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Sensory representation of typicality of Cabernet franc wines related to phenolic composition: Impact of ripening stage and maceration time

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Abstract

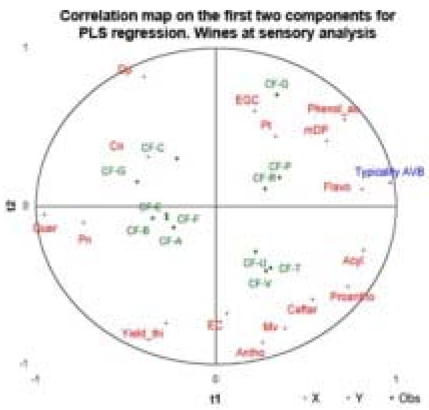
Phenolics are responsible for important sensory properties of red wines, including colour, astringency, a possibly bitterness. From a technical viewpoint, the harvest date and the maceration duration are criti decisions for producing red wine with a distinctive style. But little is known about the evolution of pheno and of their extractability during ripening to predict the composition of the wine and related sens properties. The aim of this study was to understand the relationship between the sensory profile of wines and (i) the ripening stage of the berries (harvest date) and (ii) the extraction time (macerat duration).

Phenolic acids, flavonols, anthocyanins and proanthocyanidins of *Vitis Vinifera* var. Cabernet franc w measured in grapes and in wines from two stages of maturity and with two maceration durations. Phen composition was analysed by high performance liquid chromatography, after fractionation and thiolysis proanthocyanidins. The distinctive style of wines was investigated by descriptive analysis (trained pan Just About Right profiles and typicality assessment (wine expert panel). Relationships between pheno and sensory attributes were established by multidimensional analysis, and phenolics were classif according to sensory data by ANOVA and PLS regressions.

Astringency, bitterness, colour intensity and alcohol significantly increased with ripening and astringe and colour intensity increased with maceration time. Grape anthocyanins increased and thiolysis yi significantly decreased with ripening. In wine, proanthocyanidins increased, and mean degree polymerisation and thiolysis yield decreased with longer extraction time. The high impact of harvest d on the sensory profiles could be due to changes in anthocyanin and sugar contents, but also to

evolution of proanthocyanidins. Moreover, proanthocyanidin composition was affected by maceration ti as suggested by the decrease of thiolysis yield. Our results suggest that the wine sensory qua established by the expert panel, is linked as expected to grape quality at harvest, reflected by sugar a anthocyanin contents, but also by thiolysis yield, which requires elucidation.

Graphical abstract



Highlights

► Style of wine was predicted by multiparametric models involving phenolics compounds. ► Wines, gra and juice at devatting and grapes at harvest were analysed. ► Sensory representation was related firs harvest date, then to maceration time. ► Importance of anthocyanins and proanthocyanidins. ► Thioly yield significant, but requires elucidation.

Keywords

Phenolics; Sensory analysis; Flavonoids; Typicality; Cabernet franc

Figures and tables from this article:

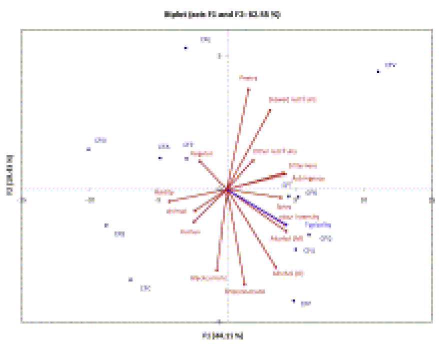


Fig. 1. PCA biplot of the covariance matrix (DA) of significant attributes for harvest date (V35 and V49) and maceration time (9 and 15 days). Wines ABC and PQR: maceration time 9 days; wines EFG and TUV: maceration time 15 days. Wines ABCEFG: V35; wines PQRTUV: V49.

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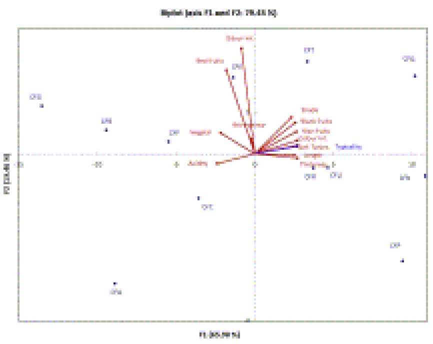

Fig. 2. PCA biplot of the covariance matrix (JAR) of significant attributes for harvest date (V35 and V49) and maceration time (9 and 15 days). Wines ABC and PQR: maceration time 9 days; wines EFG and TUV: maceration time 15 days. Wines ABCEFG: V35; wines PQRTUV: V49.

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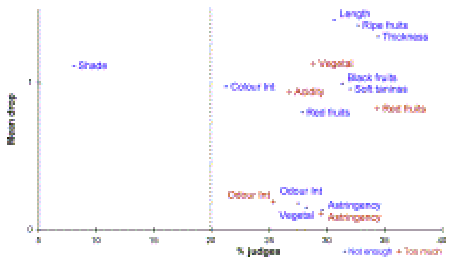

Fig. 3. Penalty analysis. Mean drops for the “too much” and “too little” levels (difference between the liking mean for the JAR levels minus the “too much” or “too little” levels). It shows how many points of liking were loose for having a product “too strong” or “too weak”. Only significant penalties are shown. For each descriptor, in red is for “too strong” and in blue is for “too weak”. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of the article.)

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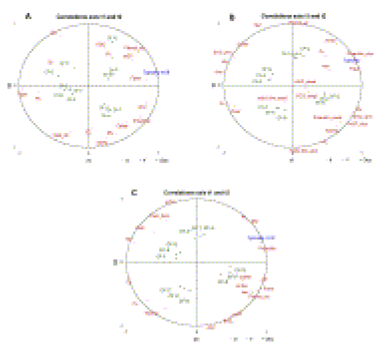

Fig. 4. Correlations map on the first two components for PLS regressions. (A) Wine at sensory analysis, (B) at end of maceration: non extractable fraction (skins and seeds) and (C) at end of maceration: extractable fraction (juice).

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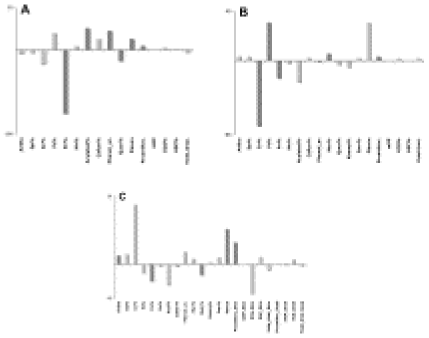

Fig. 5. Coefficients of the PLS models for wine at sensory analysis (A) for wine at the end of maceration, (B) for skins and seeds at the end of maceration and (C) VIP > 1 are in deep grey.

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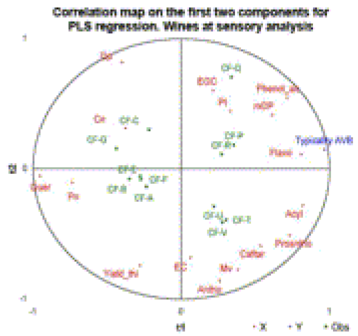

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Table 1. Descriptive attributes used to evaluate sensory properties of wines in the quantitative descriptive analysis (DA) and the Just About Right analysis (JAR).

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Table 2. Relationship between typicality scores, harvest date, maceration time and biochemical characteristics of wines. Only coefficients < 0.1 are presented. Coefficients in bold are significant ($P < 0.05$).

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Table 3. Relationships between typicality scores and sensory attributes from DA and JAR profiles. Coefficients in bold are significant ($P < 0.05$).

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Wine (Sensory analysis)	Harvest date	Macer. Time	Typicality AV	Proanthoc.	Yield thiol	C	EC	ECG	EGC	mDP	ECG %	EGC %
Wine (end macer.)												
Proanthoc.	0.844		0.918						0.843			
Yield thiol								0.612				
C	0.744		0.867						0.789	0.614		
EC	0.631	0.698	0.586	0.817		0.855	0.793	0.770			0.727	
ECG		0.927		0.796	0.578	0.928	0.992	0.981		-0.594	0.983	-0.8
EGC	0.606	-0.643	0.738		-0.635				0.778	0.837	-0.596	0.76
mDP		-0.913			-0.658		-0.733	-0.689		0.871	-0.856	0.94
ECG %		0.966		0.613	0.672	0.805	0.939	0.919		-0.762	0.988	-0.9
EGC %		-0.985			-0.676	-0.716	-0.875	-0.838		0.837	-0.960	0.98

C: catechin; EC: epicatechin; ECG: epicatechin-gallate; EGC: epigallocatechin; mDP: mean degree of polymerisation. Only coefficients $P < 0.05$ are presented. Columns in grey: enological practices; columns in blue: typicality assessment (=wine style); columns in white: proanthocyanidins.

Full-size table

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