Evaluation of fruit set, berry physiology and sugar accumulation of grapevines treated with Amino Boost Transit Max (ABTM®)

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Fruit set is the process in which flowers become fruit and potential fruit size is determined. Fruit set mainly depends on genetics of the plant, environment conditions and cultural practices (Coombe, 1970). Supplying required nutrients for plants at precise rate, time and using ideal form/product are important cultural measures in grapevine. Further, berry growth begins just after the fruit set and characterises with increasing berry weight, volume or diameter during the development. It typically follows a double sigmoid curve resulting from two consecutive stages of growth distinct by a phase of slow or no growth (Dokoozlian, 2000). This study was conducted to assess the effect of ABTM® (product consisting of amino acids, kelp, fulvic acid and Biologically Active Organic Molecules) on fruit set, berry physiology and sugar accumulation of Pinot gris grapevines. It was concluded that there was a 6% in the number of berries per bunch, however no significant difference between berry diameter and °Brix levels.

Key Words: Fruit set, berry physiology, sugar accumulation, amino acids, wine grapes, Pinot gris.

Introduction

Dual Chelate Fertilizer Pty Ltd has developed Amino Boost Transit Max® which is a premium liquid plant bio stimulant to assist in increasing root growth, improve stress tolerance and assist in transporting nutrients around the plant. Together, these qualities all improve potential yields through better plant health and increased plant nutrient status. Amino Boost Transit Max® (ABTM) contains Amino acids (10%), Kelp (6%), Fulvic acid (4%), Biologically Active Organic Molecules (BAOM) (1.5%) and amino acid derived nitrogen (1.4%).

Amino acids are used all throughout the plant for hundreds of different processes such as protein biosynthesis, photosynthesis, stomata activity, chelation and also have an influence on soil microbe activity. Applications of amino acids though ABTM reduces the energy consumption used to make amino acids and focuses the plants energy on growth and development which directly influences the yield. Kelp has many beneficial effects on plants due to the natural growth promoting hormones, polysaccharides and micro-nutrients. Kelp is high in the plant growth hormone Cytokinin which boosts cell division in new shoots and roots for increased

growth and root exploration. This increases nutrient uptake, and hence maximises plant growth development. Polysaccharides such as alginic acids assist in promoting a healthier soil by acting as a gel type substance which increases water retention and aeration in the soil. Other plant growth hormones such as auxin and gibberellins also can significantly improve plants stress coping mechanisms to biotic and abiotic stresses. Fulvic acid in ABTM benefits plants by converting minerals in soil into a plant available form which can be easily up taken by plants. Fulvic acid acts as a natural chelator and also promotes the colonisation of microbes in the soil

which in turn creates a healthier soil which can increase not only nutrient availability, but can also increase the soil structure promoting the formation of aggregates and increasing water infiltration and water holding capacity. BAOM are organically derived and are the patented technology used by Dual Chelate Fertilizer. These organic molecules contain highly plant-active compounds which are able to significantly increase the movement of nutrients within the plant, enhance root and shoot growth and helps plants increase their tolerance against abiotic stresses through increased gene expression and hormone activity.

In this study, the effect of a soil application of ABTM on Pinot gris wine grapes is evaluated to observe the fruit set (number of berries per bunch, berry physiology (diameter of berries) and sugar accumulation (°Brix).

Objectives

1. To evaluate the effect of ABTM on the number of berries per bunch of Pinot gris grape bunches.
2. To evaluate the effect of ABTM on the diameter of the berries to assess berry physiology of Pinot gris grape bunches.
3. To evaluate the effect of ABTM on the sugar accumulation of Pinot gris berries using a °Brix meter.
4. To determine is ABTM should be incorporated into fertiliser regimes in an effort to increase the quality of wine grapes.

Materials and Methods

This trial was conducted on a Pinot gris wine grape block located in Euston, NSW. A control and treated area were marked with samples and photos being taken from these areas separately.

One application of ABTM was applied during late October (before flowering) at a rate of 10L/ha using drip irrigation. Table 1 highlights the application details.

Table 1: Application rate and timing of ABTM on Pinot gris wine grapes

Treatment	Application Rate	Application date
ABTM	10 L/a	31st October 2019
Control	0 L/ha	31st October 2019

Observations

Number of Berries per Bunch (fruit set)

The number of berries per bunch was determined by randomly selecting 30 inflorescences from 30 vines from the control and ABTM® treated areas separately. The fruit set was counted at the end of November (E-L stage 27).

Diameter of Berries (Berry Growth)

The diameter of berries was determined by selecting 75 berries from 25 bunches from the control and treated areas separately. A berry from the top, middle and bottom of each bunch was selected and monitored for growth continuously from pea size (E-L stage 31) to harvest.

Sugar accumulation (°Brix)

To determine the sugar accumulation, 75 berries were randomly selected from 15 rows separately from control and ABTM® treated areas and squeezed on to the digital refractometer. Each berry was assessed for its sugar accumulation. The °Brix values were averaged for the final reading.

Results

Figure 1: Selected inflorescence from ABTM® treated vines doe fruit set counting.

Figure 2: Measuring berry growth of ABTM® treated bunches. Identical berries were measured each time.

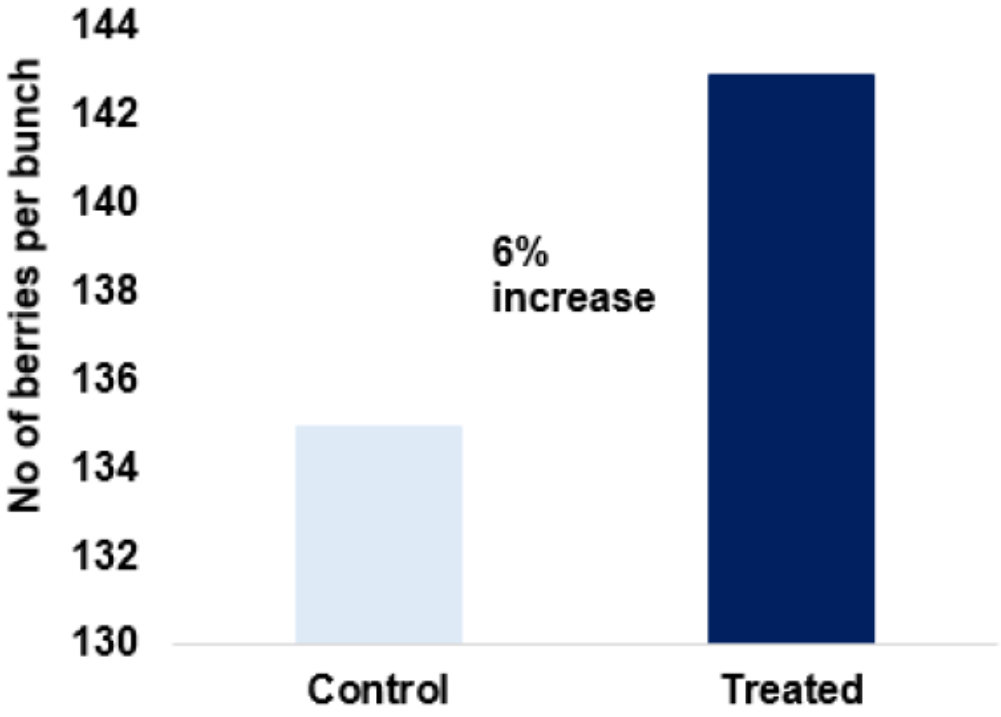

Figure 3: The average number of berries per bunch of control and ABTM® treated bunches.

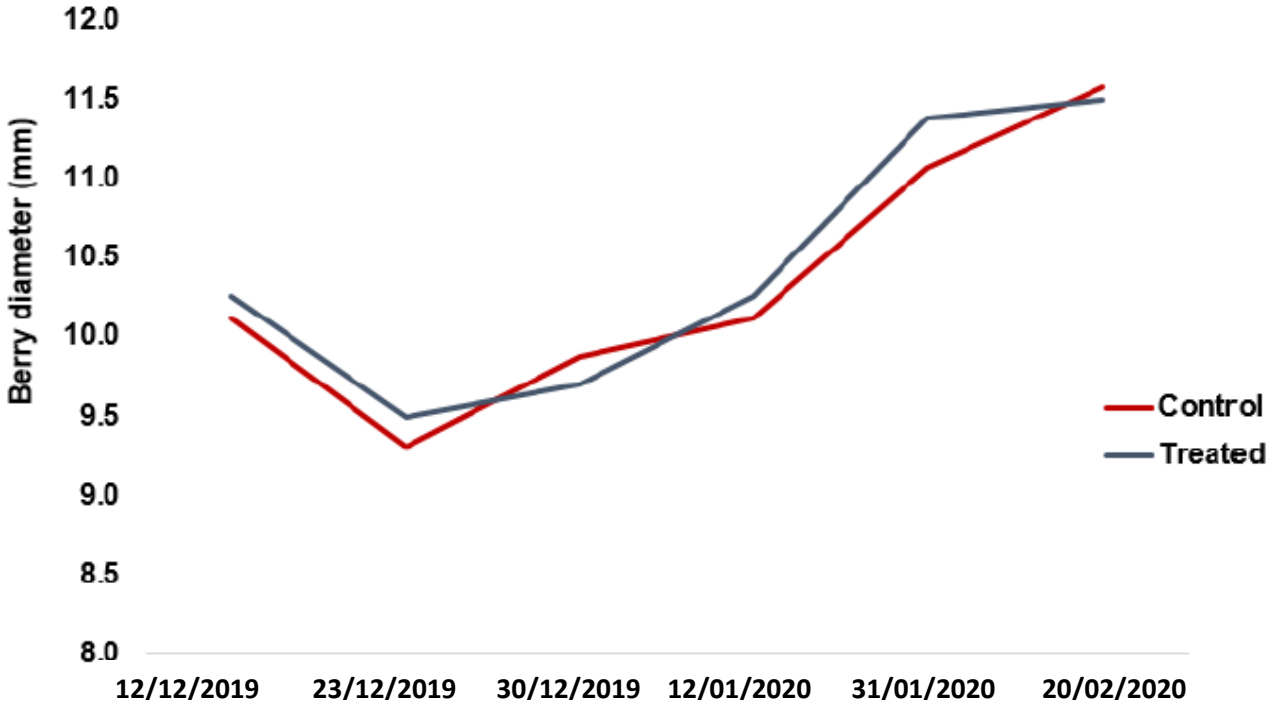

Figure 4: The average berry diameter (mm) of Pinot gris wine grapes comparing ABTM treated grapes and control grapes. No significant difference.

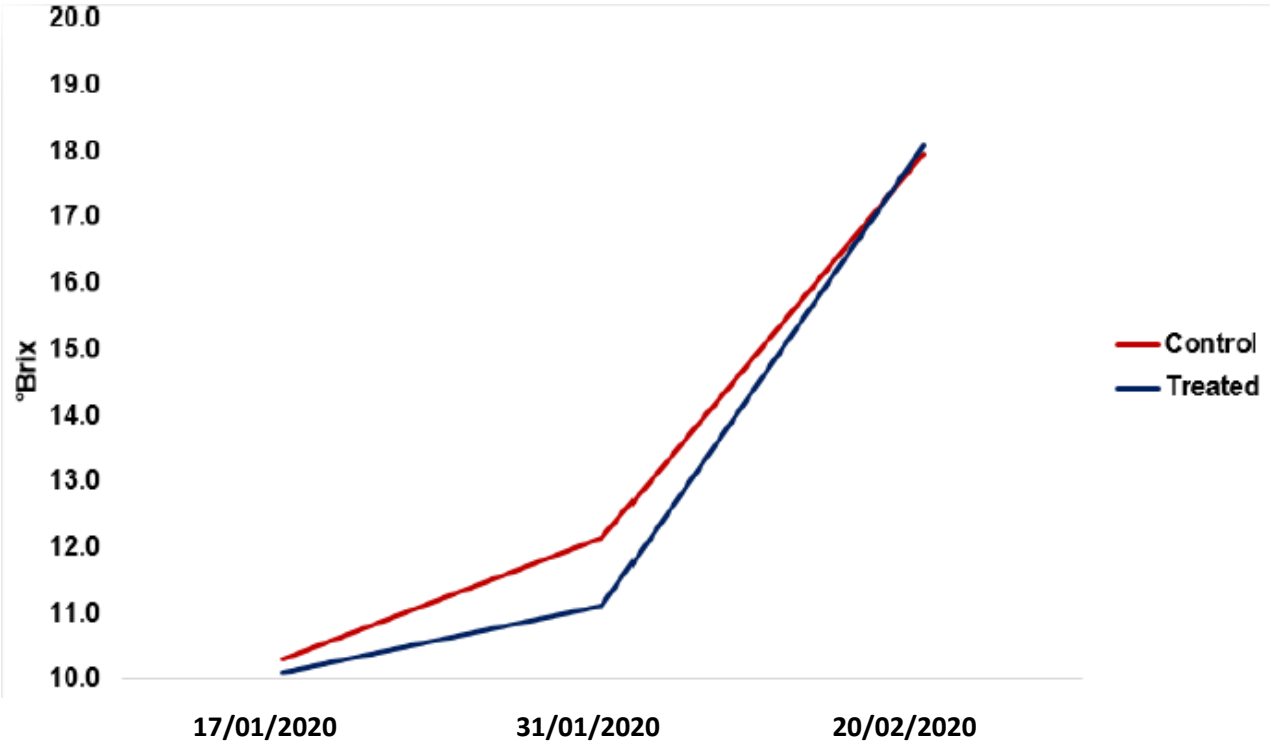

Figure 5: The °Brix levels of Pinot gris grape bunches treated with ABTM compared to control bunches. No significant difference.

Discussion

After application of ABTM®, the number of berries per bunch were calculated shortly after fruit set to determine the average number of berries per bunch. This is seen in figure 3 which shows that there is a 6% increase in the average number of berries per bunch on Pinot gris vines treated with ABTM compared to the control. This was roughly an increase from 135 berries per bunch (control) to 143 berries per bunch (treated). This increase in the number of berries.

This increase in the number of berries per bunch seen in vines treated with ABTM is a result of a number of factor related to the beneficial qualities including the bio-stimulant blend of organically derived amino acids, kelp, fulvic acid and Biologically Active Organic Molecules contained in ABTM®.

When Amino Acids are supplied to plants, processes such as photosynthesis and stomata activity are greatly increased as the plants do not need to spend time and energy on creating these amino acids to be used in proteins and other reaction. With more readily available amino acids, plant processes such as the photosynthetic reaction and stomata regulation are working more efficiently which results in the production of more available energy which the plant can use to promote the growth of more berries. These organically derived amino acids are also precursors to a number of key plant regulating hormones (such as auxin) and speed up enzymatic reactions which also provide an increase in plant growth.

Added kelp assists in increasing average bunch weight by stimulating plant root growth. The kelp used in ABTM is highly refined and contains a high percentage of the natural plant hormone, Cytokinin. When applied at the root zone, cell division is heightened which increases the root mass and encourages the production of new explorative roots. With an increase in root biomass, more roots are able to actively uptake nutrients and also explore pockets of nutrients in the soil. Kelp also increases the soil health status by promoting a more favorable environment for micro-organism colonies which can assist in the conversion of unavailable nutrients to plant available forms for enhanced uptake. Kelp is also able to increase the water holding capacity in soil due to alginic acids which prevent any water stress which may occur and also keeps the nutrients available for uptake. Kelp is also high in potassium which is necessary for the development of more berries on bunches as it is a regulatory element needed for many processes such as energy production and photosynthesis which promotes the energy required to produce more healthy berries per bunch.

Fulvic acid acts as a natural chelator by assisting in the conversion of unavailable minerals in soil to more plant available forms. Fulvic also boosts the health of micro-organism colonies in soil which provide a healthy environment for excellent root growth.

Biologically Active Organic Molecules (BAOM) are the patented technology used in Dual Chelate Fertilizer bio stimulants and fertilizers. These molecules have a number of important benefits in plants such as increasing the movement of nutrients within the plant, enhancing root and shoot growth and assist in increasing tolerance against abiotic stresses through increased gene expression and hormone activity. BAOM are able to significantly increase the productiveness of plants which in turn promotes the growth of more berries.

When looking at figure 4, it can be seen that the berry growth of ABTM® applied Pinot gris vines was increased by 1-3% compare to the control berries from beginning to end of the season. However, there was no berry growth difference at harvest. Both control and ABTM® treated berries followed typical sigmoid curve the differences were not significant.

When looking at figure 5, it can be seen that the °Brix level of treated berries reduced by 0.2-1.0 °Brix than control whereas at the harvest, there was no difference. However, these differences are also not significant.

Even though relatively higher fruit set in ABTM® treated vines, there were no significant differences in berry growth or total soluble solid

Accumulation (°Brix) between treated and control berries. Due to significantly higher fruit set of ABTM®, yield increases which creates higher income for the industry.

Conclusion

In conclusion, using ABTM will increase the number of berries per bunch, however there will be no significant difference on the berry diameter or °Brix levels. This increase in the number of berries per bunch is a result of ABTM® promoting a healthy soil for roots and microbes, increasing the plant energy efficiency usage through added amino acids, promoting abiotic stress tolerance, naturally chelating nutrients in the soil through fulvic acid and BAOM and also increasing the mobility of nutrients through the plant system and directing nutrients to where they are in highest demand.

References

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