

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 to low soil test P (8.2 ppm) and high lime (11%). P rates (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 and soil test P determined at various bed locations. 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 in the planted row. Vapam had no influence on the soil test P concentration across all bed locations.

Vapam without P reduced mycorrhizal infection of roots, delayed leaf and bulb development, and stunted early season onion growth measured at bulb initiation. Vapam without P decreased P, K, Ca, Mg, and S uptake, but fertilizer P restored early season onion growth and nutrient uptake. With Vapam, banded P was less effective than broadcast P in restoring normal growth. Without Vapam, onions did not require added P for early season growth or nutrient uptake. Vapam did not affect the onion stand.

Vapam effects on growth were not as evident at maturity as they were at bulb initiation. Nevertheless, Vapam without P reduced plant size, P, K and Ca uptake, and bulb diameter. Vapam delayed maturity at the end of the season, as measured by the percentage of tops down, and applied P did not fully compensate. Vapam also reduced the incidence of pink root. Vapam without P reduced marketable onion yield, but with P Vapam increased yield of bulbs >4". The combination of Vapam with P was especially critical for yield of onions with >4" diameters. Without Vapam, marketable yield was not affected by applied P despite low soil test P in a high lime soil.

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	9.2	18.5	16.3	17.6	9.9
Banded	5.8	6.7	34.7	6.2	6.9

Table 2. Onion growth and nutrient uptake at bulb initiation, June 25.

Vapam	P Added	Placement	Mycorrhizae	Bulb diameter	Leaf number	Dry weight	Nutrient Uptake					
Gal/A	lb P ₂ O ₅ /A		Vesicles per plant	inches		tons/A	P	K	S	Ca	Mg	Na
							------(lb/A)-----					
0	0	--	15.9	0.59	5.7	0.21	1.38	16.2	2.0	5.19	1.94	0.7
0	58	Broadcast	--	0.64	6.1	0.24	1.85	16.9	2.1	5.50	2.15	2.0
0	58	Banded	--	0.66	6.1	0.25	1.73	17.5	2.4	5.61	2.19	1.8
35	0	--	1.7	0.42	4.7	0.09	0.57	6.2	1.0	1.82	0.80	0.6
35	58	Broadcast	--	0.69	6.0	0.25	1.72	18.0	2.4	5.81	2.35	1.1
35	58	Banded	--	0.64	5.6	0.18	1.73	13.5	1.9	4.46	1.82	0.7
LSD _{.10}			6.4	0.10	0.4	0.07	0.54	6.2	0.8	2.10	0.73	0.9

Table 3. Onion growth and nutrient uptake when tops were falling, August 20

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	--	0.5	2.9	3.28	33.7	15.4	132.6	27.4	78.3	23.9	7.3
0	58	Broadcast	0.4	3.0	2.98	63.5	17.5	112.5	24.1	63.6	22.9	14.1
0	58	Banded	0.4	2.9	3.29	61.3	17.1	128.7	27.6	75.1	25.3	12.2
35	0	--	0.1	2.7	2.58	14.2	13.0	107.6	24.6	54.4	21.1	10.7
35	58	Broadcast	0.2	3.1	3.44	34.7	19.4	140.6	31.1	80.7	28.5	9.7
35	58	Banded	0.2	2.9	3.05	21.9	15.3	126.4	27.9	71.6	24.8	7.2
LSD _{.10}			0.2	0.2	0.47	19.6	2.0	22.6	6.1	16.6	4.0	5.5

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, 1998.

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	--	780	645	38	607	121
0	58	Brdcst	786	658	50	608	105
0	58	Banded	783	641	40	601	128
35	0	--	722	524	29	495	185
35	58	Brdcst	834	715	74	641	100
35	58	Banded	827	701	68	633	108
	LSD _{.10}		113	139	26	124	39
0	0	--	--	81.0	4.5	76.5	17.0
0	50	Brdcst	--	81.3	5.9	75.4	15.6
0	50	Banded	--	80.3	4.8	75.5	17.8
40	0	--	--	72.2	3.9	68.3	26.1
40	50	Brdcst	--	85.6	8.9	76.7	12.1
40	50	Banded	--	84.6	8.2	76.5	12.1
	LSD _{.10}		--	8.3	2.9	7.1	8.0

PROJECTIONS:

This report marks the first of a three year evaluation of P placement. The data confirmed earlier reports of appreciable Vapam stunting of onions in high lime and low P soils. All negative effects of Vapam, except later maturity, were overcome with applied P using moderate to low rates. The results from this initial year of study suggest that banding P will provide no advantage over broadcast applied P in alleviating Vapam effects. Onion stunting with Vapam was associated with greatly reduced beneficial mycorrhizal infection.