ALMOND BOARD OF AUSTRALIA

IT'S NOT JUST NPK

KEY POINTS

• Effective nutrient management in almond orchards involves more than just focusing on nitrogen, phosphorus and potassium.

• It's crucial to account for other nutrients like calcium and magnesium, which play key roles in tree health and productivity.

•Regular fruit & leaf sampling and soil testing help growers adjust fertiliser programs to match nutrient removal, ensuring a balanced supply for crop and tree growth.

• Over-application can lead to wasted resources, while under-application risks limiting yield potential.

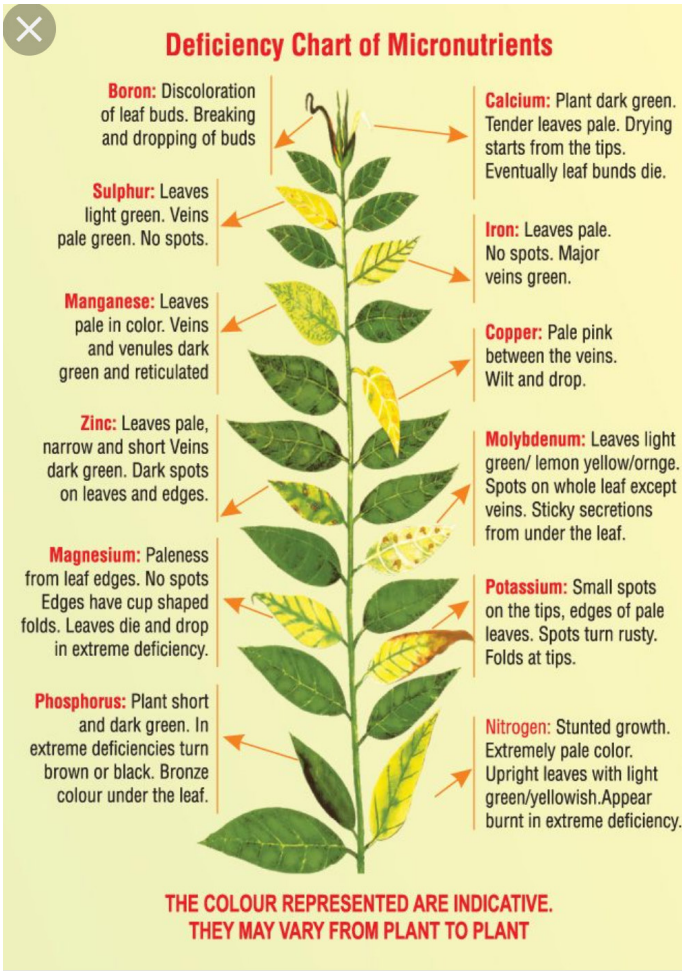

Image 1.Nutritional deficiency chart

INTRODUCTION

In almond orchards, fertigation schedules often focus on the primary macronutrients: Nitrogen (N), Phosphorus (P) and Potassium (K). These are indeed essential for tree growth and crop production, but several other micronutrients also play critical roles and their importance should not be overlooked. A typical annual nutritional program or forecast analysis includes not only N, P, and K but also Calcium (Ca), Magnesium (Mg), Sodium (Na), Chloride (Cl), Zinc (Zn), Manganese (Mn), Iron (Fe), Copper (Cu), Boron (B) and Sulphur (S).

To maintain a healthy and productive orchard, it is essential to replace the nutrients removed by the crop at harvest. The ABA fact sheet on crop nutrient removal emphasizes the need to apply nutrients in amounts that match or exceed the removal rates, allowing for not only fruit production but also root and shoot growth, age and size of trees as well as losses due to factors such as leaching or soil nutrient lock-up.

Sampling and Nutrient Analysis

To better understand nutrient use, regular sampling and lab analysis can provide insights by comparing nutrient levels in the crop with cumulative fertiliser inputs. In many cases, fertiliser applications exceed the amount removed by the crop, though specific nutrients like potassium or phosphorus may occasionally be under-applied. It is important to determine the aim of the fertiliser program, is it desirable to increase tree growth above normal growth or to apply just enough to maintain the crop and some small amount of growth? Nutrient inputs and removals can vary depending on fertiliser products chosen, application method and timing, management practices and seasonal conditions. Nutrients are utilised not only for fruit production but also for tree growth and processes such as nutrient recycling in leaves, wood and roots with additional losses occurring through leaching, volatilisation and pruning removals.

Nutrient Inputs: How Much is Enough?

The amount of nutrient input required extends beyond what is removed by the crop. There will need to be a forecast for the next season's crop load, how much the tree will naturally grow (1 year older) and how much tree growth is desired. A common approach is to increase nutrient inputs by 20-30% to account for root and shoot growth, as well as other

nutrient losses. This adjustment helps ensure a balanced nutrient supply, though application rates and timing of specific products may vary depending on fertilisation strategies, with some applying more than necessary while others achieve a closer balance to tree and crop needs.

Consequences of Over-application

When nutrient inputs significantly exceed crop removal, the excess nutrients can either accumulate in the soil or in the case of highly mobile forms like nitrates, be leached away from the root zone. Over-application might not lead to increased yields, especially in seasons where the crop load is lower. In fact, too much vegetative growth can occur, which may reduce fruitfulness by shading the canopy and hindering flower bud development. Other risks of over application may include immediate root damage (for example, extremely high nitrate levels), locking up other essential nutrients (for example, very high rates of Phosphorus can inhibit Zinc uptake) or altering soil characteristics (e.g. changing soil pH).

In such situations, it may be more economical to reduce fertiliser inputs to match the tree's actual demand, particularly in years with lighter yields. This can save costs in the short term while preserving the tree's health and productivity for the following season.

The Role of Calcium and Magnesium

Calcium and magnesium, though sometimes overlooked, are essential macronutrients that should be factored into fertiliser programs. Calcium supports root tip growth, cell wall development, kernel, shell & hull strength and soil structure, while magnesium is vital for chlorophyll production and other plant functions. Some orchards may not actually apply enough calcium or magnesium to match crop removal, though many growers successfully meet calcium needs through products like calcium nitrate. Figure 2. Both nutrients are crucial for maintaining the soil's cation exchange capacity, which affects nutrient retention and availability, especially in sandy soils with low capacity, potentially impacting tree health and productivity. Calcium also plays a role in helping to displace sodium in the soil, thereby reducing the damaging impact of salinity.

It is also important to avoid over supplying Magnesium as it can lead to diminished soil structure (slaking).

Optimising Your Fertiliser Program

To ensure a balanced nutrient supply, it is crucial to regularly review and adjust fertiliser programs based on projected yields. Taking fruit samples at harvest to calculate nutrient removal, getting accurate yield data from each block and leaf sampling before harvest can be a valuable first step in creating a nutrient budget for the next season. Incorporating calcium and magnesium into your program is also vital, even if these nutrients are required in smaller quantities than nitrogen or potassium.

Lastly, conducting a soil test to assess macro and micronutrient levels, cation exchange capacity, pH, organic matter and soil structure data can provide a comprehensive understanding of your orchard's nutritional needs and help guide future decisions. This is critical as a pre-plant exercise as it allows easier application of soil amelioration products and some base fertiliser to supply nutrients to the young tree root systems as they grow outside of the small, wetted area provided by the drip irrigation system.

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