

# EFFECT OF BORON ON WHEAT

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This study was initiated in the spring of 2003 in order to help verify the effect of boron (B) applications on wheat. Results from a previous study of similar design resulted in no yield increase of wheat on a field with a low boron soil analysis. This study should help with the verification of the previous trial.

## **METHOD:**

The soil is a Pembroke silt loam and the field is located on the UK Research and Education Center at Princeton, KY. This field has been marginally low in soil test boron in the past. The area was tilled for seeding with a chisel plow, disc and rotterra. The research will be accomplished on small plots (7' x 15'). Patton wheat was planted at 35 seeds/sq foot on Oct. 18, 2002. Nitrogen was applied at the rate of 100 pounds of N per acre on March 11.

A soil sample was taken on March 13 from the total plot area. The results were: pH 6.6, P 34, K 241 with Mehlich 3 extractant. On March 21, 70 lbs/ac P<sub>2</sub>O<sub>5</sub> and 40 lb/ac of K<sub>2</sub>O were applied. Each plot was soil sampled for boron analysis on March 14. Harmony Extra herbicide and Warrior insecticide were applied on March 24. Granular boron (14.3% B) was applied on April 2, by hand, mixed with 350 ml of sand. Boron sprayed as Solubor at head emergence (prior to flowering) on May 2. The plots were harvested on June 20 with a Hege plot combine.

## **TRIAL DESIGN:**

1. Control (no B added)
2. 0.25 lb/ac B foliar applied at initial heading (May 2)
3. 0.25 lb/ac B soil applied on April 2 (Feekes 5 to 6)
4. 0.50 lb/ac B soil applied on April 2 (Feekes 5 to 6)

Six replications of each treatment were used in a randomized complete block.

## **RESULTS:**

### ***Soil Boron***

Each plot was soil sampled to a 6 inch depth on March 14 and pH, P, K, Ca, Mg, and Zn and hot water extractable B analyses were made on each sample at the University of Kentucky Soil Testing Laboratory. The soil boron values are seen in Table 1. They are all uniformly quite low and in a range where you might expect a response to boron. However, it did not occur even with the existing high yield potential.

### ***Wheat Yields and Test Weights***

The yields for each treatment in each replication are found in Table 2. The yields were fairly uniform across replications and there were no differences found among treatments when analyzed at the 0.1 significance level. High yields in this range were found in many of the other trials close to this one. It was an excellent year for small grains.

It is surprising that there was not a response to added boron with such low hot water extractable levels. Boron was still

sufficiently available to the plants under these conditions.

Table 3 contains the test weights of the treatments by replication. As you can see, there were no differences in test weights among the treatments. The test weights were lower than expected because the test weights of several other varieties in surrounding trials were 58 to 60 lbs/bu. This is a characteristic of this variety.

**CONCLUSIONS:**

Wheat requires boron at very low levels and is able to extract the needed levels from soil that has low levels of hot water extractable boron soil tests, even at levels as low as 0.5 lb/ac. This may be due to the low levels needed, efficient extraction of the boron or the conditions, which exist during its growth.

<b>TABLE 1. SOIL BORON ANALYSIS</b>						
<b>Treatment</b>	<b>Soil Boron</b>					
	<b>Rep 1</b>	<b>Rep 2</b>	<b>Rep 3</b>	<b>Rep 4</b>	<b>Rep 5</b>	<b>Rep 6</b>
	----- lb/ac -----					
1) Control	0.5	0.4	0.6	0.3	0.6	0.5
2) 0.25 lb/ac foliar	0.5	0.4	0.5	0.2	0.6	0.6
3) 0.25 lb/ac soil	0.5	0.4	0.4	0.3	0.5	0.6
4) 0.5 lb/ac soil	0.4	0.5	0.3	0.2	0.6	0.7

<b>TABLE 2. EFFECT OF BORON APPLICATION RATES AND TIMES ON WHEAT YIELD</b>							
<b>Treatment</b>	<b>Yield</b>						
	<b>Rep 1</b>	<b>Rep 2</b>	<b>Rep 3</b>	<b>Rep 4</b>	<b>Rep 5</b>	<b>Rep 6</b>	<b>Avg</b>
	----- bu/ac -----						
1) Control	99.7	104.1	100.8	98.4	99.1	103.0	100.9
2) 0.25 lb/ac foliar	100.4	97.9	102.4	104.1	90.7	97.9	99.8
3) 0.25 lb/ac soil	104.9	102.8	97.9	103.3	92.8	97.4	98.9
4) 0.50 lb/ac soil	102.4	100.4	99.7	97.4	87.5	100.4	98.2
(0.1 level) N.S.							

<b>TABLE 3. EFFECT OF BORON APPLICATION RATES AND TIMES ON WHEAT GRAIN TEST WEIGHTS</b>							
<b>Treatment</b>	<b>Grain Test Weights (lbs/bu)</b>						
	<b>Rep 1</b>	<b>Rep 2</b>	<b>Rep 3</b>	<b>Rep 4</b>	<b>Rep 5</b>	<b>Rep 6</b>	<b>Avg</b>
	----- bu/ac -----						
1) Control	56.1	51.8	54.8	52.9	55.9	56.3	55.5
2) 0.25 lb/ac foliar	55.4	55.9	54.7	54.7	56.0	56.0	54.7
3) 0.25 lb/ac soil	48.3	56.1	54.7	54.7	56.3	55.9	54.6
4) 0.50 lb/ac soil	51.7	56.3	54.8	54.8	55.9	55.5	54.3
(0.1 level) N.S.							