Summary 209

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Differences in the amount and structure of extractable skin and seed tannin amongst red grape varieties

By: F. Mattivi, U. Vrhovsek, D. Masuero and D. Trainotti

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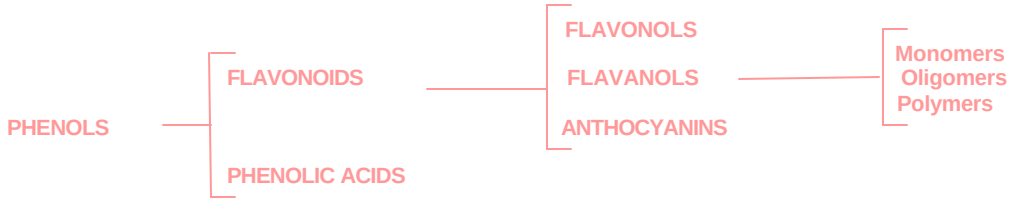
• Numerous studies have reported the protective cardiovascular effects of polyphenolic antioxidants. It is estimated that flavonoids contribute approximately two-thirds of all the polyphenols ingested, whereas phenolic acids contribute the remaining one third. Red wine is a very rich source of flavonoids, particularly the class called flavanols. Other important sources of flavonoids are apples, berries, coffee and tea. (Let's not confuse the very similar words: flavonoids, flavonols, and flavanols. The diagram below illustrates their relationship).



• The goal of this work was to try to understand the structure of the various proanthocyanidins extracted from wine, and compare them across varieties. By clarifying their chemical composition, the authors were hoping to glean some knowledge about the antioxidant potential of the various grape varieties, as well as the relationship with their astringent or bitter sensations.

• The authors studied the tannin composition of a total of 20 wines: 3 wines from each of four well-known varieties (Cabernet Sauvignon, Merlot, Pinot Noir and Syrah), as well as from two local varieties from Trentino, Italy (Marzemino and Teroldego). A single wine of Carmenère was also included.

• **Results:**
1) The majority of extractable *flavanol monomers* of the grape was localized in the seeds, with the highest values in Pinot Noir, and the lowest in Cabernet Sauvignon. Similarly, the largest amount of flavanol polymers (*proanthocyanidins)* was also found in the seeds, with Teroldego and Pinot Noir showing the highest levels.
2) In the *seed*, the main flavanol, in all varieties, was catechin, and the main tannins consisted of what is known as *procyanidins* and *galloylated procyanidins*
3) In the *skin*, the main flavanol was also catechin, with the exception of the Italian varieties Teroldego and Marzemino, for which the main skin flavanol was epigallocatechin. Skin tannins consisted of *procyanidins* and *prodelphinidins.*

4) The grape extracts of the varieties studied contained mostly monomers and small oligomers (degree of polymerization 3 to 4 units). In general, skin proanthocyanidins showed a larger degree of polymerization than their seed counterparts.

- How useful is it to know these compositional details? Since the authors detected the presence in grapes of 5 different flavanol monomers (two major ones, and three less frequent ones), this is expected to generate many possible oligomeric proanthocyanidin structures. Today, this information does not have practical application, but the authors believe that the structure of grape flavanols should continue to be investigated because it can provide a chemical explanation for the large variability in astringency found in commercial wines.

The present study conclusions are that grape proanthocyanidins (tannins) are very complex, in comparison with those of other sources, such as apple and chocolate. Also, grape proanthocyanidin biosynthesis is highly regulated at the level of variety, a difference that is likely to play a role not only in how wines from the various grapes taste, but also in how nutritional they are (their antioxidant capacity). We just don't have enough pieces of the puzzle yet.

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