS	L**Q*	NS	NS	NS
<sup>z</sup> Fruit graded by USDA grade standards for pepper. <sup>y</sup> Acre was considered to consist of beds on 6-ft. centers for fertilizer calculations. <sup>x</sup> Soluble fertilizer was mixture of ammonium nitrate and potassium nitrate. <sup>w</sup> Treatment13 was 15-5-15 Meister fertilizer broadcast and incorporated in bed. Remaining treatments were a wide-band application on surface of bed as prescribed by Meister manufacturer. <sup>v</sup> Treatment effects were significant at 1%(*) or 5% (**) probability level or were not significant (NS). Regression equations contained linear (L) or quadratic (Q) terms.							

**Table 4.** Response of pepper to Meister controlled-release fertilizer, Gainesville, FL. Fall 1996.

Trtmt	Fertilizer	N Rate lb/acre <sup>y</sup>	Cull <sup>z</sup> fruit yield (28 lb ctn/A by harvest)				
			1	2	3	4	Season
1	15-5-15	75	4	0	34	50	88
2		125	0	0	37	39	76
3		175	4	0	12	15	30
4		225	0	0	13	17	30
5		275	0	7	15	15	36
6	19-5-14	75	2	0	32	16	50
7		125	12	0	38	14	64
8		175	5	4	32	15	55
9		225	0	0	30	15	45
10		275	0	0	0	35	35
11	Check	0	0	0	4	8	12
12	Soluble <sup>x</sup>	175	0	0	22	39	62
13	15-5-15 BC <sup>w</sup>	175	0	2	15	26	43
LSD.05 <sup>w</sup>			NS	NS	NS	NS	NS
Main effects:							
	15-5-15		1	1	22	27	52
	19-5-14		4	1	26	19	49
	Signif. <sup>v</sup>		NS	NS	NS	NS	NS
		75	3	0	33	33	69
		125	6	0	38	26	70
		175	4	2	22	15	43
		225	0	0	21	16	37
		275	0	3	8	25	36
	Regression <sup>v</sup>		NS	NS	NS	NS	NS
<sup>z</sup> Fruit graded by USDA grade standards for pepper. <sup>y</sup> Acre was considered to consist of beds on 6-ft. centers for fertilizer calculations. <sup>x</sup> Soluble fertilizer was mixture of ammonium nitrate and potassium nitrate. <sup>w</sup> Treatment13 was 15-5-15 Meister fertilizer broadcast and incorporated in bed. Remaining treatments were a wide-band application on surface of bed as prescribed by Meister manufacturer. <sup>v</sup> Treatment effects were significant at 1% (*) or 5% (**) probability level or were not significant (NS). Regression equations contained linear (L) or quadratic (Q) terms.							



**Table 5.** Response of pepper to Meister controlled-release fertilizer, Gainesville, FL. Fall 1996.

Trtmt	Fertilizer	N Rate lb/acre <sup>y</sup>	Total Marketable <sup>z</sup> fruit yield (28 lb ctn/A by harvest)				
			1	2	3	4	Season
1	15-5-15	75	72	129	242	362	805
2		125	95	167	306	378	945
3		175	88	139	261	417	904
4		225	105	126	190	394	816
5		275	90	140	183	364	777
6	19-5-14	75	81	97	242	218	639
7		125	158	207	309	352	1026
8		175	187	177	308	588	1260
9		225	96	155	280	619	1150
10		275	57	111	134	420	722
11	Check	0	0	0	24	70	94
12	Soluble <sup>x</sup>	175	97	70	177	387	732
13	15-5-15 BC <sup>w</sup>	175	214	216	160	614	1204
LSD.05 <sup>w</sup>			78	92	120	210	308
Main effects:							
	15-5-15		90	140	236	383	849
	19-5-14		116	149	255	439	959
	Signif. <sup>v</sup>		NS	NS	NS	NS	NS
		75	77	113	242	290	722
		125	126	187	307	365	985
		175	137	158	284	503	1082
		225	100	141	234	507	983
		275	74	125	159	392	750
	Regression <sup>v</sup>		NS	NS	L*Q*	Q*	L**Q**
<sup>z</sup> Fruit graded by USDA grade standards for pepper. <sup>y</sup> Acre was considered to consist of beds on 6-ft. centers for fertilizer calculations. <sup>x</sup> Soluble fertilizer was mixture of ammonium nitrate and potassium nitrate. <sup>w</sup> Treatment13 was 15-5-15 Meister fertilizer broadcast and incorporated in bed. Remaining treatments were a wide-band application on surface of bed as prescribed by Meister manufacturer. <sup>v</sup> Treatment effects were significant at 1%(*) or 5% (**) probability level or were not significant (NS). Regression equations contained linear (L) or quadratic (Q) terms.							

**Table 6.** Response of pepper whole-leaf N, P, and K concentrations to Meister controlled-release fertilizer, Gainesville, FL. Fall 1996.

Trtmt	Fertilizer	N Rate lb/acre <sup>y</sup>	Leaf concentrations (%) <sup>z</sup>					
			26 September			30 October		
			N	P	K	N	P	K
1	15-5-15	75	5.7	0.53	3.9	4.1	0.38	3.7
2		125	6.6	0.53	4.1	4.8	0.38	3.6
3		175	6.8	0.50	4.1	5.8	0.38	3.5
4		225	7.2	0.55	4.1	6.1	0.43	3.8
5		275	7.4	0.55	4.4	6.1	0.38	3.6
6	19-5-14	75	4.6	0.53	4.3	3.1	0.50	5.5
7		125	5.7	0.50	4.1	4.1	0.38	4.3
8		175	6.5	0.53	4.1	4.8	0.40	4.3
9		225	6.7	0.50	4.1	5.8	0.43	4.2
10		275	7.5	0.48	4.5	6.4	0.43	4.5
11	Check	0	3.8	0.78	4.8	2.4	1.10	6.0
12	Soluble <sup>x</sup>	175	6.9	0.50	5.0	5.0	0.38	5.1
13	15-5-15 BC <sup>w</sup>	175	7.7	0.58	4.1	5.3	0.40	3.6
LSD.05 <sup>w</sup>			0.6	0.06	0.5	0.7	0.08	0.7
Main effects:								
	15-5-15		6.7	0.53	4.1	5.4	0.39	3.6
	19-5-14		6.2	0.51	4.2	4.8	0.43	4.5
	Signif. <sup>v</sup>		**	NS	NS	**	**	**
		75	5.1	0.53	4.1	3.6	0.44	4.6
		125	6.1	0.51	4.1	4.4	0.38	3.9
		175	6.6	0.51	4.1	5.3	0.39	3.9
		225	6.9	0.53	4.1	6.0	0.43	4.0
		275	7.4	0.51	4.4	6.2	0.40	4.0
		Regression <sup>v</sup>	L**	NS	NS	L**	NS	NS
		Adequate ranges	4.0 to 5.0	0.30 to 0.50	5.0 to 6.0	2.5 to 3.0	0.20 to 0.40	2.0 to 3.0
<sup>z</sup> Sampling dates were 26 Sept. (first blossoms) and 30 Oct. (at first harvest). <sup>y</sup> Acre was considered to consist of beds on 6-ft. centers for fertilizer calculations. <sup>x</sup> Soluble fertilizer was mixture of ammonium nitrate and potassium nitrate. <sup>w</sup> Treatment13 was 15-5-15 Meister fertilizer broadcast and incorporated in bed. Remaining treatments were a wide-band application on surface of bed as prescribed by Meister manufacturer. <sup>v</sup> Treatment effects were significant at 1% (*) or 5% (**) probability level or were not significant (NS). Regression equations contained linear (L) or quadratic (Q) terms.								