The Effectiveness of Amino Boost Transit Max® in Improving Nutrient Content and Yields in Almonds.

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Amino Boost Transit Max (ABTM®) is a unique formulation of bio-stimulants and chelating agents, including 17 organically derived amino acids (10%), kelp (6%), fulvic acid (4%) and biologically active organic molecules (2%, patented product). The unique combination of organic molecules contained in Amino Boost Transit Max® promotes both the uptake and transport of nutrients within plants and stimulates growth and physiological functions to improve stress tolerance[1]. Fulvic acid and kelp have been found in other studies to alleviate stress in almonds and improve growth[2].

Key words: Chelation, amino acids, kelp, fulvic acid, improved stress tolerance

Introduction

Amino Boost Transit Max® may also be able to increase the mobilization of nutrients from the soil to the plant, which is critical for areas where there is low nutrient availability or holding availability in the soil[3]. This increased transportation of nutrients and decreased susceptibility to stress may be able to increase the yield and quality of harvested almond kernels[4].

Objectives

The specific objectives of this study are:

1. To study the impact of fertigated Amino Boost Transit Max® application on the plant nutrient status; specifically leaf nutrients and nut nutrients.
2. To study the site-specific transport of different nutrients, as per the nutrient requirement of plants at each growth stage via Amino Boost Transit Max® treatment.
3. To examine the effect of Amino Boost Transit Max® treatment on crop vigor.
4. To examine the impacts of Amino Boost Transit Max® on yield parameters: nut weight, hull weight, kernel weight, and the outturn and return on investment.

Materials and Methods

Site Selection and Trial Design

This trial was conducted in an Almond orchard located in the Sunraysia region of Victoria. A block in the new development (5th leaf) was selected. Five rows were selected in the trial block, and ten trees in each row (50 trees in total) were isolated by inserting isolation taps in the fertigation lines. These were treated as control trees. From the same rows from which control trees were selected, ten further trees in each row (50 trees altogether) were chosen to receive Amino Boost Transit Max® treatment as per the orchard's fertigation plan. Table 1 shows the application rate of ABTM® in the treated versus control Almond trees.

Treatment and application rate

Table 1: Treatment application rates and growth stages

Treatment	Rate/ ha
Amino Boost Transit Max®	10L/ ha at bud burst and 15 L/ha at post-harvest
Control	0

Observations

Kernel and Leaf Nutrient Analysis

During the nut maturation stage, the following analysis was conducted at the Phosyn Analytical Laboratory in QLD:

Ten leaves per plant were collected from five plants per treatment. The leaves were washed and then analysed for the elements: Nitrogen (N), Phosphorus (P), Potassium (K), Calcium (Ca), Magnesium (Mg), Manganese (Mn) Boron (B), Zinc (Zn), Iron (Fe), Molybdenum (Mo), Copper (Cu) and Sulphur (S).

Kernel Weight, Hull Weight and Nut Weight

10 nuts each from two branches/ tree were collected prior to commercial harvest from 15 trees per treatment (altogether 10 nuts/branch X 2 branches X 5 trees/row X 3 replicate rows = 300 nuts) and nut weight, hull weight and kernel weight were assessed.

Soil Nutrient Analysis

Soil nutrient analysis of the trial site was done in the autumn. Ten core samples of soils were collected separately from the treated area and the control area, mixed and subsamples of 500 g were analysed for N, P, K, Ca, Mg, B, Zn, Fe, Mo, Cu and S at Phosyn Analytical Laboratory, QLD.

Statistical analysis

Prism 7 (Graph Pad Software) was used for the statistical analysis. A t-test was performed to determine the significant difference between the control versus treated, P values of <0.15 were considered to be significant.

Results

Soil in the trial area is very light sandy loam with very low Cation Exchange Capacity (CEC), which means limited nutrient storage ability (Table 2). All of the tested nutrients (except Mn, Cu, Fe, Zn) were low to very low in the control area. Interestingly, all of the tested minerals were lower in the ABTM® treated area compared to the control area, while mineral levels in the plant tissues were higher from the ABTM® treated area compared to the control area. This suggests that ABTM® facilitates mobilisation of nutrients from the soil and transports them into the plant tissues.

The nut weight (Figure 1), collected from the trees, showed that ABTM® treated trees had an increase in weight of 5.18% compared to that of the control.

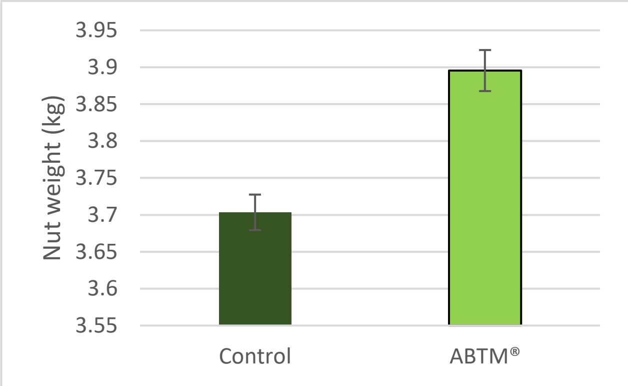

Figure 1. Whole nut weight collected from the ABTM® and control trees. Each bar represents mean ± SE. A t-test was performed to determine the significant difference between the control Vs treated, different superscripts show significant difference (P<0.15). The t-test was performed with Prism 7 (Graph Pad Software).

Figure 2 shows the kernel weight of those nuts collected from the trees. With the ABTM® having an increase of 4.67% in kernel weight compared to the kernels collected from the control trees.

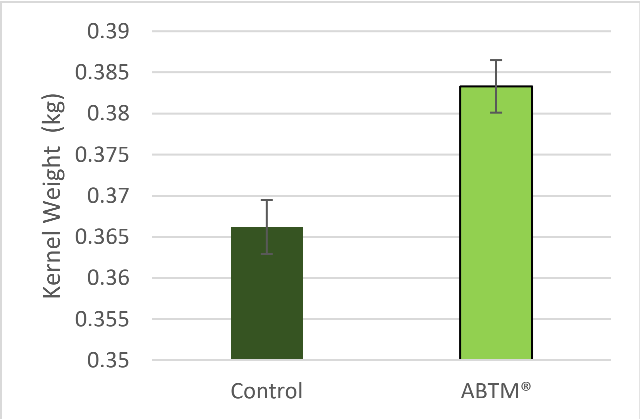

Figure 2. The kernel weight from the ABTM® and control trees. Each bar represents mean ± SE. A t-test was performed to determine the significant difference between the control Vs treated, different superscripts show significant difference (P<0.15). The t-test was performed with Prism 7 (Graph Pad Software).

A 50cm transect of whole nuts was collected from the ground, this aimed to estimate yield. It was found that the transects from ABTM® had a 7.34% higher whole nut weight compared to the control (Figure 4 - A) and increase in the kernel weight of 0.99% (Figure 4 – B). These both where considered to be statistically significant.

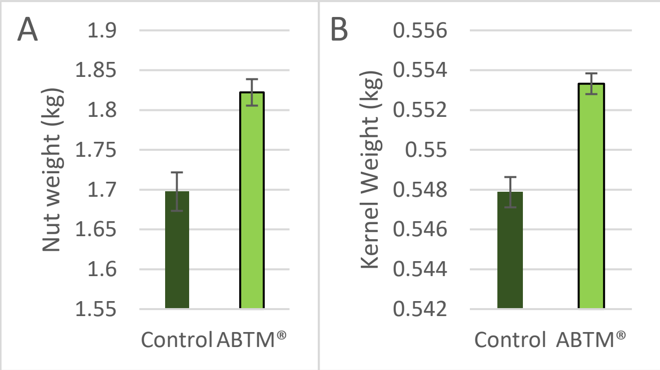

Figure 4. The weight of the whole nuts collected from the treated and control trees in a transect (50cm) (A) and the kernel weights from these nuts (B). Each bar represents mean ± SE. A t-test was performed to determine the significant difference between the control Vs treated, different superscripts show significant difference ($P<0.15$). The t-test was performed with Prism 7 (Graph Pad Software).

Figure 5 shows that the ABTM® plants had a higher kernel weight, with 100 of the treated nuts weighing significantly more than 100 of the control nuts. The ABTM® nuts had a 5.8% increase in kernel weight compared to the nuts of the control plants which were not treated with the ABTM®.

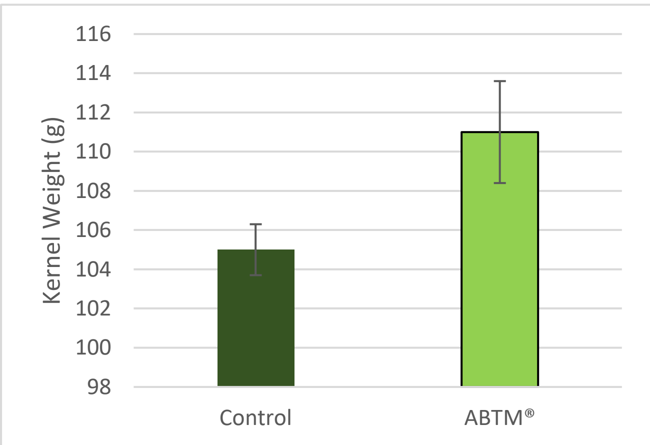

Figure 5. The weight of the 100 kernels collected from the treated and control trees. Each bar represents mean ± SE. A t-test was performed to determine the significant difference between the control Vs treated, different superscripts show significant difference ($P<0.15$). The t-test was performed with Prism 7 (Graph Pad Software).

The outturn was calculated as the percentage of kernel weight to nut weight. Outturn was increased by 3.3% by the ABTM® treatment compared to the control (Figure 6). This result was similar to the 3% outturn increase with application of ABTM® that was seen the previous year ABTM® study in same Almond Orchard[1].

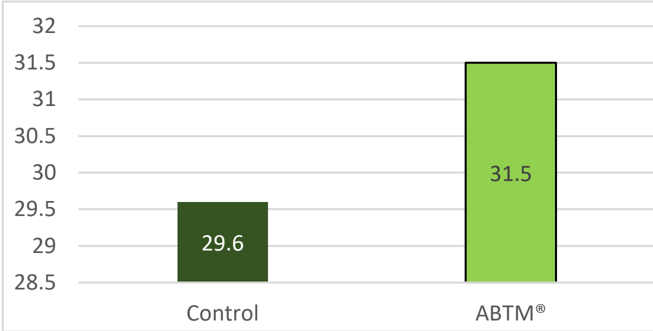

Figure 6. The outturn for ATBM as compared to that of the control.

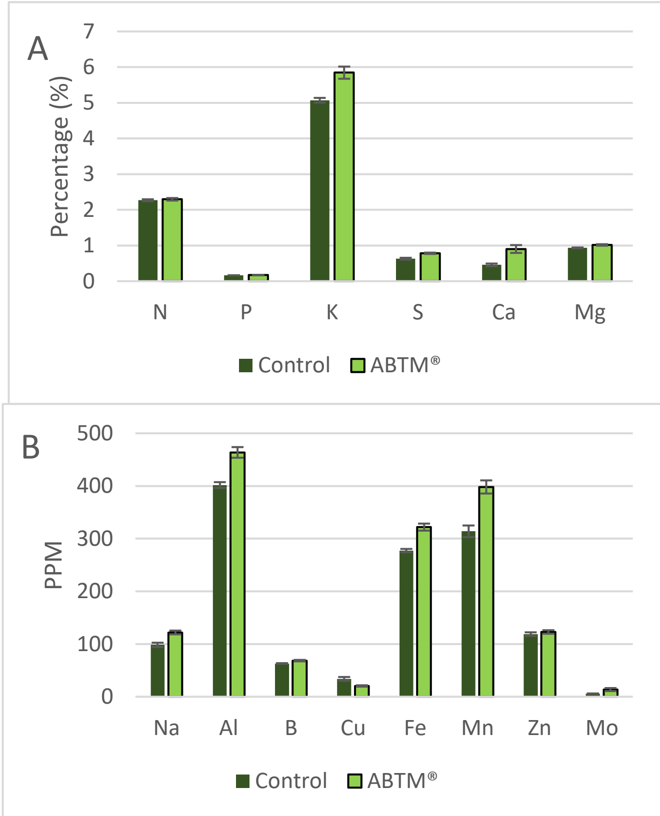

Figure 7. The effects of ABTM® on the nutrient levels in leaves compared to the control. A t-test was performed to determine the significant difference between the control vs treated, different superscripts show significant difference ($P<0.15$). The t-test was performed with Prism 7 (Graph Pad Software).

The percentage change for the nutrient levels is displayed in Figure 8. The majority of nutrients saw an increase in uptake with the application of ABTM® compared to the control. In the case of Copper, the control was found to have a higher uptake compared to ABTM®. However, the Copper levels found in the leaves of the ABTM® treated plants where still within the adequate concentration range.

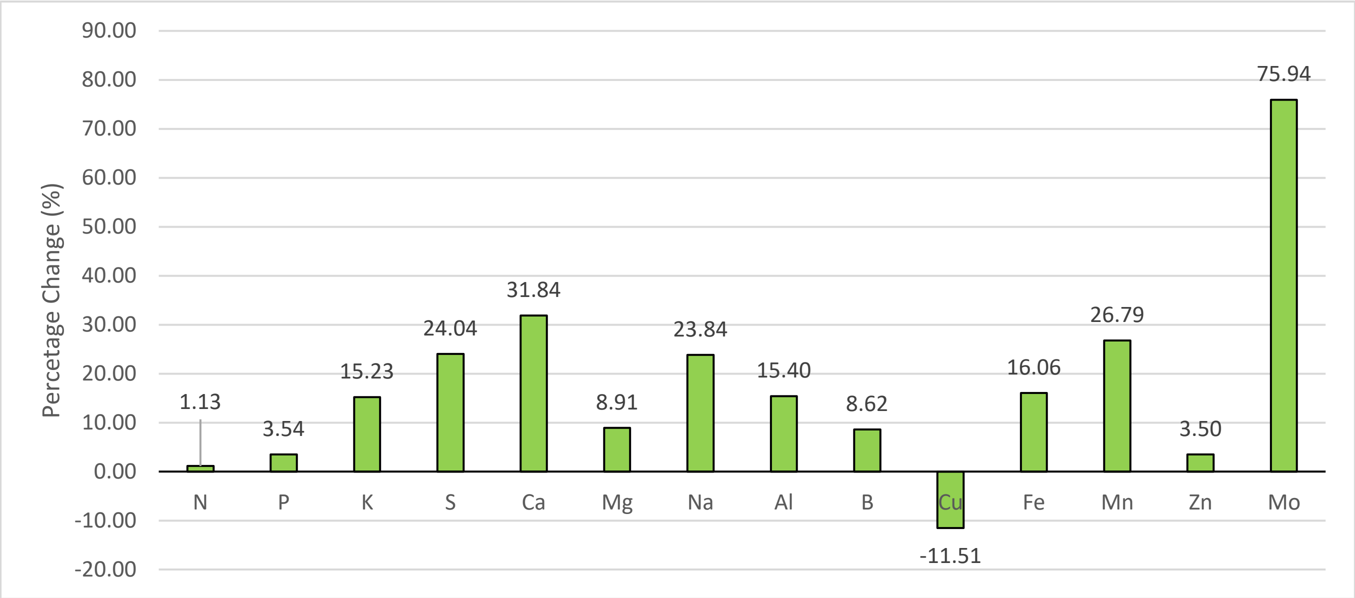

Figure 8. The percentage change of nutrient uptake between ABTM® and the control.

Discussion and Conclusion

This studied aim to demonstrate the benefits of Amino Boost Transit Max® in improving the ability of the Almond trees to increase uptake of nutrients, as well as increase the yields of Almonds.

- Amino Boost Transit Max® facilitates mobilization of nutrients from the soil and transports them into the plant tissues, as seen by the soil test taken in the testing area. The ABTM® treated plants also had increased nutrient levels in the leaves, compared to the control plants.
- Nut yield was increased in the area where Amino Boost Transit Max® had been applied, both with an increased in nuts and kernels collected from trees and a 50cm ground transect but also out turn was increased by 3.3%.
- Amino Boost Transit Max® also visually shows a positive effect on the canopy when compared to the control trees.

Overall it can be seen from this study that ABTM® is an effective way to increase orchard productivity, by increasing nutrient mobilisation and increasing yield.

References

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Table 2. Analysis of different nutrients levels in the leaves with reference to Control vs Amino Boost Transit Max®

Parameter	Treatment		*P*- Value	Significance	% increase
	Control	ABTM®			
Whole Nut Weight (kg)	3.7± 0.024	3.9 ± 0.027	0.06	yes	5.18
Kernel Weight (kg)	0.36 ± 0.006	0.38 ± 0.016	0.14	yes	4.67
Whole Nut weight (50cm transect) (kg)	1.69 ± 0.007	1.82 ± 0.005	0.078	yes	7.34
Kernel weight (50cm transect) (kg)	0.54 ± 0.007	0.55 ± 0.005	0.089	yes	0.99
Kernel Weight (100 nuts) (g)	105 ± 1.4	111 ±2.4	0.08	yes	5.71

Parameter	Treatment						*P* Value	Significance	% increase
	Control			ABTM®					
Nitrogen %	2.27	±	0.03	2.30	±	0.04	0.56	ns	1.13
Carbon %	54.07	±	0.29	55.31	±	0.09	0.25	ns	2.30
Phosphorus %	0.17	±	0.00	0.17	±	0.00	0.48	ns	3.54
Potassium %	5.07	±	0.07	5.85	±	0.17	0.02	yes	15.23
Sulphur %	0.63	±	0.03	0.78	±	0.02	0.11	yes	24.04
Calcium %	0.46	±	0.04	0.60	±	0.11	0.03	yes	31.84
Magnesium %	0.93	±	0.01	1.02	±	0.02	0.23	ns	8.91
Sodium (PPM)	98.50	±	4.01	121.98	±	3.57	0.08	yes	23.84
Aluminium (PPM)	401.83	±	5.51	463.70	±	10.11	0.13	yes	15.40
Boron (PPM)	63.10	±	0.64	68.54	±	1.36	0.09	yes	8.62
Copper (PPM)	33.90	±	3.53	30.00	±	1.30	0.003	yes	-11.51
Iron (PPM)	277.39	±	3.11	321.95	±	6.68	0.007	yes	16.06
Manganese (PPM)	314.03	±	10.98	398.16	±	12.46	0.014	yes	26.79
Zinc (PPM)	118.75	±	3.49	122.91	±	3.34	0.06	yes	3.50
Molybdenum (PPM)	6.02	±	0.24	10.59	±	2.86	0.29	ns	75.94

*values given are mean + standard deviation. P value <0.15 was considered to be significant.