

Flowering and Nut Set in Macadamias



SUNCOAST GOLD MACADAMIAS

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FLOWERING

We have reached one of the most crucial stages in the trees' phenological cycle, flowering. It is at this stage that it is of utmost importance for the tree to have luxury levels of essential nutrients. Macadamias can survive quite well with minimum nutrition levels but as farmers we don't want the tree to barely survive, we need it to thrive. Building up reserves of nutrients throughout the year is a good strategy using a robust fertiliser



Figure 1 Macadamia Flower

program. Improving the soil at the same time with organic matter assists in the maintenance of these levels in the soil as well as feeding the micro-organisms that assist the tree in assimilating the nutrients.

The mycorrhizae in the soil can be useful for structure, accessing nutrients and even plant to plant communication. There have been great

transformations within orchards that have concentrated on the improvement of the orchard floor health.

Once harvest has finished, it is good practice to add soil amendments such as gypsum or lime and band compost or wood chip (or both) under the tree. Once this is done, the best method is to run the profiler up the rows and cover these amendments with the rich topsoil that has been inadvertently pushed into the inter-row throughout the season. This then creates a favourable environment for adventitious roots to flourish, stimulating healthy growth in the trees and allowing easy access to required nutrition.

A healthy root system and well balanced soil is by far the best way for trees to access nutrients. However at this super important stage of the trees growth, it is a smart move to hedge our bets, not only fertigating nutrients or broadcasting on the ground but also by applying foliar applications.

The hard leaf of the macadamia tree is notoriously difficult to penetrate, so by targeting the emerging racemes and young shoots and then the newly set nuts, a more efficient uptake is possible.



Figure 2 Macadamia Nut Growth Stage

Many elements are important to plant growth and development but at this stage, four elements in particular are beneficial most important

CALCIUM

Calcium is required for cell wall formation. It also stabilises cell membranes and protects them – an important attribute under stress conditions. It is also known that when plants are threatened by infection, calcium binds to a protein called calmodulin that prompts plants to manufacture salicylic acid (SA). SA acts as a signal molecule that kicks off a series of reactions that help defend against external threats (SAR response). Having luxury levels of calcium at flowering and nut set can help the tree produce more nuts.



Figure 3 Plant Cell

BORON

Boron is needed for sugar movement within the plant, as well as formation of new cells at growing points. Boron also affects pollination and nut development as it is essential for pollen tube formation. It also works together with calcium, assisting its transportation around the tree.

MAGNESIUM

Magnesium forms part of the cell walls and is also an essential part of the chlorophyll molecule. This is essential for photosynthesis and therefore most other plant functions including oil and sugar production.

It is important to have adequate levels so that the tree can support a healthy flush which in turn will provide the energy to sustain higher yields. Magnesium also regulates the uptake of many other elements

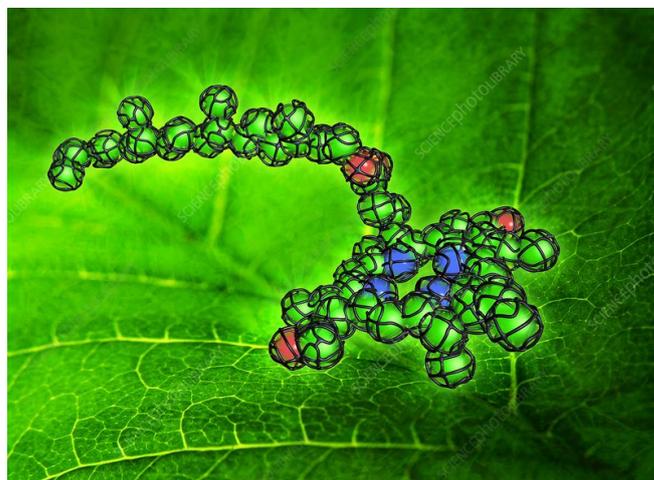


Figure 4 Chlorophyll Molecule

ZINC

Pollen tubes and shoot tips have a high requirement for zinc at the sites of protein synthesis. It is not mobile and thus may require re-application. Deficiency shows up in new growth and can affect leaf size and root development.

As mentioned, all essential elements are important, as are some that are deemed 'non-essential'. It is advisable to get soil and tissue tests to check if any particular nutrient is out of balance. A single nutrient that is lacking or deficient can potentially cause significant yield reduction and health issues.

HORMONE BALANCE AND PLANT GROWTH REGULATORS

Plant Growth Regulators (PGR) are becoming more prevalent as orchards push for higher yields from their orchards. The main hormones that the tree produces are Auxin, Cytokinin, Gibberellin, Ethylene, Absciscic Acid.

It is quite common for growers to apply synthetically produced ethylene to the trees in order to encourage the nuts to drop, combining this with the use of tree shaker can be a very useful management tool to shorten the harvest season. However, the use of PGRs should be a careful consideration as it can disrupt the growth pattern of the trees and timing is important. Generally it is the ratio of hormones in the tree that encourage a certain 'behaviour' in that tree. It is fair to say that even though scientists have discovered what the main function of the various hormones are, they are not fully understood as it is a complex process.

For instance, ethylene can be seen as a growth promoter and inhibitor. It can promote the ripening of fruit and increase the amount of root hairs but can also cause nut abscission (drop) and leaf senescence (aging). This is why it is important not to spray stressed trees with ethylene as it can cause too much leaf drop.



Figure 1 Kelp forest

Kelp products are now generally accepted as mild PGRs although not registered as such in Australia. There are many anecdotal and scientific observations that they are beneficial for the health and yield of plants including macadamias. However, it is important to know what you are dealing with when applying products with 'biological stimulants' or at least follow the manufacturer's timing recommendations. For instance, some kelp products can contain a ratio of hormones that is high in auxin.

High auxin ratios can facilitate flowering and promote adventitious root growth and prevent early nut drop. To this end, now would be a good time to apply these products into early nut development. Other kelp products may be high in cytokinin which is useful for the promotion of lateral shoot growth and can mobilise nutrients to create healthier foliage, so the timing could be slightly different.

Gibberellin is another of the plant hormones, one of its functions is to elongate stems. Interestingly anti-Gibberellin compounds such as Paclobutrazol are used in tree crops such as avocados in order to produce stouter stems and shorter internodes and promote stronger roots and earlier/better fruit set. However, this PGR is not registered for macadamias and should not be used because of AVPMA regulations and not enough work has been done to know what the full effect on macadamias is over time. Even though it may have the ability to reduce tree size, it may come at the expense of reduced flowering or other detriment so more work needs to be done.



Paul Hibbert has been working with macadamia growers in the Bundaberg region for over a decade with a strong focus on soil health and plant nutrition.

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