Improving Yield and Canopy Production on Underperforming Shiraz Vines through Applications of Transit Amino Boost 840®

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Abstract

Underperforming vines can significantly affect not only the yield, fruit quality and income generated from the vineyard, but can also damage the vines themselves as there could be an underlying issue effecting the vines such as nutrition, water availability and quality, biotic and abiotic stresses and soil structure and texture (Mariani and Ferrante, 2017). It also important to ensure that there is adequate canopy cover on the vines as it is not only important for photosynthesis and the creation of energy for the vines, 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 vigour, the developing grapes can be damaged from the sun causing the grapes to shrivel, discolour 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 bunch weights in Shiraz vines.

Keywords: Underpromoting vines, fruit quality, canopy cover, amino acids, Shiraz vines

1. Introduction

Increasing canopy production and bunch weight improves the productivity in vines resulting in more income and better vine health. Applying amino acids to underperforming vines has shown to improve the health status of underperforming vines by supplying essential amino acids directly to the plant. By supplying amino acids directly, the vines don't need to expel extra energy synthesising amino acids (Teixeira et al., 2018). Providing plants with amino acids, they can be used in the photosynthetic reaction, help increase nutrient absorption, reduce stress related issues that the vine may be experiencing, supporting plant growth hormone production, improve the microbial activity in the soil and also provide plants with beneficial amino acid nitrogen which can be utilised to make proteins and new growth (Effect of Amino Acids on Plants, 2021).

Dual Chelate Fertilizer Pty Ltd has formulated an amino acid rich fertilizer 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 either through foliar or fertigated applications which assists plants in stress management. It promotes chlorophyll formation for improved photosynthesis, improves stress tolerance, increases the uptake of other fertilizers and promotes the formation of new growth (Effect of Amino Acids on Plants, 2021). This study was conducted on an underperforming block of Shiraz vines with the aim to improve the vines by promoting the production of

adequate canopy and improving bunch weight and berry quality.

2. Objectives

The specific objectives of this trial were to:

- To assess the performance of Amino Boost 840 in increasing canopy growth in Shiraz vines.
- Improve berry production and increase bunch weight through application of foliar and fertigated applications of Amino Boost 840

3. Materials and Methods

A block with old Shiraz vines in Mudgee, NSW was selected to receive applications of Amino Boost 840 due to the farm managers expressing concerns of underperformance. After examination of the block, it was identified that the Shiraz vines had low canopy production and low bunch weights. It was noted that there were no disease issues present in the block.

Amino Boost 840 was applied 3 times during the early growing season of the vines through foliar and fertigated applications. Below in table 1 shows the application rates and timings of Amino Boost 840.

Table 1: Application rates and timings of Amino Boost 840 on underperforming Shiraz vines.

Treatment	Application Rate	Application Time
Amino Boost 840	3 kg/ha (Fertigated)	Inflorescence visible (E-L 12)
	1.5 kg/ha (Foliar)	Inflorescence swelling (E-L 17)
	1.5 kg/ha (Foliar)	Pea-size berries (E-L 31)

During and after application of Amino Boost 840, the block was regularly inspected to monitor the progress of the block. Photos were taken to measure the visual improvements.

4. Results

Figure 1: Image of a vine during the application of Amino Boost 840

Figure 2: Image of a vine after the application of Amino Boost 840

Figure 3: Image of a vine after the application of Amino Boost 840

Figure 4: Image of Shiraz grape bunches after Amino Boost 840 treatment

5. 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 (Effect of Amino Acids on Plants, 2021).

This study was conducted on Shiraz grape vines which has shown to have poor vigour 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.

Figure 1 shows a section of vine during applications of Amino Boost 840. It can be seen that there is very minimal and uneven canopy cover. At this time in the vines growth cycle, it is important to have good leaf production to maximise photosynthesis to ensure that there is enough sugar and energy production required to promote the production of flowers and good pollination. Good canopy cover also provides protection to these emerging flowers and protects them from the elements which otherwise may cause poor fruit production (Canopy Management, 2021).

Figures 2 and 3 show images of the vines after the applications of Amino Boost 840. 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 (Kriechbaumer et al., 2008).

After amino Boost 840 applications, it was also noted that the leaves were greener meaning that chlorophyll concentrations in the leaves increased as a result of the Amino Boost 840 (Khan et al., 2019). This increase in leaf greenness comes from the plant relocating the amino acid nitrogen provided by Amino Boost 840 into the production of new chlorophyll protein complexes.

During berry formation, it was also noted that bunch elongation had also improved in the vines treated with Amino Boost 840. Bunch elongation occurs naturally through the production of the plant growth regulator Gibberellic acid, however it is common practice to apply a foliar application of Gibberellic acid directly to the bunches before flowering to ensure that bunch stretch is optimal to prevent any yield losses through disease and fungal damage. Gibberellic acid is formed within new cells of plants and consists of 8 of different forms which not only helps with bunch elongation in grapes, it also assists in the elongation of new plant tissues cells found in shoots, young leaves and flowers. It is also found in seeds and promotes the gemination of the first shoots and roots through weakening the seed coats as a result of gene expression which regulated the production of Gibberellic acids.

The pathways, signals and receptors associated with Gibberellic acid production and movement has not been fully research yet. However, recent research

shows that a growth receptor called DELLA along with other various proteins are involved in the production of Gibberellic acids naturally. DELLA is a growth inhibiting protein which is often seen in new cells. Gibberellic acid has now been proven to have an integral role in binding and destruction of these DELLA growth repressors by actively binding and destroying the compound and thus promoting the elongation and development of new cells. When there are more DELLA growth repressor proteins, production of Gibberellic acid increased by the plant as it is a pathway for increased growth (Harberd, Belfield and Yasumura, 2009). This mechanism is known as the GA-GID1-DELLA mechanism and untimely induces the breakdown of DELLA growth repressors through an upregulation of Gibberellic acids.
Amino Boost 840 assists in promoting the production of DELLA proteins which in turn increases the concentration of Gibberellic acids. Amino Boost 840 contains 85% amino acids which are naturally derived and consist of 17 different forms of amino acids. These amino acids can be used to make proteins which promote the influx of Gibberellic acids.

The farm manager also noted that there was a significant increase in yield production at harvest. Yield was approximately increased by 3 times the average yield from previous years. This increase in yields come from the amino acids contained in Amino Boost 840 which supply plants with enhanced 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.

6. Conclusions

In conclusion, using Amino Boost 840 will significantly increase the production of underperforming vines. It was observed that using fertigated and foliar applications of Amino Boost 840 improved the chlorophyll density, shoot production, canopy growth, bunch stretching and also yields Shiraz grapes. Amino Boost 840 promotes a healthy soil for roots and microbes, increases the plant energy efficiency usage through added amino acids, promotes abiotic stress tolerance, naturally chelating nutrients in the soil through amino acids and BAOM and also increase the mobility of nutrients through the plant system and directing nutrients to where they are in highest demand.

7. References

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