OAK WOOD INFLUENCE ON THE ORGANOLEPTIC PERCEPTION OF RED WINE•

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1. INTRODUCTION

The ellagitannins constitute a subclass of hydrolyzable tannins, which presents a remarkable structural diversity. Today over 500 members of this family of gallic acid-derived polyphenolic natural products have been isolated from various plants (Okuda, 2005). Since the first isolation and characterization of vescalagin and its epimer castalagin thirty years ago in *Castanea* (chestnut) and *Quercus* (oak) woody species (Mayer *et al*., 1967), six other ellagitannins have been identified oak wood such as roburine A, roburine B, roburine C, roburine D, roburine E and grandinine (Hervé du Penhoat *et al.*, 1991). The level of these hydrolysable tannins in wine mainly depends of the origin and species of oak wood as well as its treatment during barrel realization.

The impact of ellagitannins concentration on the organoleptic perception of red wine is poorly known and still unclear. Some authors say that the ellagitannins influence the astringency and perception in month of red wine aged oak barrels (Quinn, Singleton, 1985), whereas others suggests in contrast that the level of these compounds is too weak to take part of the overall taste of the wine (Somers, 1990). Moreover, the astringency level of the ellagitannins in water was recently confirmed (Glabasnia, Hofman, 2006).

2. MATERIALS AND METHODS

In order to investigate the influence of ellagitannins concentration on the overall red wine taste and flavor, we first classified oak staves in three different groups according to their ellagitannins level using a NIRS online procedure (Oakscan®) (Giordanengo *et al*., 2009). Then we identified and quantified the level of the main ellagitannins. The wood is extracted by organic solvents (acetone:water, 70:30) and the obtained powder undergoes an acidic hydrolysis in order to quantify the released ellagic acid by HPLC-UV. Moreover, the powder was analyzed by HPLC UV/MS to quantify the eight main ellagitannins. In a second time, the three different groups of staves were added to red wine during its ageing and the extraction and evolution of the main ellagitannins was monitored every month for

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four months. Moreover the influence of the ellagitannin level in the resulting wine was estimated by a trained judge's panel and the results were treated by a Newman test.

3. RESULTS AND DISCUSSION

During our study it appears that the staves classification estimated by NIRS procedure on wood was in good agreement with the total level of ellagitannins which was estimated by the quantification of ellagic acid released during hydrolysis in hot acidic condition as well as by quantification of each specific ellagitannin by HPLC-UV-MS. This total ellagitannin level shows a significant variability between the three stave groups ranging from 16.38 and 84.33 mg g^{-1} (equivalent vescalagin g^{-1} of wood powders), likewise the level of the main ellagitannins followed a similar trend between 5.46 and 32.18 mg g^{-1} (equivalent vescalagin g^{-1} of wood powders) (fig 1). Such variation of ellagitannin level between different oak staves can result from rainwater leaching, microorganism biodegradation, chemical oxidation, the origin of oak wood as well as its treatment during barrel realization (Chatonnet, 1995).

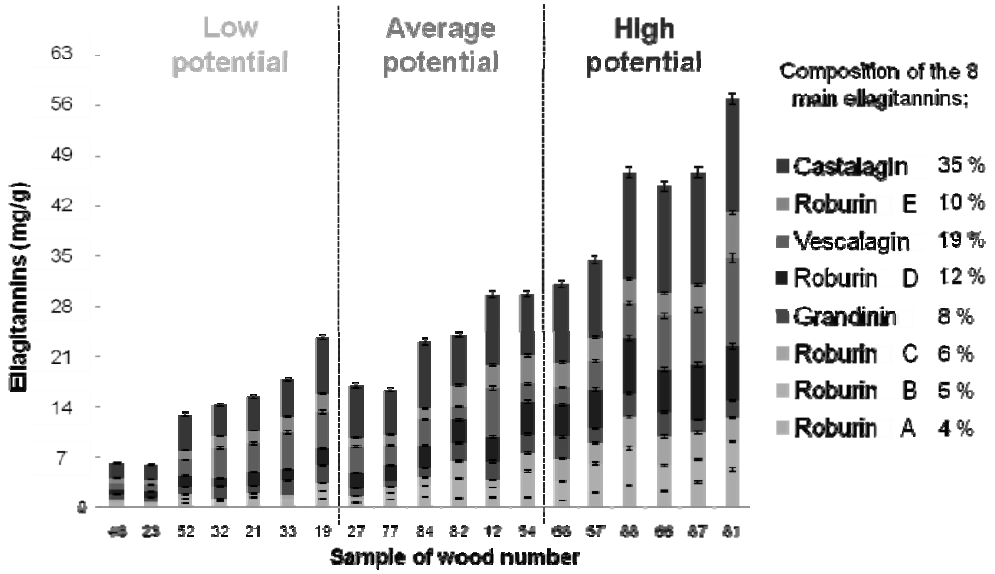

Fig. 1 - Concentration of the eight main ellagitannins (in mg/g vescalagin equivalent)

Moreover, the ellagitannin composition of each staves group estimated by HPLC-UV appears to be relatively similar: castalagin (35 %), vescalagin (19 %), roburin E (10 %), roburin D (12 %), grandinin (8 %) roburin C (6 %), roburin B (5 %), roburin A (4 %). Moreover, a similar correlation was also observed between NIRS staves classification and the level of ellagitannins in red wines aged during 4 months with the classified staves. Indeed, the same wine after ageing has different ellagitannin concentration (3.9, 5.37 and 1.32 mg equivalent vescalagin L^{-1}). The wine aged in contact with a low potential of ellagitannins stave reveals a lower ellagitannin concentration than the wine aged with a high potential stave.

Furthermore, during our study, we also estimate the impact of ellagitannin level on the organoleptic perception of red wine. Our trained judge's panel describes red wines displaying higher level of ellagitannins as rounder ($p < 0.0001$ %). Moreover, it appears that astringency and bitterness were not negatively impacted by the level of ellagitannins in wine.

Abstract

Some wood substances such as ellagitannins (vescalagin, castalagin, grandinin, roburins (A, B, C, D, E)…) can be extracted during wine ageing in oak barrels. The level of these hydrolysable tannins in wine depends of the species and origin of oak wood as well as its treatment during barrel realization. In our research, we classified wood according to their ellagitannin level using a NIRS online procedure (Oakscan®) and then we determined the level of these ellagitannins in the wood and in wine aged in contact with the wood. The impact of ellagitannin concentration on the organoleptic perception of red wine was investigated by a trained judge's panel.

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