

EVALUATION OF BIOACTIVE PHENOLIC COMPOUNDS AND ANTIOXIDANT ACTIVITY OF CABERNET SAUVIGNON WINES DURING WINEMAKING

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Introduction

Phenolic compounds are the most important components which determine the colour, mouthfeel, astringency and bitterness of the wine, influencing on the overall quality. Phenolic composition mainly depends on the grape variety, climate conditions, soil, ripening stage, vine cultivation as well as on winemaking practices. **Cabernet Sauvignon is an international variety** grown in many vineyards in the world, as well as in R. Macedonia.

✓The aim of the work was to evaluate the phenolic composition and antioxidant activity of Cabernet Sauvignon wines produced with different maceration times: 3, 6 and 9 days, applying HPLC-DAD technique.

Materials and Methods

Winemaking



HPLC analysis - Dionex system

Anthocyanins

Column: Gemini RP-C18, 530 nm

Mobile phase: solvent A (water/methanol (70/30, v/v) containing 6 mL/L of 70% perchloric acid) and solvent B (water/methanol (25/75, v/v) containing 6 mL/L of 70% perchloric acid), flow 0.9 mL/min

Gradient, solvent B: 0 min, 0%; 23 min, 25%; 51 min, 70%; 60 min, 100%; 65 min, 0%. [1]

Hydroxycinnamic acid derivatives and flavan-3-ols

Column: Aquapore ODS-300 RP-C18, 280, 308 and 324 nm

Mobile phase: solvent A (water/formic acid, 98/2, v/v) and solvent B (acetonitrile/water/formic acid, 80:12:2, v/v/v), flow 0.5 mL/min

Gradient, solvent B: 0-50 min, 9%; 65-70 min, 10%; 77 min, 30%; 80-97 min, 0%. [1]

Antioxidant activity

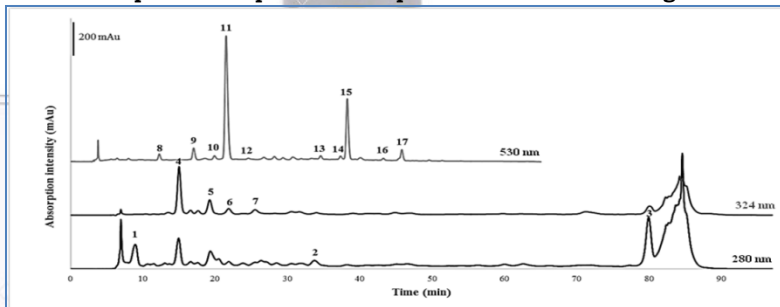
A volume of 200 µL of wine was added to 3 mL of a methanol solution of the radical DPPH with concentration of 0.025 mol/L, and measured at 515 nm after 1 h storage at dark. [1]

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Results

HPLC-DAD separation of phenolic compounds in Cabernet Sauvignon wines



Peak identification: gallic acid, (1); (+)-catechin, (2); (-)-epicatechin adducts (3); caftaric acid, (4); coumaric acid, (5); caffeic acid, (6); ferulic acid, (7); delphinidin-3-glucoside, (8); petunidin-3-glucoside, (9); peonidin-3-glucoside, (10); malvidin-3-glucoside, (11); vitisin B, (12); petunidin-(6 acetyl)-3-glucoside, (13); peonidin-(6 acetyl)-3-glucoside, (14); malvidin-(6 acetyl)-3-glucoside, (15); peonidin-coumaroyl-3-glucoside, (16); malvidin-coumaroyl-3-glucoside (17)

Quantification of phenolic compounds in Cabernet Sauvignon wines

Wines		Cabernet Sauvignon		
Compounds/ Maceration time		3 days	6 days	9 days
Dp-Glc		2.04	5.58	3.19
Pt-Glc		11.7	20.5	15.5
Pn-Glc		0.35	5.70	4.31
Mv-Glc		251	466	436
Total Glc		265	498	459
Pt-AcGlc		2.59	12.7	10.9
Pn-AcGlc		12.9	16.4	12.9
Mv-AcGlc		157	284	255
Total AcGlc		172	313	279
Pn-coumGlc		0.23	0.19	0.17
Mv-coumGlc		23.9	47.2	42.0
Total coumGlc		24.1	47.4	42.2
TA		462	858	780
ΣGlc/ΣAcG		1.54	1.59	1.65
ΣGlc/ΣcoumGlc		11.0	10.5	10.9
ΣAcGlc/ΣcoumGlc		7.15	6.61	6.61

Wines		Cabernet Sauvignon		
Compounds/ Maceration time		3 days	6 days	9 days
Protocatechuic acid		24.7	18.6	18.6
Gallic acid		113.1	328	348.4
Syringic acid		n.d.	n.d.	15.5
Total HBA		138	347	383
p-Coumaric acid		6.31	5.69	12.3
Caftaric acid		166	99.5	94.1
Coumaric acid		19.8	13.9	11.6
Caffeic acid		11.4	10.5	4.43
Ferulic acid		20.6	17.1	18.1
Total HCA		224	147	141
Total Phenolic acids		362	493	523
Catechin		87.4	292	375
AA (mg/L, TE)		113	117	115

Abbreviations: Dp-delphinidin, Cy-cyanidin, Pt-petunidin, Pn-peonidin, Mv-malvidin, Glc-glucoside, AcGlc-acetylglucoside, coumGlc-coumaroylglucoside, HBA-hydroxybenzoic acids, HCA-hydroxycinnamic acids, HCAD- hydroxycinnamic acid derivatives, AA-antioxidant activity, TE-Trolox equivalents, n.d. – not detected.

Conclusion

Anthocyanins reached highest content at 6th day of maceration. Hydroxybenzoic acids increased during winemaking and reached to the highest concentration in the wines after 9 days of maceration. Hydroxycinnamates reached to maximum concentration after 3 days of maceration. All wines showed high values of antioxidant activity.

References

[1] Ivanova-Petropulos V., Durakova S., Ricci A., Parpinello G.P., Versari A. Extraction of natural occurring bioactive compounds and change in antioxidant capacity of Macedonian red wines during vinification. *Journal of Food Science and Technology*, 53(6), 2634-2643.