

Soil pH and Plant Population Effects on Soybean Yield

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Introduction

The liming of soils is an important part of the overall fertility program for soybean production. Whether or not liming is needed is generally based on the soil pH. Soybeans are adversely affected by acidity when the pH falls below about 5.8. Considerable interest about soil pH specific management recommendations exists in Iowa. Since soil pH varies across Iowa, it is likely that the current optimum plant population for soybean needs to be adjusted depending on soil pH. The objective of this study is to identify the optimum plant population for soybean at different soil pH readings.

Materials and Methods

This experiment was done on a completely randomized block in a split-plot arrangement with four replications. Main plots had five lime treatments (0, 1.7, 5, 15, and 45 tons ag lime/acre) applied in 1995. Soil pH readings for the different treatments were, on the average, 5.4, 6.0, 6.5, 7.1, and 7.8. Continuous corn had been grown in the field since 1995. The subplots consisted of five seeding rates (75,000, 125,000, 175,000, 225,000, and 275,000 plants/acre). Plot size of the subplot experimental units was 10 ft × 37.5 ft and 5 ft × 32.5 ft was used for harvest.

The soybean variety was Pioneer 92M80 planted on May 12 with a John Deere MaxEmerge planter. Seed was inoculated with *Bradyrhizobium japonicum* (Liphatech, Milwaukee, WI), and each plot was planted in four rows at 30-in. row spacing at 1-in. depth.

Plots were harvested September 28 with an Almaco small-plot combine. Grain yields were adjusted to 13% moisture. Reported yields are shown in Table 1.

Results and Discussion

Summarized in Table 1 are the results of the study. No differences were found among lime treatments and plant populations on soybean grain yield or lodging. Grain moisture increased as plant populations increased, but no differences in grain moisture were found among lime treatment. Plant height increased as plant population and soil pH increased.

It was concluded that soil pH did not influence the optimum plant population based on the first year of data. This study will be continued in 2005.

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Table 1. Effect of soil pH and final plant population on soybean yield, moisture, height, and lodging.

Main effect	Yield (bu/acre)	Moisture (percent)	Height (in.)	Lodging (1-5) [†]
<u>Lime (L), tons ag lime/acre[‡]</u>				
0	69.2	9.8	33.6	1.0
1.7	69.9	9.8	33.3	1.0
5	70.4	9.8	33.1	1.1
15	69.9	9.8	33.9	1.0
45	66.5	9.8	34.6	1.1
LSD (0.10)	NS [¶]	NS	0.8	NS
<u>Final plant population (P), plants/acre</u>				
79,200	69.2	9.9	32.0	1.0
111,800	69.2	9.8	33.2	1.0
145,300	69.5	9.7	34.9	1.0
162,500	71.0	9.8	34.2	1.0
202,300	70.6	9.8	34.3	1.1
LSD (0.10)	NS	0.1	0.8	NS
<u>Anova</u>				
L*P	NS	NS	NS	NS

[†]Lodging score: the range extends from 1 = erect to 5 = flat.

[‡]Soil pH for the different lime treatments: 0 (pH 5.4), 1.7 (pH 6.0), 5 (pH 6.5), 15 (pH 7.1), and 45 (pH 7.8).

[¶]NS, not significant at $P \leq 0.05$.