

Deschutes Valley Farms Location

The current recommendation for a zinc soil test used in the Central Oregon area is .7 ppm. Previous experiments conducted where zinc fertilizer has been a variable and soil test values have been in the .4 - .5 range have not resulted in yield increases from the application of zinc.

The Deschutes Valley Farms location had a relatively high pH with a zinc soil test of approximately .35. It was considered that this area should respond to a zinc fertilizer application.

The field had been in grain in 1973 and was fall- or winter-plowed with 100 pounds of nitrogen applied at that time. The experimental area was laid out in March in a split-plot design with one-half of each of four replications receiving one ton of lime. The soil was sampled prior to planting and the results are shown in Table 28.

Fertilizer treatments were banded at planting time (May 15, 1974) and included two sources of nitrogen (Ammonium sulfate and Calcium nitrate) at 80#/acre N, three levels of phosphate, 0, 80, and 160#/acre, as TVA Treble phosphate, two rates and sources of potassium (Sulfate of potash and Muriate of potash) at 0 and 100#/acre; Zinc was applied at 5#/acre Zn as Rayplex.

The lime and calcium nitrate treatments were added to enhance the possibility of zinc response.

Several weeks prior to planting, the farmer fumigated the field with 3.7 gallons of Terricide (a material containing 45% chloropicrin and 55% methyl bromide). Just prior to planting 2#/acre a i Eptam was applied and disced in for weed control. Some problems were encountered in metering the Eptam and as a result there was some Eptam damage in the plot area. The Eptam injury and a frost resulted in ragged and uneven plant growth, however, the stand was not affected.

Plant samples were taken July 13-15 at which time the tubers were 1/2 - 3/4 inch in diameter and the plant at late bud. Fifteen to twenty petioles were taken from each plot. The first mature leaf, generally the fourth leaf down from the tip of the plant, was taken for a sample. The leaflets were stripped from the petiole and discarded. The chemical analysis is shown in Table 29. The border line phosphate level of the 0 phosphate treatment reflects the relatively low soil test for phosphate (Table 28). The lime treatments raised the pH of the soil an average of .8 of a pH unit from 6.9 to 7.7 and this was sufficient to generally reduce the zinc concentration in the plant but not to the point of zinc deficiency. In fact, there was adequate levels of zinc in the plant without the application of zinc. Calcium nitrate and lime with no zinc application reduced the level of zinc to a probable borderline zinc deficiency.

The yields obtained (Table 30) were not significantly different. The trends in yields (Table 31) were a reduction in yield due to the application of lime and calcium nitrate on a soil already near a pH of 7 and a response to an application of 80#/acre of phosphate.

The application of lime and calcium nitrate together, without zinc, lowered the level of zinc concentration in the petiole to a borderline zinc deficiency. However, the yield was not significantly reduced. The leaves of the plants with this treatment were generally a slightly lighter cast but no distinct zinc deficiency symptoms were apparent.

Table 28. Soil test, Deschutes Valley Farms, Deschutes Sandy Loam⁽¹⁾.

Rep	Block	Treat.	pH	P	K	Ca	Mg	Zn
				----ppm----		--meq/100g---		ppm
1	1	L1 ⁽²⁾	7.8	21	352	11.4	1.9	.32
		L0	6.8	17	444	7.2	2.4	.40
	2	L1	7.7	18	388	11.0	2.0	.32
		L0	7.0	17	352	6.1	1.8	.40
2	3	L1	7.6	18	510	12.2	2.7	.32
		L0	6.9	17	346	6.6	2.0	.40
	4	L1	7.7	19	380	13.3	1.7	-
		L0	7.0	17	392	6.9	2.1	.40
3	5	L1	7.9	19	364	11.2	1.8	.32
		L0	7.0	19	340	5.0	1.7	.40
	6	L1	7.5	21	380	9.1	1.9	.40
		L0	6.9	15	330	5.1	1.8	.48
4	7	L1	7.7	18	358	9.0	1.9	-
		L0	6.8	18	320	5.0	1.7	.40
	8	L1	7.9	17	358	12.9	2.0	.40
		L0	6.9	21	346	6.4	1.8	.48
	Ave	L1	7.7	19	386	11.3	2.0	.35
		L0	6.9	18	359	6.0	1.9	.42

(1) Area not part of Deschutes survey but probably a Deschutes Sandy Loam.

(2) Lime applied in March, 1974.

Table 29. The effect of fertilizer treatment on the concentration of phosphorus, potassium, zinc and manganese in the petiole of the Russet Burbank potato, Deschutes Valley Farms, 1974.

Treatment	Chemical analysis ⁽¹⁾ of petiole			
	P	K	Zn	Mn
	-----%-----		-----ppm-----	
Ns -- Kc Zn L1	.27	10.7	34	55
L0	.28	11.1	52	83
Ns P1 Kc Zn L1	.34	10.4	35	60
L0	.36	10.1	44	72
Ns P2 Kc Zn L1	.42	10.5	26	60
L0	.42	10.7	33	77
Ns P2 -- Zn L1	.44	8.7	30	63
L0	.42	9.5	30	58
Ns P2 Ks Zn L1	.38	9.9	24	56
L0	.37	11.0	25	60
Ns P2 Ks -- L1	.38	12.5	27	48
L0	.37	11.6	34	56
Nc P2 Ks Zn L1	.31	9.8	24	30
L0	.36	9.9	26	40
Nc P2 Ks -- L1	.24	9.8	19	18
L0	.34	10.1	28	41

Treatment Key

- Ns - 80# N as ammonium sulfate
- Nc - 80# N as calcium nitrate
- P1 - 80# P₂O₅ as 48% Treblephosphate
- P2 - 160# P₂O₅ as 48% Treblephosphate
- Kc - 80# K₂O as muriate of potash
- Ks - 80# K₂O as sulfate of potash
- Zn - 5# zinc as Rayplex
- L1 - 1 ton lime
- L0 - no lime

(1) Sampled July 13-15, plants pre-bloom tubers 1/2 - 3/4", 4th petiole from top of plant or first mature leaf.

Table 30. The main effect of rate of lime, nitrogen, phosphorus, potassium, and zinc and sources of nitrogen and potassium on the yield, specific gravity and tuber size of Russet Burbank potatoes.

Deschutes Valley Farms - Lower Bridge - 1974						
Treatment	Total yield tons/a	Specific gravity	Size categories as percentage			
			0-4oz	4-6oz	6-10oz	10+oz
Main effects						
Lime	17.86	1.090	14.71	20.34	34.83	30.12
No lime	18.39	1.090	15.89	19.77	34.40	29.94
Ns -- Kc Zn	16.60	1.089	17.19	21.03	36.38	25.40
Ns P1 Kc Zn	19.14	1.090	15.02	19.23	35.64	30.10
Ns P2 Kc Zn	17.80	1.088	17.48	20.88	31.85	29.79
Ns P2 -- Zn	18.11	1.095	16.15	20.14	35.65	28.05
Ns P2 Ks Zn	18.75	1.091	14.30	20.33	34.79	30.58
Ns P2 Kc --	19.09	1.092	15.36	19.57	34.81	30.26
Nc P2 Ks Zn	17.75	1.089	14.13	19.68	32.20	34.00
Nc P2 Ks --	17.72	1.089	12.77	19.57	35.62	32.03
LSD @ .05	Ns		Ns	Ns	Ns	Ns

N = 80# N banded at planting

Ns = ammonium sulfate

Nc = calcium nitrate

P1 = 80, P2 = 160 lbs P₂O₅

Ks = potassium sulfate @ 100# K₂O

Kc = muriate of potash @ 100# K₂O

Zn = 5# Zn

(1) Approximately 100# N applied by farmer prior to establishment of experiment.

Table 31. The effect of rate of lime, nitrogen, phosphorus, potassium, zinc, and sources of nitrogen and potassium on the yield, specific gravity and tuber size of Russet Burbank potatoes.

Deschutes Valley Farms - Lower Bridge - 1974 Deschutes sandy loam soil							
Treatment	Total yield tons/a	Specific gravity	Size categories as percentage				
			0-4oz	4-6oz	6-10oz	10+oz	
Lime 2 tons							
Ns -- Kc Zn	16.74	1.090	15.29	21.53	37.25	25.93	
Ns P1 Kc Zn	19.00	1.092	13.77	21.03	38.01	27.19	
Ns P2 Kc Zn	17.95	1.090	16.74	20.13	32.84	30.29	
Ns P2 -- Zn	18.32	1.090	14.26	20.81	35.88	29.04	
Ns P2 Ks Zn	16.93	1.090	15.94	23.11	32.79	28.15	
Ns P2 Ks --	18.51	1.088	17.31	19.99	31.70	31.00	
Nc P2 Ks Zn	17.44	1.091	13.27	17.92	34.64	34.16	
Nc P2 Ks --	17.94	1.089	11.11	18.20	35.54	35.14	
Lime 0							
Ns -- Kc Zn	16.46	1.089	19.09	20.52	35.50	24.88	
Ns P1 Kc Zn	19.27	1.091	16.27	17.43	33.29	33.01	
Ns P2 Kc Zn	17.65	1.090	18.23	21.62	30.87	29.29	
Ns P2 -- Zn	17.90	1.094	18.03	19.47	35.41	27.09	
Ns P2 Ks Zn	20.57	1.090	12.66	17.56	36.78	33.00	
Ns P2 Ks --	19.68	1.089	13.42	19.14	37.92	29.53	
Nc P2 Ks Zn	18.06	1.089	14.99	21.44	29.76	33.81	
Nc P2 Ks --	17.49	1.089	14.43	20.94	35.69	28.93	
LSD @ .05	ns		ns	ns	ns	ns	

N = 80#/A N banded at planting

Ns = ammonium sulfate

Nc = calcium nitrate

P1 = 80, P2 = 160#/A P₂O₅

Ks = potassium sulfate @ 100# K₂O/A

Kc = muriate of potash @ 100# K₂O/A

Zn = 5# Zn/A as Rayplex

(1) Approximately 100# N applied by farmer prior to establishment of the experiment.