

UNDERSTANDING THE INFLUENCE OF NUTRIENT MANAGEMENT STRATEGIES IN HIGH-PERFORMANCE AVOCADO ORCHARDS ON FRUIT CALCIUM STATUS: INITIAL RESULTS

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ABSTRACT

Nutrient management strategies vary widely in New Zealand avocado orchards because the use of diverse approaches used to recommend fertilisers by consultants. Nutrients traditionally associated with fruit quality, such as calcium (Ca), nitrogen (N), and potassium (K) are applied at a wide range of rates, even to orchards with similar soil types, tree age, yield, and environmental conditions. Given the high variability in fertilisation practices, there is a need to understand the influence of these nutrient management strategies on fruit mineral composition to help identify impacts on avocado fruit quality in New Zealand. This work shows the results of seasonal fertiliser use and soil Ca status in ten high-performance avocado orchards of the Bay of Plenty Region.

Methodology

Ten avocado orchards with differing fertiliser practices and high performance (Yield > 16 t/ha/season) were monitored in the Bay of Plenty Region, the main avocado productive district in New Zealand. The orchards had similar horticultural conditions (Tree age, Scion/rootstock variety). Mineral determinations (i.e. N, K, Ca, and Mg) on soils, leaves and fruit were performed and analysed in ten trees of each orchard monitored along with fertiliser use records. The orchards were classified according to the N fertiliser use in three categories: High N fertilization (> 250 Kg N/Ha/season), medium N fertilisation (150 – 250 Kg N/Ha/season), and low N fertilisation (<150 Kg/Ha/season). This poster is about the initial results for the fertiliser use and soil Ca status.

Fertilization by season

The Figure 1 displays the multi-seasonal average of N and K fertilization in ten orchards of Bay of Plenty. The total fertiliser use varied from 74 kg/Ha/Season to 314 kg/Ha/season of N, whereas the K use went from 31 kg/Ha/Season to 374 Kg/Ha/Season. The ratio between the total N and K applied seasonally at each orchard was defined by the combination of fertilisers used. In the case of orchards using more N than K, the main fertiliser used during the season was calcium nitrate (CAN) with occasional fertilizations using blended fertilisers. For other

orchards the main fertiliser used were blended fertilisers combined with occasional applications of CAN, when the quantity of N and K used was similar, and with sulphate of potash (SOP), when the use of K was prevalent during the season. Even though the variation in fertiliser use in the orchards monitored, one common practice is the use of blended fertilisers generally with the nutrient partitioning 18-7-22-12-2.5 (N-P-K-S-Ca) or similar. Another common practice is the use of soil amendments with high Ca content as lime and gypsum (data not shown).

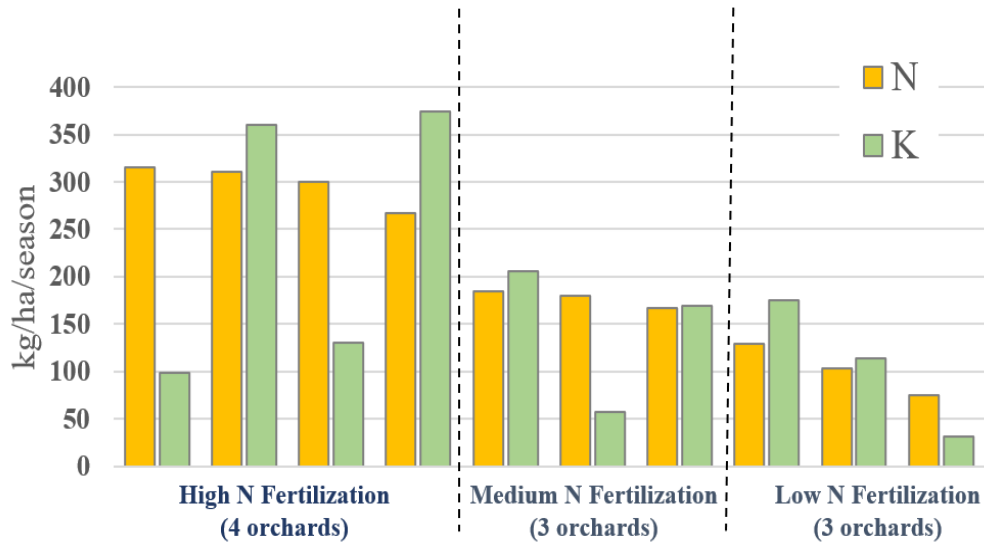


Figure 1- Fertilisation by season in 10 high performance orchards of Bay of Plenty (Kg/Ha/Season). (Average three seasons: 2020-2021, 2019-2020, 2018-2019)

Soil mineral status according to the fertilization level

The soil pH, Ca, K and Mg levels for ten trees in the ten orchards monitored pooled according to their N fertiliser use are shown in the Figure 2. Besides, the industry recommended guidelines for each parameter in high-performance avocado orchard was added for comparison purposes (Figure 2, blue line) (NZ Avocado growers association, 2000). The level of Ca and Mg at topsoil for all orchards were higher than the industry recommendation, and for some orchards, especially for those using high N fertilisers, the Ca and Mg levels were up to the recommended values. In the case of Ca (data not shown), the average Ca saturation was 62% going up to 85% in some cases. For K, the average levels at topsoil were almost in the recommended values specially for orchards in the Medium and low category of N fertilization. The pH levels were below the recommended guideline and close to 6.0. Overall, these soils showed a trend to be saturated with Ca, especially considering that the guideline used in this poster for comparison is the highest among the reference values used by consultants in New Zealand(West, 2020). However, some pH adjustments could be recommended, adding more Ca to the saturated soils under study. The effect of this soil-Ca saturation and their relationship with the Ca status in fruits are being assessed on these orchards.

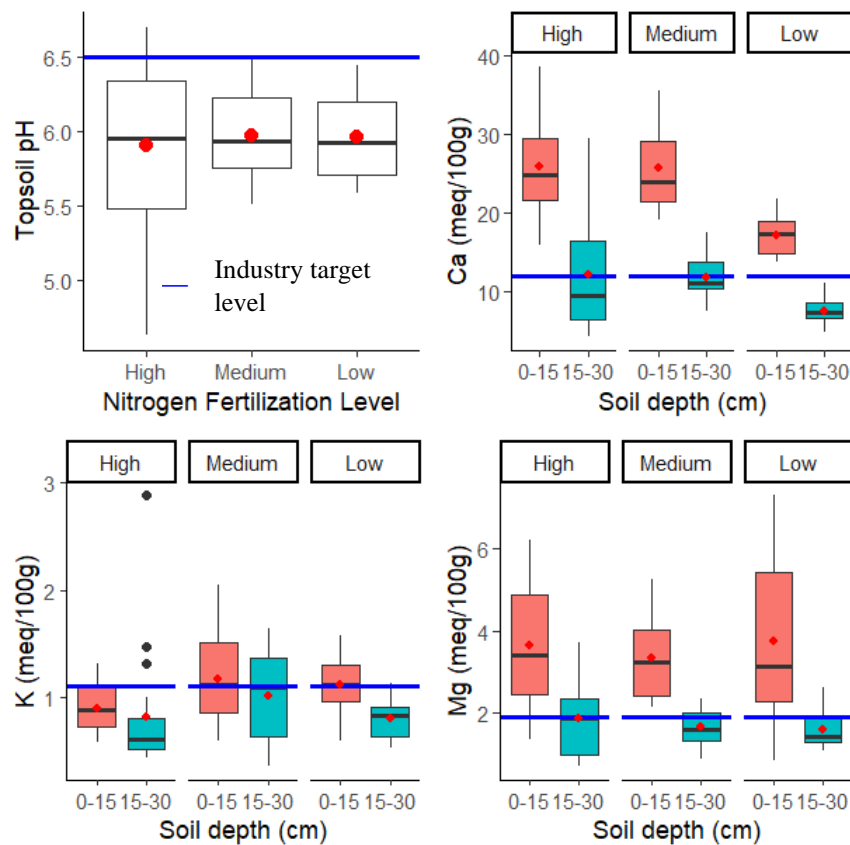


Figure 2- Soil mineral status in ten high-performance orchards according to the N fertilisation by season

Conclusions

The orchards monitored in this study constitutes a baseline to assess the influence of different fertilisation practices on fruit calcium status in avocados produced in high-performance orchards of Bay of Plenty. A wide range of variability was found in terms of quantities applied by season, as well as fertilisers used, having the composed blends as common fertiliser used in different combinations mainly with CAN and SOP.

A common characteristic for the soil Ca status in the orchards monitored, independently of their fertilisation level, is the trend to be saturated in Ca and with high levels of Mg and K. Besides, the pH in all orchards trend to be around 6.0, suggesting some further adjustments using lime or other Ca sources could be proposed by fertilisers consultants. The influence of the soil-Ca saturation status is currently being assessed.

References

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