Assessing the Effectiveness of Amino Boost 840® in Improving Grape Vine Canopy Growth

Dual Chelate Fertilizer Pty Ltd.
PO Box 963, 162 New Guinea Road Robinvale VIC 3549, Australia
Correspondence: Research and Development Division,
Email: info@dualchelate.com

Canopy cover in vines is not only important for photosynthesis and the creation of energy for the plant, but it also provides beneficial shade to protect the developing grape bunches from the elements such as harsh sun. When there is inadequate canopy cover or low vigor, the developing grapes can be damaged from the sun causing the grapes to shrivel, discolor or crack. Furthermore, these damaged grapes can become an attraction for fungal diseases and pests causing more complications to the bio security of the vineyard. Developments to increase the canopy have been explored and in particular, researching the benefits of applying amino acids to boost the foliar growth and increase stress tolerance (especially heat stress) in Thompson seedless table grape vines.

Key Words: Canopy cover, amino acids, vigor, sun damage, heat stress

Introduction

Inadequate canopy cover can be caused by a number of issues including insufficient application of fertiliser, unfavorable weather conditions, poorly pruned vines, soil texture and structure and other stress factors such as heat which may limit the vines growth. In order to combat this issue, the application of amino acids has been used to increase plant biological systems and enhance the production of plant growth regulators such as auxin to promote the development of new leaves and shoots. Dual Chelate Fertilizer Pty Ltd has formulated a foliar amino acid rich fertiliser known as Amino Boost 840®. This product contains 85% amino acids, 16% nitrogen (amino nitrogen) and 2% biologically activate organic molecules. Amino Boost 840® is applied through a foliar application which assists plants in stress management. It promotes chlorophyll formation for improved photosynthesis, improves stress tolerance, increases the uptake of foliar applied fertilizers and promotes the formation of new growth. This study was conducted on the popular table grape variety, Thompson Seedless.

Objectives

The specific objectives of this study are:

1. To assess the performance of Amino Boost 840® in increasing canopy growth.
2. To monitor the chlorophyll levels of the treated leaves using a SPAD meter.
3. To assess berry appearance and condition through marking assessments, berry harness and Brix levels.
4. To examine heat stress management through applications of Amino Boost 840®.

Materials and Methods

A section of vineyard dedicated to the production of Thompson Seedless table grapes was selected due to poor canopy growth. This entire section was treated with a foliar application of Amino Boost 840®. A row and panel were chosen in the treated area for analysis. 15 leaves on one side of the row and 15 leaves on the other side of the row were chosen and tagged for analysis along with 4 bunches of grapes. The neighbouring Thompson Seedless vines which had adequate canopy growth were used for the control when examining Brix and berry firmness measurements.

Treatment and Application Rate

Table 1: Treatment application rates and growth stages

Application Date	Application Rate
29/11/2019 Berry Formation	1.5kg/ha
06/12/2019 Berry Formation	1.5kg/ha

Trial Site

One panel was chosen in the underperforming Thompson Seedless vines to take samples from. Figure 1 shows the panel chosen for analysis.

Figure 1: A panel from a Thompson Seedless vineyard under analysis.

Assessing Canopy Growth

To assess the canopy growth, a repetitive photo was taken every 3 days to show the increased canopy cover provided through the applications of Amino Boost 840®.

Monitoring Chlorophyll Levels

To assess the chlorophyll levels in the leaves, a SPAD (Soil Plant Analysis Development) chlorophyll meter was used. 15 leaves from one side of the panel and 15 leaves from the other side of the panel were tagged with flagging tape and numbered. Every 3 days, three measurements were taken from each leaf and then averaged. Measurements from each leaf where then run through statistical analysis software (GraphPad Prism) to test for possible chlorophyll increase.

Assessing Berry Appearance, Berry Firmness and Brix Levels

On the last day of data collection (13/12/2019), berries from multiple bunches were collected from the treated area and also the neighboring Thompson Seedless vines (control) to take some comparison photos and also test the firmness of the berries using a fruit penetrometer. On the 13/01/2020, some more berries were collected to test their sugar levels using a Brix meter. Again, grapes were harvested from the treated panel and control grapes were harvested from the neighboring Thompson Seedless vines.

Results

Assessing Canopy Growth

Below shows progress images of the Amino Boost 840® treated panel before and after initial application.

Figure 2: Image of the Amino Boost 840® treated panel on the 29/11/2019.

Figure 3: Image of the Amino Boost 840® treated panel on the 13/12/2019.

Monitoring Chlorophyll Levels

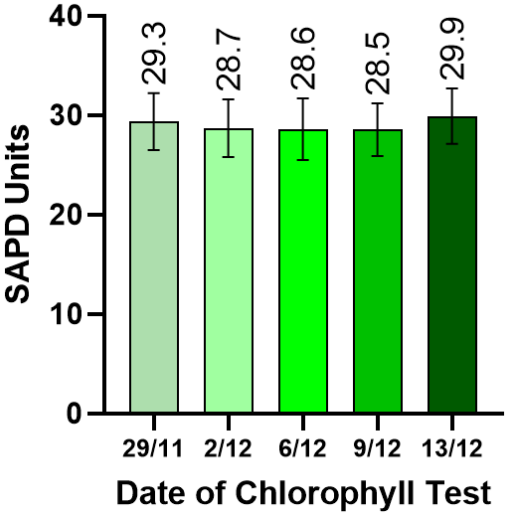

Figure 4: Data averages for the chlorophyll testing of 30 leaves on Thompson Seedless grapes treated with Amino Boost 840®. Data was recorded on the dates indicated on the graph.

Berry Firmness Measurements

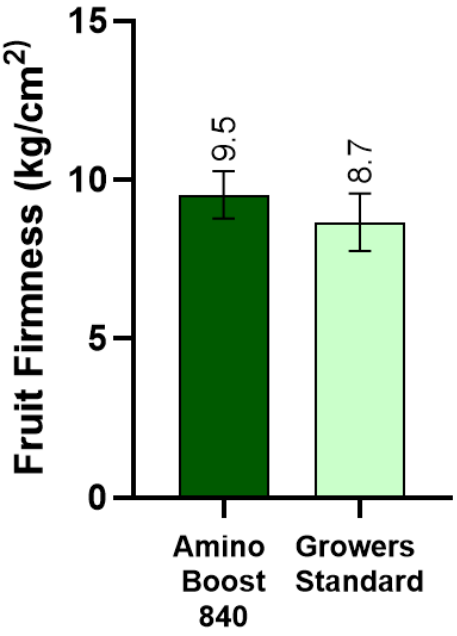

Figure 5: The fruit firmness of berries picked from the Amino Boost 840 treated vines and also from the growers standard Thompson Seedless vines which showed good growth. There is a statistically significant difference at the 95% level between the 2 treatments.

Brix Measurements

Table 2: Brix measurements from the treated and growers standard Thompson Seedless grapes.

Treatment	Brix Level	Date Measured
Amino Boost 840®	13.5	13/01/2020
Growers Standard	13.5	13/01/2020

Berry Appearance and Condition

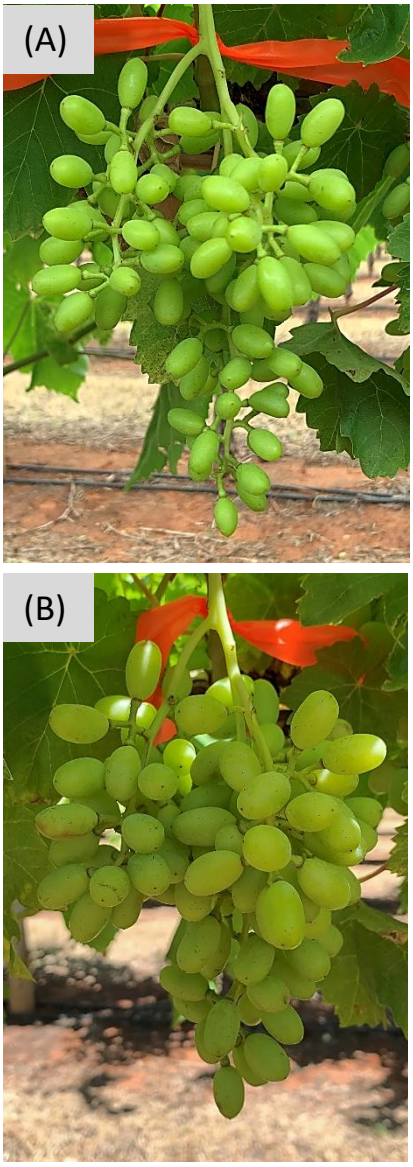

Figure 6 (A & B): Photos taken of a tagged Thompson Seedless grape bunch treated with Amino Boost 840®. Image (A) was taken on 03/12/2019. Image (B) was taken on 13/12/2019.

Discussion

Amino Boost 840® is an amino acid rich fertilizer high in nitrogen based organic compounds and also bio stimulants. This formulation assists in improving plant stress tolerance, increasing the photosynthetic pathway, enhancing the uptake of other foliar applied fertilizers and also aids in the production of plant hormones such as Auxin which is necessary for new growth.

This study was conducted on Thompson Seedless table grape vines which has shown to have poor

vigor and hence low canopy growth. As mentioned previously, canopy cover in extremely important to the successful production and protection of table grapes. However, vine canopy cover can be influenced by many factors which can induce stress on the plant. Hence why Amino Boost 840® was applied to study the beneficial effects associated in increasing canopy cover and maintaining good berry growth while exposed to stressful growth.

When looking at the initial photo taken of the affected area (figure 1), it can be seen that there is some degree of patchiness in the foliage creating uneven canopy growth. At this time, the crucial stage of berry formation and expansion was occurring. Two applications of Amino Boost 840® at a rate of 1.5kg/ha were applied 1 week a part as per table 1. After 2 weeks (14 days), another photo was taken of the affected area which is shown in figure 3. It can be seen that there is a noticeable increase in the canopy cover with more lateral shoot growth as a result of increased apical meristem production. This reduced the severity of the unevenness in the canopy. This sudden boost of growth was assisted by the 17 different amino acids contained in Amino Boost 840®, in particularly facilitated through the amino acid Serine. Serine is an amino acid which facilitates the production of plant growth regulators such as auxin which are known for their role in new shoot development and cell elongation.

During this trial, chlorophyll was measured using a hand help SPAD meter which produces a reading of the chlorophyll content of a leaf through estimation of the nitrogen status in the plant. However, the chlorophyll content can be affected by a number of different factors including cooler weather and shade which can produce variability in the data. When looking at figure 4, it can be seen that there is no statistically significant difference in the chlorophyll readings in the Amino Boost 840® treated area after the initial application is Amino Boost 840®. This my have been a result of the plant relocating the amino acid nitrogen into the production of new shoots and canopy growth and not allocating the nitrogen for new chlorophyll protein complexes. Another reason may have been from the hand held SPAD meter which is not designed to detect minute changes in leaf chlorophyll concentrations. This may have also been a result of imprecise measurements. Even though there was a high degree of accuracy taken when sampling leaves, there may have been inadequate precision as it was hard to measure the exact same spot on the leaf every 3 days. This would have caused an inaccurate comparison of chlorophyll concertation the 2 weeks of measurements.

Another important measurement taken was the berry firmness which was assessed using a hand held penetrometer. Berries were collected from a number of different bunches in the Amino Boost 840® treated area and also in a neighboring block which had admirable canopy cover (growers standard). When looking at figure 5, it can seen that there is a statistically significant difference between and berry firmness of the treated and growers standard grapes at a 95% confidence level. Figure 5 shows that grapes treated with Amino Boost 840® are on average 9% more firm than untreated grapes. It is also important to note that the Brix levels in both treatments were 13.5 when measured. This increase in firmness is possibly a result of the biologically active organic molecules assisting in the movement of nutrients, such as calcium and also amino acids. This increased translocation of nutrients assists in the formation of structural proteins found in plant cells walls which increases the firmness of the berries. This increased firmness is beneficial as it increases the customer satisfaction through higher levels of crunchiness. The increased customer satisfaction produced a larger consumer demand and causes an influx of sales promoting the growth of the table grape industry.

In addition to the increased berry firmness, figure 6 (a & b) shows that there was no marking left on the berries after the two applications of Amino Boost 840®. Again, this will increase customer satisfaction through a clean berry appearance. The berries had also filled out nicely after 10 days and were well shaded through the increased canopy growth.

Conclusion

The research presented showed that the application of Amino Boost 840® can significantly increase the canopy and berry firmness of Thompson Seedless vines whilst also providing stress relief. The addition of Amino Boost 840® to the fertilizer regime showed that vines struggling to produce adequate canopy growth can benefit from the foliar applied amino acids. The amino acids and biologically active organic molecules (which are a patented product of Dual Chelate Fertilizer Pty Ltd) assist in the translocation of nutrients around the plant and also assist in the uptake of other foliar applied nutrients by assisting elements in the absorption process.

In addition to increased canopy growth, it was demonstrated that Amino Boost 840® increased the firmness of the berries by approximately 9% compared to the control vines which had ideal canopy growth. This was found to be statistically significant at the 95% level.

Although there was no significant difference in chlorophyll production in the leaves, there was still a visual difference in canopy cover and plant health before and after the application of Amino Boost 840®.