

## Effect of Foliar Application of Amino Acid Formulations on Crop Productivity of Tea

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### Abstract

Amino acids together with carbohydrates are a group of organic molecules found in greater quantities in living beings. This research was conducted to evaluate the effect of foliar application of amino acid formulations (Terra Sorb foliar and Biokad-20) on crop productivity of tea plants. Field experiment was laid out in Randomized Complete Block Design with DT-1 cultivar. Among the different treatments tested, significant improvement in the yield was noticed in Biokad and Terrasorb amino acid based foliar formulations. Yield improvements of Biokad and Terrasorb were about 61% and 55%, respectively. The effect of Biokad with Zinc Sulphate and Terrasorb with Zinc Sulphate combinations were relatively lower than that of Biokad and Terrasorb alone. Significant difference was observed in nitrogen, calcium, magnesium, and zinc contents in mother leaves. Therefore foliar application of amino acid based plant nutrients was highly effective in improving the productivity of tea cultivation in Sri Lanka.

**Key words:** Amino acid, foliar applications, tea

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### Introduction

Tea (*Camellia sinensis* L) is a perennial crop whose leaves and leaf buds are used for the production of tea. Like all other plants, tea plant requires various nutrients for normal growth and productivity. Under normal circumstances, plant gets the required nutrients from the soil, except for small quantities of nitrogen and other elements that are obtained from air and rainwater through absorption of the leaves (Kamau, 2008). Foliar application of plant nutrients are needed to enhance the growth and development in plants. Amino acid based plant nutrients are natural substances, environmentally friendly and safe for any kind of mixture. They are very useful for overcome stress movements, increase crop quality and yield, improve the absorption of nutrients. Amino acid based plant nutrient are obtained by exclusive enzymatic hydrolysis process. Tea is a foliage crop where shoots are harvested periodically and hence stress is imposed physically and physiologically. As a result, plants undergo dormancy, a physiological malfunctioning that will result in the temporary cessation of growth. During this period, tea plants produce more number of dormant buds called banji to evade the stress. Foliar application of active amino acid formulations significantly enhanced the physiological attributes of tea plants

(Thomas *et al.*, 2009). Specific objective of this study was to study, effect of foliar applied amino acid formulations on crop productivity of tea. General objective of this study was to recommend, foliar applied amino acid formulation to Sri Lanka tea production.

The present investigation was aimed at studying the effect of foliar application of amino acid based plant nutrient on crop productivity of tea.

### **Materials and Methods**

The experimental plots were located in field No 3 A, of the St Coombs Estate of the Tea Research Institute, Talawakelle, Sri Lanka. In the experimental plots, the last fertilizer application had been done in 22<sup>nd</sup> May 2013 and last pruning had been done in April 2012. The experiment was carried out using the tea cultivar DT-1. A Randomized Complete Block Design was used. Field plots were selected for six treatments with three replicates. The 18 plots were marked out in 15<sup>th</sup> November 2013. Each plot was surrounded by a guard raw which separated the treated area in order to prevent treatment effect in any adjacent plots to influence the experiment. Each individual plots contained 50 bushes. There were a total of six treatments as given below.

Treatment1 (T1)	No spray (control)
Treatment2 (T2)	TRI ground fertilizer recommendation + 11 g of Zinc Sulphate per each plot
Treatment3 (T3)	TRI ground fertilizer recommendation + 1.2ml Biokad per each plot
Treatment4 (T4)	TRI ground fertilizer recommendation + 4.8 ml Terrasorb per each plot
Treatment5 (T5)	TRI ground fertilizer recommendation + 1.2ml Biokad + 11 g Zinc Sulphate
Treatment6 (T6)	TRI ground fertilizer recommendation + 4.8 ml Terrasorb + 11 g Zinc Sulphate

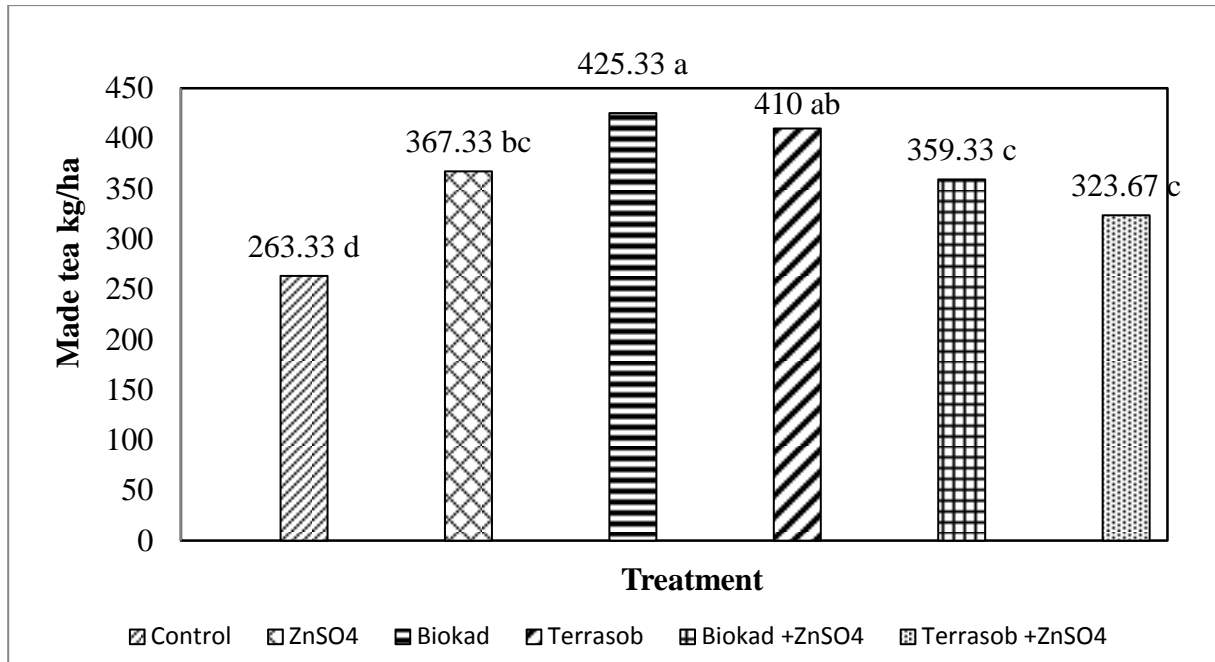
Soil sampling was undertaken before the 1<sup>st</sup> treatment application and at the end of the experimental period. Soil samples of 0-15 cm depth and 15-30 cm inch depth were collected from three randomly selected locations within each plot after removing the surface litter of the plots. Part of the soil was air dried. Then the soil was passed through a 2 mm sieve prior to chemical analysis to get a homogeneous sample.

Leaf sampling was done before 1<sup>st</sup> treatment application and at the end of the experimental period. The mother leaves and flush were collected from each experimental plot. Yield records were maintained throughout the experimental period. Harvesting was done by hand plucking and tender shoots containing bud, 1<sup>st</sup> and 2<sup>nd</sup> succulent leaves and at times 3<sup>rd</sup> succulent leaves may have harvested at 5-10 day intervals. The data collected were statistically analyzed using the Statistical Analysis System (SAS), version 6 (Anon, 1995) and Microsoft Excel (Anon, 2000) package.

### **Results and Discussion**

Significant yield improvement was recorded in Biokad and Terrasorb, amino acid based commercial formulations compared to all the other treatments (Figure 1). Yield improvements of Biokad and Terrasorb were higher than that of zinc sulphate, the current Tea Research Institute foliar recommendation. Biokad showed higher yield improvement than Terrasorb. Effects of application of Biokad with zinc sulphate and Terrasorb with zinc sulphate combinations were somewhat low compared with application of Biokad and Terrasorb alone. It may be due to antagonistic effect or nutrient toxicity when application of amino acid and zinc sulphate as a cock tail.

There are several reports available on phytomass productivity in tea due to foliar application of plant growth regulators (Manivel, 1994; Kumar, 1999; Mandal, 2007). Those reports showed a yield improvement of less than 19%. Whereas, the present study documented higher improvement in yield when compared to untreated control. Yield improvement of Biokad is about 61% and yield improvement of Terrasorb is about 55%



**Figure 1.** Effect of application of amino acid on made tea yield

Significant difference was observed in nitrogen content in mother leaf. Nitrogen content in control treatment is significantly higher than that of other treatments. It is due to the dilution effect of other treatments except control due to higher yield. It appears that increment of nitrogen content in mother leaf of all treatments except control is contributed to the yield increment of tea plant. Nitrogen content in mother leaf and flush after treatment application is higher than that of before treatment application in each treatment. Reason for increasing nitrogen content in each treatment is because of ground fertilizer application.

Phosphorus content in mother leaf and flush after treatment application are higher than that of before treatment application in each treatment. Main reason for that increment may be ground fertilization.

Significant difference was not found due to application of amino acid on sulphur, calcium in mother leaf and sulphur, calcium, magnesium content in flush. Significant difference was not found due to application of Amino acid on Manganese in mother leaf and on zinc, manganese content in flush.

Available zinc content in mother leaf and flush during after treatment application of amino acid is higher than that of before treatment application in each treatment. Application of amino acid may increase nutrient absorption capacity of plants.

### Conclusion

Among the different treatments tested, significant improvement in the yield was noticed from to Biokad and Terrasorb amino acid based foliar formulations. Yield improvements of Biokad and Terrasorb are about 61% and 55%, respectively.

Foliar application of amino acid based plant nutrients is highly beneficial to tea cultivation. However, it is important to highlight here that as tea is a perennial crop, the present results are based on an field experiment conducted only for three-month period. Therefore to get more precious results, this study has to be continued at least for one year period.

### References

- Kamau, D., 2008. *Productivity and resource use in ageing plantation*. PHD thesis, Wageningen University, ISBN 978-90-8504-808-4 Wageningen, Netherland.
- Thomas, J., Mandal, A.K.A., Kumar, R.R., Chordia, A., 2009. Role of biologically active amino acid formulations on quality and crop productivity of tea (*Camellia* sp.). *Int J Agric Res.* 1-9.
- Kumar, R.R., Marimuthu, S., and Muraleedharan, N., 1999. Tea leaf photosynthesis in relation to light. *J. Plantn. Crops*, 27: 93-98
- Mandal, A.K.A., Kumar, R.R., and Thomas J., 2007. An overview of PGR trials in UPASI TRF. *Planters Chron.*, 103: 12-16.
- Manivel, L., Marimuthu S., Venkatesalu V., and Kumar R.R., 1994. *Effect of potassium nutrition and growth regulators on photosynthesis and assimilate translocation in tea*. International Potash Institute, Basel, Switzerland, pp: