Current Trends in Natural Sciences Vol. 7, Issue 14, pp. 155-159, 2018

Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521

Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

THE DETERMINATION OF THE CONTENT OF PHENOLIC COMPOUNDS FROM DIFFERENT ROMANIAN WINES USING FOLIN-CIOCÎLTEU METHOD

Daniela Giosanu [1]*, Mircea Bărbuceanu [1], Marian Anghel [1], Loredana Vîjan [1]

[1] University of Pitesti, Targul din Vale Street no.1, 110142 Pitesti, Romania

Abstract
It is well known that the bioactive compounds could have a benefic or harmful effects on human health. Recent studies point out the role of polyphenolic compounds in antioxidant activities. Wine polyphenols are considered the main responsible molecules present in wine to have beneficial effects on cardiac health and atherosclerosis, including neurological and carcinogenic illnesses. For this reason, in this paper we determined the content of polyphenolic compounds from different sample of red and white Romanian wines. It was used the Folin-Cocîlteu method.
The obtained results are interpreted according to: grape varieties, agroecological conditions of vineyards (terroir), the vinification process, special winemaking procedures, microbial metabolism related to the fermentative process, climate conditions and other additional procedures like aging.

Keywords: Folin Ciocilteu, spectroscopy, total polyphenols, wine.

1. INTRODUCTION

Phenolic compounds constitute one of the most important quality parameters of wines since they contribute to their organoleptic characteristics, particularly colour, astringency and bitterness. During wine maturation and ageing, the phenolic compounds participate in numerous chemical reactions (Pop et al., 2008). They possess a broad spectrum of biochemical properties such as antioxidant, antimutagenic and anticarcinogenic activities (Nakamura et al., 2003). Polyphenolic compounds act as reducing agents because they neutralize free radicals or can form complexes with heavy metal ions so that prevent formation of the free radicals (Popa, 2010). Their antioxidant activity increases with the increasing of the number of hydroxyl groups in the structure. The moderate consume of wine, especially red wine, determines a optimal content of the phenolic compounds in the human body, who is correlated to the decrease of the incidence of some coronary disease, cancer, neurodegenerative (e.g., Alzheimer's disease), rheumatoid arthritis (Chang et al., 2007).

The presence of phenolic compounds in wine is influenced by the following agents: variety of grapevine, viticulture practices, different winemaking techniques, vintage effect, the region where the grapes are grown and the terroir. Each terroir is affected by climatic, geological, and soil factors, and also by human activity (Balga et al., 2014).

The levels of polyphenols are reduced in wine material treated with different adsorbents, such as bentonite, polyclar, gelatin, egg albumin and others (Schneider, 1988).

*Corresponding author, E-mail address: giosanu@yahoo.com

Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521

Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

The objective of this study was to determine the content of total polyphenolics in some red and white wines from different Romanian zone and to establish the factors that influence this parameter. Also, a comparison between results in this study and literature data was made.

2. MATERIALS AND METHODS

The experiment was conducted in the Chemistry Laboratory from University of Pitesti. The wines analysed have come from two Romanian zones, known as viticultural area (Vrancea - Moldova and Ştefăneşti - Muntenia), 2017 year. Eight wines (4 red wines: Cabernet Sauvignon, Feteasca Neagra, Pinot Noir, Merlot and 4 white wines: Sauvignon Blanc, Feteasca Regala, Feteasca Alba, Riesling), from each area, were analysed.

Quantitative determination of polyphenols was performed by spectrophotometric method using a UV-Vis spectrophotometer PerkinElmer Lambda25. The methodology proposed by Singleton and Rossi (1965) was respected. The principle of method is based on forming a blue coloured compound between phosphotungstic acid and polyphenols, in an alkaline medium. The concentration of polyphenols was calculated using the calibration curve of gallic acid, performed under the same conditions as the sample, using the absorbance values at the maximum absorption, located at 760 nm. Thus, a stock solution of gallic acid with concentration of 100 mg/L was used. 1 mL of the samples of wine was added to a 10 mL flask containing 5 mL of distilled water and 0.5 mL of Folin-Ciocalteu reagent. After 5 minutes of rest, 2 mL solution of sodium carbonate 10% was added, then diluted with distilled water up to the final volume of 10 mL. After 2 hours of rest, absorbance of the samples was measured and the concentration of polyphenols was estimated. The content of polyphenols was expressed as mg gallic acid equivalent (GAE) per litter of wine (Tudor-Radu et al., 2016). All determinations were performed in triplicate.

3. RESULTS AND DISCUSSIONS

Figures 1 and 2 indicates the UV-Vis absorption spectra of wines, measured in quartz cell of 1 mm (for red wines), respectivelly 10 mm (for white wines).

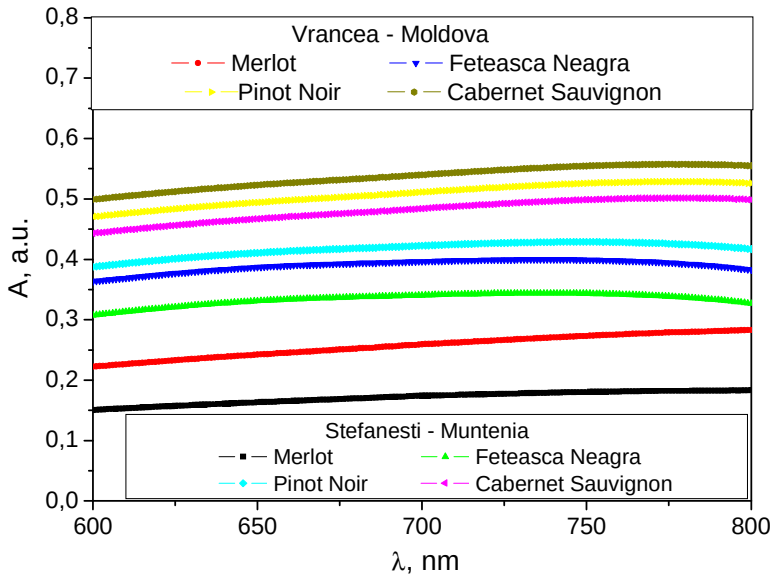

Figure 1. UV-Vis spectra of red wines

*Corresponding author, E-mail address: giosanu@yahoo.com

Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521

Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

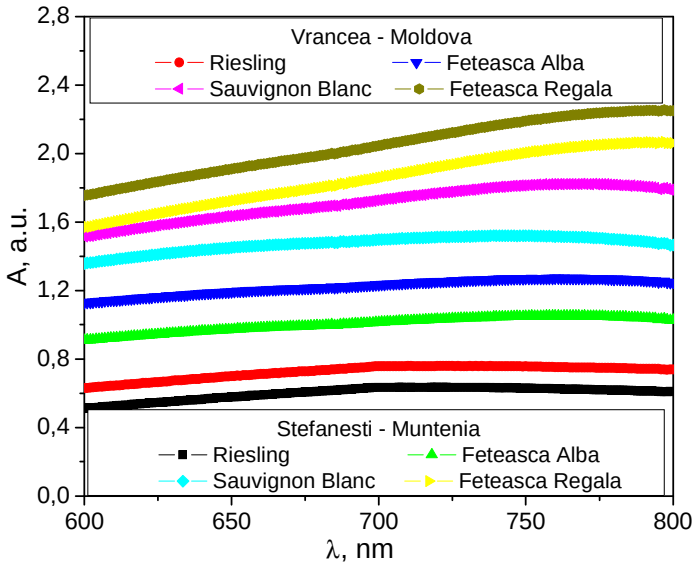

Figure 2. UV-Vis spectra of white wines

The total phenolic content was determined using Folin-Ciocalteu method, reported as gallic acid equivalents by reference to standard curve Figure 3 (y = 0.0649x + 0.1102 and r2 = 0.9988).

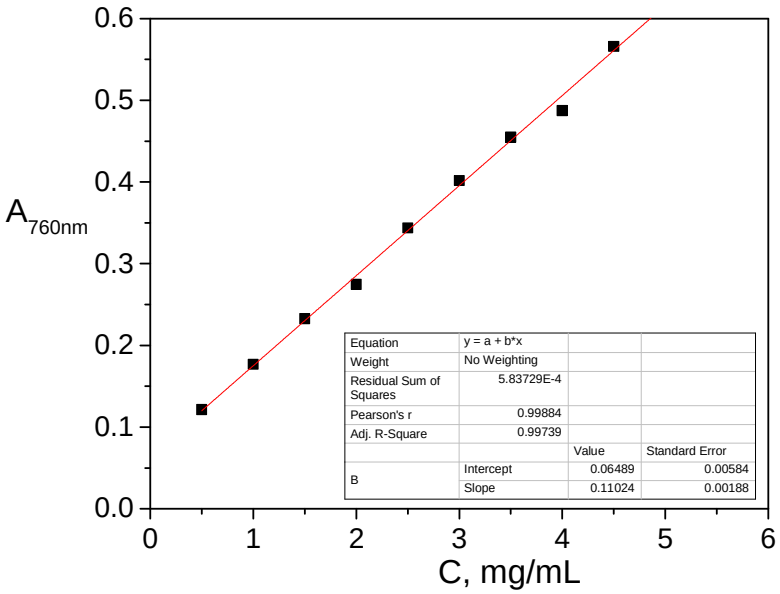

Figure 3. The calibration curves for polyphenols

The polyphenols content was calculated, taking into account the slope of the calibration line and the absorbance values at 760 nm. The obtained values for studied wines are presented in table 1(wines from Vrancea) and table 2 (wines from Stefanesti - Arges).

*Corresponding author, E-mail address: giosanu@yahoo.com

Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521

Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

Table 1. Total amount of polyphenolic substances in Vrancea wines

Wine samples Vrancea	Red wines				White wines			
	Cabernet Sauvignon	Pinot Noir	Merlot	Feteasca Neagra	Sauvignon Blanc	Feteasca Alba	Riesling	Feteasca Regala
TP (mg/l GAE)	2862	2603	1756	1896	252	234	219	296

Table 2. Total amount of polyphenolic substances in Stefanesti wines

Wine samples Stefanesti	Red wines				White wines			
	Cabernet Sauvignon	Pinot Noir	Merlot	Feteasca Neagra	Sauvignon Blanc	Feteasca Alba	Riesling	Feteasca Regala
TP (mg/l GAE)	2578	2241	1473	1768	241	223	206	279

In the studied red wines the total phenol content ranged from 1473 mg/l to 2862 mg/l (Table 1 and 2). The highest TP content was found in the Cabernet Sauvignon - Vrancea wine, whereas the lowest amount was measured in the Merlot - Stefanesti wine sample**.**

All white wine samples had < 300mg/l polyphenols and showed resistance to oxidation Our data show similar amounts of polyphenols in white wines made from grapes collected in Stefanesti and Vrancea, indicating that they had similar phenolic compound profiles.

In the white varieties the levels averaged about one tenth of the reds. By the Folin-Ciocalteau procedure, the white varieties had average levels close to 206-296 mg/L GAE. The Feteasca Regala - Vrancea was the variety with the highest average total phenol level (296 mg/L GAE) and Riesling – Stefanesti was the variety with the lowest average total phenol level (206 mg/L GAE).

4. CONCLUSIONS

The phenolic characterisation of red and white wines made from different grape varieties grown in different Romanian zones was evaluated in the present study. As expected, red wines had a higher concentration of polyphenols compared to white wines.

There are differences in the total amount of polyphenols, even among same variety of wines. For example, the Pinot Noir - Vrancea sample had presented a higher concentration of polyphenols (2603 mg/L GAE) compared to the same variety, from Stefanesti (Pinot Noir – Stefanesti, 2241 mg/L GAE).

In general, wines from Vrancea had a higher content of total polyphenols due, in part, to the soil rich in minerals, in that area.

The differences between total phenol content may be due to the wine production process, conditions of vineyards (terroir), the soil properties, climatic conditions, etc

Our values are in good agreement with values reported in the literature.

Further, more detailed studies are recommended.

6. REFERENCES

Balga I., Lesko A., Ladanyi M., Kallay M. (2014) Influence of Ageing on Changes in Polyphenolic Compounds in Red Wines , *Czech J. Food Sci*. 32(6), 563–569.

Chang, H.C., Huang, G.J., Agrawal, D.C., Kuo, C.L., Wu, C.R., Tsay, H.S. (2007). Antioxidant activities and polyphenol contents of six folk medicinal ferns used as “Gusuibu”. *Botanical Studies*, 48 (4), 397–406.

*Corresponding author, E-mail address: giosanu@yahoo.com

Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521

Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

Nakamura, Y., Watanabe, S., Miyake, N., Kohno, H., Osawa, T. (2003). Dihydrochalcones: evaluation as novel radical scavenging antioxidants. *Journal of Agricultural and Food Chemistry* 51(11), 3309-3312.

Pop. M., Lupea, A.X., Glevitzsky, M., Ardelean, A. (2008). The Effect of Berries Extract Addition on the Phenolic Content and on the Colour of Rosé and White Wines, *Rev. Chim* (Bucureşti), 59 (8), 127-143.

Popa, C.V., Danet, A.F., Jipa, S., Zaharescu, T. (2010). Determination of Total Antioxidant Activity of Wines Using a Flow Injection Method with Chemiluminescence Detection, *Rev. Chim*. (Bucureşti), 61 (1), 11-16.

Schneider, V. (1988). The behavior of phenolic substances [in wine]. Part 2. Weinwirtsch. Tech., 3, 16-20.

Tudor-Radu. M., Vijan. L.E., Tudor-Radu. C.M., Tița. I., Sima. R., Mitrea, R. (2016). Assessment of Ascorbic Acid, Polyphenols, Flavonoids, Anthocyanins and Carotenoids Content in Tomato Fruits, *Not Bot Horti Agrobo*, 44(2), 477-483.

*Corresponding author, E-mail address: giosanu@yahoo.com