

Amino acid-enriched biostimulant application enhances must quality parameters in *Vitis vinifera* L. cv. Tempranillo

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INTRODUCTION & AIM

The growing need for sustainable viticultural strategies has led to increased interest in the use of biostimulants.

Amino acid-based biostimulants enhance plant vigor, nutrient uptake, and tolerance to environmental stress.

The aim of this work was to evaluate the effects of foliar application of an amino acid-based biostimulant (Naturamin®) at two doses (500 and 1,000 g/ha) on yield components and grape quality in *Vitis vinifera* L. cv. ‘Tempranillo’ under rainfed conditions in Rioja, Spain.

METHODOLOGY

The experiment was conducted in Villamediana de Iregua (La Rioja, Spain) in 2024 in a commercial vineyard of *Vitis vinifera* cv. ‘Tempranillo’, planted in 2009 (Fig. 1).

Three foliar treatments were applied: Control; 500 g/ha of Naturamin® (T1); 1,000 g/ha of Naturamin® (T2).

A randomized block design with three replicates per treatment was performed, witch each replicate having ten vines.

Foliar applications were performed four times between May and August targeting different growth stages.

UHPLC-QqQ-MS/MS was applied to quantifiy amino acids and phenolic compounds in the grape samples.

ANOVA and Duncan’s tests were used to determine statistical significance between different treatments.



Figure 1. Image of the vineyard (*Vitis vinifera* cv. ‘Tempranillo’) where foliar treatments of Naturamin® were performed

KEY RESULTS

The foliar application of the amino acid-based biostimulant Naturamin® did not significantly affect grapevine yield parameters (data not shown).

The highest application rate (1,000 g/ha) significantly increased the levels of several amino acids, such as glutamine, arginine, and methionine, which are relevant for yeast nutrition and fermentation dynamics, as well as for the formation of aroma-active compounds that influence wine quality (Table 1).

Only minor changes were observed in the phenolic profile (Figure 2). The increase in hydroxycinnamic acids at the highest dose suggests a potential role in enhancing stress tolerance and contributing to wine color and aroma complexity.

These findings support the use of amino acid-enriched biostimulants as a sustainable tool to improve grape composition and enological potential without compromising yield.

Table 1. Amino acids in grape must from three treatments: Control, Naturamin® 500 g/ha (T2), and Naturamin® 1,000 g/ha (T3) (n = 3).

	CONTROL	T1	T2
Glutamine	774.48 ± 73.42 a	905.89 ± 345.35 ab	1394.04 ± 235.32 b
Arginine	472.92 ± 107.05 a	606.48 ± 241.90 ab	877.71 ± 143.18 b
Proline	401.12 ± 76.77	367.45 ± 38.28	398.58 ± 65.46
γ-aminobutiric acid	284.15 ± 44.74	287.06 ± 24.82	293.65 ± 45.68
Glutamin Acid	121.92 ± 8.94	116.35 ± 8.62	132.06 ± 7.62
Citrulline	73.13 ± 7.69 a	86.61 ± 35.60 ab	132.77 ± 27.81 b
Theonine	64.26 ± 9.96 a	81.09 ± 25.56 ab	108.92 ± 15.41 b
Alanine	59.74 ± 11.73 a	80.61 ± 28.75 ab	109.93 ± 20.26 b
Histidine	55.41 ± 10.74 a	72.06 ± 29.66 ab	101.51 ± 15.34 b
Serine	42.96 ± 6.19	47.88 ± 10.92	55.78 ± 5.08
L-valine	20.48 ± 5.10 a	28.84 ± 12.74 a	54.63 ± 15.94 b
Aspartic Acid	25.69 ± 2.03 a	29.74 ± 7.19 ab	38.65 ± 2.95 b
Methionine	18.73 ± 4.14 a	24.90 ± 11.87 ab	45.65 ± 12.99 b
Isoleucine	14.93 ± 3.71 a	26.11 ± 14.82 a	46.11 ± 7.63 b
Tyrosine	19.40 ± 0.95	28.95 ± 9.14	30.57 ± 2.29
Asparragine	12.48 ± 1.74 a	15.90 ± 7.60 ab	24.74 ± 4.46 b
Ornithine	9.15 ± 2.56 a	11.94 ± 6.14 a	22.07 ± 3.96 b
Leucine	7.40 ± 2.27	11.41 ± 7.78	18.47 ± 4.68
Tryptophan	8.41 ± 1.18	12.89 ± 7.97	9.56 ± 1.02
Lysine	5.68 ± 1.20 a	7.84 ± 3.05 ab	11.37 ± 1.60 b
Phenylalanine	7.28 ± 4.35	4.01 ± 0.40	5.78 ± 1.05
Glycine	2.78 ± 0.73 a	3.69 ± 0.84 ab	4.73 ± 1.00 b
Cystine	0.11 ± 0.02	0.10 ± 0.02	0.13 ± 0.06
Total	2502.6 ± 320.6 a	2857.8 ± 851.9 ab	3917.4 ± 550.0 b

Different letters indicate statistically significant differences between treatments according to Duncan’s test (p<0.05).

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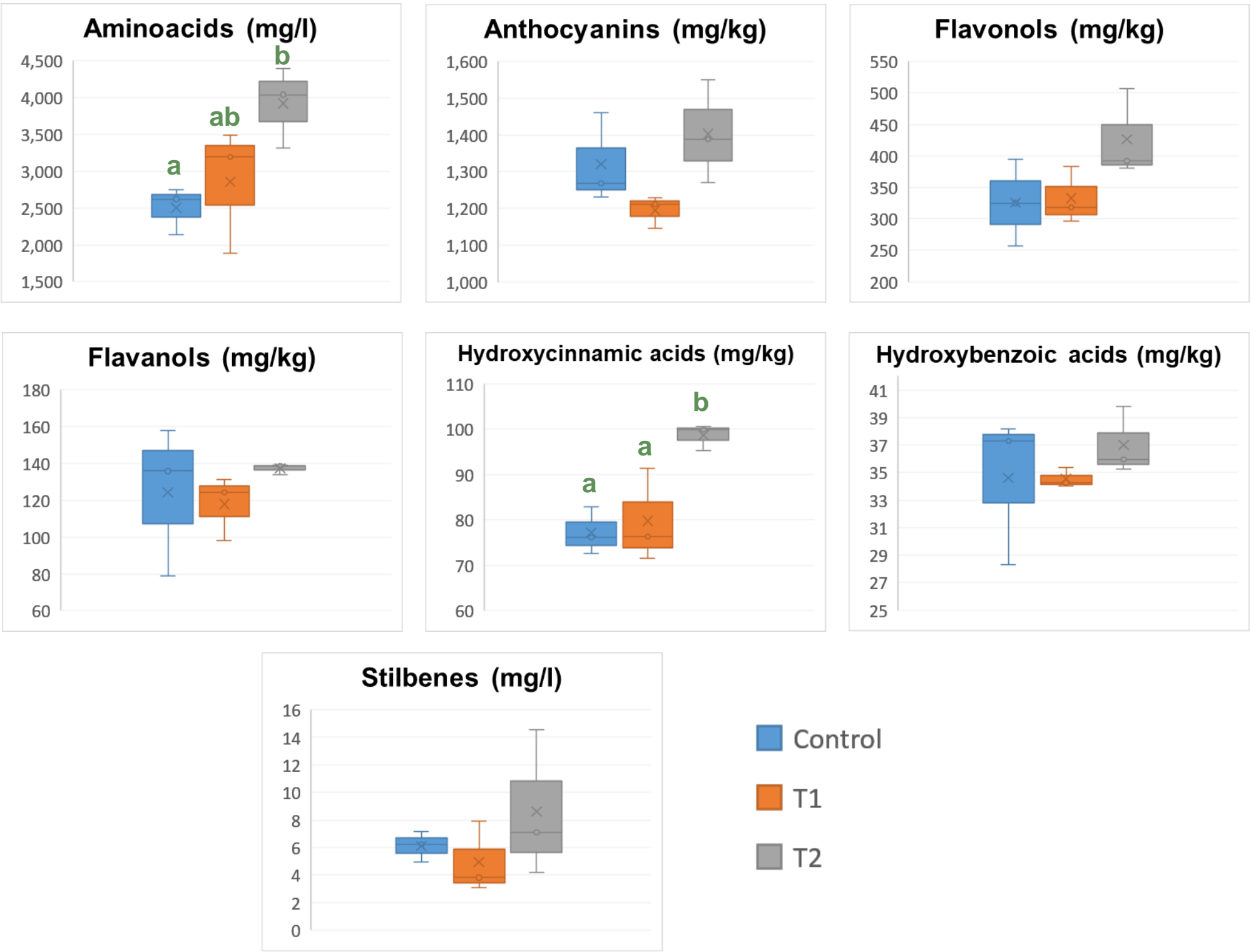


Figure 2. Effect of the foliar treatments on grape total aminoacids and phenolic content.