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Abstract

This trial was conducted to investigate how potatoes respond to boron and sulfur fertilization when grown on coarse sand soil with low organic matter.

Keywords

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Potato Response to Boron and Sulfur Fertilization

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Vince Lawson, farm superintendent

Introduction

This trial was conducted to investigate how potatoes respond to boron and sulfur fertilization when grown on coarse sand soil with low organic matter.

Materials and Methods

Trial location was Field G, which has a Fruitfield coarse sand soil with approximately 1 percent organic matter. A soil test at the start of the study reported 1.2 lb/acre of boron and 27 lb/acre of sulfur. The field had been recently limed and soil pH was 7.4. The plot area was chisel plowed and preplant fertilizer was incorporated by disking at rate of 52 lb/acre nitrogen, 52 lb/acre P₂O₅, and 177 lb/acre K₂O. Additional nitrogen was sidedressed on May 11 (potato emergence) and June 1 at rate of 50 lb/acre. Potato seed pieces were planted approximately 8 in. apart on April 11 in furrows and covered by hilling. Plots were arranged in a randomized complete block design with four replications. A plot consisted of two rows, one row of cultivar Atlantic and one row of cultivar Snowden. Data were taken on the two cultivars separately, however, because they responded identically to the treatments, data were combined to simplify presentation. Pest control was achieved with use of s-metolachlor and linuron herbicides, bifenthrin and imidacloprid insecticides and azoxystrobin and chlorothalonil fungicides. Solubor was the boron source and sprayed on the soil surface of designated plot areas at a rate to equal 1.5 lb/acre boron on April 12. Calcium sulfate (CaSO₄) was the source of sulfur and was banded alongside potato rows at a rate to equal 20 lb/acre and 40 lb/acre sulfur on May 17. Leaf samples were

collected on June 21 and sent to A&L Analytical Laboratories, Memphis, TN, to determine boron and sulfur concentrations in the plant tissue. Potato plots were harvested on July 20 to determine yield and specific gravity of the different treatments.

Results and Discussion

Results of the boron fertilizer treatment observations are presented in Table 1. Although the soil test indicated sufficient boron, applying it in the spring increased plant tissue concentrations to 19 ppm compared with the control plots (no boron), which tested at 11 ppm. This is evidence the potato plants were probably boron deficient because adequate levels in potato plant tissue are reported to be in the 20–100 ppm range. Treatment yields also support this conclusion. Larger total and A-size tuber yield were produced by potatoes fertilized with boron.

There was no strong evidence that sulfur nutrition was a limiting factor influencing potato yield in this trial. The control plots had a plant tissue concentration of 0.3 percent (Table 2), which is above the reported sufficiency level of 0.2 percent. At harvest, yield and specific gravity did not significantly differ between the control and two sulfur treatments.

Both boron and sulfur are leachable nutrients and soil tests aren't believed to be reliable indicators for predicting optimum availability during the growing season. Also, the shallow rooting of potatoes and the difficulty of predicting rainfall and leaching events during the season complicated fertilizer decisions. These factors point to a need to investigate early season plant tissue testing and in-season applications of boron or sulfur for correcting deficiencies when they occur.

Table 1. Control and boron fertilizer treatment comparison for plant tissue concentration, tuber yield, and specific gravity.

Fertilizer treatment	Plant tissue boron, ppm	Total yield cwt/acre	A-size yield cwt/acre	B-size yield cwt/acre	Specific gravity
Control (no boron fertilizer)	11	247.6	219.0	28.7	1.083
Boron fertilizer 1.5 lb/acre ^a	19	275.2	246.5	28.7	1.083
<i>LSD</i> _{0.05}		20.5	22.3	<i>n.s.</i>	<i>n.s.</i>

^aBoron applied as Solubor at 118 lb/acre rate on April 12.

Table 2. Control and sulfur fertilizer treatment comparisons for plant tissue concentration, tuber yield, and specific gravity.

Fertilizer treatment	Plant tissue ^a sulfur, %	Total yield cwt/acre	A-size yield cwt/acre	B-size yield cwt/acre	Specific gravity
Control (no sulfur fertilizer)	0.30	246.5	214.5	32.1	1.083
Sulfur fertilizer 20 lb/acre	0.34	250.1	223.4	26.7	1.083
Sulfur fertilizer 40 lb/acre	0.47	248.8	223.5	25.3	1.083
<i>LSD</i> _{0.05}		<i>n.s.</i>	<i>n.s.</i>	<i>n.s.</i>	<i>n.s.</i>

^aSulfur applied as CaSO₄ at 118 lb/acre (20 lb S) and 236 lb/acre (40 lb S) rate on May 17.