INFLUENCE OF YEAST STRAINS ON PHENOLIC COMPOSITION AND ANTIOXIDANT ACTIVITY OF VRANEC WINES

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INTRODUCTION

Wine production has a long tradition in Republic of Macedonia. Now, wine is the second most important export agro-food product after the tobaccoThe wineries are mainly located in the region of the river Vardar valley, in particular in Skopje, Tikveš, and Gevgelija-Valandovo. Red wine represents approx. 60% of the national production and includes different varieties such as Cabernet Sauvignon, Syrah, Merlot, Vranec, etc.

Polyphenolic compounds of red wine, including anthocyanins and tannins, are natural dietary antioxidant with potential health benefit and affect the quality of red wines, in terms of astringency, bitterness and color (1,2).

✓ **The aim of the work was to assess the influence of different yeast preparations, Vinalco (Macedonian autochthonous yeast) and yeasts from Lallemand, on the phenolic composition and antioxidant activity of Vranec wines.**

MATERIALS AND METHODS

Wine samples

Vranec wines (10 samples) fromTikveš region.
Grapes (ripeness: 23-24°Brix), processed with crusher/destemmer, SO_2 (ca. 65 mg/L total concen). Inoculation with *Saccharomyces cerevisiae* yeast strains: **Clos, RC212, D254, BDX** (Lallemand, Bordeaux, France) (**4 wines**)
Vinalco yeast (Bitola, Republic of Macedonia) (**6 wines**)

Determination of antioxidant activity (AA)

UV-VIS spectrophotometer (Shimadzu, UVmini 1240, Milan, Italy
DPPH method, 515 nm . AA expressed as mg Trolox equivalent/L (TE/L).

HPLC-DAD analyses

Chromeleon **HPLC system,** equipped with DAD

Anthocyanins

- Column: Gemini RP-C18 (250 × 4.6 mm; 5 µm)
- Flow rate: 0.9 mL/min
- Room temperature
- Injection volume: 10 µL
- Detection: 530 nm
- Gradien elution:
  A - water/methanol (70/30, *v/v*) , with 70% perchloric acid
  B - water/methanol (25/75, *v/v*) with 70% perchloric acid

Program for gradient elution:

t_R/min	B
0	0
23	25
51	70
60	100
65	0

Phenolic acids

- Column: ODS-300 RP-C18 9 250 × 4.6 mm; 7 µm)
- Flow rate: 0.5 mL/min
- Room temperature
- Injection volume: 10 µL
- Detection: 280, 256, 308 and 324 nm
- Gradien elution:
  A - water/formic acid, 98/2, *v/v*
  B - acetonitrile/water/formic acid, 80:12:2, *v/v/v*

Program for gradient elution:

t_R/min	B
0-50	9
65-70	10
77	30
80-97	0

RESULTS AND DISCUSSION

Table 1. Concentration of anthocyanins (mg/L), phenolic acids (mg/L) and catechin of Vranec wines fermented with different yeasts

Wines	Dp-Glc	Cy-Glc	Pt-Glc	Pn-Glc	Mv-Glc	Total Glc	Pt-AcGlc	Pn-AcGlc	Mv-AcGlc	Total AcGlc	Pn-coumGlc	Mv-coumGlc	Total coumGlc	Vitisin B	Total Ac	ΣGlc/ΣAcG	ΣGlc/ΣcoumGlc	ΣAcGlc/ΣcoumGlc
V-L1	2.1	27.2	0.9	143	344	388	4.1	3.6	27.5	35.2	4.3	28.2	32.5	n.d.	456	11.0	11.9	1.1
V-L2	19.8	1.1	43.3	24.3	347	435	4.0	5.1	45.2	54.3	2.9	29.0	31.9	3.7	525	8.0	13.7	1.7
V-L3	63.2	5.0	99.1	40.2	335	543	9.7	5.0	27.8	42.4	6.1	29.0	35.1	0.9	622	12.8	15.5	1.2
V-L4	16.5	n.d.	41.5	19.5	355	433	4.2	3.5	44.9	52.6	4.2	30.8	34.9	4.5	525	8.2	12.4	1.5
V-Vi1	38.8	8.1	82.3	73.0	544	746	7.9	12.8	68.8	89.5	8.1	69.9	78.0	n.d.	914	8.3	9.6	1.1
V-Vi2	99.6	20.1	154	134	887	1296	14.7	15.1	96.4	126	15.3	93.5	108	n.d.	1530	10.3	11.9	1.2
V-Vi3	76.6	7.5	114	68.1	524	790	12.8	11.9	61.5	86.3	9.5	54.9	64.4	n.d.	941	9.2	12.3	1.3
V-Vi4	35.7	1.0	63.1	33.6	378	512	7.1	8.1	46.1	61.3	5.1	36.2	41.3	n.d.	614	8.3	12.4	1.5
V-Vi5	59.7	5.5	89.4	50.6	411	617	8.7	6.9	45.0	60.6	5.9	36.2	42.1	2.7	722	10.2	14.6	1.4
V-Vi6	28.9	4.8	47.4	27.9	235	345	3.2	2.6	19.6	25.4	2.8	22.6	25.4	n.d.	395	13.5	13.5	1.0

Wines	Protocatecuic acid	Gallic acid	Syringic acid	p-Coumaric acid	Caftaric acid	Coutaric acid	Caffeic acid	Fertaric acid	Total HBA	Total HCA and HCAD	Catechin
V-L1	98.1	1352	419	60.8	237	13.7	94.5	19.4	1869	425	567
V-L2	44.9	460	161	10.9	243	49.1	31.2	21.4	666	355	93
V-L3	23.7	252	0.5	8.1	176	32.2	10.7	10.7	276	237	482
V-L4	31.1	317	30.0	13.2	226	45.2	14.0	36.5	378	335	348
V-Vi1	42.1	265	66.3	3.2	206	35.1	8.3	29.7	373	282	150
V-Vi2	62.6	311	55.3	18.6	275	55.6	14.6	49.4	429	413	n.d.
V-Vi3	62.6	472	13.5	13.3	507	89.2	11.5	39.0	548	660	347
V-Vi4	29.3	291	17.4	11.0	365	68.4	10.2	38.4	338	493	271
V-Vi5	37.2	391	n.d.	11.5	384	72.9	7.54	30.6	428	507	331
V-Vi6	50.8	671	n.d.	16.3	362	67.1	31.9	43.6	722	521	284

Abbreviation of wines: V-Vranec

Abbreviation of *Saccharomyces cervisie* yeasts: Vi-Vinalco; L-Lallemand yeasts

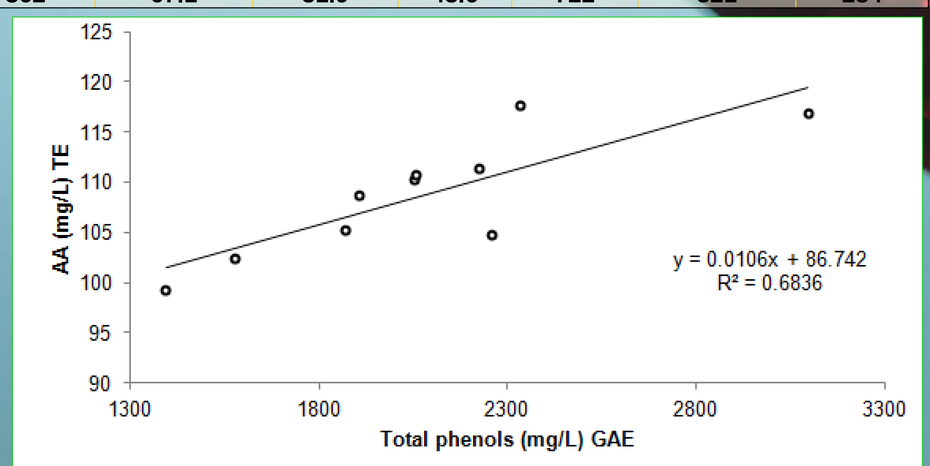

Fig. 1 Correlation between total phenols and antioxidant activity of **(a)** Merlot, Cabernet Sauvignon and Syrah wines from different wine regions and **(b)** Vranec wines produced with different yeast strains for fermentation.

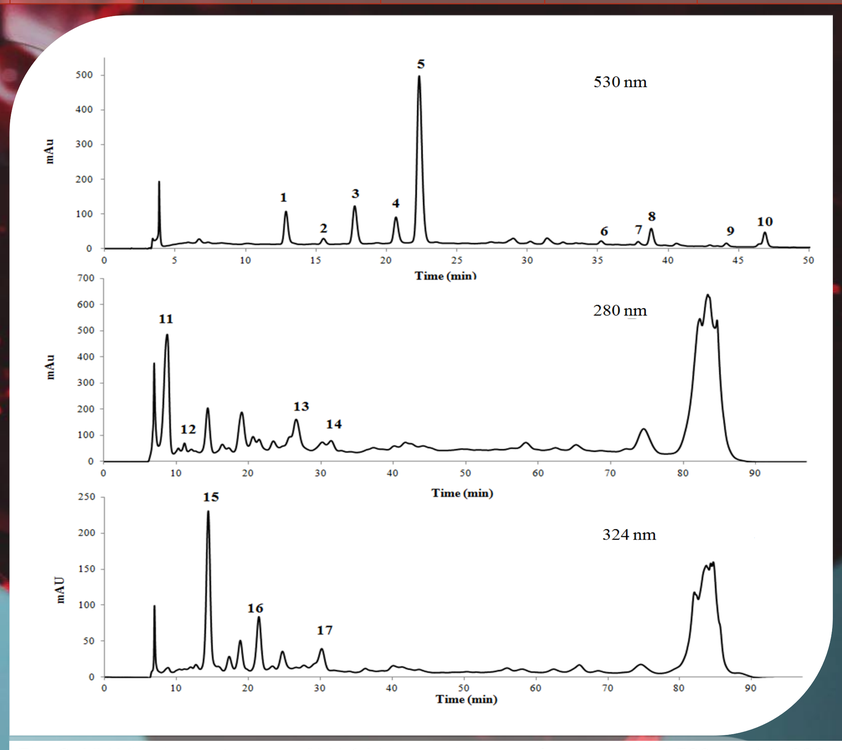

Fig. 2. UV-Vis chromatogram of V-L1 Vranec wine sample recorded at 530 nm (a), 280 nm (b) and 324 nm (c) for separation and quantification of anthocyanins, flavan-3-ols/hydroxybenozic acids and hydroxycinnamic acids/derivatives, respectively. Peak identification: delphinidin-3-glucoside, (1); cyanidin-3-glucoside, (2); petunidin-3-glucoside, (3); peonidin-3-glucoside, (4); malvidin-3-glucoside, (5); petunidin-(6 acetyl)-3-glucoside, (6); peonidin-(6 acetyl)-3-glucoside, (7); malvidin-(6 acetyl)-3-glucoside, (8); peonidin-coumaroyl-3-glucoside, (9); malvidin-coumaroyl-3-glucoside, (10); gallic acid, (11); protocatecuic acid, (12); syringic acid, (13); (+)-catechin, (14); caftaric acid, (15); caffeic acid, (16); *p*-coumaric acid, (17).

CONCLUSION

Wines fermented with Vinalco yeast presented higher amount of anthocyanins as well as phenolic acids (hydroxycinnamic and hydroxybenzoic) compared to the wines fermented with Lallemand yeasts. Wines showed relatively high value of the antioxidant activity regardless the yeast strain used for fermentation.

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