Evolution of the amino acids content through grape ripening: Effect of foliar application of methyl jasmonate with or without urea

Teresa Garde-Cerdán*, Rebeca Murillo-Peña, Elisa Baroja, José M. Martínez-Vidaurre, Pilar Rubio-Bretón, Eva P. Pérez-Álvarez

Instituto de Ciencias de la Vid y del Vino (CSIC, Gobierno de La Rioja, Universidad de La Rioja). Ctra. de Burgos, Km 6. 26007 Logroño, Spain.

*teresa.garde.cerdan@csic.es

INTRODUCTION

★ The parameters that determine the grape quality, and therefore the optimal harvest time, suffer changes during berry ripening, related to climate change, with the widely known problem of the gap between technological and phenolic maturities [1].

★ However, there are few studies about its incidence on grape nitrogen composition. These compounds, especially amino acids, determine the fermentative kinetics and the formation of the main fermentative volatile compounds [2, 3]. For this reason, the use of an elicitor, methyl jasmonate (MeJ), alone or with urea (Ur), is proposed as a tool to reduce climatic decoupling, allowing to establish the harvest time in order to achieve the optimum grape quality.

★ Therefore, the aim was to study the effect of MeJ and MeJ+Ur foliar applications on the evolution of Tempranillo amino acids content throughout the grape maturation.

MATERIAL AND METHODS

- The experimental design was a randomized block design in the vineyard with 3 treatments, each in triplicate, with 10 vines per replicate. Foliar applications were carried out at veraison and 7 days later.
- In each application, 200 mL of solution was applied per plant, being the treatments:
  - Control (water)
  - MeJ (10 mM)
  - MeJ+Ur (10 mM + 6 kg N/ha)
- Grape samples were taken at five points in time: one day before the first application (Fol1), one day before the second application (Fol2), fifteen days after the second application (Pre: pre-harvest), the day of harvest (Har) and 15 days after harvest (Post: post-harvest).
- In each sample, the amino acids were determined by HPLC [4].

Vineyard

RESULTS

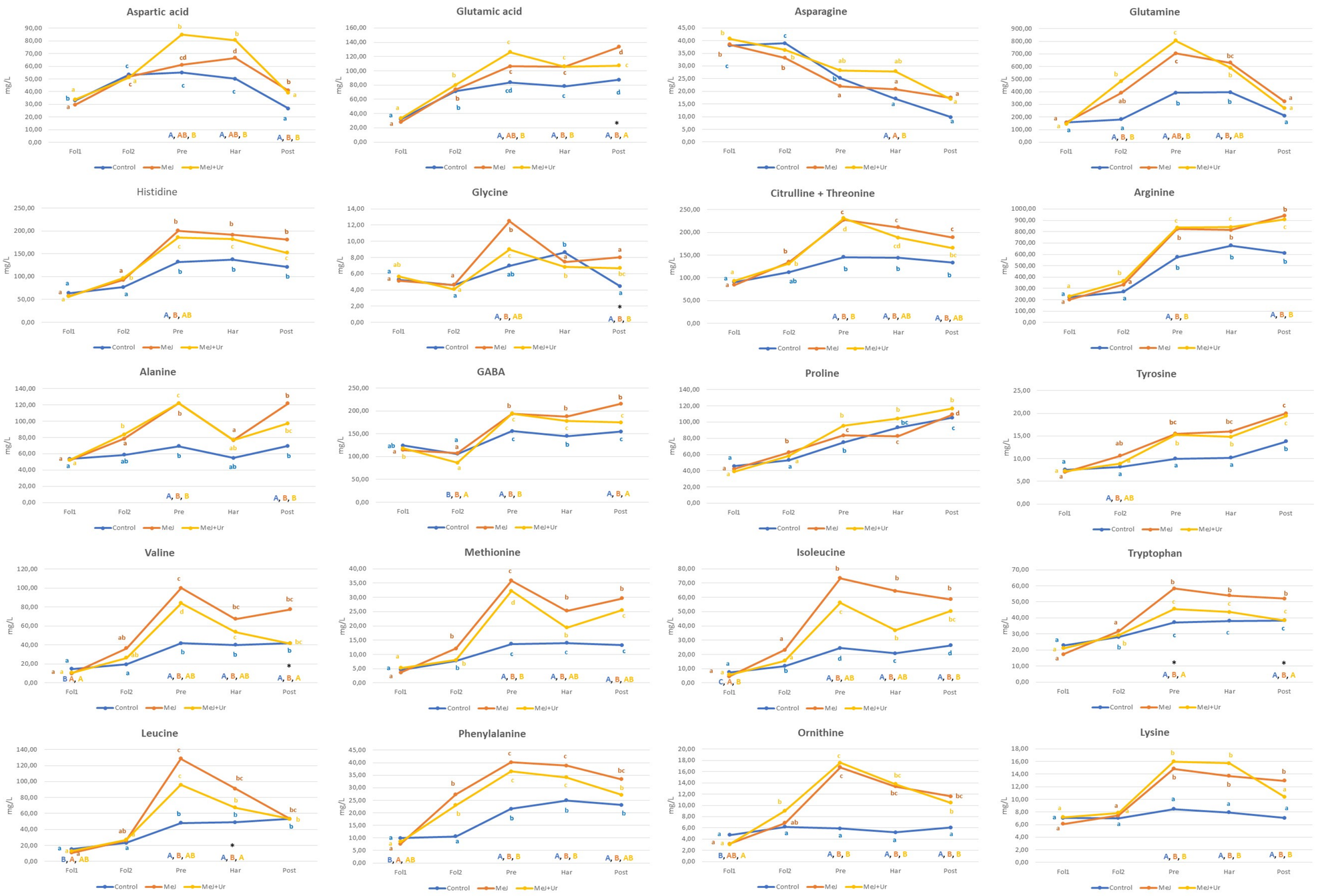
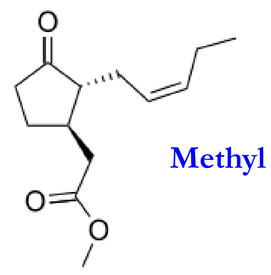


Figure 1. Evolution of amino acids concentration (mg/L) throughout the grape ripening of control, MeJ and MeJ+Ur treatments.

Results are shown as mean of 3 repetitions (n = 3).

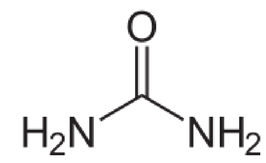
For each treatment, different small letters indicate significant differences between moments ($p \leq 0.05$).

For each moment, different capital letters indicate significant differences between treatments ($p \leq 0.05$). The absence of letters indicates that there were no significant differences ($p > 0.05$).



Methyl jasmonate

Urea



- Results showed that, in general, the evolution of amino acids was similar regardless of the treatment. However, foliar applications influenced the nitrogen compounds content, i.e., there was no qualitative effect but quantitative one (Figure 1).
- Most of the amino acids reached the maximum concentration in pre-harvest (Pre), being higher in grapes from the treatments than in the control samples (Figure 1).
- In general, no differences in grape amino acids content were observed between MeJ and MeJ+Ur foliar treatments (Figure 1).

CONCLUSIONS

- ✓ Foliar applications with MeJ and MeJ+Ur improved the grape amino acids content, without affecting their profile, helping to optimize their quality and allowing to establish a more complete grape ripening standard.
- ✓ Consequently, MeJ and MeJ+Urea foliar treatments can be a good agronomic practice, which has shown promising results in order to enhance the grape quality.

REFERENCES

[1] Mira de Orduña, R. 2010. Climate change associated effects on grape and wine quality and production. Food Research International, 43, 1844-1855.

[2] Garde-Cerdán, T., Ancín-Azpilicueta, C. 2008. Effect of the addition of different quantities of amino acids to nitrogen-deficient must on the formation of esters, alcohols, and acids during wine alcoholic fermentation. LWT-Food Science and Technology, 41, 501-510.

[3] Pérez-Álvarez, E.P., Rubio-Bretón, P., Intrigliolo, D.S., Parra-Torrejón, B., Ramírez-Rodríguez, G.B., Delgado-López, J.M., Garde-Cerdán, T. 2022, Year, watering regime and foliar methyl jasmonate doped nanoparticles treatments: Effects on must nitrogen compounds in Monastrell grapes. Scientia Horticulturae, 297, art. no. 110944.

[4] Garde-Cerdán, T., Lorenzo, C., Lara, J.F., Pardo, F., Ancín-Azpilicueta, C., Salinas M.R. 2009. Study of the evolution of nitrogen compounds during grape ripening. Application to differentiate grape varieties and cultivated systems. Journal of Agricultural and Food Chemistry, 57, 2410-2419.

ACKNOWLEDGMENT

This work has been carried out thanks to funding from the Ministerio de Ciencia e Innovación through the RTI2018-096549-B-I00 project. R. M.-P. thanks to INIA for her pre-doctoral contract. E.P. P.-Á. thanks to Ministerio de Ciencia e Innovación her post-doctoral contract.