

BORON FERTILIZATION OF WHEAT

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In 1999 and 2000, a nutrient sufficiency survey of 20 different wheat fields was conducted in the wheat growing areas of Kentucky. Flag leaves were collected at initial heading and the nutrient concentrations in the leaf were used as an indication of the nutrient status. Boron (B) was the only nutrient, of the 11 tested, that was marginally low. There has been a yield response to the application of foliar B on coarse textured soils in the southeastern part of the U.S. In order to look at this possibility on the silt loam soils in the upper part of the southeastern U.S., B rate and method of application studies were initiated.

METHODS:

The trial ran for 3 growing seasons (2000-01, 2002-03, and 2003-04). The fields were located on the UK Research and Education Center at Princeton, Ky. The soil is a Pembroke silt loam. The research was accomplished on small plots (7 ft x 15 ft). Trial areas were soil tested and fertilized and limed each fall prior to planting. The wheat was planted in a tilled seed bed the first two seasons and no-tilled the last season. The planting dates ranged from Oct. 9 to Oct. 18. The varieties planted were Pioneer 25R26, Patton and Pioneer 25R37 in the first, second and third seasons, respectively. Insecticides were applied in the fall and spring. Fungicides were applied in the spring at initial heading. An herbicide was applied at Feekes 5 each year and also prior to planting for the no-till planting. Nitrogen was applied at Feekes 3 and Feekes 5 each year at the rate of 40 lb/ac and 60 lb/ac on tilled wheat and 40 lb/ac and 80 lb/ac for the no-tilled planting. Granular boron (14.3% B) was mixed with 350 ml of sand and applied for the broadcast soil treatments. Boron was sprayed as Solubor for the foliar application. Flag leaf samples were collected at heading, just prior to flowering for analysis. The plots were harvested with a plot combine.

TREATMENTS:

- 1) Control (no B added)
- 2) 2 lb/ac B broadcast on soil at planting
- 3) 0.25 lb/ac B foliar applied at initial heading
- 4) 0.25 lb/ac B broadcast on soil at Feekes 5
- 5) 0.50 lb/ac B broadcast on soil at Feekes 5

RESULTS:

Trial areas were thoroughly soil sampled each year to a six inch depth prior B fertilization. Hot water extractable B analyses were made. The results are presented in Table 1. They are quite low, especially in 2002-2003 and in a range that might cause one to expect a response to added B. However, it did not occur even with the high yields obtained.

Year	Soil Boron (lb/ac)
2000-2001	1.3
2002-2003	0.5
2003-2004	0.9

Flag Leaf B Concentrations

Flag leaf concentrations taken in 2004 at flower initiation indicate that B concentrations were sufficient in all treatment including the control (Table 2). They also indicate that the foliar treatment at 0.25 lb/ac B and the soil broadcast application at 0.5 lb/ac. B, both effectively increased B in the plant. The foliar application was the most effective.

Treatment	Flag Leaf Boron (PPM)
1) Control	9.2 C*
2) 0.25 lb/ac B foliar	19.3 A
3) 0.25 lb/ac B soil	10.0 C
4) 0.50 lb/ac B soil	11.7 B
*Different letters indicate significant differences at the 0.1 level.	

Treatment	Yield		
	2000-2001	2002-2003	2003-2004
	----- bu/ac -----		
1) Control	108.4	100.9	106.2
2) 2 lb/ac B soil	110.0	-	-
3) 0.25 lb/ac B foliar	107.6	99.8	102.3
4) 0.25 lb/ac B soil	111.2	98.9	104.9
5) 0.50 lb/ac B soil	111.6	98.2	107.0
	N.S.	N.S.	N.S.

Wheat Yields and Test Weights

The yields for each year were very high and are found in Table 3. There was no yield response to adding B on any of the treatments. It did not seem to make any difference when B was added or how much, which indicates that B was supplied in sufficient quantities naturally from this silt loam soil. The B release from the organic matter and other sources as well as that contained in the soil was sufficient for a high yielding wheat crop.

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Table 4 contains the grain test weights from the different treatments. There were no differences in test weights among the treatments.

Table 4. Effect of Different Boron Application Rates and Methods On Wheat Grain Test Weights for Two Years		
Treatment	Grain Test Weights	
	2002-2003	2003-2004
	----- lb/bu -----	
1) Control	55.5	57.5
2) 0.25 lb/ac foliar	54.7	57.8
3) 0.25 lb/ac soil	54.6	57.5
4) 0.50 lb/ac soil	54.3	57.4
	N.S.	N.S.

CONCLUSION

Wheat requires boron at very low levels and is able to extract the needed levels from soil that has a hot water extractable boron soil test between 1.3 and 0.5 lbs/ac. This may be due to the low levels needed by the plant, efficient extraction of the boron or in season release of boron from soil sources such as organic matter or soil minerals.

