# Assessing Current Boron Recommendations for Peanut Production through Remote Sensing, Agronomic Factors, and Seed Germination

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## Introduction

- Boron (B) is deficient in sandy soils which are preferred for peanut production.
- Lack of B during peanut seed development can cause the physiologic disorder "hollow heart".
- Damaged seeds (DS) by "hollow heart" can reduce crop quality and value up to 65% if the DS ≥ 2.5%.
- B deficiency effects nitrogen fixation, which is the main source of nitrogen for peanut.
- B toxicity, when B >85mg B/kg in youngest fully mature leaves, can cause yield loss.
- Current B application in peanut production has been determined by research in 1970's with recommendations of 0.6 kg B/hectare applied, pre-plant or with the first or second fungicide application, when soil B was below 0.4 kg B/hectare. (Perry, 1971, Hartzog and Adams, 1973)
- 97% of producers in VA and NC apply B annually. (Morgan, *et al*., 2014)
- Outdated recommendations could lead to over- or under-application of B, and decrease yield and quality.

## Hypothesis and Objective

Changes in cultivars and production practices may require different B rates and application times than those determined in the early 70's.

**The objective** of this research was to determine if the earlier B recommendations are still optimal for the current production practices and peanut cultivars.

## Materials and Methods

- Locations: in Suffolk, Boykins, and Hometown, VA; Lewiston and Rocky Mount , NC
  - All sites were replicated in a randomized complete block design.
- Cultivar: Bailey
  - 11 meter, two row plots
- B type: liquid 9%:
  - 0 kg B/hectare –control
  - 0.3 kg B/hectare –current recommendation
  - 0.6 kg B/hectare –current recommendation
  - 1.1 kg B/hectare –control (excessive rate)
- B rates
  - Planting
  - Beginning peg (R2) (Boote, 1982)
  - Full Pod (R6)
  - Split rate with half applied at planting, and half at R2
  - Split rate with half applied at planting, and half at R6

**Plant Evaluations:**

- Soil Plant Analysis Development (SPAD) for relative chlorophyll content
  - Sampled 25 days after planting (DAP)
  - Again 5 days after R2, and R6 applications
- Normalized Difference Vegetative Index (NDVI) readings
  - Trimble Hand held GreenSeeker held 45-60cm above canopy
  - Sampled 25 DAP, and 5 days after R2 and R6 treatments
- Leaf tissue nutrient analysis
  - Youngest fully mature leaves from15 different plants per plot
  - Leaves dried to constant weight and analyzed for B content (A&L Lab)

**Figure 1:** Pictures of test plots growing during the 2015 season. A range of maturities from beginning peg (R2) to full seed (R6), from left to right.

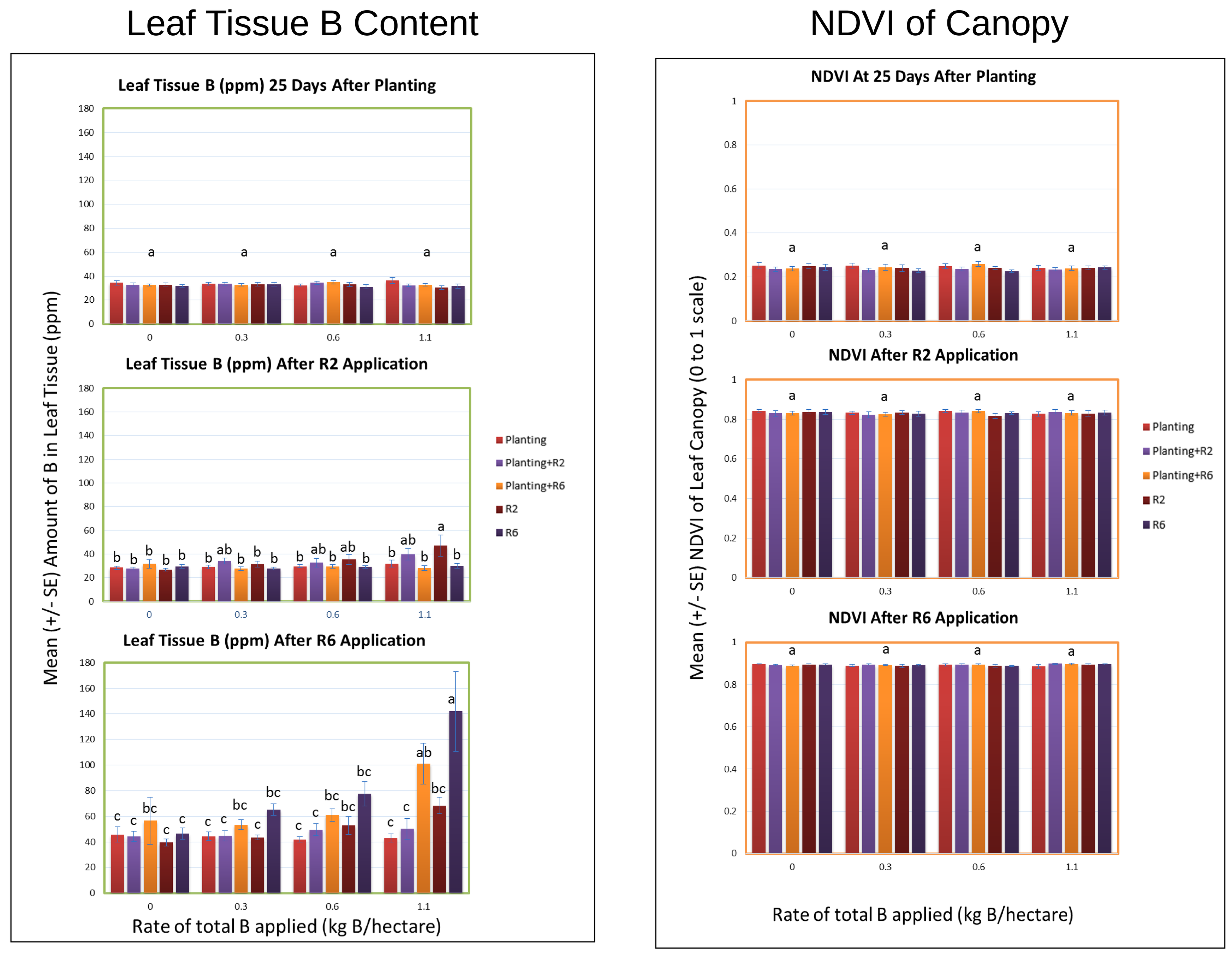


**Figure 2:** Application time and rate of the B had significant interaction for the amount of B in the leaf tissue. NDVI did not show any significance between treatments. Boron levels showed some significant differences between locations accounted for in a blocked effect.

## Results and Discussion

- There were significant interactions in the tissue B content between the rate of B applied, and the time at which it was applied, but only after the R6 application.
- Boron rate, and application time had significant main effects on B leaf content after R2 application (ANOVA, not shown).
- There was a small increase in leaf B after the second application at R2 *vs.* other treatments; and a large increase when 1.1 kg B/hectare was applied at R6 (Fig. 2, left side)
- The effect of location was significant for NDVI and SPAD, but no significant effect was observed for the rate and application time (Fig. 2, right side); interaction among these factors was also absent (ANOVA, not shown). This is most likely due to color change in leaf tissue being related to other factors, like nitrogen content, and not B content. Even though B deficiency and toxicity can cause color differences in plant tissue (Rerkasem *et al*., 1993, Gopal 1975), it does not appear that these differences out weighed other factors to be distinguishable using NDVI.

## Future Work

- Yield and seed quality will be evaluated after harvest .
- Seed B content will be analyzed using samples ground and sent to A&L Lab.
- Germination will be evaluated using seed samples for possible affect of B content.

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