

Jack Root and Don Boyle Location

The location was divided into two portions. The first portion was established as a lime and potassium fertility experiment conducted in cooperation with Dr. T. L. Jackson, OSU Soils Dept. The second portion, treated with several soil amendments, was conducted in cooperation with Dr. C. H. Ullery, OSU Soils Dept. and will be discussed in the following section of this report.

The experimental area had been in peppermint for a number of years prior to 1974. The soil was a Madras loam and was sampled by replication just prior to the establishment of the treatments on May 4, and the results indicate a rather low pH marginal potassium level but, otherwise, satisfactory levels existed.

The field was fall-plowed and had 100# N applied prior to the establishment of the experiment. The lime and potassium treatments were applied broadcast on May 4 and rototilled into the soil before the area was planted May 15, 1974. Four hundred pounds per acre of 16-20-0 and 80# of K₂O as KCl was banded at planting time. The 80# of K₂O was to be omitted but there was no satisfactory way of accomplishing this without changing the fertilizer in the hopper on each round.

Table 39 shows the yield, specific gravity, and the size classes of the potatoes as affected by treatment. Yields were significantly increased by treatment and this increase came in part from an increase in tuber size. There were significantly fewer potatoes in the less than 4 oz. tuber class and a significantly greater number of tubers in the over 10 oz. class.

The effect of KCl (Muriate of Potash) in reducing specific gravity and of the sulfate ion (SO₄) in K₂SO₄ (Sulfate of Potash) and gypsum in increasing specific gravity can be observed.

The yield of increases from potassium sulfate (K₂SO₄) were slightly higher than from potassium chloride (KCl) as is usually the case in Central Oregon, but not enough to justify the use of sulfate because of its substantially higher cost on the basis of yield alone. The yield spread between the individual treatments L0 K1 vs L2 K2 (SO₄) was a little over 6 tons increase in favor of 2 tons of lime and 200# of sulfate of potash. The 100# K₂O treatment, whether sulfate or chloride, had no effect on yield and tended to increase the Mn level in the plant at the first sampling date (see Table 40). The average effects (Table 41) indicate that 2 tons of lime increased yield 2.5 tons per acre and 200# K₂O increased yield by 1.25 tons per acre. The yield increase resulting from the interaction of 2 tons of lime and 200# K₂O (K₂SO₄) was 5 tons per acre. These results are consistent with results of other years but somewhat more dramatic.

The chemical analysis shown in Table 40 is for three sampling dates. The first sampling date was taken at the pre-bloom stage when the tubers were 1/2 to 3/4" in diameter, the second sampling was taken when the vines had reached their maximum growth and the third sampling was at maturity just before die-down. In each case, the sample taken was the first mature leaf which was generally the fourth petiole down the stem from the tip of the plant. The second and third sampling dates were involved in a fire in the dryer, and as a result, approximately 1/2 of the samples were lost. All of the second and third samples of the L1 K0 treatment were lost and, in several cases, the results represent only one sample instead of four. Because of the

considerable variation in manganese between samples of the several replications, limited emphasis should be placed on the second and third samples. The average Mn levels in ppm for the three sampling dates are 1-133, 2-138, and 3-177 confirming the reported tendency of Mn to increase in the plant as the season progresses.

The soil sample (see Table 42) indicates an adequate level of phosphate and a rather marginal level of potassium, however, the first sampling date of the chemical analysis indicates a deficiency in phosphate and a good level of potassium. Probably, the potassium level was adequately supplied at this early stage by the 80# K₂O applied by the farmer.

The high soil test value for phosphate plus the 80# of P₂O₅ banded at planting time would normally have plant values above the .30-.35 considered adequate for plant growth, however, the low pH was apparently effective in reducing the availability of the phosphate to the plant.

Table 39. The effect of lime and potassium fertilizer on the total yield, specific gravity, percentage no. 1 potatoes and distribution of potatoes in size classes of Russet Burbank potatoes, Jack Root and Don Boyle farm, Madras, Oregon, 1974.

Treatment	Percentage tubers in size classes				(1) % no. 1	Total yield tons/A	Spec. grav.
	<4oz	4-6oz	6-10oz	>10oz			
L ₁ K ₀	6.33	21.44	41.53	30.70	93.67	17.85	1.090
L ₁ K ₂ (C1)	7.10	24.29	38.18	30.42	92.89	20.41	1.089
L ₁ K ₂ (S04)	6.94	20.08	41.61	31.37	93.06	21.27	1.090
L ₀ K ₀	12.45	27.27	38.45	21.83	87.55	16.88	1.091
L ₀ K ₁ (C1)	12.18	27.37	34.02	26.43	87.82	15.03	1.090
L ₀ K ₂ (C1)	12.84	29.24	34.38	23.54	87.16	17.05	1.091
L ₀ K ₁ (S04)	12.37	26.73	38.72	22.18	87.63	16.25	1.091
L ₀ K ₂ (S04)	11.91	31.95	39.22	16.92	88.09	17.46	1.092
Gypsum	10.12	24.37	37.04	28.46	89.87	16.86	1.093
L.S.D. @ .05	.85		.78	1.33		2.23	

Treatment key

L₁ = 2 tons lime per acre.

K₁ = 100# K₂O per acre.

K₂ = 200# K₂O per acre.

(C1) K₂O supplied as Muriate of Potash.

(S04) K₂O supplied as Sulfate of Potash.

Farmer applied 100# N as Ureasol late winter,
400# 16-20-0 + 80 K₂O banded at planting time.

Fertilizer treatments applied May 4, 1974.

Potatoes planted May 15, 1975.

(1) Mechanical injury not considered as grade factor.

Table 40. The effect of lime and potassium fertilizer treatment on the chemical analysis of the petioles of Russet Burbank potatoes, Jack Root and Don Boyle Farm, Madras, Oregon, 1974.

First sample - pre-bloom - tubers 1/2-3/4" diameter						
Treatment	Chemical analysis of potato petiole ⁽²⁾					
	P %	K %	Ca %	Mg %	Zn ppm	Mn ppm
L1 K0	0.23	10.2	1.41	1.07	28	94
L1 K2 (C1)	0.27	11.8	1.35	0.98	34	106
L1 K2 (S04)	0.24	14.9	1.23	1.00	28	92
L0 K0	0.22	11.8	1.11	1.00	38	136
L0 K1 (C1)	0.20	12.1	1.10	0.96	32	122
L0 K2 (C1)	0.22	12.5	1.05	0.88	36	152
L0 K1 (S04)	0.21	12.9	1.02	0.92	38	141
L0 K2 (S04)	0.21	11.1	0.98	0.89	36	148
Gypsum	0.28	12.6	0.96	0.76	44	165

Second sample August 17, 1974 - maximum vegetative growth						
Treatment	Chemical analysis of potato petiole					
	P %	K %	Ca %	Mg %	Zn ppm	Mn ppm
L1 K0	(1)					
L1 K2 (C1)	0.26	11.2	1.08	0.63	12	160
L1 K2 (S04)	0.24	9.3	1.53	1.08	8	172
L0 K0	0.28	12.1	1.41	0.86	9	131
L0 K1 (C1)	0.29	10.1	1.35	0.73	9	144
L0 K2 (C1)	0.18	9.8	1.31	0.75	11	109
L0 K1 (S04)	0.28	11.1	0.96	0.72	14	106
L0 K2 (S04)	0.26	10.2	1.35	0.84	11	145
Gypsum	0.22	10.2	1.31	0.77	10	106

Third sample September 20, 1974 - prior to vine breakdown						
Treatment	Chemical analysis of potato petiole					
	P %	K %	Ca %	Mg %	Zn ppm	Mn ppm
L1 K0	(1)					
L1 K2 (C1)	0.13	9.1	1.08	0.68	9	190
L1 K2 (S04)	0.13	9.1	1.67	0.63	7	177
L0 K0	0.09	7.8	1.50	0.78	8	154
L0 K1 (C1)	0.10	8.8	1.75	0.75	8	168
L0 K2 (C1)	0.09	9.3	1.50	0.60	13	206
L0 K1 (S04)	0.09	9.0	1.62	1.08	14	166
L0 K2 (S04)	0.08	10.8	1.62	0.93	10	189
Gypsum	0.11	9.0	1.85	0.81	9	171

(1) Approximately one half of the second and third sampling dates destroyed by fire.

(2) All samples were taken as the first mature leaf - generally the fourth petiole from the top of the plant.

Table 41. Average effect of fertilizer application on total yield of Russet Burbank potatoes, Jack Root and Don Boyle farm, Madras, Oregon, 1974.

K ₂ O		Tons/acre
0		17.27
200#	K ₂ O	18.65

Lime		Tons/acre
0		17.16
2 tons		19.84

		KCl	
		0	200#
Lime	K ₂ O		
	Lime		
0		16.88	17.05
2 tons		17.85	20.41

		K ₂ SO ₄	
		0	200#
Lime	K ₂ O		
	Lime		
0		16.88	17.46
2 tons		17.85	21.27

Table 42. Soil test for Jack Root and Don Boyle farm, Madras Loam soil.

Block	Soil depth in	pH	P ppm	K ppm	Ca meq/100g	Mg meq/100g	Na meq/100g	B ppm	Salts (mmhos /cm.)
A	0-8	5.3	48	268	9.3	5.8	.28	.32	.46
B	0-8	5.3	45	250	7.7	5.0	.26	.30	.47
C	0-8	5.2	44	262	7.5	5.0	.28	.35	.80
D	0-8	5.5	41	256	9.1	5.8	.30	.35	.52
A-D Comp	8-16	6.4	12	250	7.9	5.2	.26	.39	.59

Soil sampled May 3, 1974.