

Foliar Boron Fertilizer Application and Timing in Hybrid Carrot Seed Production

Tracy Wilson and Rich Affeldt

Introduction

Hybrid European Nantes carrot seed production can be challenging for growers as yields can be unreliable. Demand for boron (B) in many crops is greatly elevated during flowering and seed set even when B in the plant leaves are in the “adequate” range for that crop. Several studies have found that foliar B applications can increase fruit set and yield (Nyomora et al., 1999; Perica et al., 2001; Asad et al., 2003). Research conducted on alfalfa seed found that foliar B applications increased seed yield even though B concentrations in the plants and soil were considered adequate for alfalfa forage production (Dordas, 2006). The objective of this research project was to determine what effect foliar B application and application timing had on hybrid carrot seed production.

Materials and Methods

Three hybrid carrot seed fields of the same variety were selected for the trial. Soil tests for the three fields selected had B levels that ranged from “low” (1.1 lb B/ac) to “medium low” (1.5 lb B/acre). Two fields were planted in a 2x4 configuration of two rows of males and four rows of females, the third field was planted in a 4x4 configuration of four rows of males and four rows of females. Four areas near the corners of each field were randomly assigned a treatment: control (no B), pre-bloom B application, during bloom B application, and split (pre- and during bloom) B application. Four plots (replicates) of one treatment were placed in one area of each field in a quasi-randomized complete block in an effort to minimize pollen carryover from other treatments while bees were in the fields. Plots were 50 feet long with two sets of males (4 rows in 2x4, 8 rows in 4x4) and one set of females in each plot. A buffer of one set of females separated the plots. Foliar B applications were made using a CO₂ powered backpack sprayer to apply Tri-Plex B (0-0-0-16, Redox, Burley, Idaho). Pre-bloom and during bloom applications of 0.5 lb Triplex B/(0.08 lb. B/ac) were applied to the males in each plot in all three fields June 13, 2016 and July 8, 2016, respectively. Split applications of 0.25 lb Triplex B/(0.04 lb. B/ac) were applied at pre-bloom (June 13, 2016) and during bloom (July 8, 2016).

Just prior to application and seven days after application, above ground samples were collected from male and female plants in each treatment by clipping the carrot plant at the soil surface. Plant samples were dried at 80° F and then ground. Ground plant samples were sent to the Central Analytical Laboratory at Oregon State University for analysis of B concentrations. Just prior to each field being swathed, a 5 ft by 5 ft area of each plot was hand harvested to determine seed yield. Seed heads were clipped in the field and placed in a burlap sack to dry down. Once seed heads dried down, they were passed through a thresher and sieved to remove pieces of stem and other flower pieces. Seed will be stored until it can be cleaned.

Preliminary Results

Preliminary results from the plant sample analysis indicate that foliar applications of B to the male plants at pre-bloom increased plant B concentrations one week after application (Figures 1-3). The half-rate of foliar B applied pre-bloom in the split treatment did not increase plant B

concentrations (Figures 1-3). However, the application at the during bloom timing did increase plant B concentrations one week after application (Figures 1-3).

While the foliar B applications show promise to increase plant B concentrations when applied at certain stages of plant growth, it remains to be seen if these increases in plant B concentrations in the male plants will translate into increased seed set in the females.

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Figures

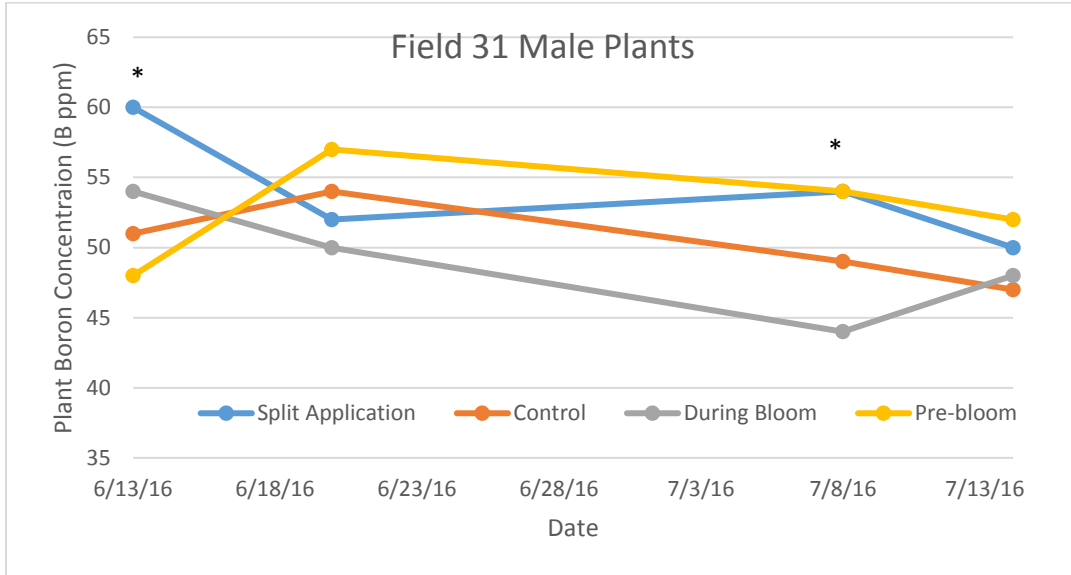


Figure 1. Plant B concentrations (ppm) for male plants collected from field 31 (2x4 planting). Application dates are noted with an *.

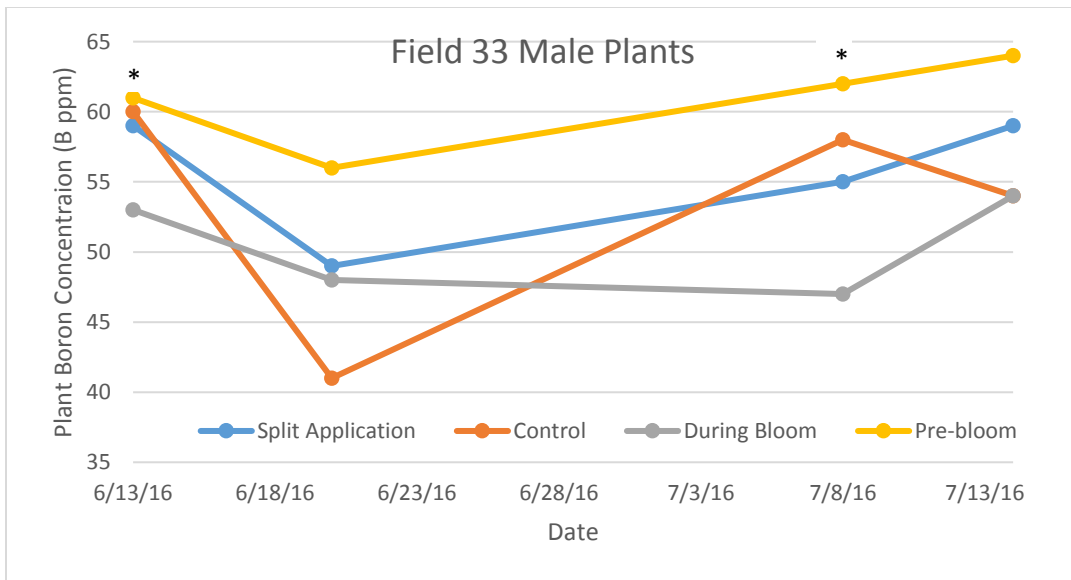


Figure 2. Plant B concentrations (ppm) for male plants collected from field 33 (2x4 planting). Application dates are noted with an *.

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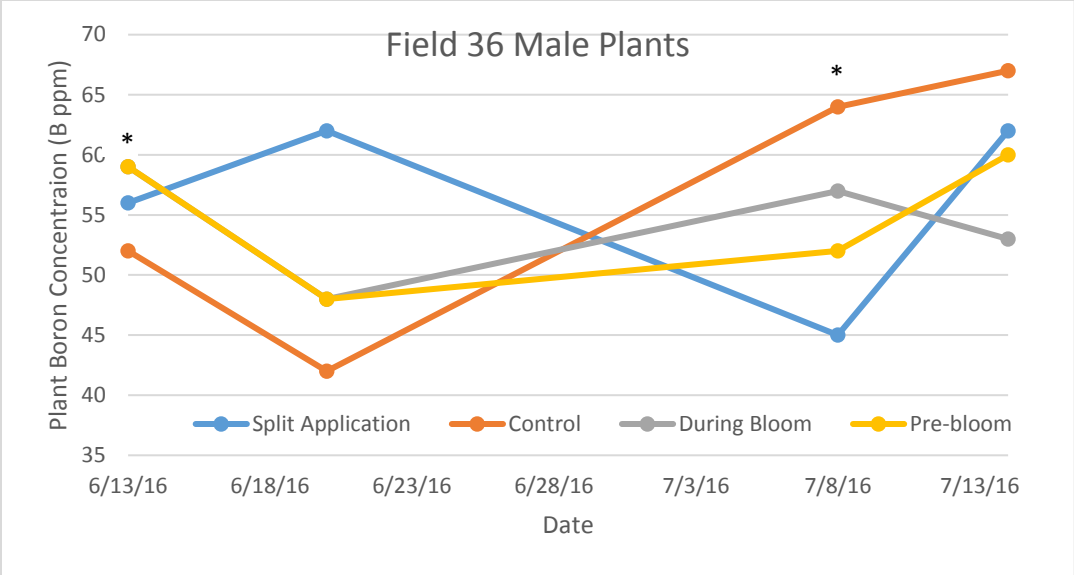


Figure 3. Plant B concentrations (ppm) for male plants collected from field 36 (4x4 planting). Application dates are noted with an *.