Effects of winemaking practices on Pinot blanc quality

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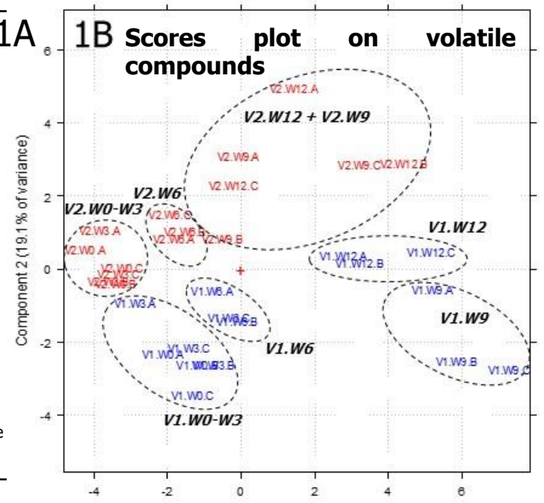
Introduction: Two winemaking protocols for Pinot blanc (harvest 2018) were investigated following the chemical and sensory profiles over the vinification and for 12 months after wine bottling. We have investigated chemical (phenolics, volatile compounds) and sensory parameters. The harvested grapes were processed in an experimental (**including a pre-fermentative maceration and autolysate addition**) *vs* a control vinification, both in triplicates. SPME-HS-GCMS, HPLC-DAD and HPLC-MS (chemical) and qualitative descriptive analysis - QDA (sensory) techniques were applied (for details on the methods applied, please see: *Dupas de Matos, A. et al., Foods, 2020, 9(4), p.499*). Multivariate statistical analysis (Principal Component Analysis, Multivariate Regression) was applied; used software: XLStat – Addinsoft, France; CAT – Chemometric Agile Tool (see: *R. Leardi, C. Melzi, G. Polotti, CAT (Chemometric Agile Tool) - freely downloadable from http://gruppochemiometria.it/index.php/software*).

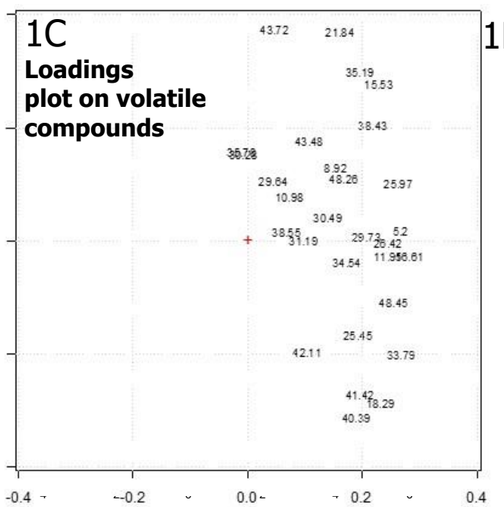
R.t. (min)	COMPOUND	R.t. (min)	COMPOUND
5.20	ethyl acetate	30.49	n-octanol
8.92	ethyl butanoate	31.19	2,3-butanediol
10.98	2-methyl-1-propanol	33.79	ethyl decanoate
11.95	3-methylbutyl acetate	34.54	3-methylbutyl octanoate
15.53	3-methyl-1-butanol	35.19	diethyl succinate
16.61	ethyl hexanoate	35.78	ethyl 9-decenoate
18.29	hexyl acetate	38.43	n-decanol
21.84	n-hexanol	38.55	citronellol
25.45	ethyl octanoate	40.39	phenylethyl acetate
25.97	acetic acid	41.42	ethyl dodecanoate
26.42	isopentyl hexanoate	42.11	isoamyl pentadecanoate
29.64	ethyl nonanoate	43.48	butanedioic acid, ethyl 3-methylbutyl ester
29.73	2,3-butanediol	43.72	phenylethyl alcohol
30.28	isopropyl caprylate	48.26	ethyl tetradecanoate
		48.45	octanoic acid

1A

1B **Scores plot on volatile compounds**



1C **Loadings plot on volatile compounds**



1D

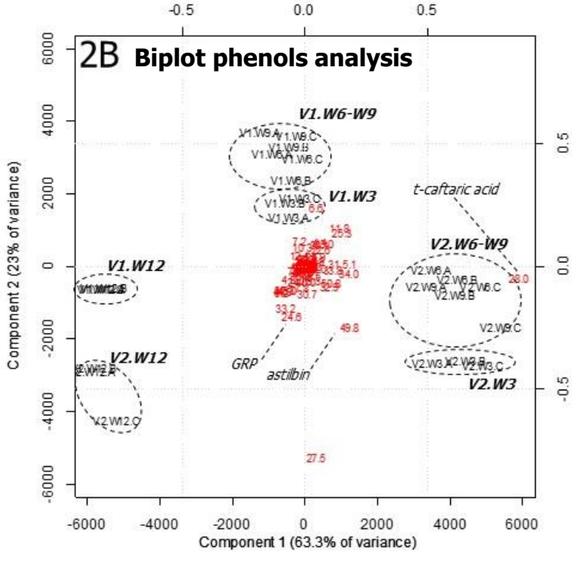
Rt (min)	p-val. (VINIFICATION)	p-val. (MONTH)	p-val. (INTERACTION)	Rt (min)	p-val. (VINIFICATION)	p-val. (MONTH)	p-val. (INTERACTION)
5.2	0.00	0.00	0.00	31.19	0.11		
8.92		0.01		33.79	0.00	0.00	0.00
10.98		0.03		34.54	0.00	0.00	
11.95	0.01	0.00		35.19	0.05	0.00	
15.53	0.00	0.00		35.78			
16.61	0.00	0.00	0.00	38.43		0.00	
18.29	0.00	0.01		38.55			
21.84	0.00	0.00	0.00	40.39	0.00	0.04	
25.45	0.00	0.00	0.00	41.42	0.00	0.05	
25.97	0.00	0.00	0.02	42.11	0.00		0.01
26.42	0.04	0.00		43.48	0.01	0.00	0.02
29.64		0.01		43.72	0.00	0.00	
29.73	0.01	0.00	0.03	48.26		0.00	
30.28	0.22	0.04		48.45	0.00	0.00	0.00
30.49	0.36	0.03					

Results of GCMS analysis of the **volatile profiles** in the studied wines summarized by PCA (standardized variables – Pearson correlation): A) identified compounds (NIST 2011 and LRI comparison with library); B) observations/samples separated in the PC1 *vs* PC2 space; C) Variables' plot in the PC1 *vs* PC2 space; D) *p*-values from 2-way ANOVA: reported (significance at α = 95%) for vinification, month (at bottling = W0, three months after bottling = W3, month 6 = W6 etc.) and interactions. **RESULTS:** 1) **PC1 (main effect) differentiated the samples over time**; the volatile profile in V1 samples (non-macerated) evolved faster up to 9 month than in V2 (macerated) samples; 2) **PC2 separated the two vinifications**, according to the trends of specific compounds; 3) ANOVA highlighted the **compounds significantly affected by the vinification, by time evolution, both factors and/or their interaction**.

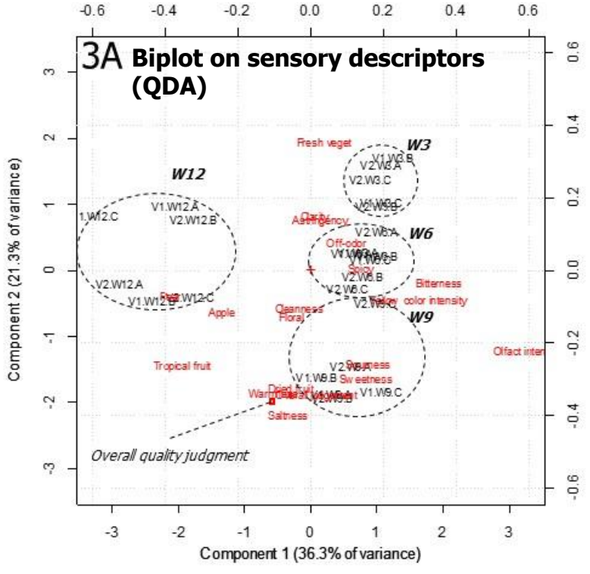
2A

Assignment	R.t. (min)
gallic acid, hexoside (*tentative*)	12.4
gallic acid	17.1
(-)-gallocatechin	24.0
glutathionylcaftaric acid (GRP)	24.6 [2]
caftaric acid (*cis*, *trans*)	26.8, 28.0
(-)-epigallocatechin	31.4
(+)-catechin	33.1
coutaric acid (*cis*, *trans*)	33.8 [1], 34.5 [2]
trans-caffeic acid	37.0
(-)-epicatechin	38.5
p-coumaric acid	45.5
astilbin	49.8
taxifolin	50.8

2B **Biplot phenols analysis**



3A **Biplot on sensory descriptors (QDA)**



3B

Descriptor	p-val. (VINIFICATION)	p-val. (MONTH)	p-val. (INTERACTION)
Clarity			
Yellow color intensity		0.001	0.029
Olfact intensity		<0.0001	
Floral	0.028	0.005	0.011
Apple		0.008	
Pear		0.003	
Tropical fruit	0.017	<0.0001	
Dried fruit		0.057	
Fresh veget		0.031	
Spicy		0.036	
Cleanness	0.016		
Off-odor			
Warmness		0.011	
Sweetness		<0.0001	
Sourness		0.001	
Saltness		<0.0001	
Bitterness		<0.0001	
Astringency			
Overall judgement		0.014	

Results of LC-DAD analysis of the volatile profiles summarized by PCA (mean-centred variables – covariance): A) Identified compounds (by LC-MS/MS and LC-DAD; see, *Dupas de Matos, A. et al., Foods, 2020, 9(4), p.499*); B) Biplot for samples W3-W12. **RESULTS:** GRP, astilbin and taxifolin were significantly affected by the temporal evolution. No significant effect due to time was observed instead for *trans*-caftaric acid. Almost all compounds were instead significantly affected by vinification.

Results of sensory analysis - QDA summarized by A) PCA (mean-centred variables – covariance) and B) 2-way ANOVA. **Clear temporal trends** are visible up to month 9. Indeed, most descriptors showed significant differences over storage/time. Only descriptors "**tropical fruit**", "**floral**" and "**cleanness**" showed significant differences for the wine (all these had higher scores in V1).

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