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The color of beverages accounts for a crucial criterion which influences the choice of the consumers [1]. Moreover, color differences are the source of innovative products as it is now attested by the development of pink ciders in the French market. In juices and ciders commonly produced, the color is mainly formed during the first steps of apple processing when fruits are crushed and pressed leading to the enzymatic oxidation of the polyphenols in the presence of polyphenoloxidase (PPO) and dioxygen. Still today, the structures of the molecules, the environmental factors and the mechanisms associated to color formation in juices and ciders are unclear. In addition, those mechanisms are rendered more complex in rosé products with the involvement of apple anthocyanins.

Our recent works aim to better know the molecules and the mechanisms that control the color in both conventional and rosé apple musts during the first steps of fruit processing. The varietal effect was studied using both classical French cider apple varieties and also red fleshed cultivars. Juices were prepared according to two contrasted modalities regarding the oxidation level. The color of the clarified juices was measured (CIE Lab) and the detailed polyphenol profiles were monitored by C18 HPLC coupled to UV-visible spectroscopy and mass spectrometry. PPO activities in the crude juices were measured by polarography.

For conventional juices, UV 420 nm chromatographic profiles allowed to distinguish between well-resolved peaks corresponding to yellow-orange phenolic oxidation products and a large unresolved absorbance hump. The latter was characterized as a complex colored fraction having tanning properties with regard to its large removal after gelatine fining [2]. In parallel, the structures of new colored oxidation products deriving from dihydrochalcones or corresponding to coupling products between flavanols and dihydrochalcones were clearly identified and confirmed in model solution using purified substrates and apple PPO.

For the musts issued from red fleshed apples, the crucial role of the cultivar was highlighted influencing both the polyphenol profiles and the PPO activity. Cyanidin-3-O-galactoside (*i.e.* ideain) was confirmed as the main anthocyanin contributing to the red color of the juice although it was more or less degraded depending on the cultivars. The underlying mechanisms were studied by HPLC monitoring of model solutions containing ideain, apple PPO and mixtures of standard compounds representative of the main other polyphenolic classes (i.e. chlorogenic acid, (-)-epicatechin, and procyanidin trimers). Results confirmed that ideain is not a substrate for PPO but can be extensively degraded by redox reactions involving other polyphenols. LC-MS analyses of the oxidised model solutions gave access to preliminary information concerning the structures and the formation mechanisms of those anthocyanins oxidation products.

References:

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