

ARE POLYSACCHARIDES IMPORTANT TO MODULATE PROTEIN/TANNIN INTERACTIONS?

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MAIN CONCLUSION

The present work showed evidences that the major wine polysaccharides can inhibit salivary protein-tannin interactions and may hence be used to modulate wine astringency elicited by tannins.

INTRODUCTION

Among polyphenols, tannins are usually associated with flavor and particularly with astringency [1]. It is usually a non-pleasant sensation, however in the case of red wine, astringency is a quality parameter and it is desired in balanced levels [2]. Astringency is defined as complex group of sensations including dryness, puckering and tightening on the oral cavity. The most accepted mechanism for astringency onset relies on the interaction between salivary proteins (SP) and tannins, leading to aggregate formation and, consequently, to their precipitation [1,2]. Several SP are described to interact with tannins, namely proline-rich proteins (PRPs), statherin, P-B peptide, cystatins and mucins [1,3].

Tannin-protein interactions can be affected by different factors, such as tannin and protein structural features, pH, ethanol, ionic strength and polysaccharides, among others [1,4]. In general, the factors that affect the binding affinity of tannins to proteins are expected to affect astringency in the same way. Several studies using different approaches showed that polysaccharides can affect protein-tannin interactions and may hence lead to astringency modulation. The aim of this work was to understand, at a molecular level, the influence of polysaccharides naturally present in wine on the interaction between SP and tannins. This could be a valuable information for winemaking industry which can develop methods to increase these polysaccharides extraction during winemaking processes.

MATERIALS AND METHODS

The experimental approach described herein intended to mimic the phenomenon during ingestion, where polysaccharides and tannins are present together in foods and then they enter simultaneously in contact with SP.

This work was divided in different parts: a) obtain saliva samples in different conditions (dialyzed saliva, saliva with adjusted ionic strength and mixture of SP); b) isolate tannins from different classes (procyanidin B2, as a model of condensed tannins, and punicalagin (PNG), as a model of a hydrolysable tannins); c) isolate and characterize the major wine polysaccharides from grape cell wall (RGII and AGPs), and d) characterize the interaction between the referred compounds by different techniques such as HPLC, fluorescence quenching and nephelometry measurements.

RESULTS AND DISCUSSION

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It was observed a high interaction between tannins and saliva, with PNG showing a higher affinity to interact with saliva in comparison with procyanidin dimer B2. Overall, the obtained results show that polysaccharides commonly found in wine are able to inhibit the interaction and precipitation of SP with tannins. Their effect was dependent on the saliva sample studied as well as the polysaccharide used. In general, RGII was more effective to inhibit SP-tannin interactions than AGPs for most of the techniques used. For instance, by HPLC results (Fig. 1) it was possible to observe a high recovery of the chromatographic peaks area of the different SP families, namely acidic PRPs, statherin/P-B peptide and cystatins in the presence of RGII on the interaction between dialyzed saliva and PNG. In the presence of AGPs, only a slightly recovery of the chromatographic peaks area of these SP was observed.

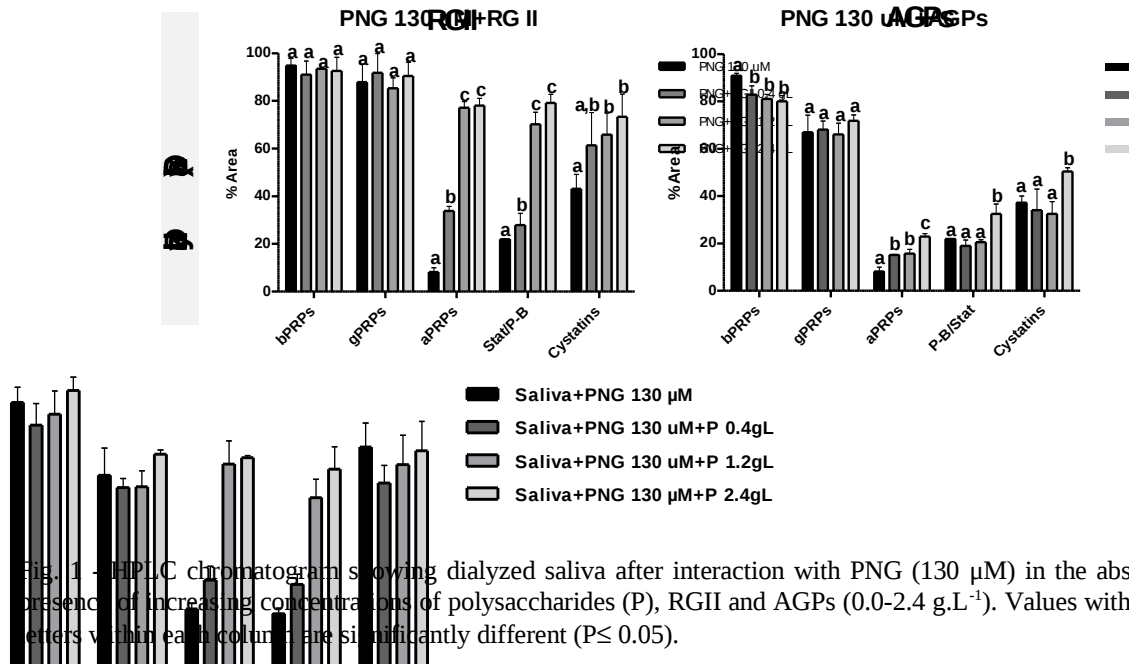


Fig. 1 - HPLC chromatogram showing dialyzed saliva after interaction with PNG (130 μM) in the absence and presence of increasing concentrations of polysaccharides (P), RGII and AGPs (0.0-2.4 $\text{g}\cdot\text{L}^{-1}$). Values with different letters within each column are significantly different ($P \leq 0.05$).

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