

PHENOLIC COMPOSITION OF BORDEAUX GRAPES 2009 VINTAGE: COMPARISON WITH 2006, 2007 AND 2008 VINTAGES*

Bénédicte LORRAIN, Kleopatra CHIRA, Pierre-Louis TEISSEDE

UMR 1219 Œnologie, Laboratoire de Chimie Appliquée, Institut des Sciences de la Vigne et du Vin, Faculté d'Œnologie, 210 chemin de Leysotte, 33882 Villenave d'Ornon Cedex, F.

E-mail: benedicte.lorrain@u-bordeaux2.fr

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1. INTRODUCTION

'Cabernet sauvignon' (CS) and 'Merlot' (M) are the world's most widely recognized red wine grape varieties. The phenolic nature of CS and M is of paramount interest, particularly in the Bordeaux wine-growing region which is mostly planted with these two cultivars. Indeed proanthocyanidins or condensed tannins are grape-derived flavonoids compounds of great importance to red wine quality due to their astringent, bitter properties and their role in long-term color stability (Peleg *et al.*, 1999). The goal of this work is to investigate the proanthocyanidin composition of skins and seeds from CS and M grapes (vintage 2009) in order to determine the grape variety effect and the vintage influence on the phenolic composition of Bordeaux red grapes (Chira *et al.*, 2009).

2. MATERIALS AND METHODS

'Cabernet sauvignon' and 'Merlot' grape samples were collected at maturity stage from seven vineyards located in Bordeaux (Pauillac, Margaux, Graves, Entre deux Mers, Saint Emilion (1), Saint Emilion (2) and Côtes de Bourg). Seeds and skins removed from grapes were first lyophilized and ground before being extracted with acetone/water (80:20, v/v) followed by methanol/water (60:40). The centrifugal supernatants were evaporated and residue was dissolved in water and freeze-dried to obtain a crude tannin extract. Total polyphenol, tannin and anthocyanin contents were determined respectively by the Folin-Ciocalteu, the Bate-Smith and the sodium bisulfite decoloration procedures from crude tannin skin and seed extracts dissolved in water/ethanol (90:10 v/v, pH 3.5 with tartaric

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acid). The other part of crude tannin extract, in water/EtOH solution, was extracted three times with chloroform to remove lipophilic materials and then the aqueous phase was extracted three times with ethyl acetate to obtain low molecular weight procyanidins and polymeric procyanidins respectively in the organic and aqueous phases. The proanthocyanidin monomers [(+)-catechin, (-)-epicatechin, (-)-epicatechin-*O*-gallate] and oligomers were identified and quantified by HPLC-UV-Fluo. Percentage of galloylation (%G), percentage of prodelphinidins (%P) as well as mean degree of polymerization (mDP) of grape tannin oligomers were determined by phloroglucinolysis and HPLC-UV-MS analysis (Kennedy, Jones, 2001). Vintages (2006, 2007 and 2008 from a previous study (Chira *et al.*, 2009) and 2009) and grape variety influence on the above parameters were explored.

3. RESULTS AND DISCUSSION

The total content of polyphenols and tannins in the seed extracts of ‘Merlot’ was 1,4 higher than that of ‘Cabernet sauvignon’ for all the studied vineyards and these data can be successfully used to discriminate the two cultivars. On the other hand in the skin extracts no significant differences in total polyphenol, tannin and anthocyanin concentrations were observed (Fig. 1). HPLC analysis confirmed these first results and underlined important differences in the absolute concentration and composition of free flavanols and proanthocyanidins between the two cultivars as previously observed by Chira *et al.* (2009).

This influence concerned particularly epicatechin and epicatechin gallate concentrations which were respectively 37 % and 63 % higher in the M than in the CS seeds.

The previous study showed that grape variety influenced also mDP ($mDP_{CS} > mDP_M$), %G ($\%G_{CS} > \%G_M$) and %P ($\%P_{CS} > \%P_M$) (Chira *et al.*, 2009). The same trend was observed in this study but differences between these parameters for the two grapes cultivars (CS and M) were less pronounced in 2009.

The significant effect of the vintage on the grape phenolic composition (Chira *et al.*, 2009) was confirmed for 2009. In comparison to 2006, 2007 and 2008 vintages, particularly low concentrations of proanthocyanidins were found in seeds and skins extracts (fig. 2). These observations are to correlate with the flowering stage, which is determinant in the biosynthesis of tannins (Gagné *et al.*, 2009). For the 2009 vintage and contrary to 2007 vintage, flowering happened early (at the beginning of June) without hydric stress that is necessary to stimulate the production of abscisic acid, whose role is determinant in modulating tannin metabolism.

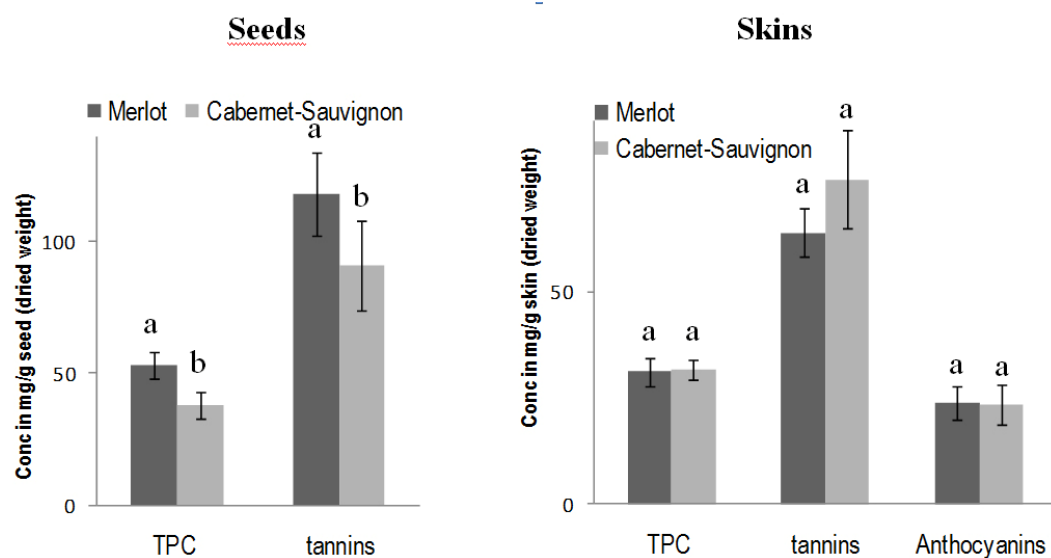


Fig. 1- Levels of total phenols content (TPC) in gallic acid equivalent of tannins and of anthocyanins in seeds and in skins.

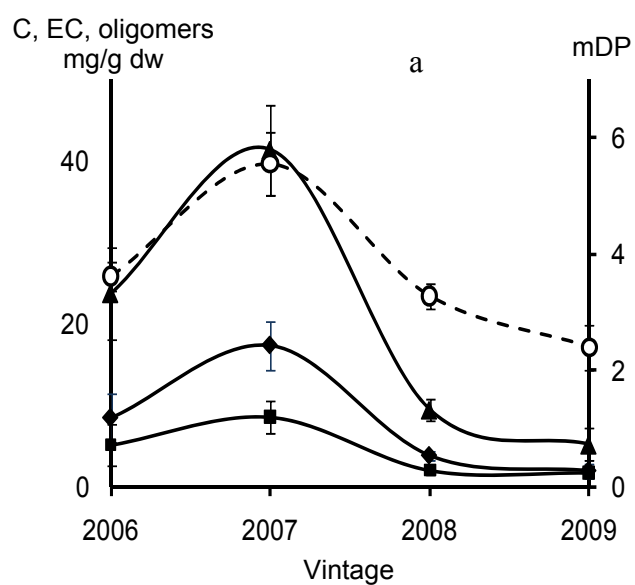


Fig. 2 - Evolution of phenolic concentrations (C : full diamond, EC : full square, sum of oligomers concentrations : full triangle) and mDP (open circle) in function of vintage in CS-seeds.

Abstract

‘Cabernet sauvignon’ and ‘Merlot’ are among the most recognized red wine grape cultivars. This work is aimed at investigating the proanthocyanidin composition of skins and seeds to determine the grape variety and the vintage effects on the phenolic composition of Bordeaux grapes. ‘Cabernet sauvignon’ and ‘Merlot’ grape samples were collected from vineyards in Bordeaux. Total polyphenol and tannin contents were determined from skin and seed extracts. The proanthocyanidin monomers and oligomers were identified/quantified by HPLC-UV-Fluo. Percentages of galloylation (%G), of prodelphinidins (%P) and mean degree of polymerization (mDP) of tannins oligomers were determined by HPLC-UV-MS. Vintage and grape variety influence on these parameters were explored. The total content of polyphenols and tannins in the seed extracts of ‘Merlot’ was higher than that of ‘Cabernet sauvignon’; these data can be successfully used to discriminate the two cultivars. HPLC analysis confirmed these results and underlined important differences in the absolute concentration and composition of free flavanols and proanthocyanidins among the two varieties. The effect of the vintage on the grape phenolic composition was confirmed for 2009. In comparison to last vintages, low concentrations of proanthocyanidins were found in seed and skin extracts.

Literature cited

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