

THE EFFECT OF pH AND POTASSIUM CHLORIDE ON THE YIELD AND TEST WEIGHT OF DAWS WINTER WHEAT

Stephen R. James¹ and T.L. Jackson²

A long-term study on a Deschutes sandy loam soil at Powell Butte was initiated in the spring of 1979 to study the effects of soil pH and potassium fertilizer (KCl) on potato production. In 1983, the study area was planted to Daws winter wheat. Yield and test weight data were collected. An in-depth study was not undertaken since this was a transitional year between the potato experiments and long-term alfalfa experiments planned for 1984.

The data presented in this report are from one growing season only, hence care should be exercised in interpretation of the data. Ideally, conclusions should be based on two or more years of repeated experimentation. Since this was not possible with our current objectives for the pH and potassium study, no conclusions or recommendations will be made.

METHODS

Four soil pH levels were created by the application of 1½ tons/A of sulfur, no lime, 2 tons/A of lime, and 4 tons/A of lime on April 16, 1979. For each pH level, five rates of KCl were applied; 0, 100, 200, 400, and 800 lbs/A of actual potassium were broadcast on May 5, 1980. Another identical application of KCl was made on April 29, 1982. No KCl was applied in 1983.

Treatments were arranged in a completely random experimental design with four replications. Plots were 20 x 30 feet.

Daws winter wheat was planted on November 16, 1982, at approximately 100 lbs/A with a field drill. Two pints of Bronate were applied on April 19, 1983 for broadleaf weed control. On April 20, 1983, 606 lbs/A of 27-12-0 (NPK) fertilizer were applied.

Fifty square feet from the center of each plot were harvested September, 1983. Individual plots were then weighed and test weights determined.

RESULTS

A wide range of soil pH levels was created by the application of lime and sulfur in 1979. The pH levels two months after application on May 10, 1979, were: sulfur, 4.6; no lime, 5.3; two tons/acre lime, 6.3; and four tons/acre

¹ Research assistant, Central Oregon Experiment Station, P.O. Box 246, Redmond, OR 97756

² Soil Scientist, Oregon State University, Corvallis, OR 97331

Table 2. The effect of four soil pH levels and five potassium treatments on the yield of Daws winter wheat at Powell Butte, Oregon, 1983

TREATMENT	YIELD				AVERAGE
	4.6 pH	5.4 pH	5.9 pH	6.4 pH	
	-----bu/A-----				
No K	115.2 ¹	115.2	111.9	115.8	114.5 ³
100 lb/A K	105.1	119.8	127.1	119.5	117.9
200 lb/A K	124.9	131.7	132.1	121.1	127.5
400 lb/A K	100.6	131.9	139.8	127.7	125.0
800 lb/A K	104.7	124.9	130.2	123.9	122.2
AVERAGE	110.1 ²	124.7	130.2	123.9	122.2

1 - LSD 5% among pH x potassium treatments = 15.7 bu/A.

2 - LSD 5% among pH treatments = 7.0 bu/A.

3 - LSD 5% among potassium treatments = 7.8 bu/A.

Table 3. The effect of four soil pH levels and five potassium treatments on the test weight of Daws winter wheat at Powell Butte, Oregon, 1983

TREATMENT	TEST WEIGHT				AVERAGE
	4.6 pH	5.4 pH	5.9 pH	6.4 pH	
	-----lbs/bu-----				
No K	56.6 ¹	55.8	55.2	55.8	55.8 ³
100 lb/A K	56.4	55.7	56.2	55.5	55.9
200 lb/A K	57.5	57.7	56.8	56.1	57.0
400 lb/A K	56.3	57.4	57.6	57.0	57.1
800 lb/A K	56.8	56.7	56.4	56.7	56.7
AVERAGE	56.8 ²	56.7	56.4	56.7	56.7

1 - LSD 5% among pH x potassium treatments = not significant.

2 - LSD 5% among pH treatments = not significant.

3 - LSD 5% among potassium treatments = 0.9 lbs/bu.

lime, 6.8. The April 5, 1983, soil analysis for the pH and potassium treatments is shown in table 1. After four years the pH's of the sulfur treatment and check plot (no lime) have not changed. The pH of both lime treatments dropped 0.4 in four years.

YIELD. Both pH and KCl affected the grain yield of Daws wheat (Table 2). The pH x KCl interaction was statistically significant (p=0.05). Grain yields were uniformly low among pH levels when no KCl was applied. However, the greater the amount of KCl applied, the greater the grain yield response to the soil pH. With an application of 100 lb/A of KCl, yields varied from 105.1 to 127.1 bu/A or 22.0 bu/A. When 400 or 800 lb/A of KCl were applied, yields varied nearly 40 bu/A among pH treatments. The data indicate that the higher the soil potassium level, the greater the response of grain yield to soil pH.

In all treatments where KCl was applied, maximum yields were obtained at soil pH of 5.9.

Septoria was present in the trial and may have influenced yields but its severity was not measured. Research has shown that chloride will decrease the incidence of take-all and stripe rust in winter wheat (1, 2). Chloride may have a similar effect in controlling Septoria. Since the incidence of Septoria was not measured for each treatment, this is mere speculation.

TEST WEIGHT. Soil pH had no effect on test weight. However, the greater the application of KCl, the higher the test weight was (Table 3).

LITERATURE CITED

1. Christensen, N.W., R.L. Powelson, and T. Fairweather. 1983. Chloride Suppression of Stripe Rust Development in Wheat. 1982-83 Wheat Research Project Reports. Agricultural Experiment Station, Oregon State University.
2. Jackson, T.L., R.L. Powelson, and N.W. Christensen. 1983. Combating Take-All Root Rot of Winter Wheat in Western Oregon. Fact Sheet 250, Oregon State University Extension Service.

Table 1. Soil Potassium and pH analyses for the Lime x Potassium experiment (April 5, 1983)

POTASSIUM	ppm	TREATMENT	pH
No K	152	Sulfur	4.6
100 lb/A K	178	No Lime	5.4
200 lb/A K	224	2 Ton Lime	5.9
400 lb/A K	294	4 Ton Lime	6.4
800 lb/A K	526		
LSD 5%	35		0.1