Response of red grape varieties irrigated during the summer to water availability at the end of winter in four Spanish wine-growing regions: berry phenolic composition

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INTRODUCTION

Water availability is the most limiting factor for vineyard productivity under Mediterranean conditions. Due to the effects caused by the current climate change, wine-growing regions may face serious soil moisture conservation problems, due to the lower water retention capacity of the soil and higher soil irradiation. The aim of this work was to evaluate the effects of soil recharge irrigation in pre-sprouting on berry phenolic composition at harvest.

MATERIALS AND METHODS

IRRIGATION TREATMENTS

-Soil recharge irrigation in pre-sprouting and summer irrigation every week (30 % ETo) from the pea size state until the end of ripening **(RP)**
-Summer irrigation every week (30 % ETo) from the pea size state until the end of ripening **(R)**

ANALYTICAL METHODOLOGY

Extraction of phenolic material from grapes, identification and quantification by HPLC of 36 phenolic compounds integrated in:

Anthocyanins	Glucosides Acetates Coumarates	Delphinidin
		Cyanidin
		Petunidin
		Peonidin
		Malvidin
Non-anthocyanidins	Flavanols	
	Flavonols	
	Fenolic acids	
	Stilbenes	

EXPERIMENTAL SITE AND PLANT MATERIAL

The experiment was carried out during two consecutive seasons (2021 and 2022), in vineyards of:

1. **Mencía** (**Lugo**, 2021-2022)
2. **Tempranillo** (**Valladolid**, 2021)
3. **Garnacha Tinta** (**Badajoz**, 2021-2022)
4. **Syrah** (**Albacete**, 2021-2022)

STATISTICAL ANALYSIS

-Statistical comparisons between values were established with Student's t-test using Xlstat software.
All data are expressed as the mean of four blocks and three replicates per block.

RESULTS AND DISCUSSION

2021

Figure 1 shows that in 2021, pre-sprouting irrigation tended to cause a decrease in the concentration of both anthocyanin and non-anthocyanin compounds in Garnacha Tinta and Syrah, although this was only significant in the case of Syrah flavanols compounds (Fig. 2d). In Mencía, RP compared to R, increased the concentration of anthocyanins, mainly of the glucoside forms (Fig.2a, 2b).

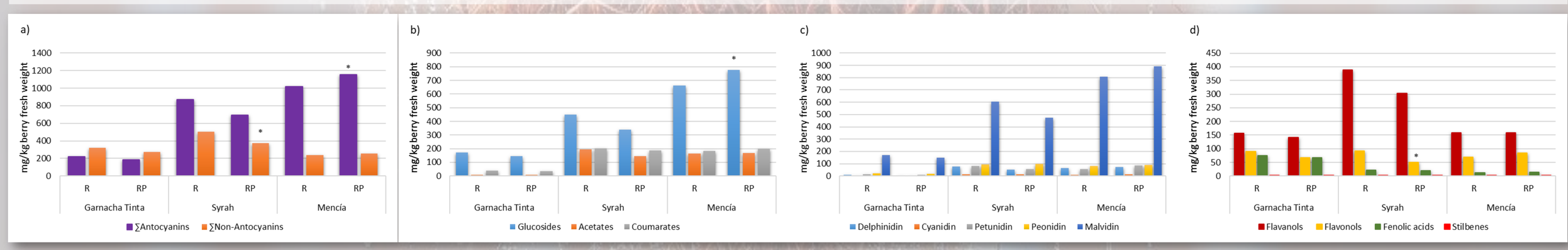

Figure 1. Effect of pre-sprouting recharge irrigation on berry phenolic composition in 2021 season. a) Total anthocyanins and non-anthocyanins. b) Monoglucoside forms (Glucosides), acetylglucoside forms (Acetates) and p-coumaroylglucoside forms (Coumarates). c) Delphinidin, cyanidin, petunidin, peonidin and malvidin derivates. d) Non-anthocyanins integrated in flavanols, flavonols, fenolic acids and stilbenes. For the each variety and parameter, * indicate significant differences (p<0.05) due to irrigation treatment.

2022

In 2022, the effect of soil water recharge was more noticeable. In relation to anthocyanin compounds, RP significantly reduced the concentration of acetylated compounds in Garnacha Tinta and monoglucoside, acetylated and coumarilated anthocyanins in Tempranillo (Fig.2b), as well as the values of delphinidin, petunidin, peonidin and malvidin derivatives (Fig.2c), while in the rest of the varieties the values remained unaffected. The RP treatment, compared to R, tended to increase the concentration values of flavonols and phenolic acids in Tempranillo and decrease that of flavonols in Syrah (Fig.2d).

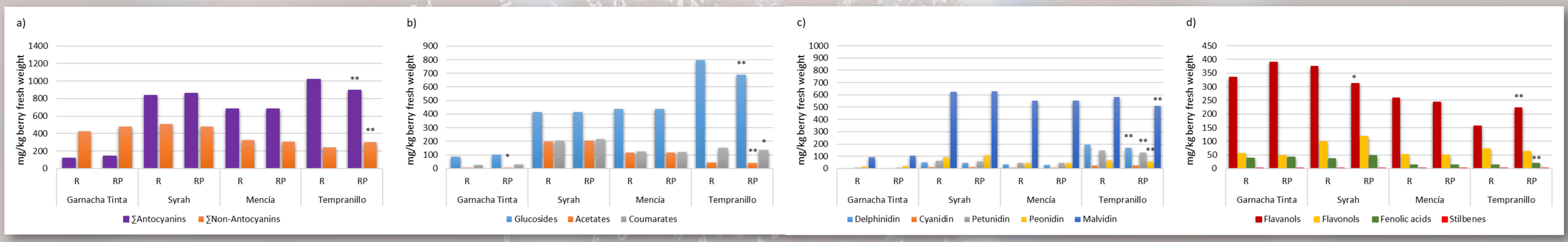

Figure 2. Effect of pre-sprouting recharge irrigation on berry phenolic composition in 2022 season. a) Total anthocyanins and non-anthocyanins compounds. b) Monoglucoside (Glucosides), acetylglucoside (Acetates) and p-coumaroylglucoside (Coumarates) forms. c) Delphinidin, cyanidin, petunidin, peonidin and malvidin derivates. d) Non-anthocyanins classifieds in flavanols, flavonols, fenolic acids and stilbenes. For the each variety and parameter, * and ** indicate significant differences (p<0.05 and p<0.01 respectively) due to irrigation treatment.

CONCLUSIONS

Pre-sprouting recharge irrigation tended to increase the anthocyanin content in Mencía, while in Tempranillo and Syrah tended to decrease the phenolic content. The effect of this technique was highly dependent on the year and the characteristics of each vineyard.

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