

IMPROVING STILBENES IN *VITIS LABRUSCA* L. GRAPES THROUGH METHYL JASMONATE APPLICATIONS

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Abstract:

Context and purpose of the study - Grapes (*Vitis* sp.) are considered a major source of phenolic compounds such as flavonols, anthocyanins and stilbenes. Studies related to the beneficial effects of these compounds on health have encouraged research aimed at increasing their concentration in fruits. On this behalf, several plant growth regulators such as jasmonic acid and its volatile ester, methyl-jasmonate (MeJa), have demonstrated promising results in many fruits. However, Brazilian subtropical climate might interfere on treatment response. The present study aims to evaluate the application of MeJa in the pre-harvest period in Concord and Isabel Precoce grapes (*Vitis labrusca* L.).

Material and methods - Grapes cultivated in Brazil's southern region (Bento Gonçalves, RS, altitude: 671 meters) receive a MeJa solution into different periods during ripening. Grapes were harvested, analyzed and the results compared to non-treated fruit (control group). Edaphoclimatic conditions and cultural practices were monitored (climate data, soil, fertilization, pruning, etc.). Anthocyanins and stilbenes were quantified by analytical reversed-phase liquid chromatography (Agilent Technologies, model 1260 Infinity) equipped with a DAD.

Results – The results obtained after a 2-years study has provided evidence that MeJa application is an eco-friendly means to enhance compounds such anthocyanin and stilbenes in *Vitis labrusca* L. grapes, grown even in subtropical climate. The effectiveness of MeJa application seems to be related to phenological state in the period of application. Best results were obtained with two applications: during *véraison* and approximately two weeks before harvest. Our results suggest that MeJa treatment enhances *trans*-resveratrol and piceid contents when grapes are treated in these conditions. Further studies are being conducted in other Brazilian regions with the objective of better understanding the behavior of *Vitis labrusca* L. grapes towards MeJa treatment in different edaphoclimatic conditions.

Keywords: *Vitis labrusca* L., stilbenes, anthocyanins, pre-harvest, elicitors, methyl jasmonate

1. Introduction.



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INTRODUCTION & OBJECTIVE

Vitis labrusca L. species are very expressive on Brazilian grape production.

Many researches have encouraged application of elicitors, as methyl-jasmonate (MeJa), to increase phenolic compounds such as flavonols, anthocyanins and stilbenes (Portu et al., 2017).

However, moment of treatment application and Brazilian subtropical climate might interfere on treatment response.

The present study aims to evaluate the moment of MeJa application during pre-harvest period in *Vitis labrusca* L. grapes regarding stilbenes and anthocyanin content.



MATERIAL & METHODS

The experiment was conducted in 2015 and 2016, in Bento Gonçalves, (Rio Grande do Sul, Brazil) in Isabel Precoce (spontaneous somatic mutation of cultivar Isabel) and Concord (*Vitis labrusca* L.).

Experimental design: Randomized blocks consisting of three replicates of 10 grapevines per treatment (20 clusters per vine). The treatments were applied directly into the clusters at veraison, (3 applications) and/or a single application two weeks before harvest: Methyl Jasmonate (MeJa): 10 mM MeJa Vezzulli et al (2007); Control (CTRL) sprayed with water.

Stilbenes and anthocyanins were quantified by HPLC equipped with a DAD. Anthocyanins were identify by LC-ESI-MS/MS.



ANTHOCYANINS

MeJa treatment does not affect the profile of this anthocyanins, only their quantity.

Main anthocyanins for Concord: delphinidin 3-glucoside (peak 1), delphinidin-3-(6"-p-coumaroyl) glucoside (peak 9), cyanidin 3-(6"-p-coumaroyl) glucoside (peak 11).

For Isabel Precoce grapes the results were as follows: peonidin 3-glucoside (peak 4); malvidin 3-glucoside (peak 5); peonidina-3-(6"-p-coumaroyl) glucoside (peak 13) and malvidin-3-(6"-p-coumaroyl) glucoside (peak 14).

MeJa application before *véraison* plus a single application two weeks before harvest does not increase anthocyanins.

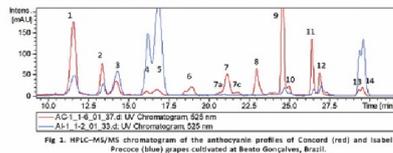


Fig. 3. HPLC-MS/MS chromatogram of the anthocyanin profiles of Concord (red) and Isabel Precoce (blue) grapes cultivated at Bento Gonçalves, Brazil.

STILBENES

MeJa treatment at two periods (*véraison* and two weeks before harvest) promotes higher concentration of trans-resveratrol and piceid.

Viniferin was not enhance by MeJa treatment.

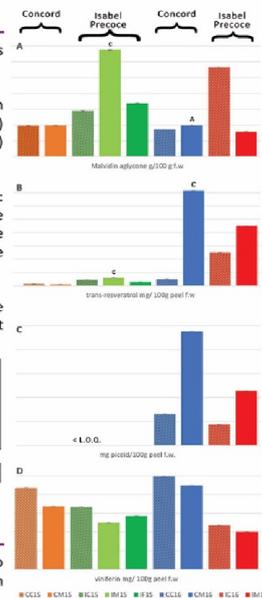


Fig. 4. Anthocyanin (A); Stilbene content quantified as trans-resveratrol (B), piceid (C) and viniferin (D), on Concord (red) and Isabel Precoce (blue) grapes grown at Bento Gonçalves, Brazil. CC15: Concord CTRL 2015; CM15: Concord MeJa 2015; IC15: Isabel Precoce CTRL 2015; IM15: Isabel Precoce MeJa 2015; IF15: Isabel Precoce MeJa 2015; CC16: Concord CTRL 2016; CM16: Concord MeJa 2016; IC16: Isabel Precoce CTRL 2016; IM16: Isabel Precoce MeJa 2016. (a,b,c) Different lower case letters denote significant differences between CTRL and MeJa grapes harvested in 2015; (A-C) Different capital letters indicate significant differences between grapes harvested in 2016 according to ANOVA (Student-Newman-Keuls test, $\alpha = 0.05$). < L.O.Q.: above limit of quantification.

CONCLUSION

MeJa application is an eco-friendly means to enhance compounds such anthocyanin and stilbenes in *Vitis labrusca* L. grapes, grown even in subtropical climate.

The effectiveness of MeJa application seems to be related to phenological state in the period of application.

Best results were obtained with two applications: during *véraison* and approximately two weeks before harvest.

Our results suggest that MeJa treatment enhances trans-resveratrol and piceid contents when grapes are treated in these conditions.

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