

Southern Region Small Fruit Consortium

Final Research Report

Title: Elucidating the Role of Calcium and Boron in Fruit Quality and Flower Bud Necrosis

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Public Abstract

Calcium (Ca) and boron (B) are essential nutrients that play critical roles in plant development, including cell wall structure, membrane stability, pollen tube elongation, and cell division. Deficiencies in these nutrients can negatively affect fruit quality, leading to issues such as necrosis of flower buds, poor fruit set, and reduced firmness. The objectives of this study were to identify the concentration of Ca and B through various growth stages and to evaluate the application of Ca and B on the fruit quality of two blueberry cultivars: 'Farthing' and 'Brightwell.' The sampling of flower buds was performed from December to May at three different farms. Flower buds at different phenological stages from the cultivars 'Farthing,' and 'Brightwell' were sampled. Soil, leaves, as well as young, old, and necrotic shoots and buds were sampled for nutrient analysis. Foliar and soil applications of Ca (calcium oxide and calcium acetate) and B (boric acid) were performed through different developmental growth stages. Soil, leaves, and fruit samples were collected for nutrient analysis. Additionally, total yield and fruit quality analysis (berry firmness, berry size, total soluble solids, titratable acidity, and anthocyanin concentration) were performed at harvest and after storage. The two-year data collected at different growth stages identified that Ca and B concentrations increased from tight bud to petal fall and continuously declined after petal

fall and during berry ripening. The application of Ca to the soil or via foliar application did not increase fruit Ca concentration and blueberry firmness. On the contrary, the foliar applications of B increased leaf and fruit B concentration and yield. However, neither Ca nor B applications impacted the fruit quality of ‘Farthing’ and ‘Brightwell’ cultivars.

Introduction

Calcium (Ca) and boron (B) play crucial roles in several developmental processes, including pollen tube elongation, cell wall synthesis, membrane regulation, and cell division, which are directly linked to yield and fruit quality (Botelho et al., 2022). Deficiencies in Ca and B can cause necrosis of flower buds, flower bud abortion, or failure of flower buds to open, poor fruit set, and issues related to poor fruit quality, such as soft fruit (reduce firmness), reduced shelf life, and low phenolic concentration (Chen et al. 1998; Eftekhari and Shafari., 2019). These deficiencies are usually observed in bushes with heavy crop load or under dry weather conditions (Strik et al., 2017; Strik & Davis, 2022).

Foliar applications of Ca and B are used alone or in combination, with the aim of increasing fruit quality or foliar concentrations of both nutrients (Chen et al., 1998; Gerbrandt et al., 2019). Previous research on the ‘Duke’ cultivar has reported that the best time for Ca application is from the bloom stage onward (Gerbrandt et al., 2019), and shortly after fruit set in the ‘Liberty’ cultivar (Gerbrandt et al., 2019; Lobos et al., 2021). Foliar application during fruit ripening is less efficient due to the lower number of stomata on the peel of the fruit (Yang et al., 2019). In addition, research conducted on northern highbush linked the green fruit drop disorder with the interaction of Ca and B with other nutrients, and the effect of cultural practices on Ca and B concentrations (Gerbrandt et al., 2019; Hart et al., 2006; Strik et al., 2019).

In the seasons 2022 and 2023, producers reported fruit quality issues in the ‘Brightwell’ cultivar. These issues include rapid fruit softening of the fruit immediately after harvest, oozing (Fig.1-A), splitting (without a rain event) (Fig.1-B), and failure of berries to ripen (Fig. 1 C-D). Additionally, producers have reported flower bud necrosis and failure of flowers to open (Fig.1-E) in the ‘Farthing’ cultivar.



Figure 1. Fruit quality issues and flower bud necrosis. Oozing from the stem scar (A), splitting (B), berries that failed to ripen (C and D), and flower buds that failed to open and flower bud necrosis “black bud” (E).

Thus, elucidating the role of Ca and B concentrations in the fruit quality of ‘Brightwell’ and the flower bud necrosis (colloquially known as “black bud”) in ‘Farthing’ is critical for improving nutrient management. In the last decade, the role of Ca and B concentrations in southern highbush (SHB) and rabbiteye (RE) blueberries has received limited attention (Clark et al., 1994; Spiers, 1993). Understanding Ca and B nutrient concentrations for SHB and RE cultivars ‘Farthing’ and ‘Brightwell’ in each phenological stage will allow producers to make educated decisions on the

best time of application of these two nutrients. Furthermore, understanding how Ca and B are allocated among different plant organs (flower buds, flowers, leaves, and fruit) will allow producers to improve production management practices and increase the sustainability of blueberry production in Georgia. The results of the proposed study will be used to develop guidelines for the timing of Ca and B application and improve growers' understanding of Ca and B physiology in blueberries, ultimately leading to better fruit quality and increased revenues.

Objectives:

- 1) Determine Ca and B concentration in 'Farthing' and 'Brightwell' cultivars at different phenological stages.
- 2) Examine the effect of different Ca and B applications to improve fruit quality of 'Brightwell' and reduce flower bud necrosis on 'Farthing.'

Materials and Methods

The study was conducted on commercial farms (Objective 1 - Experiment 1) and at the Alma Research farm (Objective 2 - Experiment 2).

Experiment 1

Location and experimental design. This study was conducted for two years experiment at three commercial farms using mature plants from two different blueberry cultivars: 'Farthing' located in two sites (located at 31°19'38.8"N 82°25'32.2"W, and 31°21'16.9"N 82°27'54.7"W), and one 'Brightwell' (located at 31°25'58.1"N 82°24'59.9"W). The farms were located in Ware County and Bacon County, Georgia. Each cultivar had four replicates. No foliar Ca applications were performed on any of the sites.

Sampling collection. Samples were collected from each replicate at each developmental stage. The growth stages were identified using a modified scale developed by Michigan State University (Growth Stages – Blueberries) (Fig. 2). Samples were taken from both lateral sides of the plants. Additionally, leaf samples were collected (50 leaves per replicate) from October and November 2023, and March, June, and August 2024 and 2025. Soil samples were collected at two depths: 0-10 cm and 10-20 cm in February and June in 2024 and 2025. Shoot samples, both young and old shoots, were collected in February and July in 2024 and 2025. Young and necrotic shoots were collected from the 'Farthing' cultivar at a commercial farm in March 2024 and at the Alma research farm in February 2025. All samples were sent to an external analysis laboratory to determine nutrient concentration.



Figure 2. Modified growth stages development scale developed by Michigan State University.

Statistical analysis. The Kruskal Wallis test was performed using JMP software. Significant differences were determined at $P \leq 0.05$. Tukey's tests were used in order to resolve differences.

Experiment 2

Location and experimental design. For this study, ‘Farthing’ and ‘Brightwell’ cultivars were located at the Alma Research Farm. No additional Ca or B was applied to the treated plants. All sites followed conventional practices. The experiment was set up as a randomized complete block design, with nine treatments and two cultivars: ‘Farthing’ with four replicates per treatment and ‘Brightwell’ with three replicates per treatment. Each experimental unit (plot) consisted of five plants.

The treatments involved various concentrations of Ca, humic acid, and B (Table 1). The products used for the treatments were applied in accordance with the recommended rates on the labels and the manufacturer's instructions. AlCaplant and Pow humus were applied to the soil (drenched), while the others were applied as foliar treatments using a non-ionic surfactant. The foliar treatments were administered using a hand sprayer.

Table 1: Description of each of the nine treatments applied to ‘Farthing’ and ‘Brightwell.’
Treatment details, product name and chemical formulation, application rate and time.

Treatments	Product name	Chemical form	Rate	Boron	Application Time
T1	Alcaplant + Pow Humus	Calcium oxide + potassium humate	4.45 + 0.6 lb/acre	Low B ^d	January to September
T2	Alcaplant + Pow Humus	Calcium oxide + potassium humate	2.67 + 0.3 lb/acre	High B ^c	January to September
T3	Alcaplant	Calcium oxide	4.45 lb/acre	Low B ^d	January to September
T4	Alcaplant	Calcium oxide	4.45 lb/acre	High B ^c	January to September
T5	Calcium acetate	Calcium acetate	2 quarts/acre	Low B ^d	Late pink bud and early green
T6	Calcium acetate	Calcium acetate	2 quarts/acre	High B ^c	Late pink bud and early green
T7	Calcium acetate	Calcium acetate	2 quarts/acre	Low B ^d	Late green and fruit coloring
T8	Calcium acetate	Calcium acetate	2 quarts/acre	High B ^c	Late green and fruit coloring
T9	Control	-	-	-	-

^d: low B rate (1 quarts/acre),

^c: high B rate (2 quarts/acre)

Note: Boron (B). Boron chemical form: Boric acid.

Alcaplant and Pow Humus: In 2024, these products were applied to the soil biweekly from January until September. In 2025, both products were applied weekly from January to 10% blue (from petal fall to 10% blue, only Alcaplant was applied three times a week). From T5 to T8, foliar product was applied once at each developmental stage mentioned in the table. Boron was applied once at the early pink bud, late pink bud and full bloom stage.

Soil samples. Soil samples were collected in February and June in 2024 and 2025. Each sample was divided into two sections: 0-10 cm and 10-20 cm deep. Additionally, leaf tissue samples (40 leaves) were collected from each plot in March and June in 2024 and 2025. All samples were sent to an external laboratory for nutrient concentration analysis.

Total yield and berry measurements. To determine total yield, three central plants of ‘Farthing’ and one central plant of ‘Brightwell’ were hand-harvested, and the fruit was weighed using a calibrated scale. Berry weight was assessed by weighing 100 grams of berries and counting the number of berries in that sample. To analyze the nutrient concentration of the fruit, samples were sent to an external laboratory for analysis.

Physicochemical measurements. Fruit firmness and size were measured using a FruitFirm® (CVM Inc., Pleasanton, CA). A sample of 25 berries per plot was used. Total soluble solids were measured using a table-top refractometer (HI-96801, Hanna Instruments, Smithfield, RI). Titratable acidity was measured using a titrator with an autosampler (916 Ti-Touch, 810 Sample Processor, Metrohm, Switzerland). Anthocyanin concentration was measured using the differential pH method and a microplate reader (Epoch2, Biotek, Winooski, VT).

Statistical analysis. A mixed model analysis was performed using the software JMP. Significant differences were determined at $P \leq 0.05$. Mean separations were performed using Tukey's test.

Results

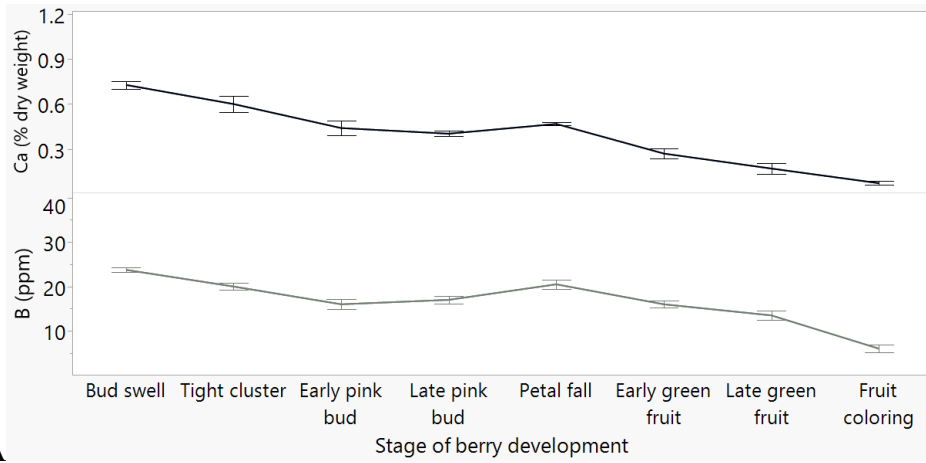
Experiment 1

The highest Ca concentration was found during the initial growth stages: tight bud, bud swell, and tight cluster. At the petal fall stage, Ca concentration increased and then started to decline as fruit ripened (Fig. 3). The pattern was consistent across all farms. Similar results were found for B and remained consistent across farms (Fig. 3 A-D).

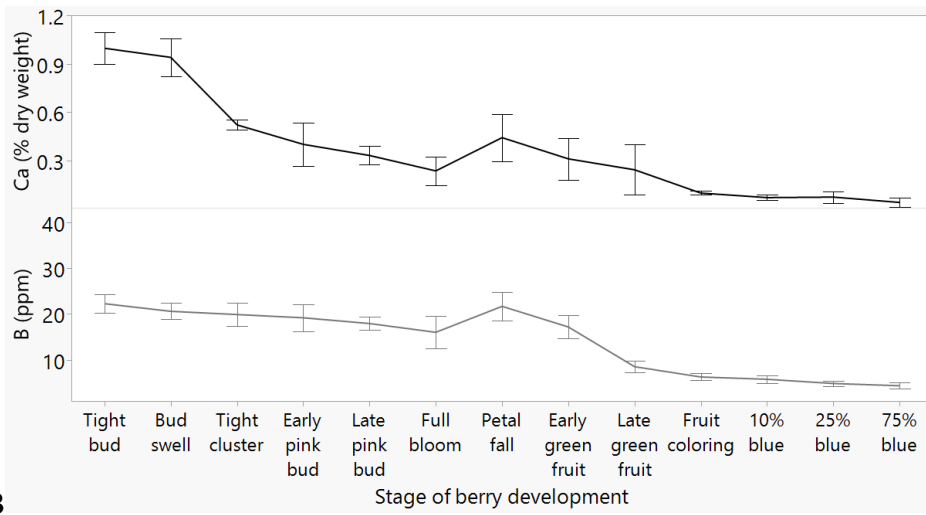
Leaf Ca concentration was higher in June in both years across all farms (Fig. 4). Leaf B concentration was higher in June 2024 for 'Farthing' - Farm 2, and in June and August for 'Brightwell' - Farm 3 (Fig. 5A). In 2025, B concentration was higher in June for 'Farthing' in Farm 1 and Farm 2, and in June and August for 'Brightwell' - Farm 3 (Fig. 5B). Soil Ca concentration was higher in February 2024 for all sampled farms (Fig. 6A). In 2025, the highest soil Ca concentration was exhibited in June for 'Farthing' in Farm 1 and Farm 2, while no significant differences were found in soil Ca in 'Brightwell' - Farm 3. There were differences in soil B concentration in 2024, with higher B concentration in February for the 'Farthing' cultivar in Farm 1 and Farm 2 (Fig. 7A).

There were no consistent differences between the Ca concentration in young and old shoots among cultivars and commercial farms. The Ca concentration for young shoots of 'Farthing' - Farm 1 were higher in July 2024 (Fig. 8A). In 2025, young shoots exhibited high Ca concentration in July and February in 'Farthing' - Farm 2 (Fig. 8B). The concentration of B in old shoots of 'Farthing' - Farm 1 was lower in February and July 2024, and only in July for 'Farthing' - Farm 2 and Farm 3 (Fig. 9A). In 2025, B concentration exhibited a similar pattern, in which older shoots had less B concentration, but only in July for 'Farthing' - Farm 2, and for 'Brightwell' - Farm 3 in February and July (Fig. 9B).

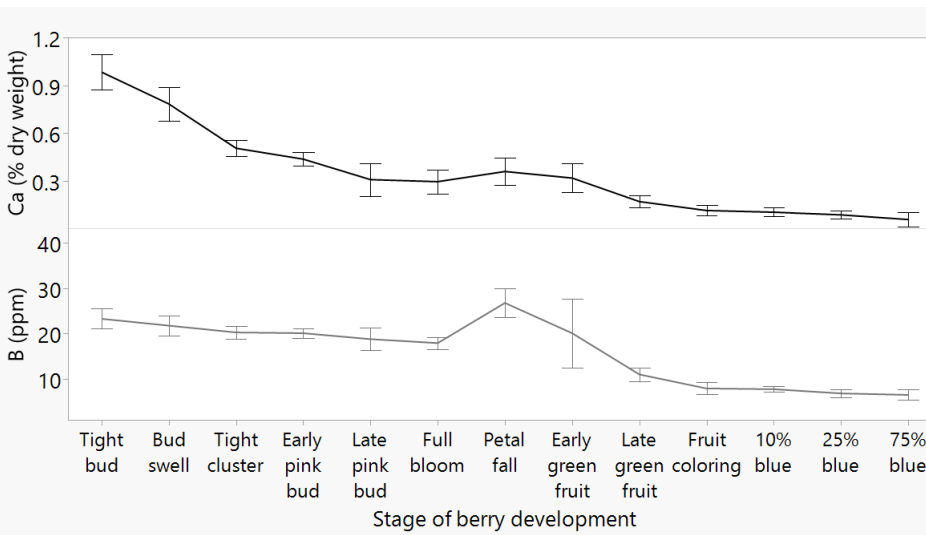
In the analysis of healthy and necrotic shoot tissues, no significant differences were found in Ca concentration in the healthy and necrotic shoots and between healthy and necrotic buds. The results were consistent across both years (Fig. 10). Conversely, B concentration was significantly higher in healthy shoots compared to necrotic shoots in both years. No differences were found in B concentration between healthy and necrotic buds in both years (Fig. 11).



A



B



C

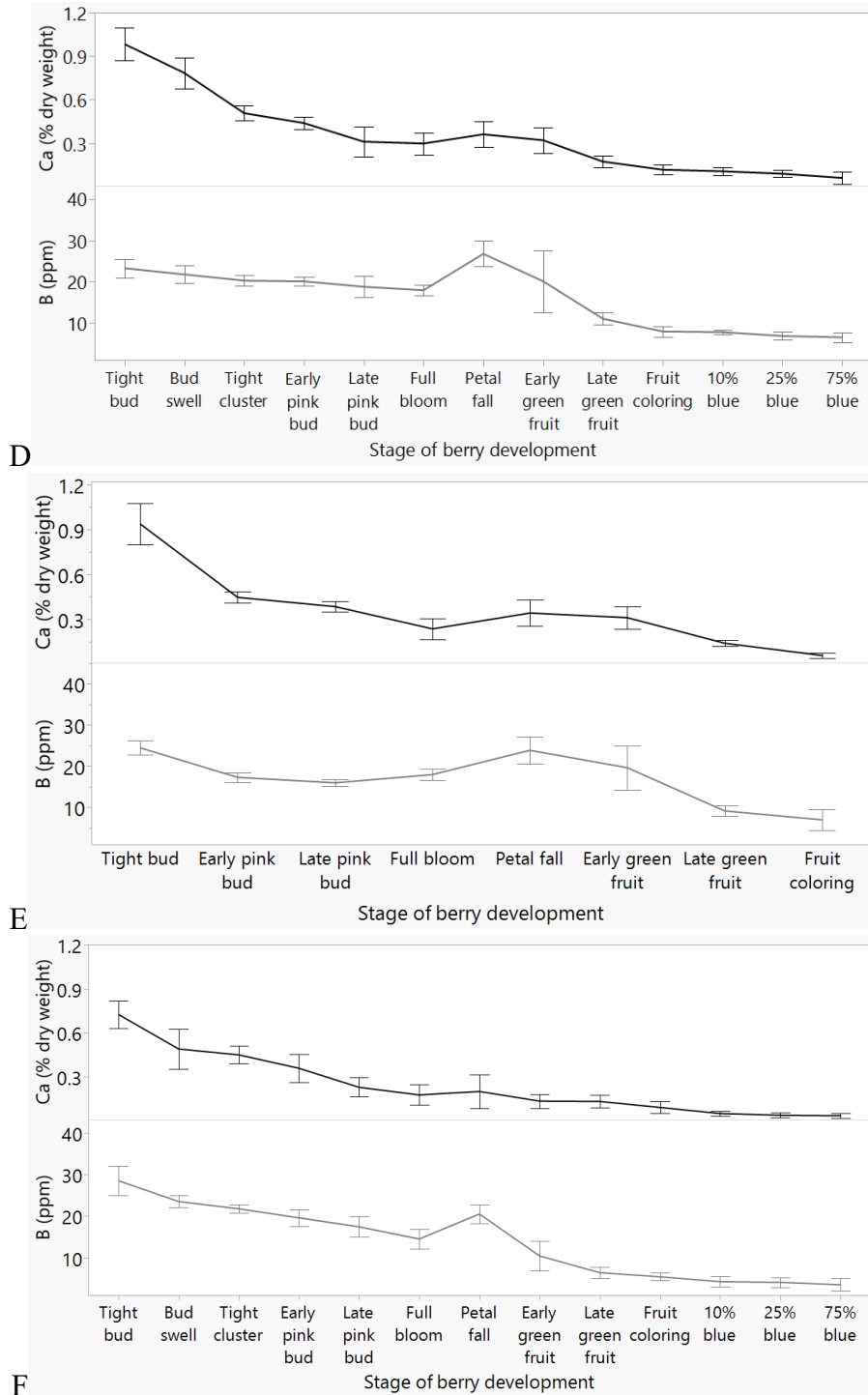


Figure 3. Calcium (% dry weight) and B (ppm) concentration in blueberry growth stages across three different farms: ‘Farthing’ in Farm 1 in 2024 (A) and 2025 (B), ‘Farthing’ in Farm 2 in 2024 (C) and 2025 (D), and ‘Brightwell’ in Farm 3 in 2024 (E) and 2025 (F). The Ca percentages were derived from a 0.5-gram sample.

Note: For 2024 data, for Farm 1 – ‘Farthing,’ we lack data for the tight bud and full bloom stages. And for the bud swell and tight cluster stages for Farm 3 – ‘Brightwell.’

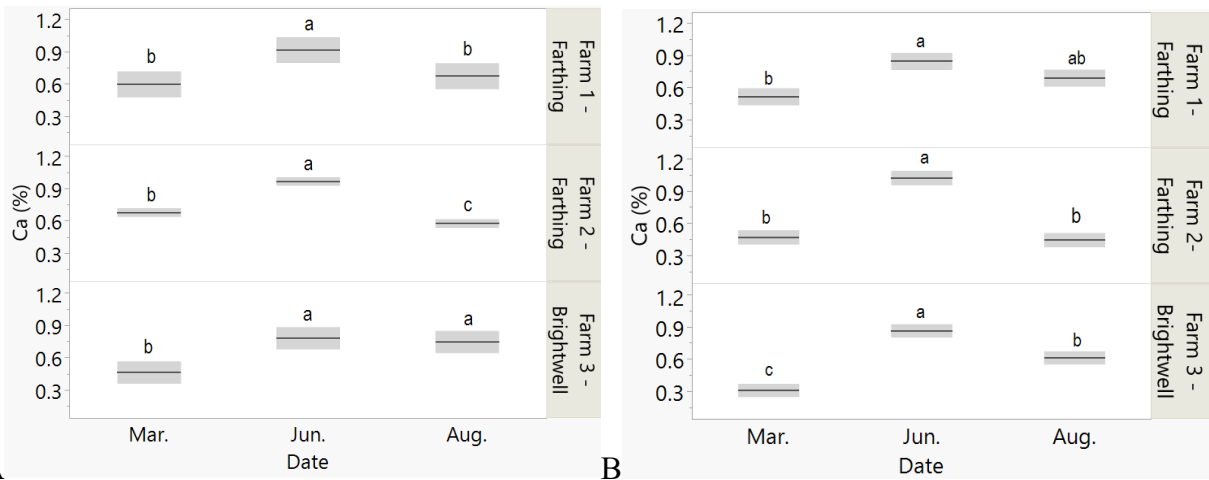


Figure 4. Leaf Ca concentration (%) in ‘Farthing’ and ‘Brightwell’ in the three commercial farms, 2024 (A) and 2025 (B). Different uppercase letters indicate significant differences ($p < 0.05$) for each evaluation date.

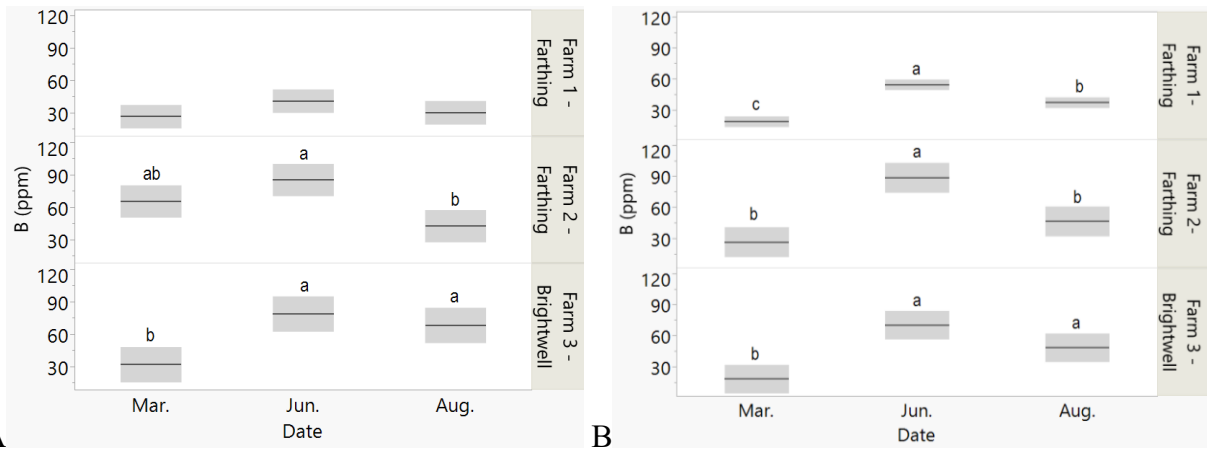


Figure 5. Leaf B concentration (ppm) in ‘Farthing’ and ‘Brightwell’ in the three commercial farms, 2024 (A) and 2025 (B). Different uppercase letters indicate significant differences ($p < 0.05$) for each evaluation date.

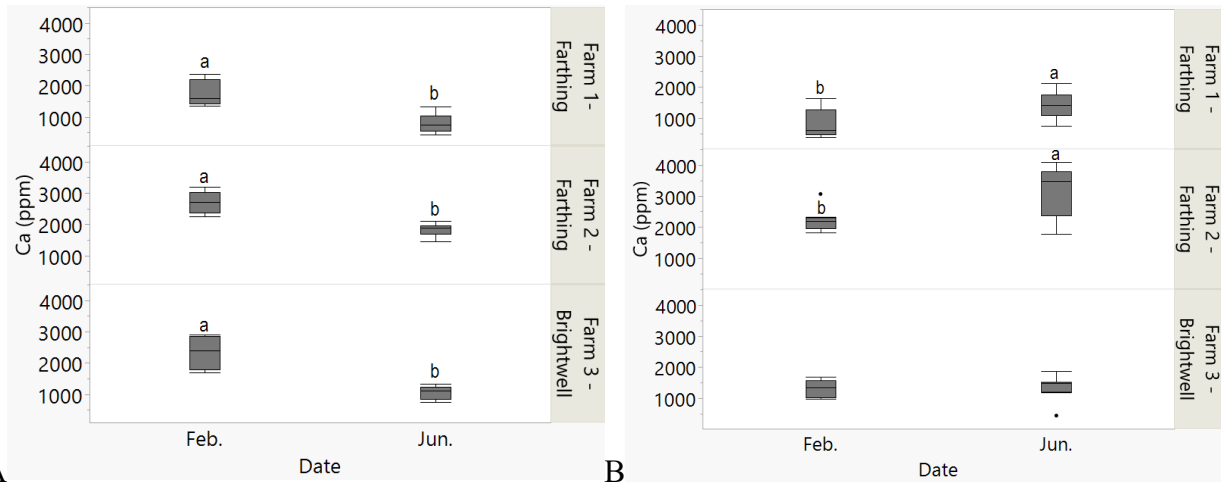


Figure 6. Calcium concentration (ppm) in the soil collected from commercial farms in Bacon and Ware County in 2024 (A) and 2025 (B). Different uppercase letters indicate significant differences ($p < 0.05$) within dates.

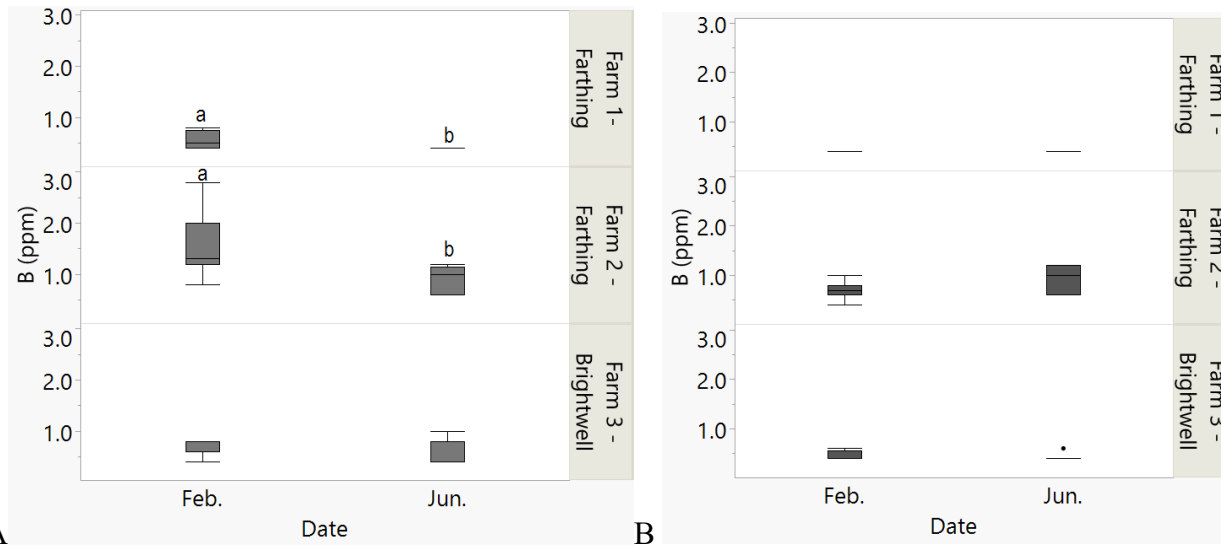


Figure 7. Boron concentration (ppm) in the soil collected from commercial farms in Bacon and Ware County in 2024 (A) and 2025 (B). Different uppercase letters indicate significant differences ($p < 0.05$) within dates.

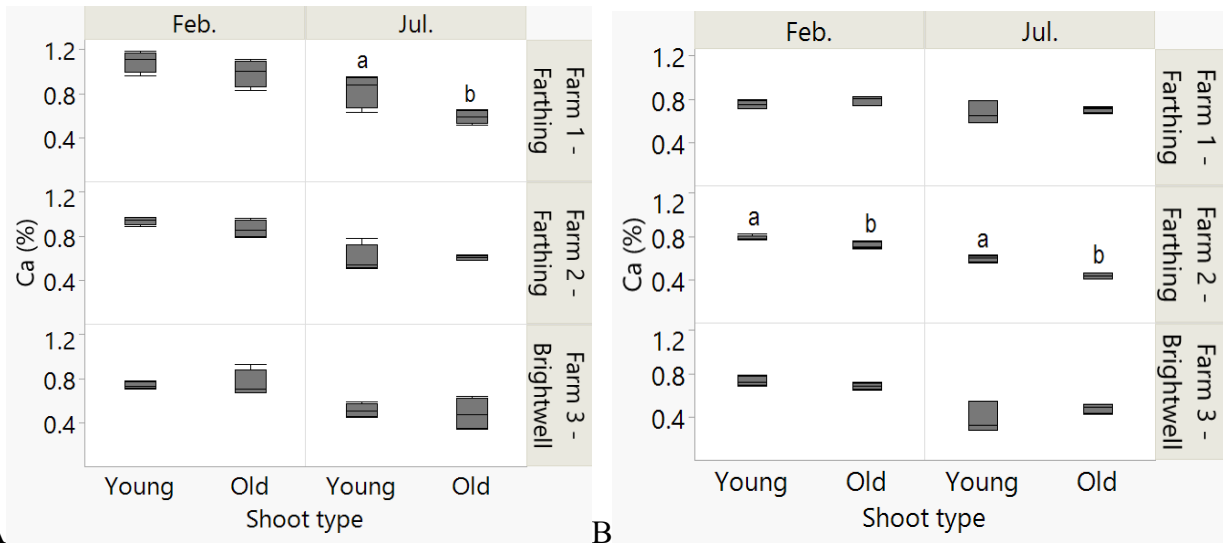


Figure 8. Calcium concentration (%) in young and old shoots collected from ‘Farthing’ and ‘Brightwell’ at commercial farms in Bacon and Ware county in 2024 (A) and 2025 (B). Different uppercase letters indicate significant differences ($p < 0.05$) within shoots in each sampling date.

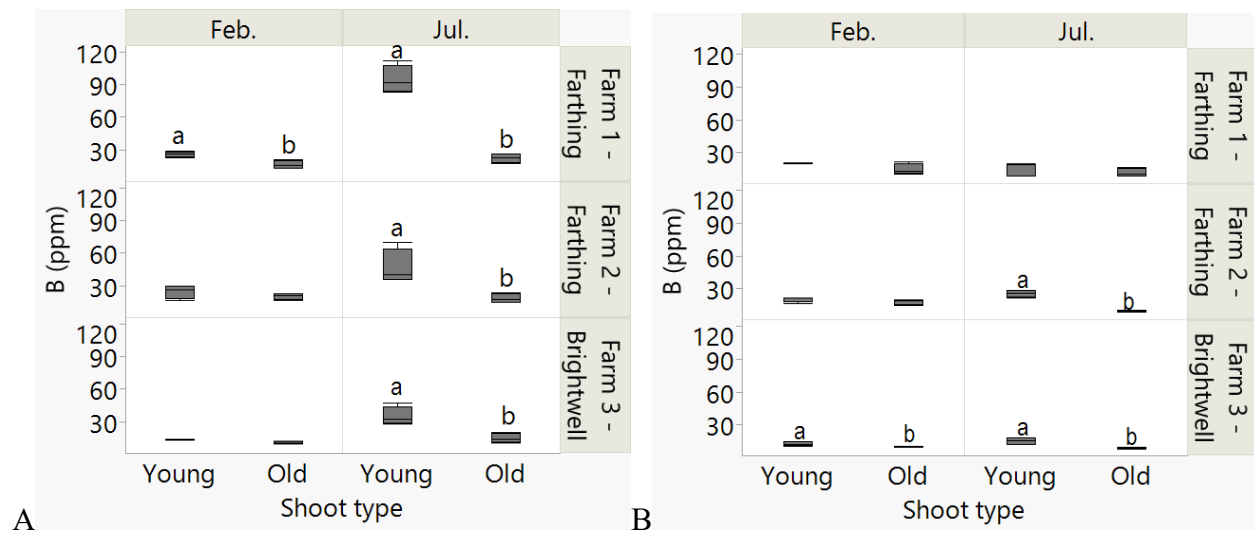


Figure 9. Boron concentration (ppm) in young and old shoots collected from ‘Farthing’ and ‘Brightwell’ at commercial farms in Bacon and Ware county in 2024 (A) and 2025 (B). Different uppercase letters indicate significant differences ($p < 0.05$) within shoots for each date.

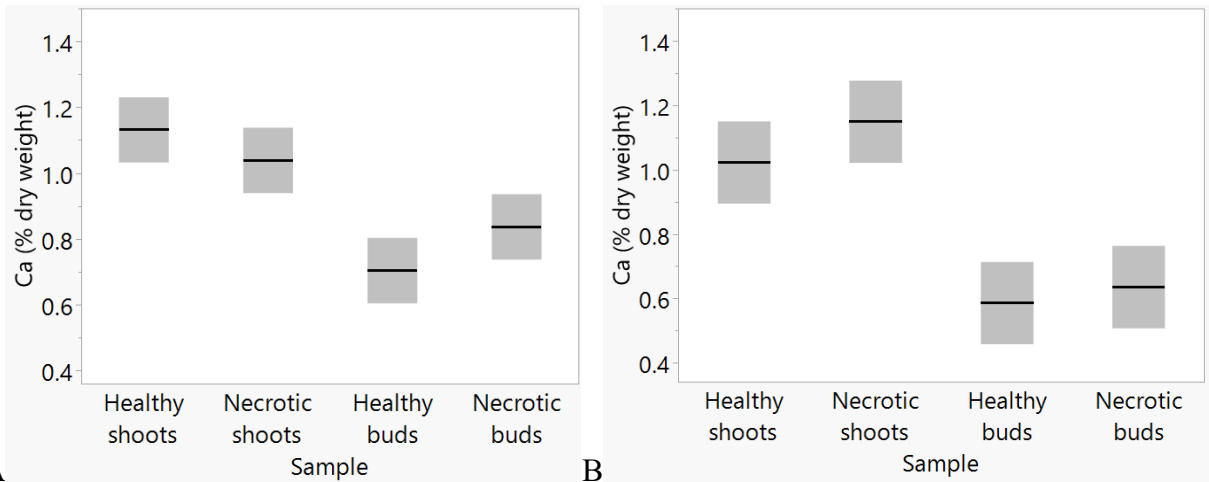


Figure 10. Calcium concentration (%) in young and necrotic blueberry shoots, and healthy and necrotic buds collected from ‘Farthing’ located in a commercial farm in March 2024 (A) and from a research farm in February 2025 (B). Different uppercase letters indicate significant differences ($p < 0.05$) within samples.

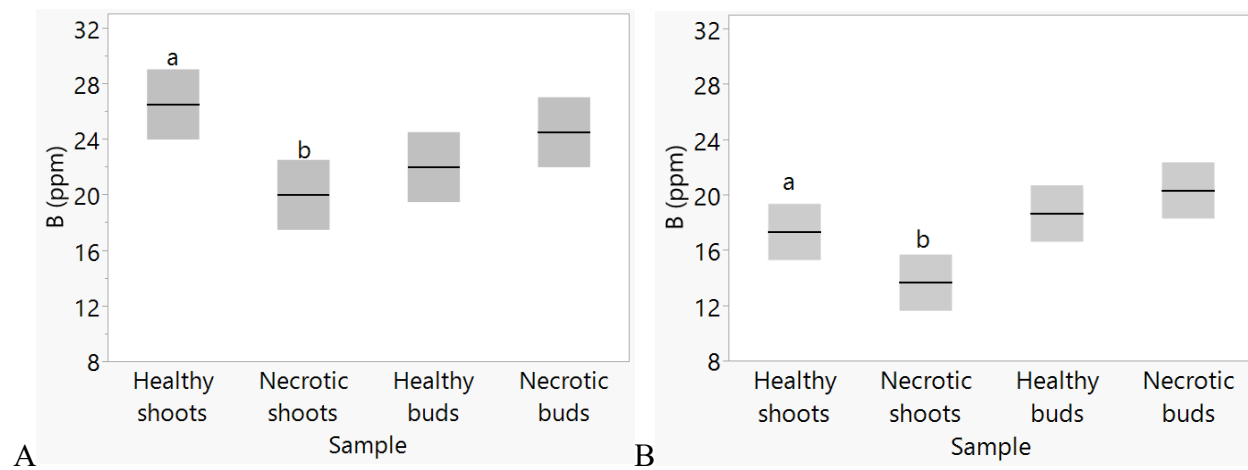


Figure 11. Boron concentration (ppm) in young and necrotic blueberry shoots, and healthy and necrotic buds collected from ‘Farthing’ located in a commercial farm in March 2024 (A) and from a research farm in February 2025 (B). Different uppercase letters indicate significant differences ($p < 0.05$) within samples.

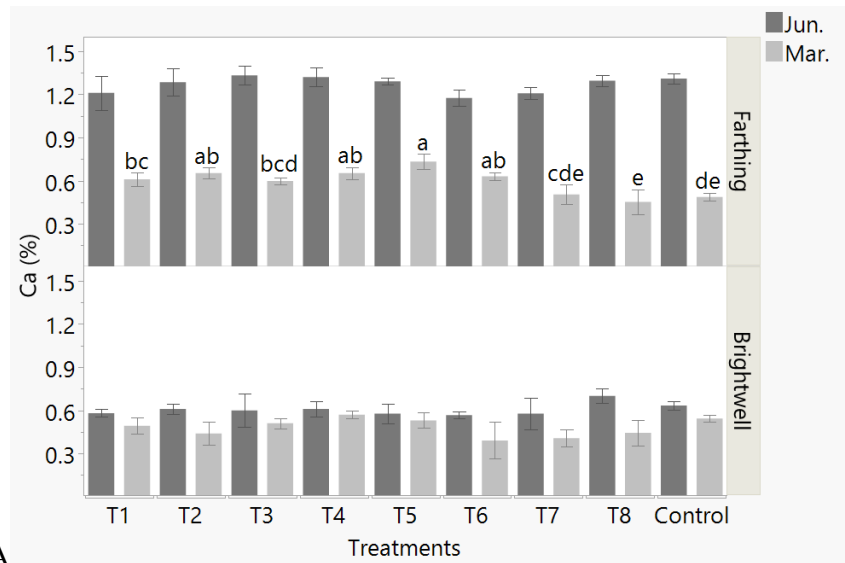
Experiment 2

Different sources of Ca were applied foliar and to the soil, combined with foliar applications of B: calcium oxide + humic acid + B low/high rate (T1 and T2 respectively), calcium oxide + B low/high rate (T3 and T4 respectively), calcium acetate at late pink bud and early green + B low/high rate (T5 and T6 respectively), calcium acetate at late green and fruit coloring + B low/high rate (T7 and T8 respectively), and untreated control (Control). These treatments were applied in 2024 and 2025 at the Alma Research Farm. In both years, leaf Ca concentration was highest in March under T5 (calcium acetate + B low rate) (Fig. 12) for the ‘Farthing’ cultivar, and in June 2025 in leaf from plants under T4 (calcium oxide + B high rate) compared to the other eight treatments. The ‘Brightwell’ cultivar had the highest leaf Ca concentration in March 2025

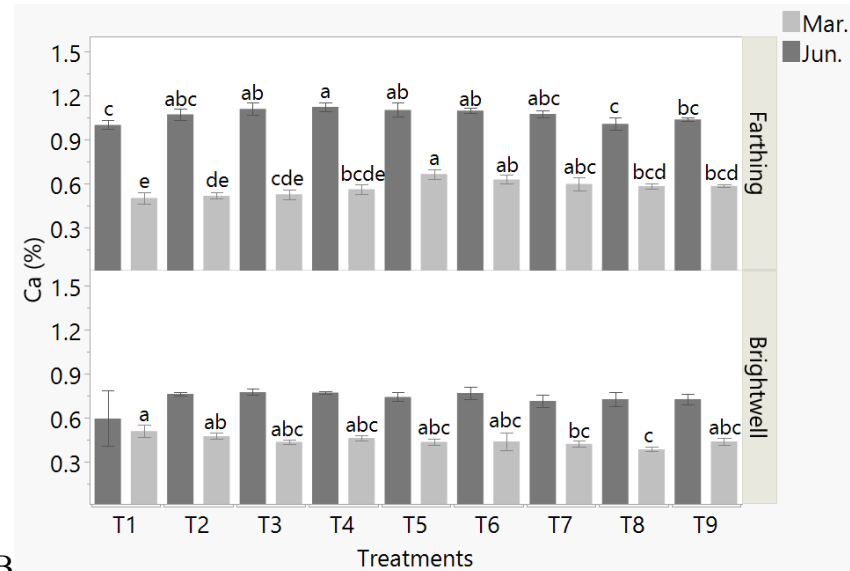
under T1 (calcium oxide + humic acid + B low rate) (Fig. 12B) compared to the other treatments. In both years, in 'Farthing,' leaf B concentration was significantly higher in March and June under T6 (calcium acetate + B high rate) compared to the control (Fig. 13). In 2024, leaf B concentration for 'Brightwell' was higher in March for plants under T6 (calcium acetate + B high rate), and in June under T2 (calcium oxide + humic acid + B high rate) compared to the control. In March 2025, leaf B concentration was higher under T6 (calcium acetate + B high rate) in comparison with the control, and in June under T3 (calcium oxide + B low rate), T6 (calcium acetate + B high rate), and T7 (calcium acetate + B low rate) compared with the other treatments.

The Soil Ca concentration in the 'Farthing' increased to 4000 ppm, which was higher compared to the 'Brightwell' cultivar, with values below 1000 ppm (Fig. 14). No significant differences in soil Ca concentration were found among the treatments in any of the cultivars tested, except in February 2024 for 'Farthing,' in which the highest soil Ca concentration was obtained under T3 (calcium oxide + B low rate). Significant differences in soil B concentration were found only in February for both cultivars and years (Fig. 15). In 2024, the highest soil B concentration was obtained under T3 (calcium oxide + B low rate) and T6 (calcium acetate + B high rate), and in 2025 for T1 (calcium oxide + humic acid + B low rate) in the 'Farthing' cultivar. For the 'Brightwell' cultivar, the highest soil B concentration was found under T7 (calcium acetate + B low rate) in 2024 and under T8 (calcium acetate + B high rate) in 2025.

There were no significant differences for fruit Ca concentration analysis among the treatments for any of the cultivars in any year (Fig. 16). In contrast, significant differences in B concentration were found for the two cultivars in both years. Fruit B concentration increased consistently under T6 (calcium acetate + B high rate) compared to the control (Fig. 17). Additionally, total yield was significantly higher only for the 'Farthing' cultivar in the two years of study (Fig. 18). In 2024, the highest yield was found under T7 (calcium acetate + B low rate) and T8 (calcium acetate + B high rate) compared to the other treatments, while in 2025 under T3 (calcium oxide + B low rate), T4 (calcium oxide + B high rate), T6 (calcium acetate + B high rate), T7 (calcium acetate + B low rate), and T8 (calcium acetate + B high rate) in comparison to the other treatments. The lowest total yield obtained from 'Farthing' plants was found under T1 (calcium oxide + humic acid + B low rate) and T5 (calcium acetate + B low rate) in 2024, and under T5 (calcium acetate + B low rate) in 2025. Additionally, firmness measurements were not significantly different between treatments for either cultivar (Fig. 19). The same results were found for total soluble solids, titratable acidity, and anthocyanin concentration (data not shown).



A



B

Figure 12. Leaf Ca concentration (%) in 'Farthing' and 'Brightwell' under different Ca and B treatments. Data collected in 2024 (A) and 2025 (B). Different uppercase letters indicate significant differences ($p < 0.05$) within treatments. Sufficiency range: 0.40-0.80%. Treatments: T1: Alcaplant + Pow Humus + Low B; T2: Alcaplant + Pow Humus + High B; T3: Alcaplant + Low B; T4: Alcaplant + High B; T5: calcium acetate (late pink bud and early green stage application) + Low B; T6: calcium acetate (late pink bud and early green stage application) + High B; T7: calcium acetate (late green and fruit coloring stage application) + Low B; T8: calcium acetate (late green and fruit coloring stage application) + High B; Control: no product application.

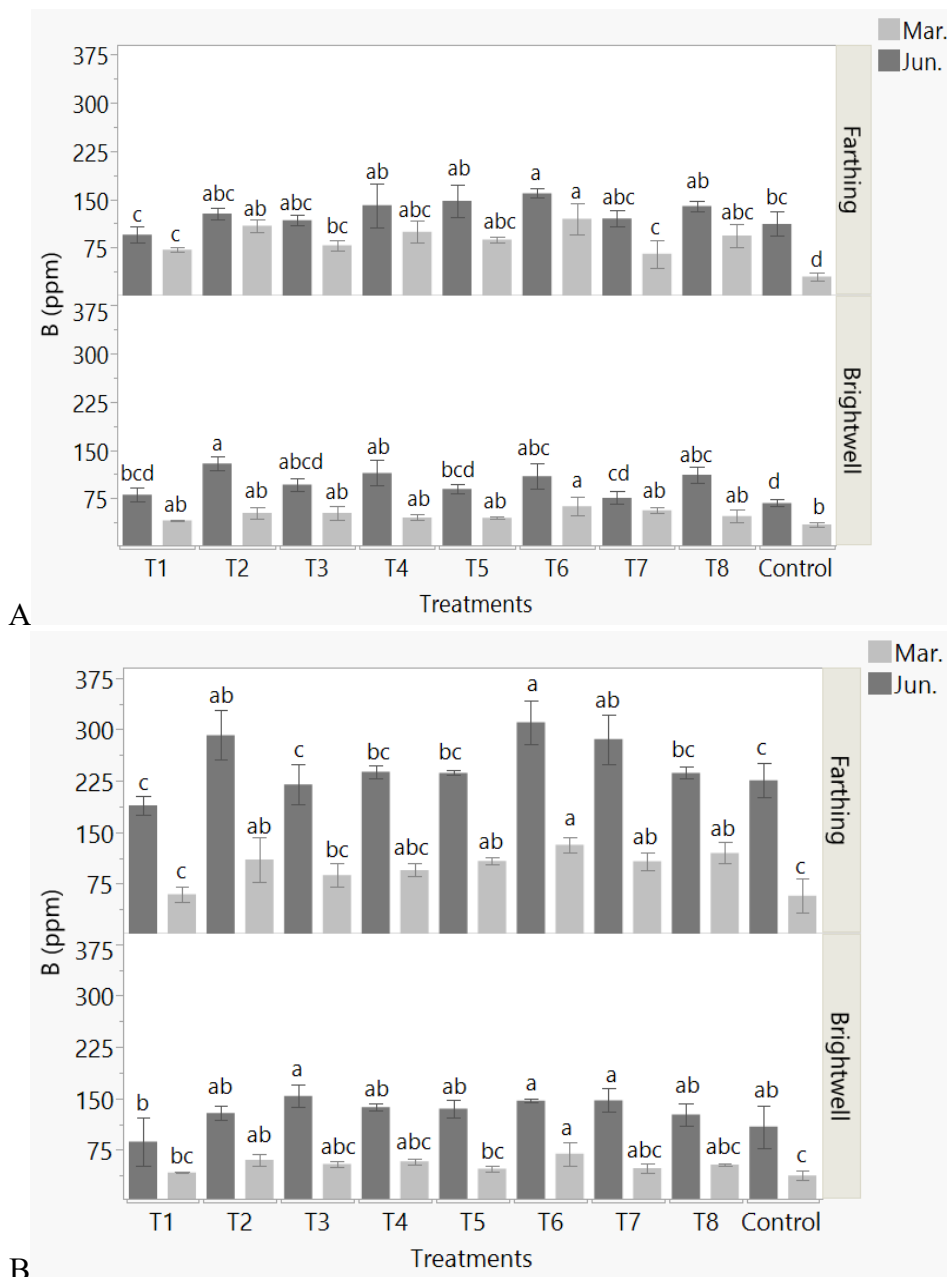


Figure 13. Leaf B concentration (ppm) in 'Farthing' and 'Brightwell' under different Ca and B treatments. Data collected in 2024 (A) and 2025 (B). Different uppercase letters indicate significant differences ($p < 0.05$) within treatments. Sufficiency range: 30-70 ppm. Treatments: T1: Alcaplant + Pow Humus + Low B; T2: Alcaplant + Pow Humus + High B; T3: Alcaplant + Low B; T4: Alcaplant + High B; T5: calcium acetate (late pink bud and early green stage application) + Low B; T6: calcium acetate (late pink bud and early green stage application) + High B; T7: calcium acetate (late green and fruit coloring stage application) + Low B; T8: calcium acetate (late green and fruit coloring stage application) + High B; Control: no product application.

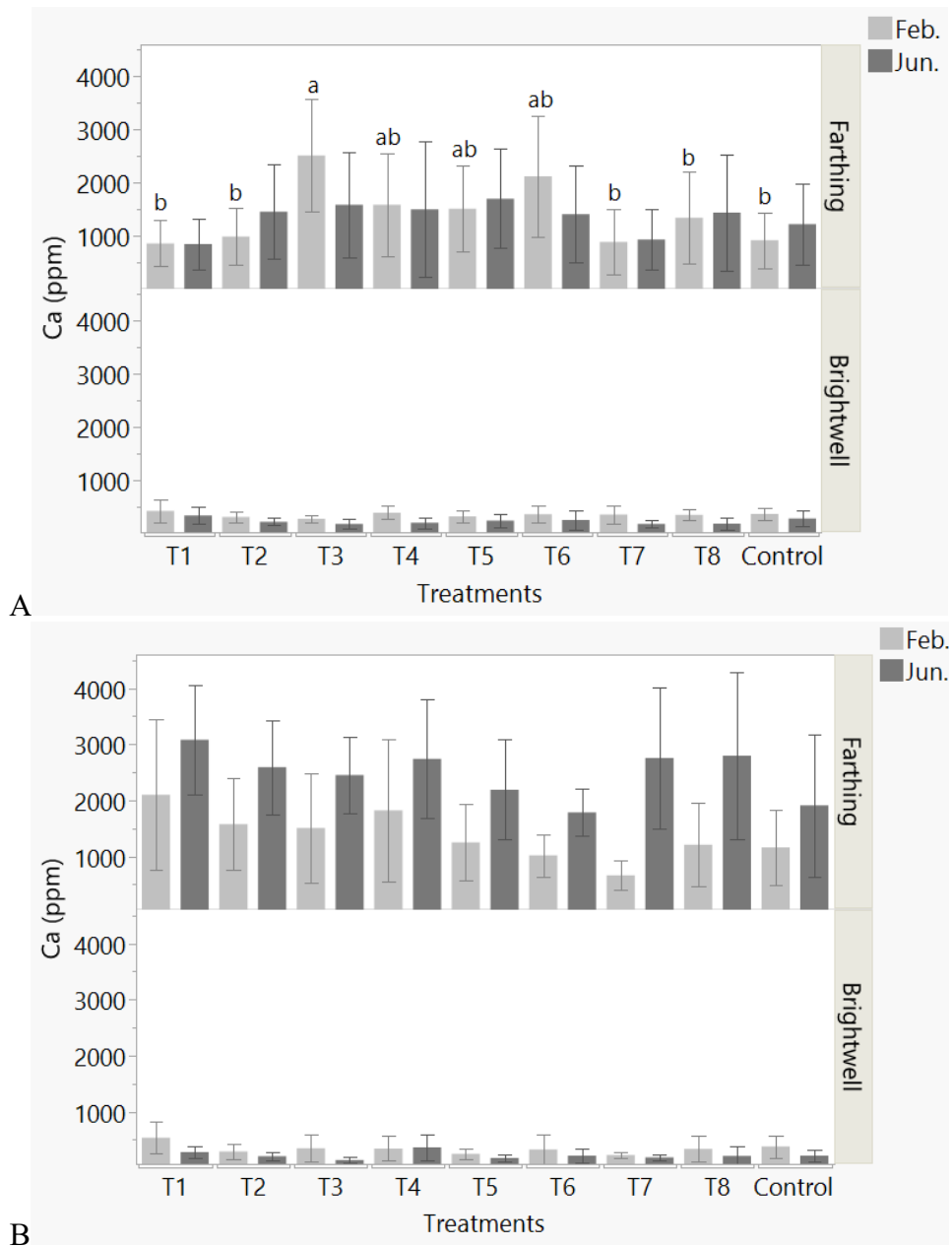


Figure 14. Soil Ca concentration (ppm) in ‘Farthing’ and ‘Brightwell’ under different Ca and B treatments. Data collected in 2024 (A) and 2025 (B). Different uppercase letters indicate significant differences ($p < 0.05$) within treatments. Treatments: T1: Alcaplant + Pow Humus + Low B; T2: Alcaplant + Pow Humus + High B; T3: Alcaplant + Low B; T4: Alcaplant + High B; T5: calcium acetate (late pink bud and early green stage application) + Low B; T6: calcium acetate (late pink bud and early green stage application) + High B; T7: calcium acetate (late green and fruit coloring stage application) + Low B; T8: calcium acetate (late green and fruit coloring stage application) + High B; Control: no product application.

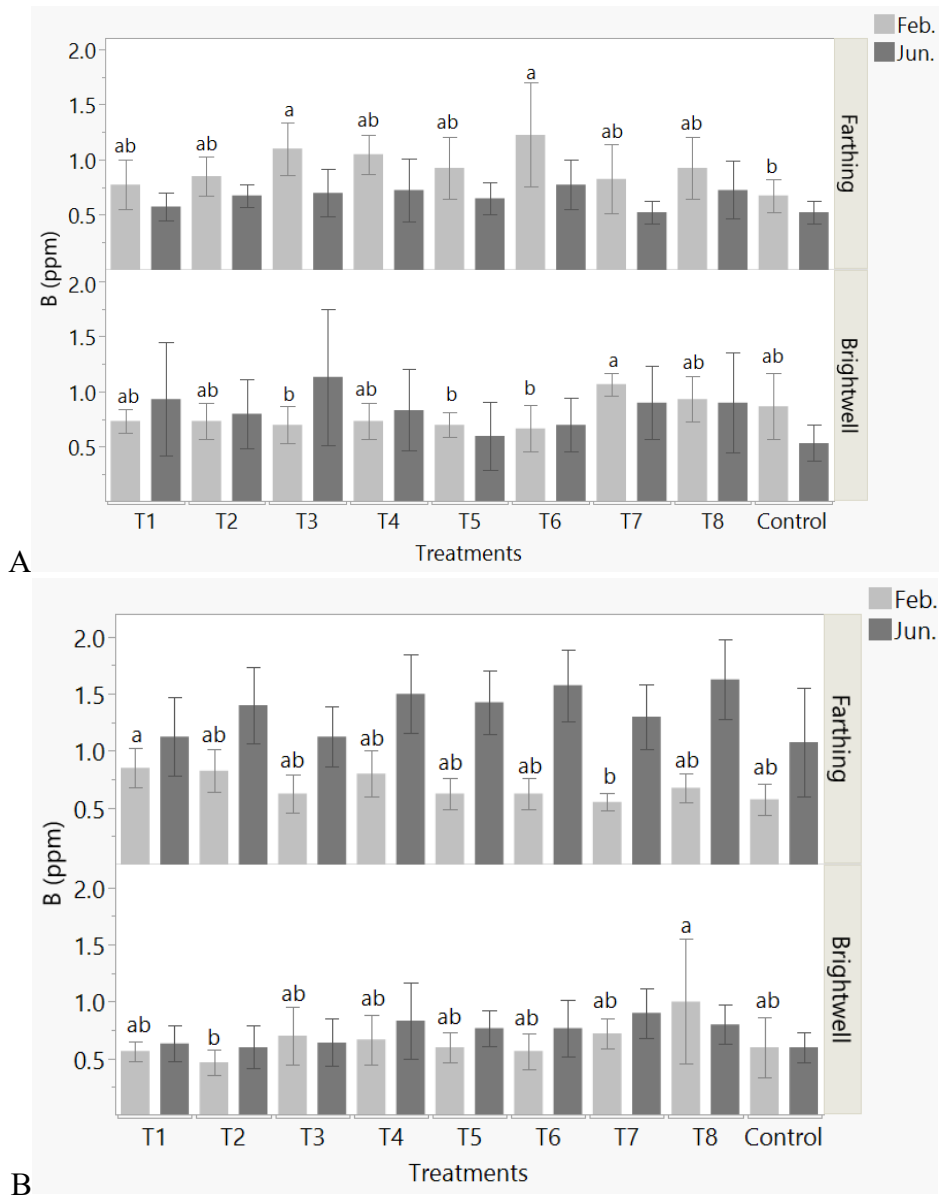


Figure 15. Soil B concentration (ppm) in ‘Farthing’ and ‘Brightwell’ under different Ca and B treatments. Data collected in 2024 (A) and 2025 (B). Different uppercase letters indicate significant differences ($p < 0.05$) within treatments. Treatments: T1: Alcaplant + Pow Humus + Low B; T2: Alcaplant + Pow Humus + High B; T3: Alcaplant + Low B; T4: Alcaplant + High B; T5: calcium acetate (late pink bud and early green stage application) + Low B; T6: calcium acetate (late pink bud and early green stage application) + High B; T7: calcium acetate (late green and fruit coloring stage application) + Low B; T8: calcium acetate (late green and fruit coloring stage application) + High B; Control: no product application.

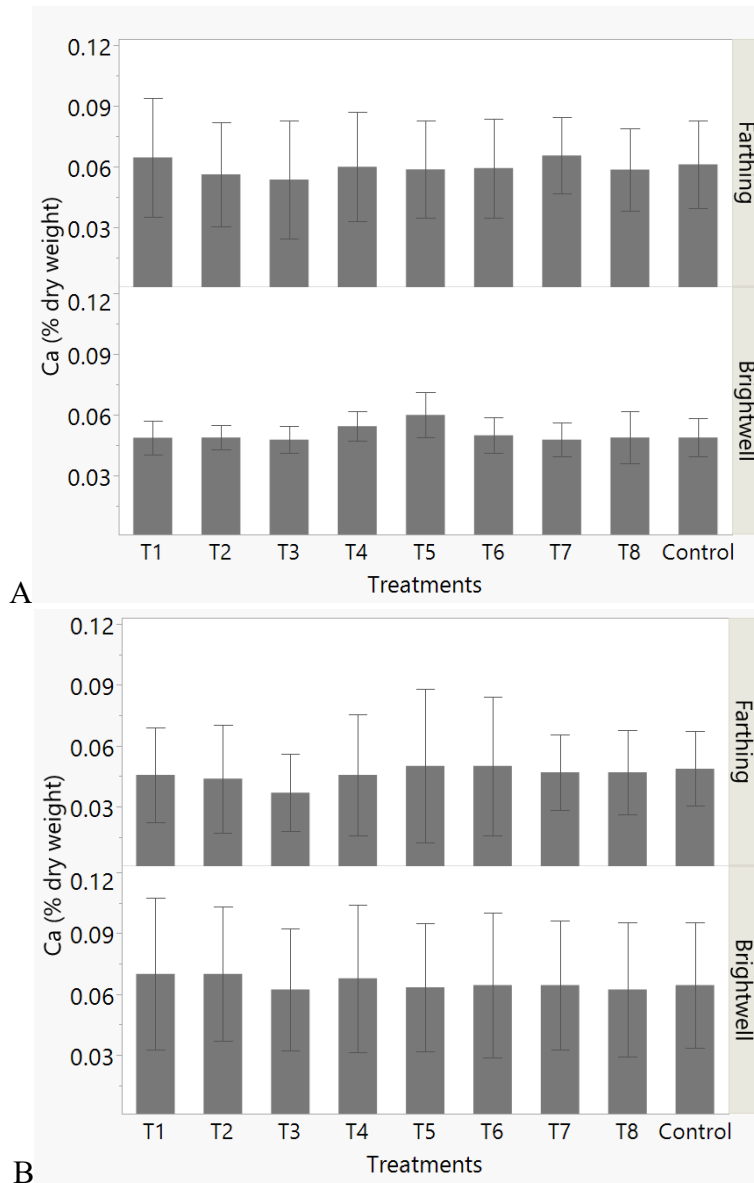


Figure 16. Fruit Ca (%) concentration in 'Farthing' and 'Brightwell' under different Ca and B treatments. Data collected in 2024 (A) and 2025 (B). Different uppercase letters indicate significant differences ($p < 0.05$) within treatments. Treatments: T1: Alcaplant + Pow Humus + Low B; T2: Alcaplant + Pow Humus + High B; T3: Alcaplant + Low B; T4: Alcaplant + High B; T5: calcium acetate (late pink bud and early green stage application) + Low B; T6: calcium acetate (late pink bud and early green stage application) + High B; T7: calcium acetate (late green and fruit coloring stage application) + Low B; T8: calcium acetate (late green and fruit coloring stage application) + High B; Control: no product application.

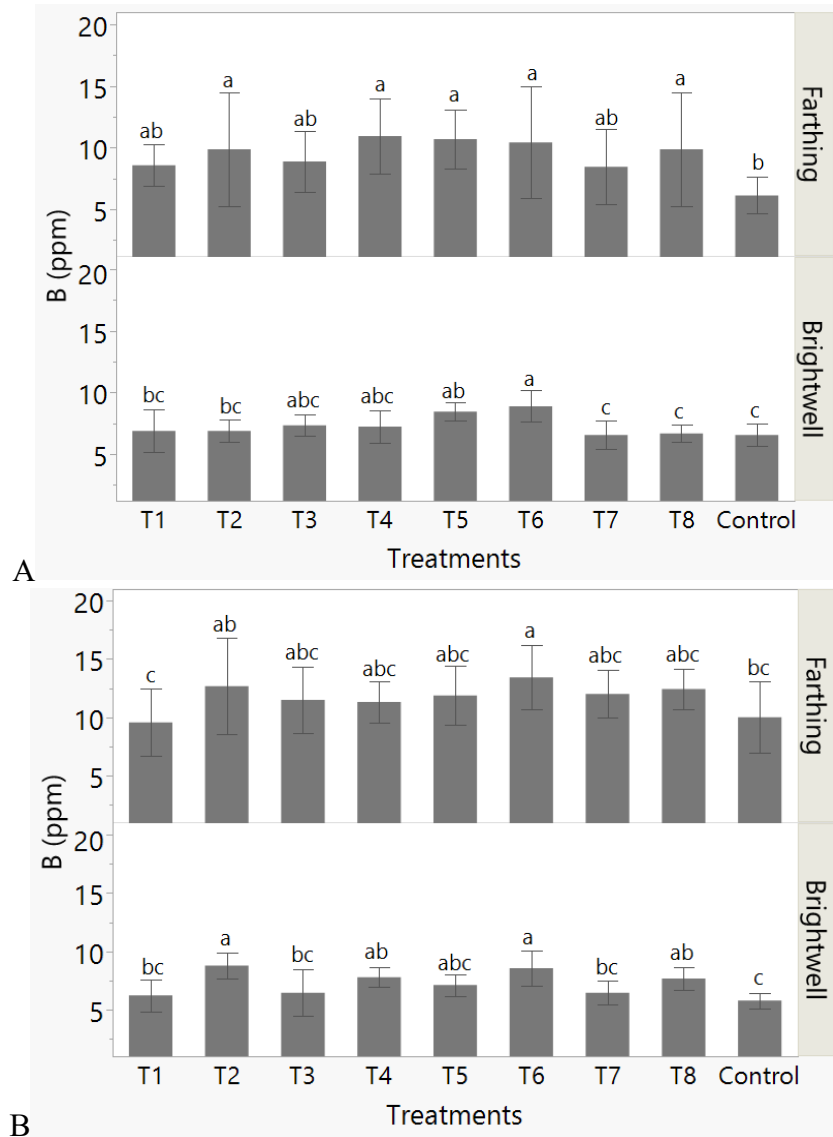


Figure 17. Fruit B concentration (ppm) in ‘Farthing’ and ‘Brightwell’ under different Ca and B treatments. Data collected in 2024 (A) and 2025 (B). Different uppercase letters indicate significant differences ($p < 0.05$) within treatments. Treatments: T1: Alcaplant + Pow Humus + Low B; T2: Alcaplant + Pow Humus + High B; T3: Alcaplant + Low B; T4: Alcaplant + High B; T5: calcium acetate (late pink bud and early green stage application) + Low B; T6: calcium acetate (late pink bud and early green stage application) + High B; T7: calcium acetate (late green and fruit coloring stage application) + Low B; T8: calcium acetate (late green and fruit coloring stage application) + High B; Control: no product application.

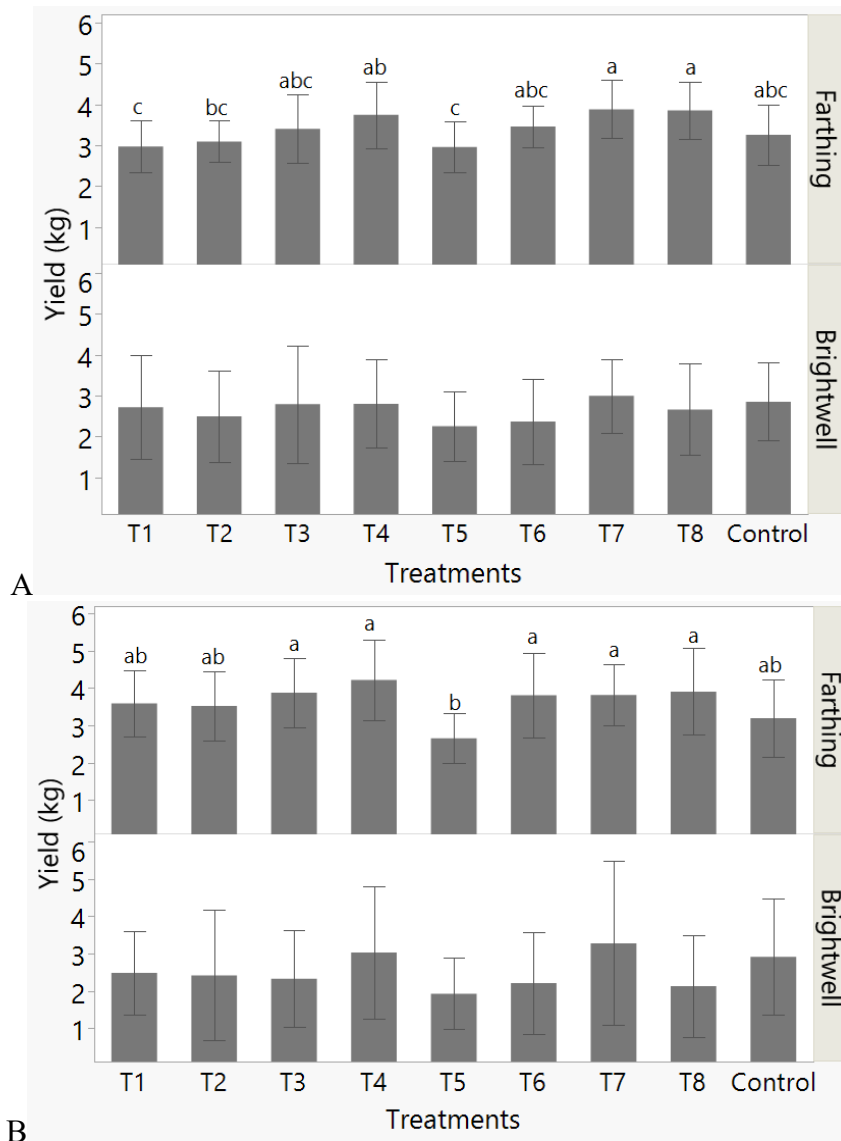


Figure 18. Total yield (kg) in ‘Farthing’ and ‘Brightwell’ under different Ca and B treatments. Data collected in 2024 (A) and 2025 (B). Different uppercase letters indicate significant differences ($p < 0.05$) within treatments. Treatments: T1: Alcaplant + Pow Humus + Low B; T2: Alcaplant + Pow Humus + High B; T3: Alcaplant + Low B; T4: Alcaplant + High B; T5: calcium acetate (late pink bud and early green stage application) + Low B; T6: calcium acetate (late pink bud and early green stage application) + High B; T7: calcium acetate (late green and fruit coloring stage application) + Low B; T8: calcium acetate (late green and fruit coloring stage application) + High B; Control: no product application.

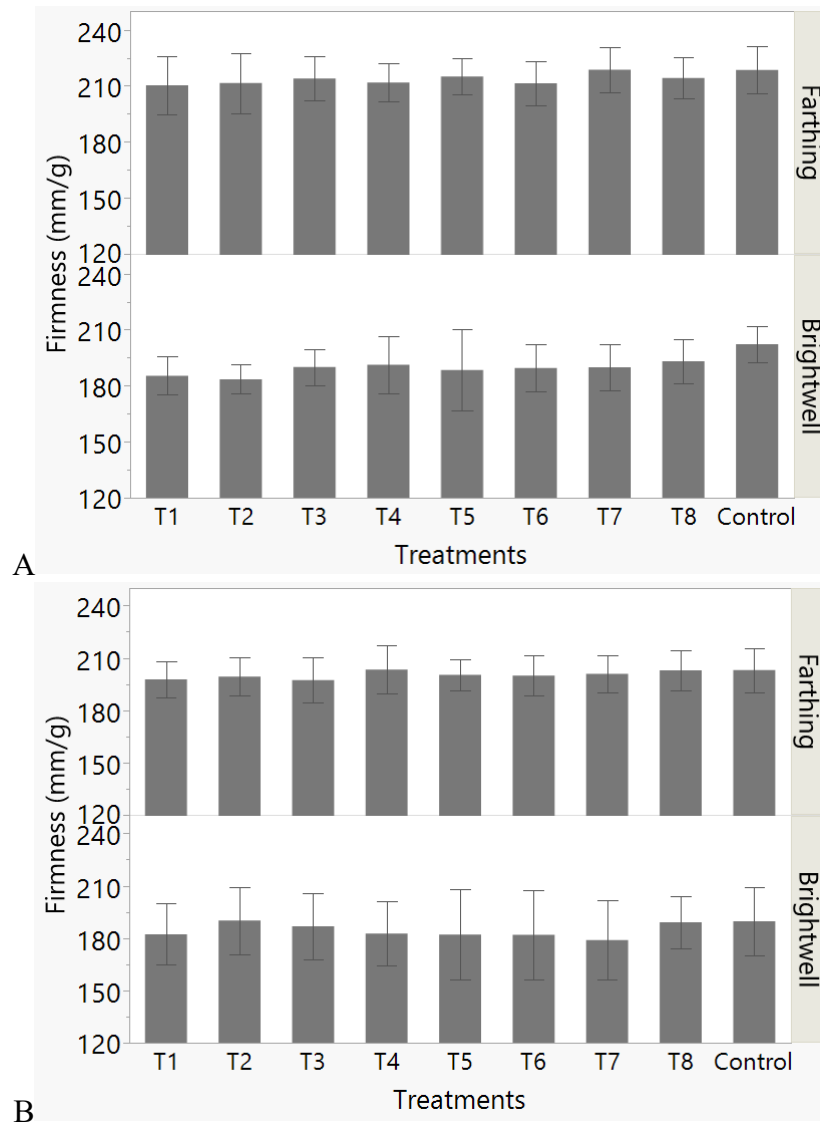


Figure 19. Firmness (mm/g) in ‘Farthing’ and ‘Brightwell’ under different Ca and B treatments. Data collected in 2024 (A) and 2025 (B). Different uppercase letters indicate significant differences ($p < 0.05$) within treatments. Treatments: T1: Alcaplant + Pow Humus + Low B; T2: Alcaplant + Pow Humus + High B; T3: Alcaplant + Low B; T4: Alcaplant + High B; T5: calcium acetate (late pink bud and early green stage application) + Low B; T6: calcium acetate (late pink bud and early green stage application) + High B; T7: calcium acetate (late green and fruit coloring stage application) + Low B; T8: calcium acetate (late green and fruit coloring stage application) + High B; Control: no product application.

Conclusions

Calcium and B concentrations increased at the petal fall stage across the evaluated farms. Then, the nutrient concentration decreased as the blueberry fruit developed. In the second study, Ca and B applications did not increase fruit Ca concentration but did increase leaf and fruit B concentration under T6 (calcium acetate + B high rate) compared with the other treatments. However, yield was not increased compared to the control. And firmness, total soluble solids,

titratable acidity, and anthocyanin concentration remained unchanged across treatments in both years.

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