# Polyphenols in apple fruits and their derived products, an overview of their variability, reactivity and properties in relation to organoleptic qualities of French juices and ciders

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World apple production accounted for 80 million tons per year (1.7 and 3.1 Mts in France and Poland, respectively). Most of this production corresponds to dessert apples. However, in France, ciders (fermented apple juices) are famous beverages produced from specific apple varieties classified according to two main criteria: polyphenol concentration and acidity of the crude juice (i.e. the must). Indeed, polyphenols are divided into six main classes: phenolic acids, catechins, procyanidins (i.e. condensed tanins), dihydrochalcones, flavonols and anthocyanins. Depending on the considered classes, polyphenols more or less contribute to organoleptic qualities of ciders including colour, bitter and astringent tastes, colloidal stability (clearness/cloudiness) and also indirectly to some particular aromas. Now they are also well-known for their contribution to preserve human health through their presence in food.

In this conference, I will present a review of our works in the field of varietal diversity, biochemistry, analytical chemistry and physico-chemistry of apple polyphenols in raw materials (fruits) and in processed products (musts, juices and ciders) with regard to their contribution to organoleptic properties. Particular attention will be paid to enzymatic and chemical oxidation reactions that occur during fruit processing and that contribute to significant changes in both qualitative and quantitative polyphenol composition in cider apple products. The impact of polyphenol molecular structures on solubility, tanning properties and sensory characteristics of polyphenols will be also discussed. Regarding methodological approaches, the benefits of associating chemical degradation, chromatographic separations, UV-visible and mass spectrometry detections for the analysis of complex phenolic structures and mixtures will be illustrated by examples. Research questions related to valorisation of apple by-products (apple pomaces) to produce natural colorant or related to the production of innovative apple products such as "Rosé" ciders and juices will be also discussed.

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