

PROGRESS REPORT

PROJECT NO: BJK-085

TITLE: Placement of Fall Applied P for Early Season Onion Growth

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ACCOMPLISHMENTS:

A field study was conducted to evaluate Vapam and P fertilizer placement in fall bedded onions at the Parma Research and Extension Center. The soil was a Nyssaton silt loam with moderate soil test P (10.2 ppm) and high lime (12%). Rates of P (0 or 58 lb P₂O₅/A) were either broadcast prior to bedding or banded into 22" bed centers after bedding in the fall. All P treatments were evaluated with and without Vapam (33%) applied at 35 gal/A after beds were formed in the fall. The treatments were arranged in a randomized complete block design with six replications.

Soil samples (0-12") were collected from each individual plot in the spring at various bed locations and soil test P determined. Broadcast P resulted in P enrichment of the soil extending across the 44" beds with greatest enrichment within 5.5" of the planted row (Table 1). As expected, the banded P placement resulted in elevated soil test P only between the planted rows. Vapam had no influence on the soil test P concentration across all bed locations.

Table 1. Soil test P as affected by method of P placement

Placement	-----Bed Location-----				
	furrow	5.5" from furrow	mid row	16.5" from furrow	bed center
	-----ppm-----				
Broadcast	12.9	38.9	23.0	20.5	14.7
Banded	10.1	11.1	74.3	11.3	10.3

Onion stunting with Vapam was associated with greatly reduced beneficial mycorrhizal infection in 1998 but there was little infection in any treatment in 1999. Vapam did not affect infection in 1999. But Vapam delayed leaf and bulb development, and stunted early season onion growth measured in late June regardless of whether P was added. Macro nutrient uptake in late June was also reduced with Vapam.

Broadcast P increased bulb diameter in late June as compared to banded P, especially in Vapam treated soil. Dry weights of plants in late June also tended to be higher with broadcast than with banded P.

Vapam effects on growth were not as evident at maturity as they were at bulb initiation in late June. Nevertheless, Vapam reduced bulb diameter on August 30, delayed maturity at the end of the season as measured by the percentage of tops down, reduced the incidence of pink root, and reduced marketable onion yield. Marketable yield was not significantly affected by applied P or P placement regardless of Vapam treatment, despite a moderate soil test P in a high lime soil.

Table 2. Onion growth and nutrient uptake at bulb initiation, June 29.

Vapam	P Added	Placement	Mycorhyzae	Bulb diameter	Leaf number	Dry weight	Nutrient Uptake						Roots
Gal/A	lb P ₂ O ₅ /A		Vesicles per plant	inches		tons/A	P	K	S	Ca	Mg	Na	P
							------(lb/A)-----						
0	0	--	2.9	0.71	6.4	0.30	2.33	24.3	4.4	8.63	2.79	3.1	1.9
0	58	Broadcast	--	0.79	6.8	0.36	2.74	29.7	5.6	10.48	3.86	3.3	2.8
0	58	Banded	--	0.71	6.7	0.32	2.82	28.2	5.0	9.83	3.33	2.5	2.2
35	0	--	3.9	0.45	5.9	0.22	1.64	19.6	3.5	5.99	2.13	2.1	1.5
35	58	Broadcast	--	0.63	5.6	0.26	2.16	22.6	4.2	7.30	2.43	2.5	1.9
35	58	Banded	--	0.49	5.4	0.21	1.79	18.3	3.2	5.68	2.08	2.2	1.5
LSD _{.10}			2.1	0.11	0.5	0.07	0.74	7.3	1.3	2.47	0.78	2.0	0.56

Table 3. Onion growth and nutrient uptake when tops were falling, August 30

Vapam	P Added	Placement	Pink Root ¹	Bulb diameter	Dry weight	Tops Down	Nutrient Uptake					
Gal/A	lb P ₂ O ₅ /A			inches	tons/A	%	P	K	S	Ca	Mg	Na
							------(lb/A)-----					
0	0	--	0.23	2.8	2.73	53.3	19.9	111.0	30.0	72.7	19.7	10.9
0	58	Broadcast	0.20	3.0	2.44	64.2	17.8	94.4	25.7	61.8	19.4	9.4
0	58	Banded	0.14	3.0	2.81	68.3	20.9	118.9	29.8	75.4	23.2	11.4
35	0	--	0.11	2.4	2.25	18.0	15.9	94.7	26.0	59.7	16.5	8.3
35	58	Broadcast	0.07	2.9	2.90	42.5	22.7	120.5	32.4	83.2	21.1	10.4
35	58	Banded	0.04	2.6	2.55	27.7	19.7	104.8	26.6	68.6	19.5	9.4
LSD _{.10}			0.1	0.3	0.63	17.1	4.6	27.0	6.4	19.5	5.0	5.4

¹ Pink root ratings: 0=none 1=25% 2=50% 3=75%

Table 4. Onion yield and grade as affected by Vapam, phosphorus and placement. Parma, 1999.

Treatments			Total	Marketable all>3"	> 4"	3-4"	2-3"
Vapam	P added	Method	-----Yield (cwt/A)-----				
Gal/A	P ₂ O ₅ /A		-----Grade (% by weight)-----				
0	0	--	793	664	110	554	113
0	58	Brdcst	766	616	99	517	131
0	58	Banded	829	728	145	583	91
35	0	--	700	499	70	428	178
35	58	Brdcst	735	569	75	495	141
35	58	Banded	655	490	62	428	151
	LSD _{.10}		128	142	60	101	49
0	0	--	--	83.2	69.9	69.9	14.8
0	58	Brdcst	--	79.0	11.9	67.1	18.6
0	58	Banded	--	87.3	10.4	70.2	11.3
35	0	--	--	71.1	9.8	61.3	25.7
35	58	Brdcst	--	77.4	10.4	67.0	19.1
35	58	Banded	--	71.8	8.8	63.1	25.5
	LSD _{.10}		--	8.4	6.5	4.8	8.4

PROJECTIONS:

This report marks the second of a three year evaluation of P placement in fumigated white soils. The data confirmed earlier reports of appreciable Vapam stunting of onions in high lime and low to moderate P soils. Unlike the previous year, negative effects of Vapam were not overcome with applied P. The results from the first two years of study suggest that banding P between onion rows will provide no advantage over broadcast applied P in alleviating Vapam effects or increasing early season onion growth. The results suggest that stunting caused by Vapam in some years is due in part to suppression of beneficial mycorrhizae which increase P availability, but other nutrients or factors are involved in other years. We are examining early season minor element availability due to Vapam with additional plant analyses.