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COLLOIDAL STABILIZATION OF YOUNG RED WINE BY ACACIA SENEGAL GUM: THE MAJOR IMPLICATION OF PROTEIN-RICH ARABINOGALACTAN-PROTEINS

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Acacia senegal gum (Asen) is an edible dried gummy exudate¹ added in young red wines to ensure their colloidal stability, precluding the precipitation of the coloring matter. Asen macromolecules, belonging to the arabinogalactan-protein (AGP) family², are hyperbranched, charged and amphiphilic heteropolysaccharides composed especially of sugars (92-96%) and a small fraction of proteins (1-3%). Asen is defined as a continuum of macromolecules that could be separated into three fractions by hydrophobic interaction chromatography (HIC)³⁻⁴. HIC-F1 (85-94% of Asen), HIC-F2 (6-18% of Asen) and HIC-F3 (1-3% of Asen) are named and classified in that order according to their protein content, and then a growing hydrophobicity. The efficiency of Asen towards the coloring matter instability is evaluated according to an "efficacy test" that consists to determine the Asen quantity required to prevent the flocculation by calcium of a colloidal iron hexacyanoferrate solution (International Oenological Codex).

In this study, we investigated the stability mechanism of Asen and its HIC fractions towards the iron hexacyanoferrate - calcium and polyphenols flocculation in hydro-alcoholic solutions and unstable young red wine. The AGPs prevented the colloidal instability of both iron hexacyanoferrate salts and polyphenols in hydro-alcoholic solutions and young red wine with a good correlation between results obtained on both systems. The iron hexacyanoferrate salts was stabilized by electrostatic binding of Asen with calcium, the driver of the flocculation. Experiments performed with HIC fractions showed that the functional property of Asen was only determined by the presence of the AGP rich in proteins (HIC-F2 and HIC-F3 fractions containing 6.3 and 13.8% of proteins, respectively). HIC-F1, the major fraction in weight that contained 0.5% of proteins, was thus devoid of colloidal stability properties. The ability of AGP rich in proteins to colloidal stabilize polyphenols was confirmed in a hydro-alcoholic matrix containing polyphenols and unstable young red wines. Moreover, the richer in proteins is the AGP, the best are their colloidal stabilizing properties. The differences observed in the protective activity between AGPs from the three HIC fractions are related to their protein content but also to their related rate of glycosylation that modulates the protein accessibility to its environment, then their physicochemical properties.

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