CHEMICAL AND BIOLOGICAL PROPERTIES OF JUICE AND WINE MADE FROM MALVASIA GRAPE VARIETY ORIGINATING FROM FRUŠKA GORA, SERBIA

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Introduction

Malvasia is a grape variety belonging to an ancient and heterogenic grapevine group, most probably originating from Greece and growing in the Mediterranean basin. Although it is cultivated in the neighboring countries such as Croatia and Slovenia, where it is very popular, in Serbia Malvasia can only be found in a few vineyards, one of which is located in a famous winery region of Fruška Gora.

Objectives

Since the agroclimatic factors can greatly influence the chemical composition of grapes, and consequently wine, which in turn affects the organoleptic properties of grapevine products, the aim of this study was to determine the polyphenolic profile of grape juice and wine of Malvasia variety originating from Serbia and evaluate their antioxidant and neuroprotective properties.

Materials and Methods

Malvasia grape juice and wine were obtained from a winery located in the Fruška Gora vineyard region during the year 2015. The samples were filtered and stored at -20°C, before the assays. **Total phenolic and flavonoid content** was determined using standard spectrophotometric assays while a detailed **quantitative analysis of 39 phenolic compounds** was performed by the LC-MS/MS technique[1]. **Antioxidant potential** was evaluated by measuring the reduction potential (FRAP) and free radical scavenging ability of the samples towards diphenylpicrylhydrazyl (DPPH·) and nitric oxide (·NO) radicals[2]. **Neuroprotective properties** of the samples were tested by conducting the acetylcholinesterase (AChE) inhibition assay.

Results

Table 1. Concentrations of detected* phenolic compounds in Malvasia juice and wine (mg/L)

Phenolic acids (mg/L)	Grape juice	Wine
2,5–dihydroxybenzoic acid	-	0.436 ± 0.031
p–hydroxybenzoic acid	-	0.142 ± 0.004
protocatechuic acid	-	0.106 ± 0.005
caffeic acid	-	4.757 ± 0.418
chlorogenic acid	-	0.004 ± 0.000
p–coumaric acid	-	0.777 ± 0.046
ferulic acid	-	0.476 ± 0.018
gallic acid	-	0.057 ± 0.003
ellagic acid	-	0.110 ± 0.005
syringic acid	-	0.087 ± 0.003
Flavonoids (mg/L)		
catechin	-	0.231 ± 0.022
epicatechin	-	0.411 ± 0.036
kaempferol–3–*O*–glucoside	0.186 ± 0.006	0.006 ± 0.000
kaempferol	0.007 ± 0.000	-
hyperoside + quercetin–3–*O*–glucoside	0.200 ± 0.005	0.026 ± 0.001
quercitrin	-	0.006 ± 0.000
rutin	-	0.003 ± 0.000
naringenin	-	0.010 ± 0.001
Stilbenes (mg/L)		
resveratrol	-	0.090 ± 0.004
Coumarins (mg/L)		
esculetin	0.017 ± 0.001	0.011 ± 0.001

*analyzed but not detected: vanillic, cinnamic, *o*–coumaric,,sinapic acids, quercetin, isorhammnetin,myricetin, morin, luteolin, luteolin-7-*O*-gluciside, chrysoeriol, vitexin, epigallocatechin gallate, umbelliferone, apigenin, apigenin-7-*O*-glucoside, amentoflavone, baicalein

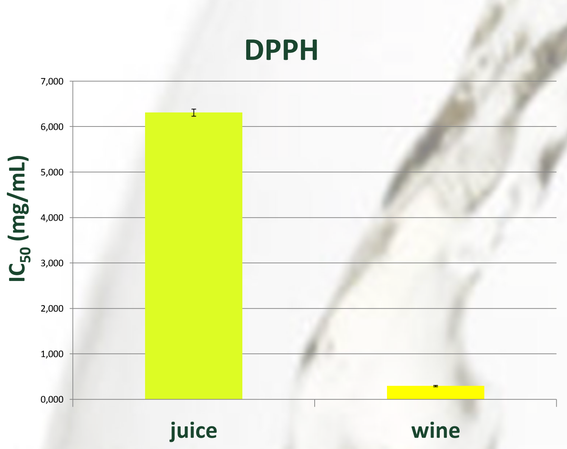

Figure 1. DPPH· scavenging assay results (expressed as IC_{50} (mg/mL))

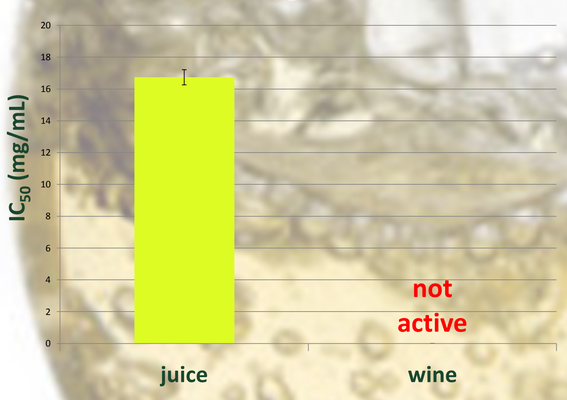

Figure 2. ·NO scavenging assay results (expressed as IC_{50} (mg/mL))

Figure 3. FRAP assay results (expressed as µg of ascorbic acid equivalents per mL)

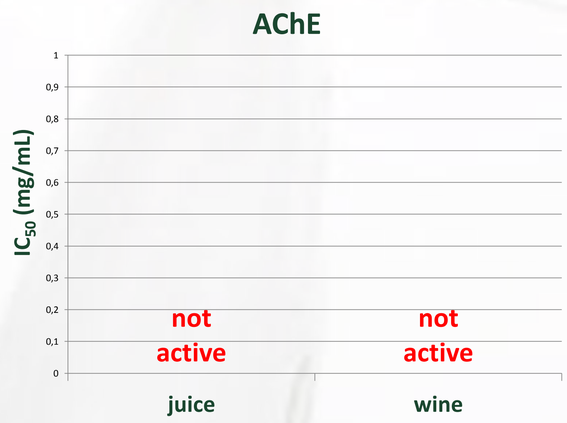

Figure 4. Inhibition of AChE assay results (expressed as IC_{50} (mg/mL))

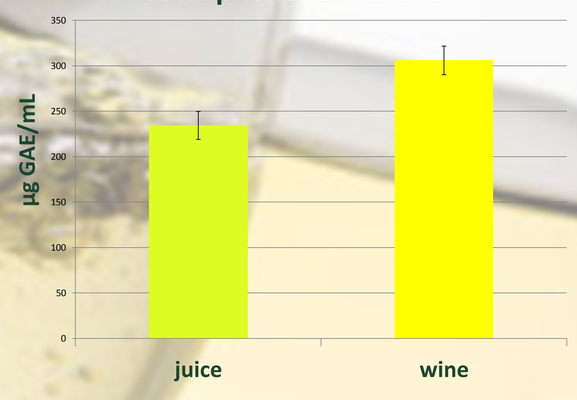

Figure 5. Total phenolic content (expressed as µg of gallic acid equivalents per mL)

Figure 6. Total flavonoid content (expressed as µg of quercetin equivalents per mL)

Discussion

- 21 compounds were detected using the LC-MS/MS technique
- Grape juice contained higher amounts of esculetin, kaempferol, kaempferol-3-*O*-glucoside, quercetin-3-*O*-glucoside and hyperoside, while the rest of the detected compounds were more abundant in wine
- Wine contained large quantities of caffeic, *p*-coumaric, ferulic and 2,5-dihydroxybenzoic acids
- Both samples showed a similar content of total flavonoids, while the wine had a higher total phenolic content
- Both juice and wine exhibited good reduction potential, wine was a better scavenger of DPPH· radicals, while juice exhibited higher inhibitory potential towards ·NO
- Samples did not inhibit the enzyme AChE

Acknowledgements

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References

1. Orčić, D. *et al*., (2014): Food Chem. 143: 48-53.
2. Lesjak, M. *et al*., (2011): Food Chem. 124: 850–856.

Conclusion

This study characterized the phenolic profile and biological activity of Malvasia grape juice and wine originating from Fruška Gora, Serbia. Caffeic acid stood out in wine, along with some other phenolic acids, while flavonoid glucosides characterized the juice. Further analyses of regional Malvasia grape products are needed to better define the unique properties that arise from specific agroclimatic factors and vineyard and winery practices of different winery regions.