# Yield Response to Boron and Changes in Mehlich 1 Soil Boron Over Time


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## Abstract


Research was conducted on a Staser silt loam (Fine-Loamy Mixed, Active Thermic, Cumulic Hapludoll) at the Springfield Research and Education Center in middle Tennessee. Mehlich 1 boron (B) initially tested 0.4 mg/kg in the top 15 cm in 2009. Boron was applied each year with 4 replications of a control plot and 3 rates of boron at 2.3, 4.5 and 9 kg/ha. The site was then cropped to bermuda grass hay for 3 years with no response to added boron. In 2012, Alfalfa was then cropped at the same rates of applied boron each year for 3 years with no response to added boron. This current study started in 2015 evaluating boron in a corn, wheat, soybean row-crop rotation. The initial two years have shown no yield response or apparent reduction in yield to boron from all 3 row crops.

Soil test boron in the top 15 cm remained at reasonable soil test values, at all rates of applied B since 2009 (8 years) , In Sept. of 2016, an evaluation of boron throughout the top 60 cm of each plot revealed increased boron in the rate plots over that found throughout the same depth in the control plots. At the rates applied, soil boron enrichment to at least 60 cm occurred over the 8 year period.


## Introduction

- Boron problems in tobacco and yield response by corn in fields testing <.3 mg/kg Meh 1 B initiated interest in further B studies.

## Objectives

- Measure changes in Meh 1 Soil Test B over Time .
- Evaluate yield response to B over time with intensive cropping using forages followed by row crops

## Methods

- Experiment set up with four replications of a control plot and 3 rates of B applied annually at 2.3, 4.5 and 9 kg/ha in a randomized complete block latin square.
- Site cropped to Bermuda hay, alfalfa hay, each for 3 years , to try and deplete soil B.
- Row crop rotation of corn wheat beans started in 2014.
- Measured effects on yield and change in Meh 1 soil test boron over time (2009-16) and with depth in 2016

## Results

Table 1. Mehlich 1 Soil Test Levels of Boron Over Time (15 cm depth)

| Annual Boron rate Kg/ha | Meh 1 Boron ( mg/kg) | | | | |
|---|---|---|---|---|---|
| | 2009 Bermuda-grass | 2010 Berm. | 2012 Alf. | 2015 Wht./bean | 2016 corn |
| 0 | 0.40 | .42 c | .37 c | .48 b | .42 b |
| 2.3 | . | .50 bc | .60 bc | .64 b | .70 b |
| 4.5 | . | .60 b | .80 b | .94 a | .78 ab |
| 9.0 | . | .82 a | 1.2 a | 1.0 a | 1.1 a |
| | Average of 4 replications (P ≤ 0.05) | | | | |

Table 1. After the initial year there is little change in Meh 1 boron (15 cm depth) at each level of application. Rates applied increased Meh 1 boron over the control plots. Control plot Meh 1 boron did not decrease over time.

Table 2. Mehlich 1 Soil Test Levels of Boron with Depth (Sept. 2016)

| Annual Boron rate Kg/ha | Meh 1 Boron ( mg/kg) after 8 years | | | |
|---|---|---|---|---|
| | 0-15 cm | 15-30 cm | 30-45 cm | 45-60 cm |
| 0 | .42 b | .40 c | .25 b | .25 |
| 2.3 | .70 b | .60 b | .75 ab | .67 |
| 4.5 | .78 ab | .99 b | .95 a | .90 |
| 9.0 | 1.1 a | 1.5 a | 1.0 a | .95 |
| | Ave. of 4 replications (P ≤ 0.05) | | | NS |

Table 2. Enrichment of the soil with boron at each rate of application over the control plot levels is shown to a depth of at least 60 cm.

## Results Continued

- No yield increase or decrease to added boron by bermuda grass hay or alfalfa (data not shown)

Fig. 1 Wheat, Soybean (2015) and Corn (2016 Yield Response to Applied Boron

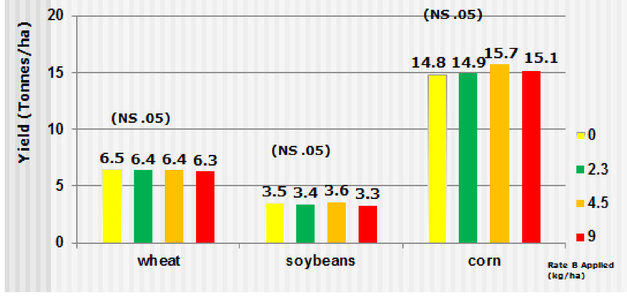


Fig. 1, There is no yield increase or decrease that can be attributed to applied B on wheat, soybeans or corn in this first 2 year rotation.

## Summary

- Meh 1 soil boron in the top 15 cm did not reflect the large amounts of boron applied over the 8 year period, especially at the highest rate.
- Evaluation of Meh 1 soil boron to a depth of 60 cm revealed B enrichment of the profile to at least that depth over boron found in the control plot profile.
- Applied boron did not increase or decrease yield over time with intensive cropping using forages followed by row crops


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