

PROGRESS REPORT

PROJECT NO: BJK-085

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

PERSONNEL: Brad Brown, Soil Scientist, University of Idaho
Roger Gibson, Scientific Aide

ACCOMPLISHMENTS:

A field study was conducted for the third and final year 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 low soil test P (6.8 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% ai) applied at 35 gal/A after beds were formed in the fall. A KPam[®] (54% ai) treatment without P was also included in the 2000 study. 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

Table 1. Soil test P as affected by method of P placement. Parma, 2000.

Placement	-----Bed Location-----				
	furrow	5.5" from furrow	mid row	16.5" from furrow	bed center
Broadcast	11.9	15.4	26.0	24.0	11.9
Banded	8.5	12.4	23.9	7.6	7.9

rows. Vapam[®] had no influence on the soil test P concentration across all bed locations.

Onion stunting with Vapam[®] was associated with greatly reduced beneficial mycorrhizal infection in 1998 but there was little infection in any treatment in 1999 or 2000. Vapam[®] did not affect infection in 1999 or 2000. But Vapam[®] delayed leaf and bulb development, and stunted early season onion growth measured in June. Vapam[®] reduced P uptake in June as well as the macronutrients Ca and Mg. Kpam[®] was not as detrimental as Vapam[®] to early season growth and nutrient uptake.

Broadcast P increased bulb diameter in late June as compared to banded P, especially in Vapam[®] treated soil. Dry weights of plants in June in all years were higher with broadcast than with banded P.

Vapam[®] effects on growth were not as evident at maturity as they were at bulb initiation in June. Nevertheless, Vapam[®] reduced bulb diameter at maturity, 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 and colossal onion yield. Colossal yield increased with broadcast applied P but banded P yields did not differ from the untreated control. KPam[®] yields did not differ from the yields for Vapam[®] despite being less detrimental during early season growth. Broadcasting P, the most effective application method, did not fully compensate for the effects of Vapam on yield.

Table 2. Onion growth and nutrient uptake at bulb initiation, June 13, 2000.

KPam	Vapam [®]	P ₂ O ₅ Added	Placement	Mycorrhizae	Bulb diameter	Leaf number	Dry weight	Nutrient Uptake				
								P	K	S	Ca	Mg
gal/A	gal/A	lb /A		Vesicles per plant	inches		tons/A	------(lb/A)-----				
0	0	0	--	2.2	0.43	5.0	0.11	0.71	9.0	1.5	3.51	0.80
0	0	58	Broadcast	--	0.44	5.0	0.12	0.77	7.8	1.6	3.52	0.92
0	0	58	Banded	--	0.43	4.9	0.10	0.64	8.3	1.5	3.03	0.78
0	35	0	--	0.3	0.23	3.6	0.08	0.46	6.4	1.1	2.21	0.57
0	35	58	Broadcast	--	0.37	4.7	0.12	0.75	9.4	1.7	3.43	0.93
0	35	58	Banded	--	0.28	4.0	0.08	0.52	6.6	1.2	2.29	0.61
22	0	0	--	0.2	<u>.36</u>	<u>4.4</u>	<u>0.10</u>	<u>0.64</u>	<u>7.9</u>	<u>1.3</u>	<u>2.80</u>	<u>0.75</u>
			LSD _{.10}		0.07	0.5	0.02	0.17	2.3	0.4	0.78	0.17

Table 3. Onion growth and nutrient uptake when tops were falling, August 22, 2000.

KPam	Vapam [®]	P ₂ O ₅ Added	Placement	Pink Root ¹	Bulb diameter	Dry weight	Tops Down	Nutrient Uptake				
								P	K	S	Ca	Mg
gal/A	gal/A	lb /A			inches	tons/A	%	------(lb/A)-----				
0	0	0	--	0.68	3.2	3.83	55.3	20.5	141	39.7	98	21.7
0	0	58	Broadcast	0.48	3.4	3.84	72.5	20.6	140	40.1	99	22.7
0	0	58	Banded	0.49	3.4	3.78	70.0	20.9	118	39.3	92	22.4
0	35	0	--	0.22	2.8	3.14	26.7	18.0	124	35.8	75	18.1
0	35	58	Broadcast	0.23	3.2	3.68	45.0	22.8	140	41.0	99	23.1
0	35	58	Banded	0.11	3.0	3.25	28.3	18.8	125	37.0	85	20.0
22	0	0	--	<u>0.34</u>	<u>3.0</u>	<u>3.35</u>	<u>41.7</u>	<u>18.5</u>	<u>125</u>	<u>34.8</u>	<u>84</u>	<u>20.0</u>
			LSD _{.10}	0.27	0.3	0.63	18.3	4.8	33	8.2	19	3.8

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, 2000.

Treatments				Total	Marketable all>3"	> 4"	3-4"	2-3"
Kpam	Vapam	P ₂ O ₅ added	Method					
gal/A	gal/A	lb/A		-----Yield (cwt/A)-----				
0	0	0	--	1047	965	272	693	59
0	0	58	Brdcst	1120	1042	382	660	58
0	0	58	Banded	1028	937	283	654	72
0	35	0	--	882	743	169	573	117
0	35	58	Brdcst	1018	890	240	650	104
0	35	58	Banded	866	724	197	527	117
22	0	0	--	<u>848</u>	<u>745</u>	<u>157</u>	<u>588</u>	<u>87</u>
			LSD _{.10}	183	178	98	151	40
				-----Grade (% by weight)-----				
0	0	0	--	--	91.9	26.4	65.5	5.7
0	0	58	Brdcst	--	92.7	32.5	60.1	5.4
0	0	58	Banded	--	90.8	27.2	63.6	7.3
0	35	0	--	--	82.8	18.9	63.9	14.3
0	35	58	Brdcst	--	86.8	23.0	60.8	10.8
0	35	58	Banded	--	82.3	21.5	63.8	14.5
22	0	0	--	--	<u>87.7</u>	<u>19.1</u>	<u>68.6</u>	<u>10.3</u>
			LSD _{.10}	--	4.4	8.7	7.6	4.3

PROJECTIONS:

This report marks the third and final year evaluation of P placement in fumigated white soils. The data confirm earlier reports of appreciable Vapam[®] stunting of onions in high lime and low to moderate P soils. Unlike the first year of study, negative effects of Vapam[®] in the second and third year were not fully compensated for with applied P. Banding P between double onion rows and below the seed is less effective than broadcast applied P in alleviating Vapam[®] effects or supporting early season onion growth. The results suggest that stunting caused by Vapam[®] in some years is due in part to suppression of beneficial mycorrhizae and decreased P availability. Other nutrients, possibly micronutrients may be involved in other years. Fumigation clearly exacerbates the P and possibly the micronutrient infertility of high lime soils. Fumigation was helpful in some years in facilitating the comparison of P application methods.