Evaluating the Effect of Transit Foliar Nutrition on Almond Nut Retention

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The profitability of an almond orchard can be improved through increased nut set and also through enhanced nut retention. Increased nut retention can reduce the proportion of nuts which fall from trees prematurely before harvest. As a result, through increased nut retention, overall yields can be increased. Therefore, tree nutrients should be applied at the right time, and in the right forms and mixes. Nutrients such as Boron, Zinc, Calcium, Molybdenum, Copper, Iron and Manganese are important for almond nut set, retention and sizing. Three product nutrient delivery formulations were tested, to compare their impacts on almond plant flower to nut ratios, nut retention percentages and canopy growth.

Key Words: Almonds, nut retention, tree nutrients, nut set

Introduction

Dual Chelate Fertilizer Pty Ltd has developed a line of fertilizers known as the Transit Foliar range. These fertilizers specifically target the delivery of important nutrients to the plant to amend deficiencies, and have the capability to deliver these nutrients element by element. The elements in the Transit Foliar range are all chelated by organically derived amino acid. This chelation achieves premium plant absorption and nutrient movement within the plant. Elements delivered in the Transit Foliar range include Zinc (Zn), Boron (B), Calcium (Ca), Copper (Cu), Iron (Fe), Manganese (Mn), Magnesium (Mg) and Potassium K. A selection of Transit Foliar products with chelated elements were applied in trial conditions to almond trees at various stages: pink bud stage; 5% flowering; and, 100% flowering and petal fall. Within almond trees, Zn is required for maximum leaf development, vascular function and root growth, B and Ca have synergistic effects to enhance pollination, and. Cu, Fe and Mn maximize chlorophyll leaf area and root growth. These nutrients are known to have associations with nut set, retention, and sizing, however, very limited studies are available on the effects of nutrient chelated fertilizers on nut set, retention and sizing. Therefore, the effects of the Transit Foliar range on almond nut retention is examined in this study

Objectives

The specific objectives of this study are:

1. Assess the application effect of Transit Foliar fertilizers with chelated elements on almond nut retention.

2. Determine theoretical increased out-turns with the use of Transit Foliar fertilizers with chelated elements.

3. Analyze canopy growth of almond trees with the application of Transit Foliar fertilizers and chelated elements using aerial imaging.

Materials and Methods

An almond orchard situated in Robinvale, Victoria was chosen as the trial site. Figure 1 shows the trial layout including control areas and treated areas.

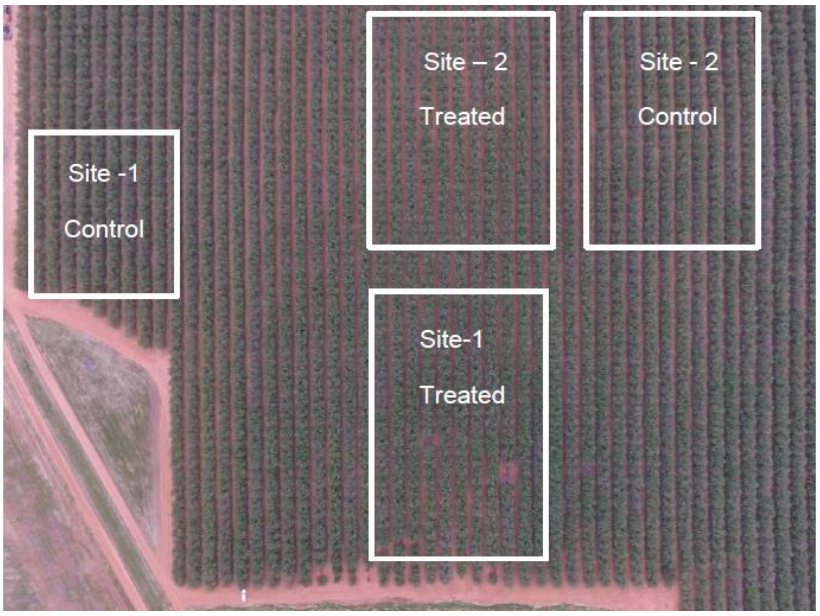

Figure 1: Aerial image of the almond trial site in Robinvale, Victoria

Treatments and Application Rates

For the control sites, the grower's standard was used according to their fertilizer program. For the treated sites, Transit Foliar chelated elements were applied at key bud and flower developing stages.

Table 1: Product application rates with the grower's standard used as the control and Transit Foliar elements incorporated at key development stages for the treatment. Rate of water application was 1,300L/ha

Growth Stages	Product Details		
	Control	Treated	Rate/ha
Pink bud stage (08th August)	Growers Standard	Liquid Transit Zinc Liquid Transit Boron	2L/ha
5% Flowering (15th August)	Growers Standard	Liquid Transit Zinc Liquid Transit Calcium and Boron	3L/ha
100% Flowering (25th August)	Growers Standard	Liquid Transit Zinc Liquid Transit Calcium	3L/ha
Petal fall (23rd September)	Growers Standard	Liquid Transit premium Trace	4L/ha

Sampling Method

Nut retention

In order to determine almond nut retention, 50 almond flowers were selected and tagged on 15 control trees and 15 trees treated with Transit Foliar Fertilizers. These flowers were tagged at the 100% flowering stage in late August. These flowers were the monitored until mid-October when fruiting had begun and almond nut were beginning to form. At this stage, the flowers which had turned into almond nuts and had also been retained on the trees were counted to provide a nut retention percentage.

Results

Aerial Images

Figure 2 (a.b,c) displays aerial images showing the visual differences between the Transit Foliar products and control areas at full bloom (flowering), after fruit set and nut maturity stages. Figure 2 (a) shows more flowers in treated area compare to control area in both early and late varieties. Figure 2 (b) shows a higher fruit set and denser canopy in the treated area relative to the control area. Similarly, in the nut maturity stage, figure 2 (c) shows nuts with denser canopy in the treated area compared to the control. At the pink bud stage, Transit Zinc (Zn) and Transit Boron (B) was applied to the treated trees.

Zn is vital for the synthesis of Auxin for growth and pollen viability at flowering and seed set. Also, Zinc applications at budburst positively affect fruit set and nut size, which determines the final yield. In addition, Boron influences pollination, cell wall development, cell division, seed and fruit development, sugar transport and hormone development. The amino acid chelation contained in the Transit Foliar products stimulates Zn and B uptake which resulted in higher floral density in the treated area compared to the control. In addition, Transit Ca, Cu, Fe, Mn with amino acid chelation were applied at 5% flowering, 100% flowering and petal fall stages. Ca mainly influences pollination, cell membrane and cell wall integrity and cell wall strength. Cu is important for chlorophyll production, photosynthesis, enzyme systems, water movement and seed production. Fe and Mn also determine chlorophyll formation. The amino acids act as chelation agents and have a role in increasing the crop yield and quality. Consequently, higher fruit set and denser canopy resulted in the Transit Foliar treated trees. The aerial images show the three-key bud, flower and nut maturing stages in almonds.

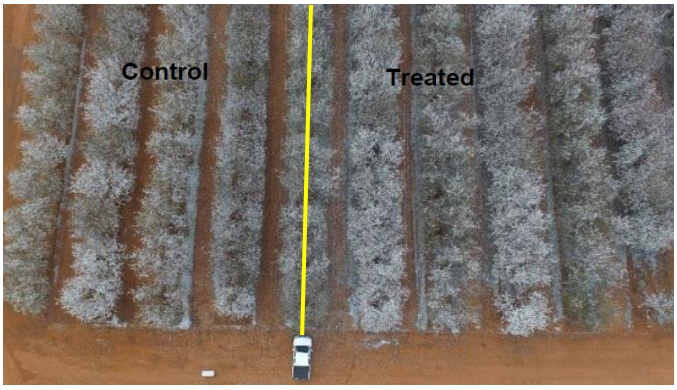

Figure 2 (a): Aerial image taken a full bloom stage in the almond trial site.

Figure 2 (b): Aerial image taken a fruit set stage in the almond trial site.

Figure 2 (c): Aerial image taken a nut maturing stage in the almond trial site.

Nut Retention

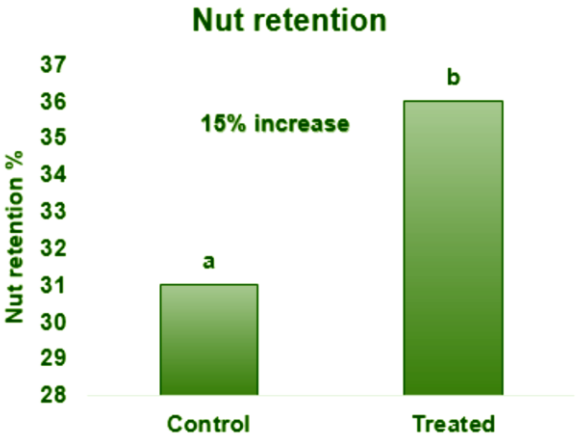

Figure 3: Nut retention percentages of Transit Foliar fertilized almond trees with chelated elements and control trees.

Transit Foliar treated almond trees had a statistically significant increase ($P \leq 0.1$) of 15% in nut retention compared to the grower standard in the trial. As mentioned above, the amino acid chelation in the Transit Foliar products stimulates Zn, Ca, B mobility which are important for pollination and nut set. As a result, nut retention percentage increased in the treated trees compared to the control. This trial was conducted at a commercial level, and the increment percentages facilitated in a significant increase in yield for the commercial orchards.

Trial Out-turn

Kernel yield (Assumption) –	3.2 tons/ha
Yield due to the trial –	3.68 tons/ha
Average market price of kernel (Assumption)	$8.00/kg

Increment of income due to the trial **- $3,840/ha**

Conclusion

In conclusion, this trial showed that with the addition of Transit Foliar products into the fertiliser program in almond production, there can be up to a 15% increase in nut retention (compared to the grower's standard). Not only did the Transit Foliar products increase nut retention, but there was also a visible increase in the number of flowers, canopy cover and nut formation in the almond trees treated with the Transit Foliar products.