

Foliar application for apple



Study details

Research institution: University of Horticulture and Forestry, Institute of Soil Science

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Date: 2024 and 2025

Location: Solan, Himachal Pradesh, India

Crop variety: Red Velox

Soil before study start:

pH: 6.45	Mg: 2.22 (cmol (p+) kg ⁻¹)
OC: 1.24%	B: 0.44 mg kg ⁻¹
EC: 0.14 dSm ⁻¹	Cu: 1.38 mg kg ⁻¹
N: 298.44 kg/ha	Mn: 5.35 mg kg ⁻¹
P: 70.89 kg/ha	Zn: 2.22 mg kg ⁻¹
K: 258.05 kg/ha	Fe: 13.24 mg kg ⁻¹
Ca: 3.15 (cmol (p+) kg ⁻¹)	

Synergy between calcium and boron

Calcium and boron are nutrients that play key roles in plant nutrition and plant physiology. Both nutrients, when supplied adequately to plants, provide greater productivity and quality of grains and fruits. In the literature, the main functions of calcium and boron in plant nutrition and plant physiology are associated with pollen tube growth and development, cell wall formation, pollen germination, pollen tube growth, flower and fruit formation, and flower and fruit viability.



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Plant age: 7 years

Number of selected plants: 78

Spacing: 2.5m x 1m

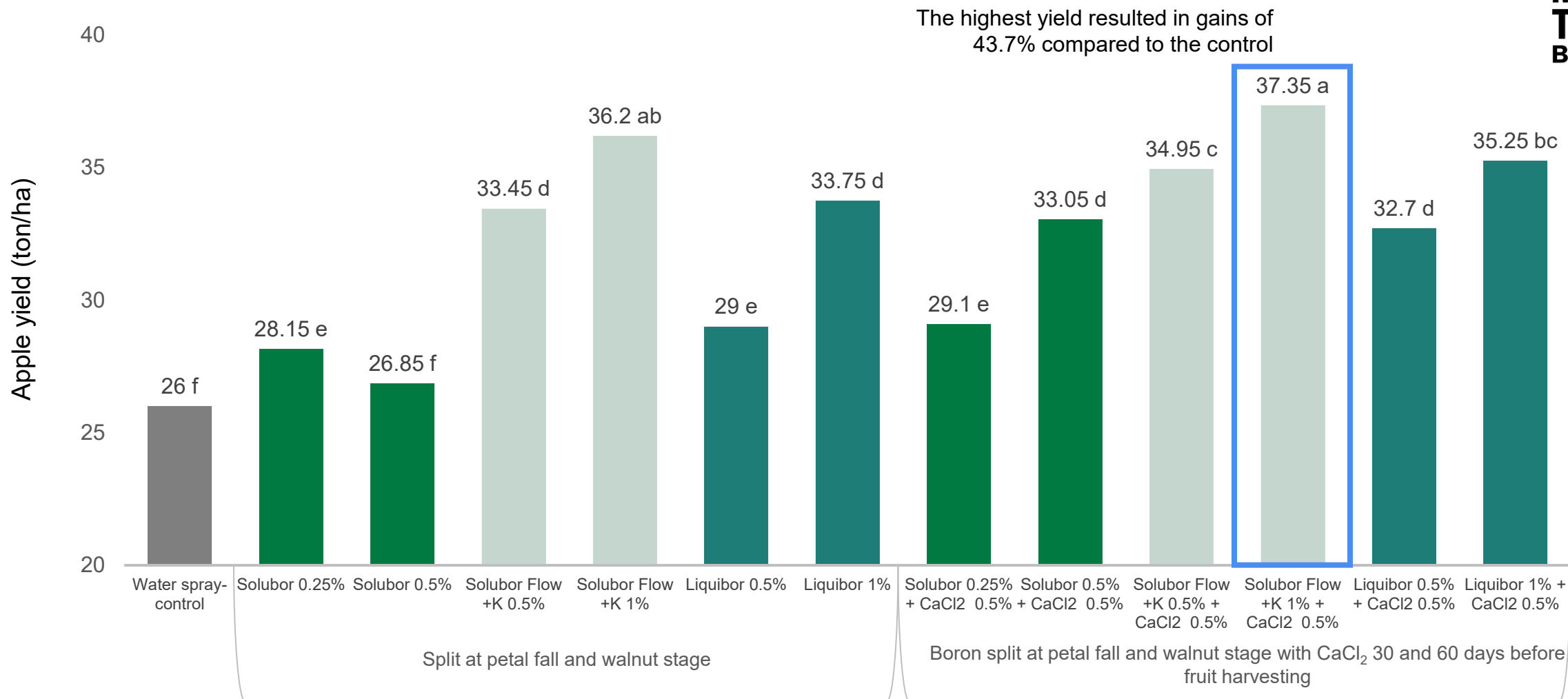
Fertilizer: *Solubor*[®], *Liquibor*[®], and *Solubor Flow +K*

Methodology: Two field experiments (one based on soil application and other on foliar application of boron) were conducted during a two-year period. The apple plants selected for the experiments were uniform in size and vigor. They also received uniform doses of fertilizers, according to university recommendations (as per POP) and as per treatments applied. The experiments were laid out in randomized block design (RBD) with three replications.

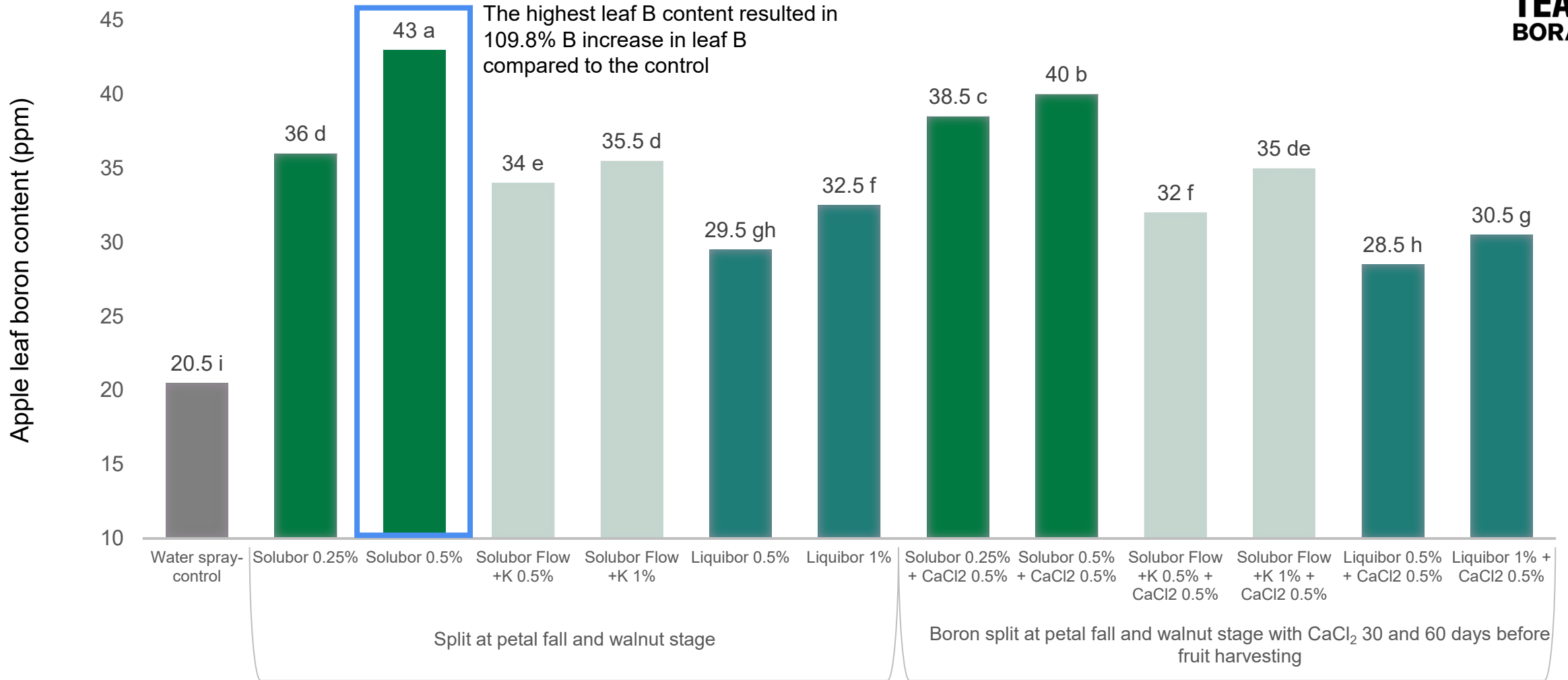
Statistical analysis: Statistical analysis was conducted using SPSS (version 14.0) and Microsoft Excel 2021. Analysis of variance (ANOVA) was employed to determine the significance of variations among treatments, while significant differences between treatment means were identified using the Critical Difference ($CD_{0.05}$) and Duncan Multiple Range Test (DMRT) at a 5% significance level.



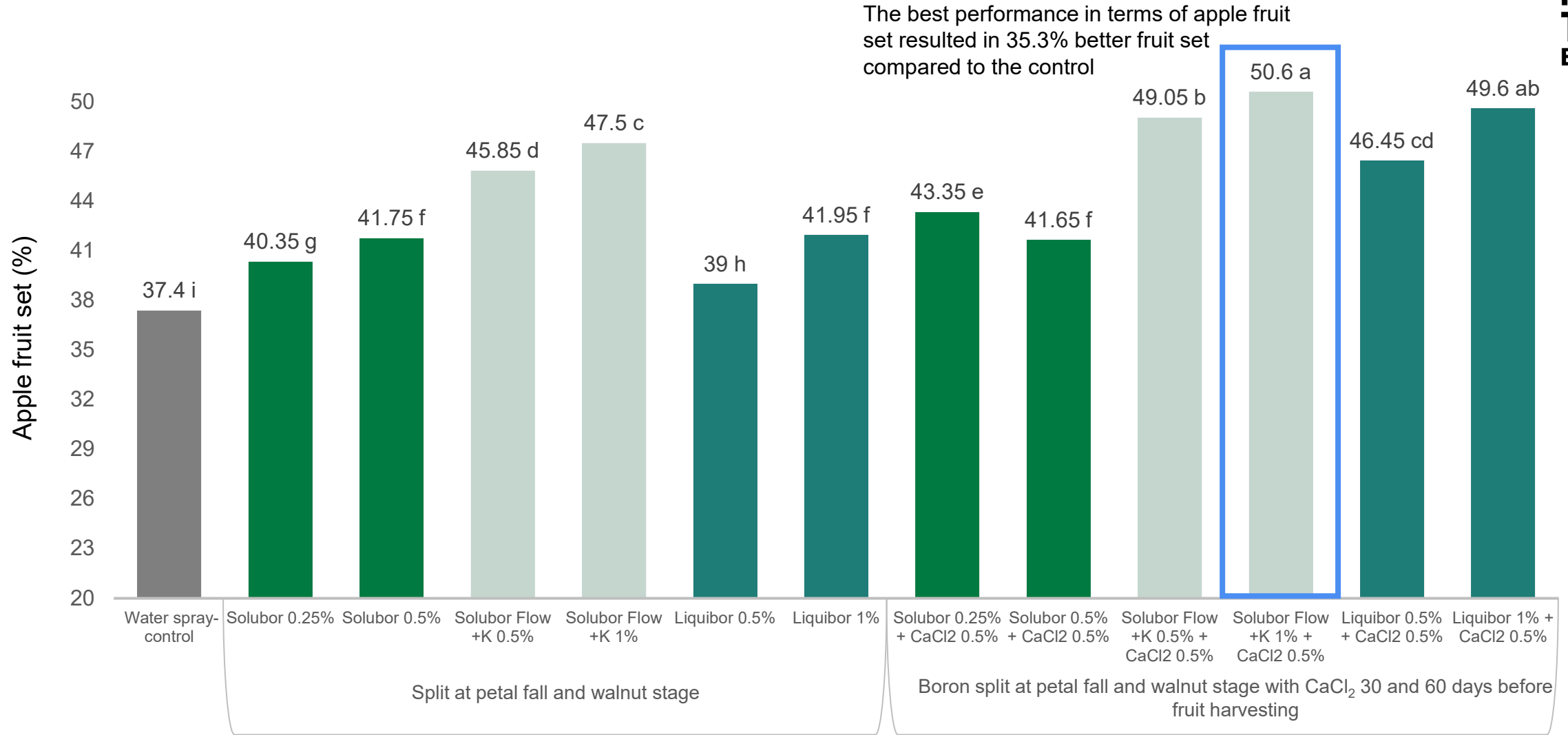
Apple yield (ton/ha)



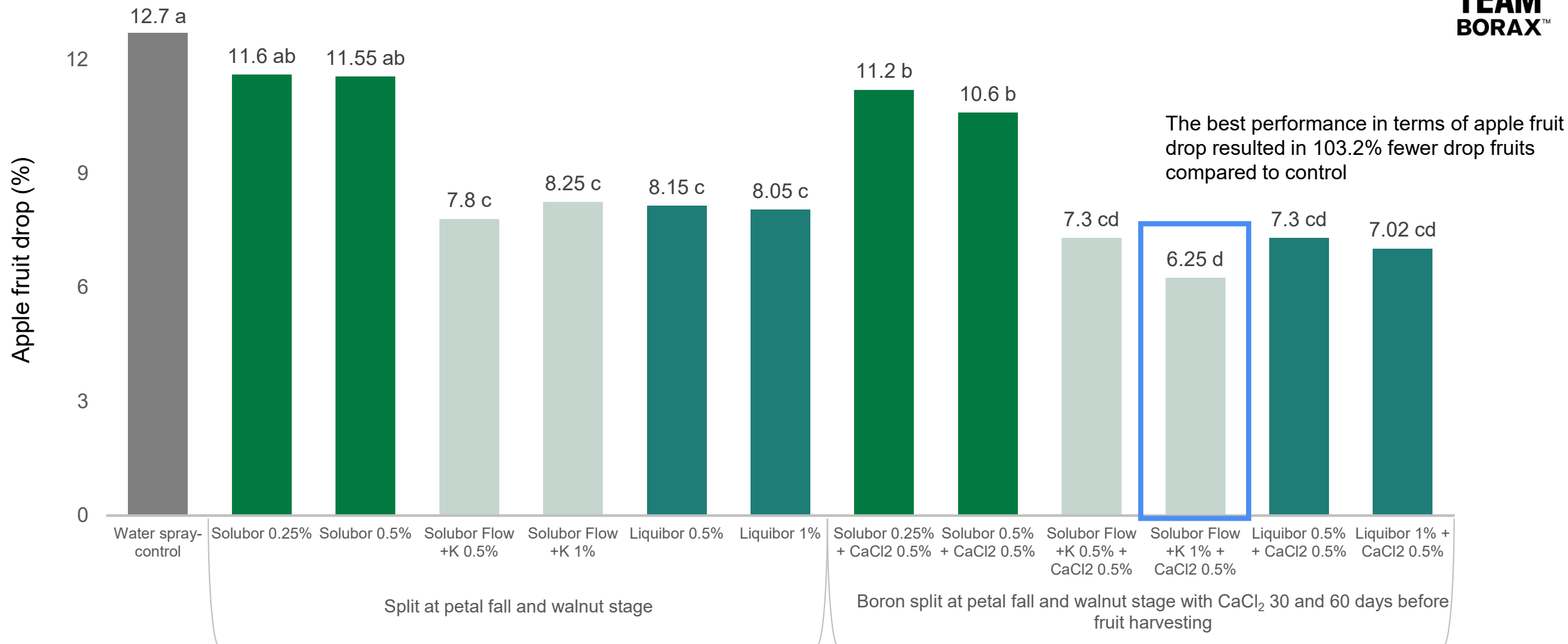
Apple leaf boron content (ppm)



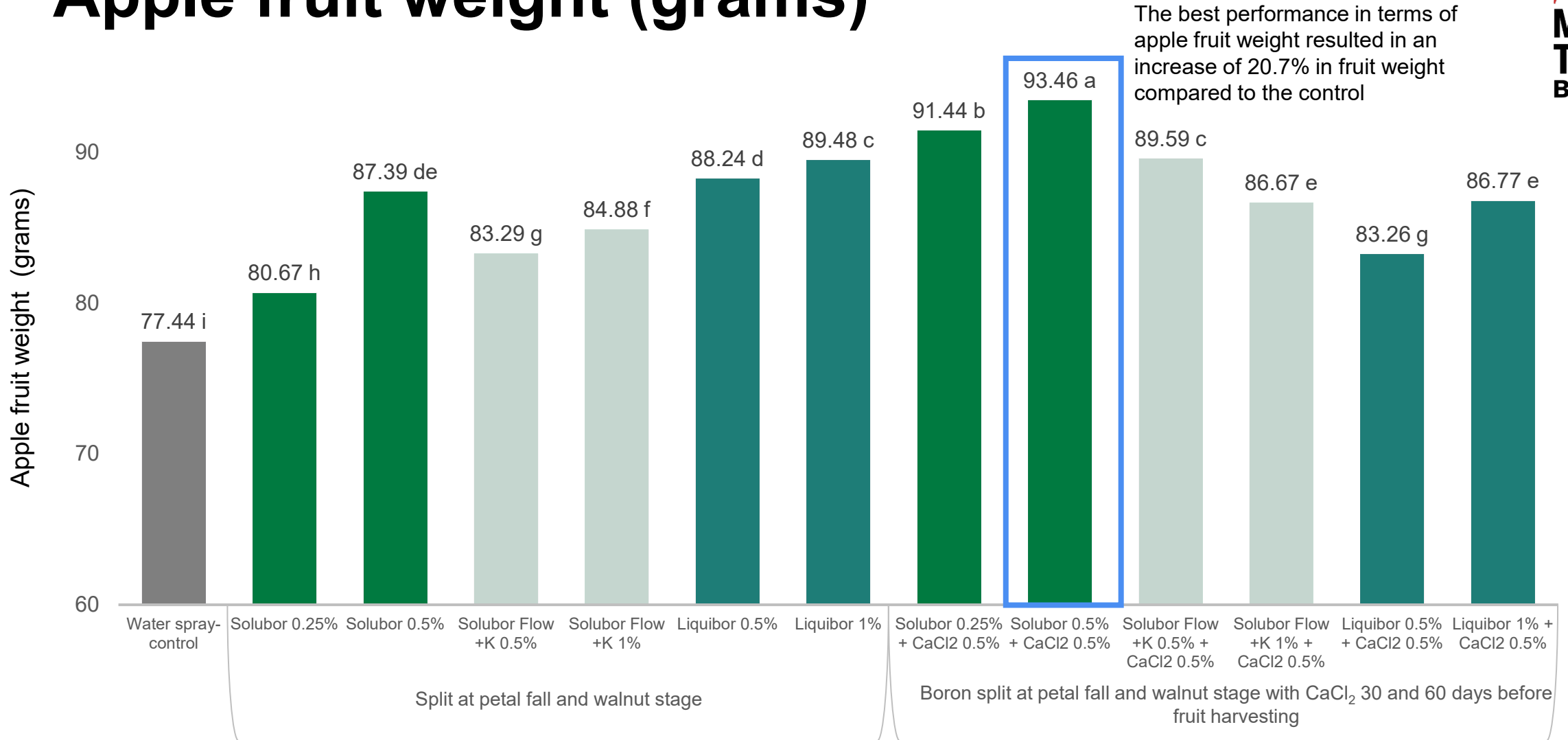
Apple fruit set (%)



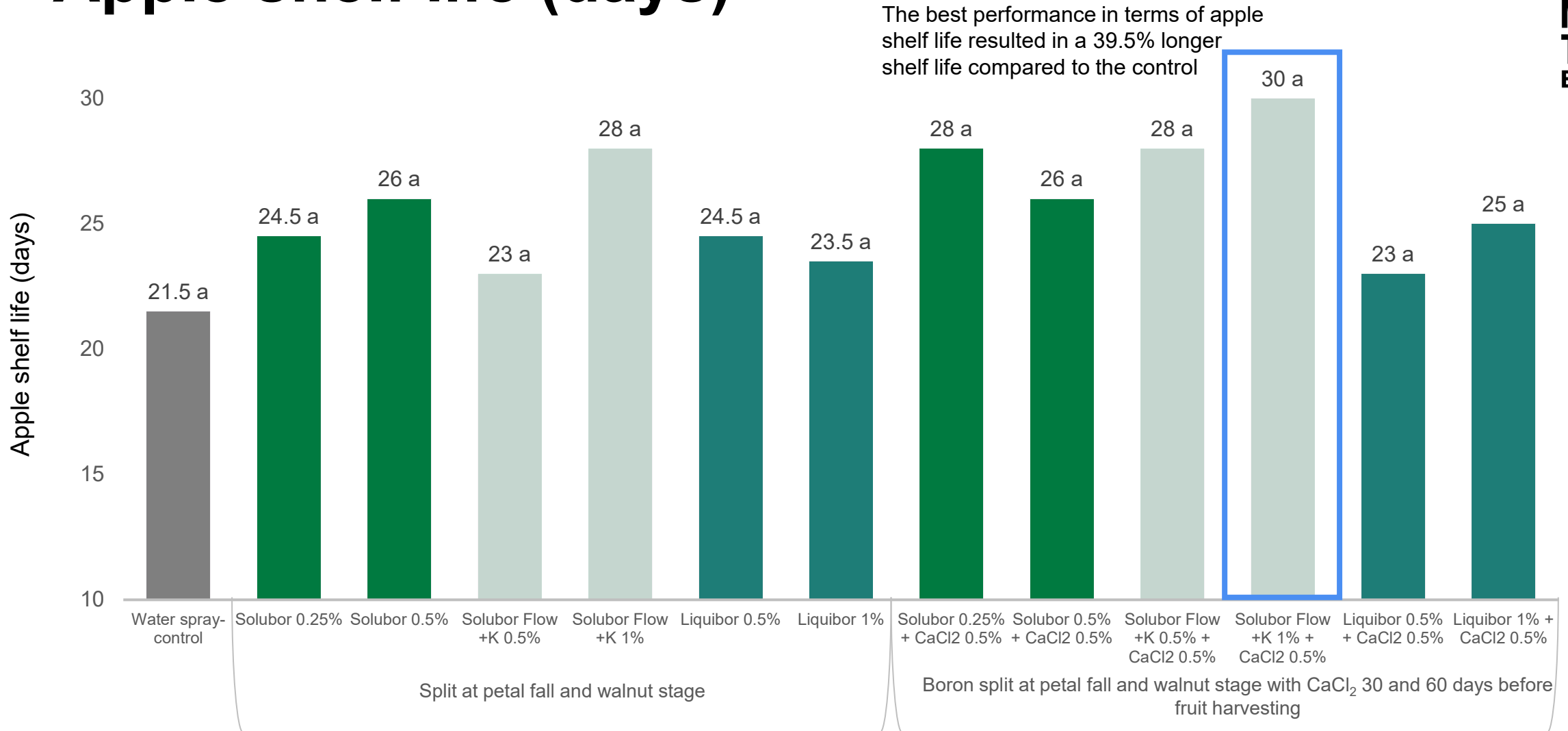
Apple fruit drop (%)



Apple fruit weight (grams)



Apple shelf life (days)





Conclusions

Foliar application of different boron sources exhibited a pronounced effect on apple yield and fruit quality parameters.

The application of *Solubor* Flow +K at 1% at the petal fall and walnut stages, in conjunction with CaCl_2 at 0.5% applied at 30 and 60 days prior to harvest, was found to be the best in maximizing fruit yield, improving fruit set, reducing premature fruit drop and increasing shelf life of fruits; followed by *Liquibor* at 1% applied in split doses at the petal fall and walnut stages, along with CaCl_2 at 0.5%, which also demonstrated significant improvement in yield related attributes.

Application of *Solubor* at 0.5% at the petal fall and walnut stages, combined with CaCl_2 @ 0.5% at 30 and 60 days before fruit harvesting, was observed to be particularly effective in enhancing fruit size and improving various quality parameters.

Overall, the study highlighted that both soil and foliar application of boron sources emerged as a highly effective strategy for improving fruit retention, yield and quality parameters in apple.

