

ANALYSIS OF HYDROXYCINNAMIC ACIDS CONTENT FROM WINES OF COTNARI AND TÂRGU BUJOR VINEYARDS

ANALIZA CONȚINUTULUI DE ACIZI HIDROXICINAMICI ALE VINURILOR DIN PODGORIILE COTNARI ȘI TÂRGU BUJOR

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Abstract. This study determined and correlated the hydroxycinnamic acids profile of four wines from Cotnari wine area (Frâncușă, Fetească albă, Grasă de Cotnari și Tămâioasă românească), and four wines from Tîrgu Bujor wine region (Băbească gri, Fetească regală, Fetească albă, Italian Riesling) with the geographical origins and vinification year, using high performance liquid chromatography. Ferrulic acid was registered in high concentrations in wine samples from 2010 (grapes from Cotnari vineyard), especially in Grs I 10 (0.72 mg/L) and Tr I 10 (0.81 mg/L). In the same samples, harvested in 2011, the quantity of ferrulic acid was under the detection limit. The highest chlorogenic acid concentration was registered in RI II 10 sample (4.70 mg/L) while the lowest, under the detection limit, was identified in Bg II 11 sample (Târgu Bujor).

Key words: wine, HPLC, hydroxycinnamic acids

Rezumat. Acest studiu a determinat și corelat profilul acizilor hidroxicinamici a patru vinuri din zona Cotnari (Frâncușă, Fetească albă, Grasă de Cotnari și Tămâioasă românească), și patru vinuri din regiunea viticolă Târgu Bujor (Băbească gri, Fetească regală, Fetească albă, Riesling italian), cu originea geografică și anul de vinificație, utilizând cromatografia de lichide de înaltă performanță. S-au identificat valori mari pentru acidul ferulic în probele vinificate în 2010 (struguri din zona Cotnari) mai ales Grs I 10 (0.72 mg/L) și Tr I 10 (0.81 mg/L) pe când în aceleași probe, dar vinificate în 2011 cantitatea de acid ferulic a fost sub limita de detecție. Cantitatea de acid clorogenic cea mai mare a fost determinată în proba RI II 10 (4.70 mg/L) iar cantitatea cea mai mică, sub limita de detecție în proba Bg II 11 (zona Târgu Bujor).

Cuvinte cheie: vin, HPLC, acizi hidroxicinamici

INTRODUCTION

The composition of wines and associated organoleptic properties are greatly dependent on many factors such as: grape varieties, soil, climate (sunlight), ripening time, must – fermentation time, yeasts and enological microflora, wine – making technologies, wine ageing type and bottle storage (Harris et al., 2007; Huang et al., 2009).

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Wine polyphenolic compounds, on the basis of their carbon skeleton, are usually subdivided into two major classes: non-flavonoids and flavonoids (Moreno Arribas and Polo, 2009; Garrido et al., 2011).

The non-flavonoids include hydroxybenzoic and hydroxycinnamic acids, stilbenes (mainly cis- and trans-resveratrol), phenolic alcohols, and aldehydes.

Characterized by a C6–C3 skeleton, hydroxycinnamic acids are one of the most representative classes of phenolic acids found in both grapes and wine. Their derivatives are almost exclusively derived from p-coumaric acid, caffeic acid and ferulic acid, whereas sinapic acid is, in general, less encountered. They commonly occur esterified to sugars, various alcohols, or organic acids, mainly tartaric acid. Moreover, hydroxycinnamic acids are also associated with the wine browning process and are precursors of volatile phenolic compounds (Castellari et al., 2002).

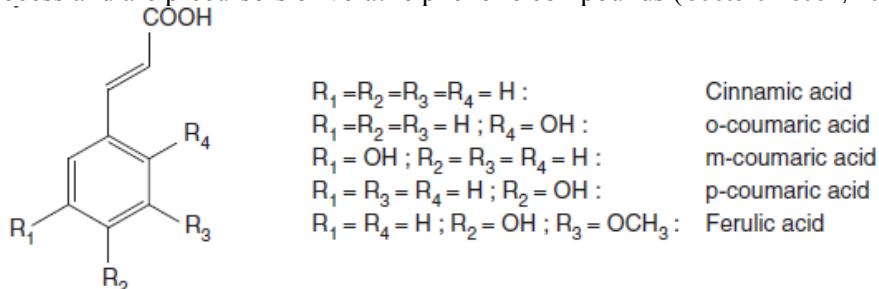


Fig.1- Chemical structures of the several hydroxycinnamic acids found in wines.

The aim of this research is to investigate the variation of hydroxycinnamic acids content in wines obtained from grapes of Moldova regions: Tîrgu Bujor and Cotnari with year of winemaking. The method used for determining the benzoic acids content is a HPLC method (OIV, 2012).

MATERIALS AND METHODS

In this study we have selected four wine grape varieties from Cotnari area: Frâncușă (encoded Frș I 10 and Frș I 11), Fetească albă (Fa I 10 and Fa I 11), Grasă de Cotnari (Grs I 10 and Grs I 11) și Tămâioasă românească (Tr I 10 and Tr I 11) It was selected four wines from Tîrgu Bujor wine region Băbească gri (encoded Bg II 10 and Bg II 11, Fetească regală (encoded Fr II 10 and Fr II 11), Fetească albă (encoded Fa II 10 and Fa II 11), Italian Riesling (encoded IR II 10 and IR II 11).

To simplify encoding was done for samples as following: variety - region - year (eg Frș I 10 - Frâncușă Cotnari 2010).

The grapes were harvested at technological maturity from Târgu Bujor and Cotnari vineyard and processed by classical technology for obtaining white wines. Before fermentation a fining procedure was made to remove all rough organic parts and afterword's a co-inoculation whit enzymes (2 g/hL) and yeasts (30 g/hL) was done. After its alcoholic fermentation, the wine was racked at room temperature. After 7-8 days the wine was filtered and bottled. Immediately after taking a dose of sulphur dioxide by 40 mg/L per glass, they were closed semi with a Mini TS.

The experiments were done during September 2010 – March 2012, at the Oenology Laboratory of the University of Agricultural Sciences and Veterinary Medicine “Ion Ionescu de la Brad” Iași. Each wine, after decarbonisation, was

analysed: volatile acidity OIV-MA-AS313-02, total acidity OIV-MA-AS313-01, specific gravity at 20°C OIV-MA-AS2-01B, alcoholic strength by frequency oscillator OIV-MA-AS312-01A, reducing substances OIV-MA-AS311-01A, total dry matter and non-reducing substances OIV-MA-AS2-03B were done according to present standards (6) and specific literature (Ribereau Gayon et al., 2006).

Reagents and standard for HPLC: the standards solutions for HPLC analysis were supplied by Sigma and Alfa Aesar. By dissolving known amounts of the analytical-reagent grade standards in methanol the calibration solutions were prepared.

The wine phenolic compounds were carried out with high-performance liquid chromatograph (HPLC) Shimadzu equipped with two chromatographic columns Merck Chromolith Performance RP-18.

RESULTS AND DISCUSSIONS

Table 1 registers the content of hydroxycinnamic acids in wines obtained in Cotnari vineyard. The samples were processed in 2010 and 2011. In 2010, the hydroxycinnamic acids quantity is higher (the quantity of chlorogenic acid and p-coumaric acid). The quantity of sinapic acid was under the detection limit in all wine samples analysed in 2010 and 2011. High values of ferulic acid in wine samples from 2010 are identified, especially in Grs I 10 (0.72 mg/L) and Tr I 10 (0.81 mg/L). In the samples from the same grape varieties but different harvest year, 2011, the ferulic acid was under the detection limit. The p-coumaric quantity was under the detection limit in the following samples: Fa I 11, Grs I 11, Tr I 11, from 2011.

Table 1

**Variation of hydroxycinnamic acids content in wine samples from Cotnari area
vinified in 2010 and 2011 (mg/L)**

Wine sample	Chlorogenic acid	Caffeic acid	p-coumaric acid	Ferulic acid	Sinapic acid
Frş I 10	5.44	0.19	3.12	0.72	SLD
Fa I 10	4.47	5.66	4.51	1.07	SLD
Grs I 10	5.44	0.19	3.12	0.72	SLD
Tr I 10	1.84	2.09	3.71	0.81	SLD
Frş I 11	1.73	2.43	2.80	0.48	SLD
Fa I 11	1.66	0.20	SLD	0.82	SLD
Grs I 11	3.95	0.60	SLD	SLD	SLD
Tr I 11	4.11	17.82	SLD	SLD	SLD

Table 2 shows the hydroxycinnamic acids quantities in wine samples from Târgu Bujor in 2010 and 2011. The sinapic acid quantity was under the detection limit for all analysed samples.

The variation of the quantity of benzoic acids is can be randomly characterised by the harvest year and the compound. The chlorogenic acid was highest in RI II 10 sample (4.70 mg/L) while the lowest, under the detection limit, was in Bg II 11. Fa II 10 sample contains the the highest quantity of caffeic acid (11.40 mg/L).

Table 2

Variation of hydroxycinnamic acids content in wine samples from Târgu Bujor area vinified in 2010 and 2011

Wine sample	acid clorogenic	acid cafeic	Acid p-cumaric	acid ferulic	acid sinapic
RI II 10	4.70	3.94	3.34	0.48	SLD
Fr II 10	3.37	7.63	4.25	0.76	SLD
Fa II 10	2.48	11.40	2.29	1.72	SLD
Bg II 10	2.92	5.48	4.61	0.57	SLD
RI II 11	3.82	1.09	SLD	SLD	SLD
Fr II 11	3.42	8.76	4.45	1.14	SLD
Fa II 11	3.75	1.47	2.34	0.98	SLD
Bg II 11	SLD	8.95	4.77	1.06	SLD

CONCLUSIONS

1. The obtained wines are dry or demi-dry (DOC), with an 11,5% alcoholic concentration.
2. High values for ferullic acid in wine samples from 2010 from Cotnari vineyard are registered, especially Grs I 10 (0.72 mg/L) and Tr I 10 (0.81 mg/L). In the samples from 2011, the ferullic acid was under the detection limit.
3. The chlorogenic acid quantity was highest in RI II 10 sample (4.70 mg/L) and the lowest quantity, under the detection limit, was identified in Bg II 11 sample (from Târgu Bujor).

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