Evaluation of Fruit Set of Grapevines Treated with Complete Trace Plus (CTP®) and Amino Boost Transit Max (ABTM®)

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Fruit set is the process in which flowers become fruit and the potential fruit size is determined. Fruit set depends mainly on genetics of the plant, environment conditions and cultural practices (Coombe, 1970). Supplying the required nutrients for plants at the precise rate and time, and using ideal form/product, are important cultural measures in grapevine cultivation. Nitrogen, Boron and Zinc are mainly required at fruit set of grapevines, and fruit set can be stimulated by suppling these nutrients just before E-L stage 9. Infrequent high rate of fruit set failure causes a decreased yield which adversely affects the income of growers. Therefore, increasing and stimulating fruit set is vital in commercial vineyards. Complete Trace Plus (CTP®) which supplies these nutrients and Amino Boost Transit Max (ABTM®), which acts as the absorbance of stresses and emulsion between soil and roots. Therefore, this study was conducted to assess the stimulation of fruit set by CTP® and ABTM®. It was concluded that there was a percentage increase of 12% in the number of fruits per bunch of Shiraz grapes treated separately with an application of ABTM® and CTP® in comparison to the control.

Key Words: Wine grapes, yield, fruits per bunch, Shiraz, amino acids, macro and micro nutrients, Biologically Active Organic Molecules.

Introduction

Complete Trace Plus® is a fertiliser developed by Dual Chelate Fertilizer Pty Ltd which is a premium liquid macro and micro nutrient fertiliser with added organically derived amino acids and Biologically Active Organic Molecules (BAOM). Dual Chelate Fertilizer has also 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. Complete Trace Plus® provides plants with a necessary dose of many key nutrients such as chelated Nitrogen (N), Iron (Fe), Zinc (Zn), Manganese (Mn), Boron (B), Copper (Cu), Molybdenum (Mo) and Cobalt (Co). CTP® contains 2 types of chelation including 17 organically derived amino acids and Biologically Active Organic Molecules (BAOM). Together, CTP improves the quality of produce, assisting in abiotic stress tolerance, enhancing plant growth through increased metabolism, enzymatic reaction, the creation of necessary compound molecules and also improving nutrient mobility within plants for increased nutrient efficiency. Amino Boost Transit Max® contains Amino acids (10%), Kelp (6%), Fulvic acid (4%),

Biologically Active Organic Molecules (BAOM) (1.5%) and amino acid derived nitrogen (1.4%). ABTM is an excellent product which dramatically improves the health of plants, but also increased soil health too. Amino acids assist in many aspects by providing the building blocks required to make proteins which are necessary for photosynthesis, protein biosynthesis, stomata activity, nutrient chelation and also positively influencing soil microbial activity. Another key ingredient in ABTM is kelp which is highly purified and contains 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. 4% Fulvic acid contained in ABTM benefits plants by working as a natural chelator, promoting the uptake of nutrients in the soil and also promotes the colonisation of microbes in the soil promoting a better soil structure.

BAOM are both contained in CTP® and ABTM®. These molecules 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 separate application of soil applied ABTM and a foliar applied CTP on Shiraz wine grapes is evaluated to observe the yield difference between control and treated grapes, specifically looking at the number of fruits on each bunch between ABTM, CTP and control vines. This will provide an insight into the yielding benefits obtained through using ABTM and CTP.

Objectives

1. To evaluate the effect of ABTM on the number of fruits per bunch on Shiraz wine grapes.
2. To evaluate the effect of CTP on the number of fruits per bunch on Shiraz wine grapes.
3. Determine if ABTM and CTP should be incorporated into fertiliser regimes in an effort to increase yields.

Materials and Methods

This trial was conducted on a Shiraz wine grape block located in Robinvale, VIC. A control and treated areas (ABTM and CTP) were marked with samples and photos being taken from these areas separately.

CTP Treated Vines

25 vines were selected as the control and from another 25 vines, 25 inflorescences were randomly chosen to receive a foliar application of CTP® before flowering begins. At the end of November fruit set was evaluated and the number of set berries were counted at E-L stage 27.

ABTM Treated Vines

25 vines were selected as the control and from another 25 vines, a fertigation application of ABTM was applied before flowering begins. At the end of November, 25 bunches were randomly chosen and fruit set was evaluated by counting the number of set berries at E-L stage 27.

Table 1: Application rates and timing of CTP® and ABTM® on Shiraz wine grapes.

Treatment	Application Rate	Application Time
CTP®	5 L/ha (Foliar)	19th October 2019
ABTM®	11.5 L/ha (Fertigation)	19th October 2019
Control	0 L/ha	19th October 2019

Observations

Determining the Number of Berries per Bunch

Each treatment had 25 bunches collected for analysis. For each bunch, the number of young

berries enlarging (> 2mm diameter) were counted and tallied. For each treatment (CTP® and ABTM®), their respective number of berries per bunch were averaged and then compared to the average number of berries per bunch for the 25 control bunches.

Graphs were generated using Graph Pad Prism 7 to evaluate the percentage differenced between the treated bunches and the control bunches. It is important to note that the 2 treatments were not combined, but analysed separately.

Results

Figure 1: Shiraz grape bunch treated with CTP® in Robinvale, Vic. Pink tags highlighted bunches to be collected.

Figure 1: Shiraz grape vine treated with ABTM® in Robinvale, Vic. Orange tags highlighted bunches to be collected.

Fruit Set of bunches treated with CTP®

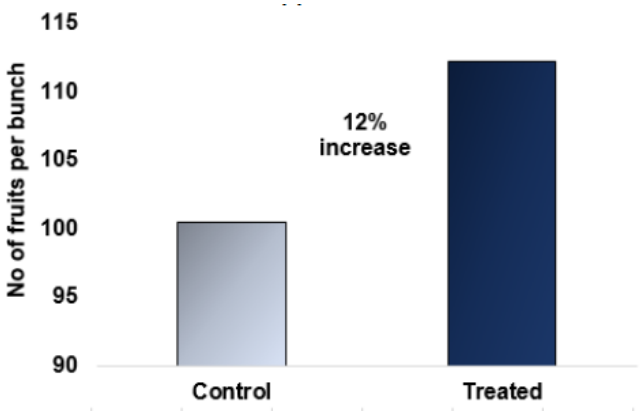

Figure 3: Average number of berries per Shiraz bunch treated with a foliar application of CTP® compared to the average number of berries per bunch collected off control bunches.

Fruit Set of bunches treated with ABTM®

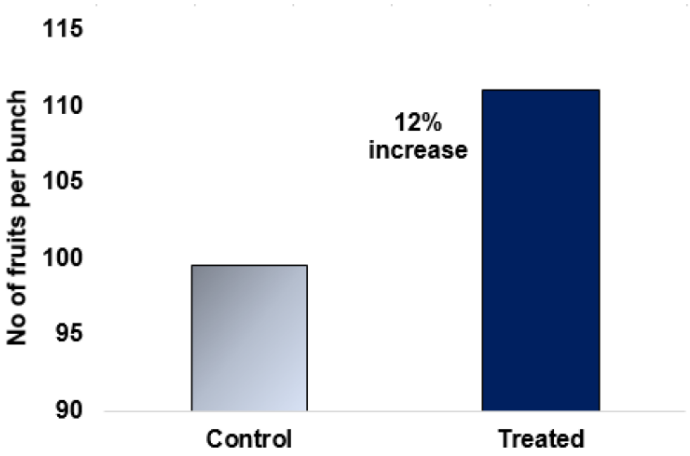

Figure 4: Average number of berries per Shiraz bunch treated with a fertigated application of ABTM® compared to the average number of berries per bunch collected off control bunches.

Discussion

When looking at figure 3, it shows that there was a percentage increase of 12% in the number of berries per bunch in comparison to the control. This increase in the number of berries per bunch has a direct correlation to an increase in yields as the bunches would also weigh heavier due to more set berries. A previous report evaluating the yield increase of Shiraz wines grapes through an application of CTP® concluded that there was a percentage increase of 22% in average bunch weight of Shiraz vines treated with the same application of CTP®. This therefore concludes

applications of CTP® can increase the bunch weight along with total yields. This increase in the number of berries per bunch highlighted in figure 3 is mainly a result of enhanced flowering and fertilization. CTP® contains 3 key elements which enhances flowering, fertilization and berry set: Nitrogen (N), Boron (B) and Zinc (Zn).

Nitrogen is the main element involved in the production of amino acids which are the building blocks of proteins. Nitrogen is also a key element in the production of chlorophyll molecules which are necessary for photosynthesis. Amino acids and nitrogen are both contained in CTP® and when applied as a foliar fertiliser, nitrogen can be directly supplied to the areas of rapid growth. This supplied nitrogen encourages the production of sugars and carbohydrates which are necessary for new cell development. The energy gained form enhanced photosynthetic reactions is used in cellular reactions to maintain normal function and continue the growth of plants. This therefore promotes the development of more berries on bunched treated with CTP® as a result of more available energy for new cell development.

Boron is one of the main elements which influences the flowering and fertilization processes. Adding a foliar application of Boron is vital to ensuring a high flower to fruit conversion ratio. Applying Boron before flowering occurs is essential to ensure effective pollination. Boron acts as a receptor which guides pollen tube elongation down into the ovary of the flowers. This increases the fertilization rate and hence increases the number of berries on bunches. Without boron acting as a receptor, the pollen tube is less likely to make its way down to the ovary for fertilization.

Zinc also plays a major role in ensuring the development of new emerging leaves and buds. Zinc an element which is used to make the Plant Growth Regulator (PGR) Auxin. Auxin is responsible for the elongation of new shoots and roots and is also involved in the formation of chloroplasts. Auxin effects these chloroplasts via auxin signalling which can increase the expression and regulation of genes related to chloroplast development. These chloroplasts are the housing for the photosynthesis reaction which creates energy for the plant through sugars, carbohydrates and starches. These molecules are then used for reactions which promote normal leaf growth, pollen development and berry set. These are all important plant phycological developments which can increase overall plant health and also have an effect on the number of berries set per plant. Zinc is also an important element to combat the common grape bunch disorder – Hen and Chicken. Applying Zinc before flowering will ensure that there is goo pollen development and set of fully formed berries.

When looking at figure 4, there is also a percentage increase of 12% in the number of berries set per bunch in Shiraz vines treated with ABTM® compared to the control vines. This also has a direct correlation to a previous report evaluating the yield increase (bunch weight) of Pinot gris wine grapes treated with similar application rates of ABTM®. This previous study concluded that there was a significant increase of 43% in the average bunch weight of Pinot gris vines treated with ABTM®. This therefore concludes applications of ABTM® can increase the bunch weight due to more berries on the bunches.

This 12% increase in the number of berries per bunch as a result of fertigated applications of ABTM® is a result of a number of factors related to the beneficial plant bio-stimulant blend of organically derived amino acids, kelp, fulvic acid and Biologically Active Organic Molecules. 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 larger bunches and 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 assist in increasing the average number of berries per bunch 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 larger bunch growth as it is a regulatory element needed for many processes such as energy production and photosynthesis which promote more energy for new cell development which directly influences the viability of berries and promotes the production of more berries.

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 and larger bunches.

Conclusion

In conclusion, using either of both CTP® and ABTM® can increase the number of berries found on Shiraz wine grape bunches. Both CTP® and ABTM® increased the number of berries per bunch 12% in comparison to the control.

When applying a foliar application of CTP® before flowering, essential flowering and fertilization elements are supplied (nitrogen, boron and zinc). These elements aid in increasing the energy supplied for cellular reactions, providing a signal for pollen tube elongation and increasing the fruit set though plant growth regulators and reducing the incidence of the Hen and Chicken disorder.

Applying a fertigated application of ABTM® before flowering promotes a healthy soil for roots and microbes, increases the plant energy efficiency usage through added amino acids, promotes abiotic stress tolerance, naturally chelates nutrients in the soil through fulvic acid and BAOM and also increases the mobility of nutrients through the plant system and directs nutrients to where they are in highest demand.