

# Influence of Polysaccharides on the Extraction of Polyphenols During Maceration at Different Levels of Grape Maturity

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## Introduction

Polyphenol extraction during red wine maceration and fermentation determines wine quality and consumer liking. The extractability limits the proportion of polyphenols that is extracted into the wine during fermentation [1-2]. Influential factors are next to enzymatic activity, cell wall structural and other physiological changes most likely polysaccharide interactions [3-5]. Different polysaccharides can interact with anthocyanins and tannins, often reducing their concentration in solutions [6-9]. The effects of those interactions must be analyzed in the complex fermentation environment to evaluate the impact of grape cell wall polysaccharides on the extractability.

## Method

Cabernet Sauvignon (17.8, 19.6, 21.0 °Brix) and Pinot noir (17.2, 20.1, 22.0 °Brix) grapes at different maturity levels, were fermented for 12 days in 1.6 kg microvinifications with 0.3 % w/w added polysaccharides. The polysaccharides were previously extracted as the alcohol insoluble residues at three harvest points in 2019 from the respective berries from the same vineyard. During fermentation tannin, anthocyanin and non protein precipitable polymeric pigment (n-p PP) concentration were monitored with UHPLC-UV-DAD and protein precipitation assay. Potential alcohol was equilibrated to 14.5 % v/v and pH was set to 3.3. At lowest and highest maturity, the same unspecific mixture of all polysaccharides was added. At medium maturity level varietal specific polysaccharides from each harvest point were added individually.

[1] KA Bindon et al., J Agric Food Chem 62 (5), 1130 (2014).  
[2] JM Hernandez-Hierro et al., Food Chem 146, 41 (2014).  
[3] G Garrido-Banuelos et al., Food Chem 278, 26 (2019).  
[4] R Castro-Lopez Ldel et al., Food Chem 196, 526 (2016).  
[5] L Rolle et al., J Agric Food Chem 59 (16), 8796 (2011).

[6] LR Larsen et al., J Agr Food Chem 67 (33), 9344 (2019).  
[7] KA Bindon et al., J Agric Food Chem 58 (19), 10736 (2010).  
[8] C Medina-Plaza et al., Am J Enol Vitic 71 (2), 149 (2020).  
[9] A Osete-Alcaraz et al., Biomolecules 10 (1), 36 (2019).

## Results

The addition of grape polysaccharides changed tannin concentration in the must. Anthocyanin and n-p PP concentration was not significantly affected by grape specific polysaccharides but harvest maturity of the berry. Polysaccharide tannin interactions were strongest at medium maturity of the grape. The added polysaccharides that were extracted from more mature grapes had the strongest interactions. In Cabernet Sauvignon tannin concentration was decreased and in Pinot noir wines increased. In Cabernet Sauvignon a similar decrease was observed for anthocyanin and n-p PP concentration but did not maintain the whole fermentation duration.

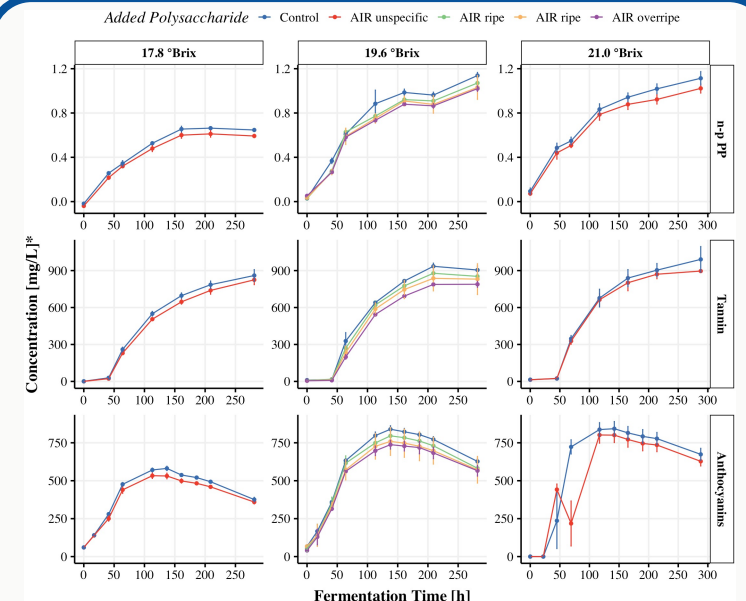


Fig 1 Cabernet Sauvignon phenolic extraction during fermentation  
\*n-p PP Concentration is displayed without a unit

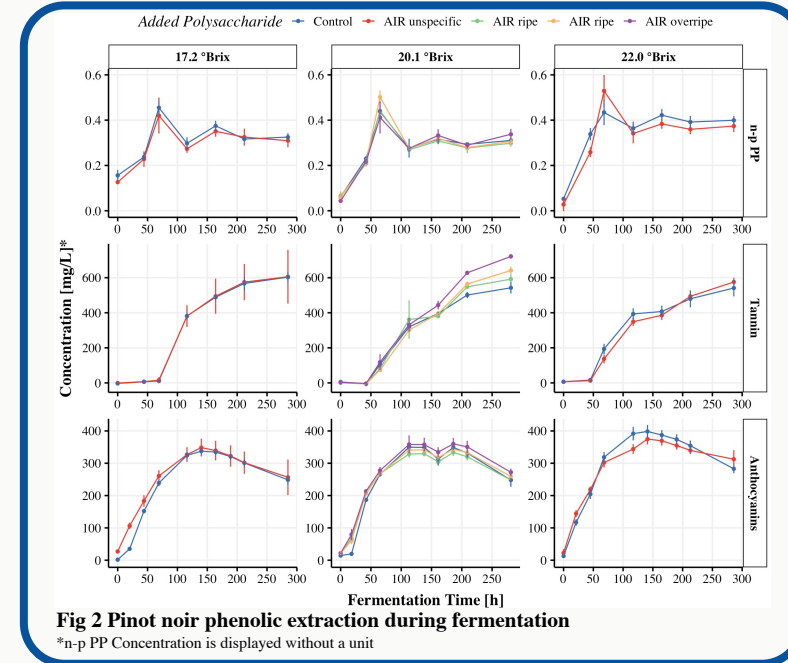


Fig 2 Pinot noir phenolic extraction during fermentation  
\*n-p PP Concentration is displayed without a unit

## Conclusion

Tannin concentration in wine is influenced by polysaccharides and especially their maturity. Variety specific, interactions can either precipitate tannins thereby decreasing the concentration or protect tannins from precipitation by other must components. Tannin structure or reactive must components are most likely to influence this varietal difference. Tannin extractability variances can be linked to changes of polysaccharides during grape ripening. Anthocyanin and n-p PP extractability is not affected by grape polysaccharides interactions.

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