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One plant-based biostimulant stimulates good performances of tomato plants grown in open field

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Abstract: Most agricultural practices have evolved towards biological and sustainable systems. The purpose of modern agriculture is to reduce inputs without reducing yield and quality. This objective can be achieved through breeding programs and the identification of organic molecules capable of activating plant metabolism. Biostimulants contain a wide range of mostly still unknown bioactive compounds. These products are generally able to improve the plant's nutrient utilization efficiency and increase tolerance to biotic and abiotic stresses. The aim of this study was to determine biometric measurements and metabolic profiling of two tomato genotypes grown in open field and treated or not with a plant-derived biostimulant named CycoFlow (Agriges). The application of the biostimulant stimulated growth (plants up to 55.06% higher) and yield *per* plant (up to 111.66%). In plants treated with the biostimulant, antioxidants and pigments contents in fruit were higher compared to non-treated plants. In particular, the content of β-carotene increased after treatments with CycoFlow. The present study proves that the application of plant-derived biostimulant can increase tomato performance in the field.

Keywords: sustainable agriculture; bioassay; crop; *Solanum lycopersicum*

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Results and Discussion

As reported in **Figure 1**, the application of a plant-based biostimulant named CycoFlow (Agriges) resulted in higher height and higher fresh and dry biomass of the vegetative plant parts only in the genotype E42 compared to non-treated plants. In both genotypes the application of CycoFlow resulted in significantly higher yields compared to non-treated control plants (+111.67% in E42 and +43.37% in LA3120). The observed effect may be due to the physiological mechanisms triggered in tomato plants after biostimulant application and linked to an increased content of signaling molecules, which are the main components of this biostimulant of plant origin.

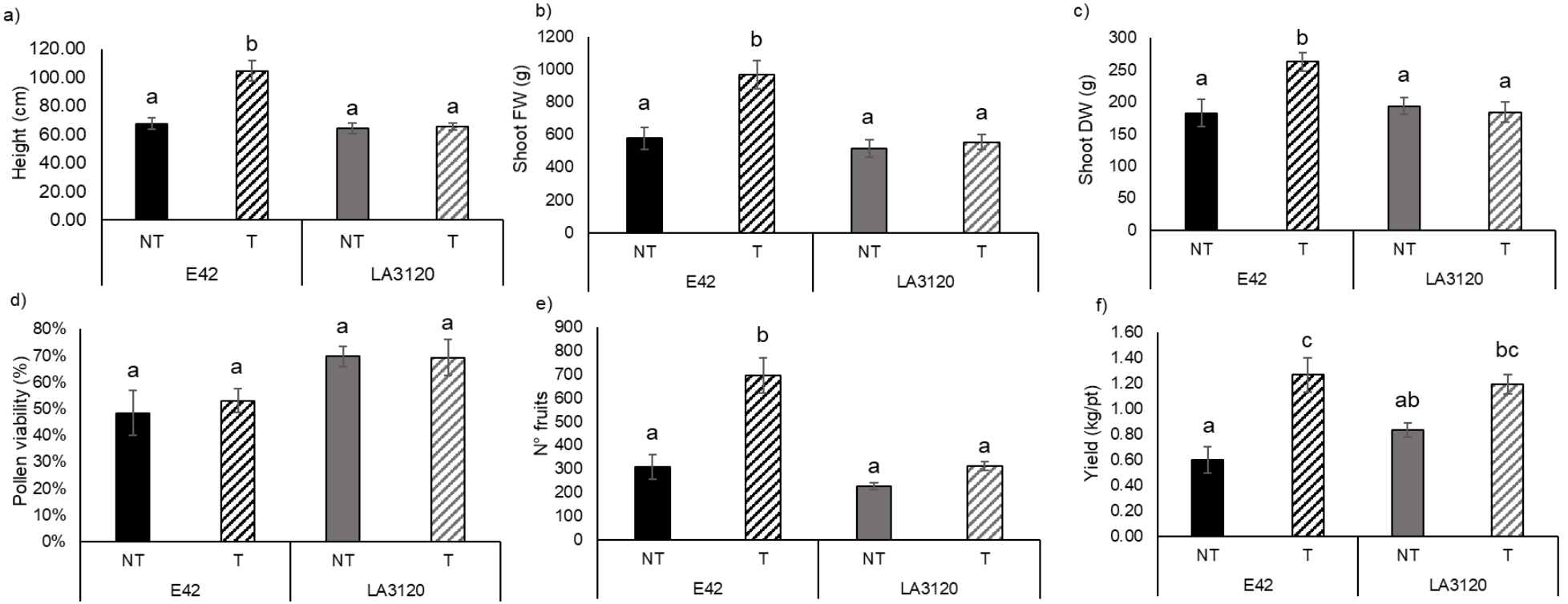

Figure 1. Effect of CycoFlow on (**a**) height, (**b**) shoot fresh weight, (**c**) shoot dry weight, (**d**) pollen viability (**e**) number of fruits (**f**) yield *per* plant on two tomato genotypes. Values are mean ± SE. Different letters indicate significant differences based on Tukey's test ($p \leq 0.05$).

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Results and Discussion (2)

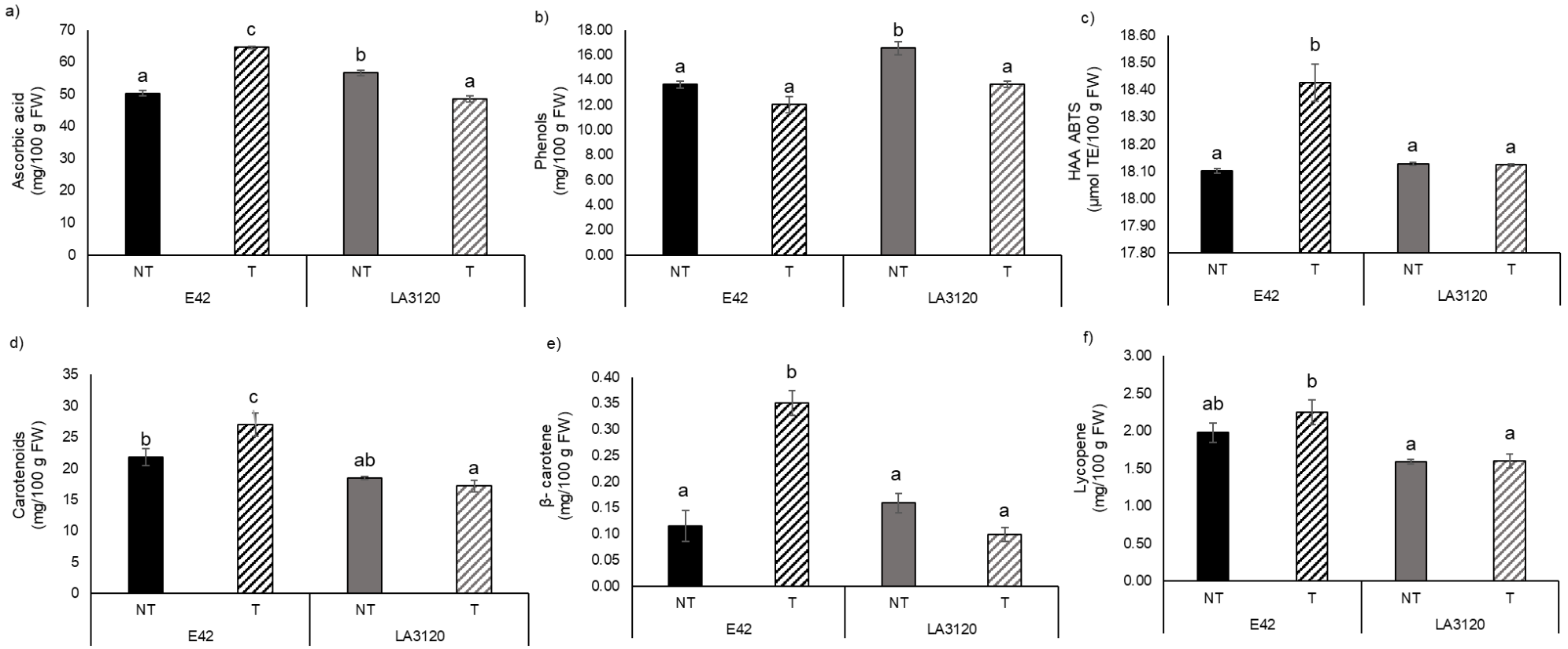

Figure 2. Effect of CycoFlow on the content of (**a**) ascorbic acid, (**b**) phenols, (**c**) hydrophilic antioxidant activities (HAA), (**d**) carotenoids (**e**) β-carotene (**f**) lycopene in fruit of two tomato genotypes. Values are mean ± SE. Different letters indicate significant differences based on Tukey's test ($p \leq 0.05$).

The treatment with the biostimulant increased the content of ascorbic acid only in the genotype E42 (**Figure 2a**). The content of ascorbic acid increased by 28.59% in fruit from E42 treated plants, while it decreased by 14.36% in fruit from LA3120 treated compared to non-treated plants (**Figure 2a**). Only in the LA3120 treated plants there was a significant decrease in phenol content equal to 17.47% (**Figure 2b**). Moreover, a significantly higher antioxidant activity HAA was demonstrated in fruits from E42 plants treated with CycoFlow (**Figure 2c**).

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Conclusions

From the research conducted on the two tomato genotypes, the effects of the application of a biostimulant based on plant extracts on fruit yield, nutritional and functional attributes emerged. Controversial results have arisen from the comparison between the two genotypes, since the effect of the biostimulant appears to be clearer only in the genotype E42. Altogether, the present study highlighted that the application of biostimulants may contribute to make sustainable a conventional tomato cultivation system.

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