



Evaluation of spray deposition parameters quantity, quality and uniformity as influenced by spray application practices in macadamia nut trees

Challenge

- There is a lack of understanding regarding the deposition parameters achieved by current spray application techniques used in macadamia nut production.
- Specifically, the deposition parameters on target surfaces, such as leaves, nuts, twigs, limbs, and branches, are unknown.
- Additionally, the methodology for spray application varies widely, this includes the variation due to different spray applicator types, nozzle selections, air volumes, and speed.

Aim

- The primary aim of this two-year study was to evaluate the influence of spray water volume, calculated using the tree row volume (L/ha), in both a dense Beaumont orchard and a less dense 788 orchard.
- The study utilized an air-assisted high-profile (tower) sprayer and tested four spray volumes: 1250, 2500, 3750, and 5000 L/ha in both types of macadamia canopies. Deposition parameters, specifically quantity (Fluorescent Particle Coverage (FPC) %) and uniformity (Deposition uniformity (CV) %), were determined using a yellow fluorescing pigment and digital image analysis (fluorometry).

Results

- In the 2021 trials, it was found that the less dense 788 canopy had higher deposition quantity and better deposition uniformity compared to the dense Beaumont canopy. The

less dense canopy also showed improved canopy penetration, highlighting the importance of canopy spray friendliness. However, higher spray volumes did not lead to improved canopy penetration.

- Volumes of 3750-5000 L/ha achieved better deposition parameters than 1250 L/ha, which were insufficient for effective pest and disease control. High canopy growth (above 8m) had very poor spray deposition, indicating the challenges of protecting such high canopies from pests and diseases, with higher volumes not significantly improving results.
- In the 2022 trials, conducted in the same orchards after pruning for improved aeration and sunlight penetration, similar results were obtained. Pruning increased deposition quantity and uniformity in both dense and less dense orchards, emphasizing the importance of canopy spray friendliness.
- The use of a higher spray tower and increased air volume/momentum improved deposition quantity on top canopy leaves but not significantly. High variation in deposition uniformity on leaves was observed in both studies due to the complex structure of the macadamia canopy, making effective spraying challenging.
- The formula used to determine spray volume was the van Schalkwyk, Levings and Ras model. The spray water can be calculated for specific canopies with parameters such as tree height, row width, and tree width. This method rendered super-optimal results for effective application of macadamia orchards when using high profile (tower) air assisted sprayers.



Photo credit: Alwyn du Preez

What does this mean?

The macadamia tree is a difficult tree to spray effectively due to the large tree structure, obscure leaf shape and varying branches and twigs throughout the macadamia canopy.

- 1. Optimized spray volumes:** Macadamia farmers can use the TRV (macadamia tree row volume) model with a constant of 937 to calculate spray volumes for disease and pest control. It is important to use adequate volumes, especially for scale and mealybug control.
- 2. Canopy density management:** Pruning and canopy management techniques can improve spray penetration in dense cultivars, enhancing disease and pest control efficacy.
- 3. Canopy height limitations:** Effective pest and disease control is challenging at canopy positions above 8 meters. Farmers may need to consider alternative strategies for managing pests and diseases in the upper canopy, such as selective pruning or specialized equipment.



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