STUDIES OF THE INFLUENCE OF SOME CONDITIONING TREATMENTS ON SOME VOLATILE COMPOUNDS IN FETEASCĂ ALBĂ WINES

STUDII ASUPRA INFLUENȚEI UNOR TRATAMENTE DE CONDIȚIONARE ASUPRA UNOR COMPUȘI VOLATILI ÎN VINURI DE FETEASCĂ ALBĂ

COLIBABA Cintia[1], COTEA V. V. [1], ROTARU Liliana[1], NICULAUA M.[2], VARARU F. [1], LUCHIAN Camelia[1]
e-mail: cintia_colibaba@yahoo.co.uk

Abstract. *Volatile compounds of Romanian wines made from local grape varieties considered neutral from a sensorial point of view are not sufficiently studied. This article mainly aims at underlining the influence of conditioning/fining treatments of wines, specifically their influence on physico-chemical composition and aroma profile of Fetească albă wines in Cotnari vineyard. Five experimental samples were obtained as follows: FA M - raw new wine before fining; FA V1- after treatment with potassium sorbate, FA V2 – cross-flow filtration, FA V3 after treatment with gum Arabic, FA V4- after treatment with cellulose gum CELSTAB®. The fining treatments applied to Fetească albă wines lead to changes in the concentration of flavor compounds through their adsorption or catalyse reactions leading to the formation of higher weight molecular compounds with a different sensory impression.*
Key words: *local grape varieties, aroma compounds, fining treatments*

Rezumat. *Compușii volatili din vinurile românești obținute din soiuri de struguri autohtoni considerați neutri din punct de vedere senzorial nu sunt suficient studiați. Articolul de față are ca scop principal redarea importanței tratamentelor de condiționare și stabilizare a vinului, în mod specific, influența acestora asupra compoziției fizico-chimice și a profilului de aromă asupra vinurilor obținute din struguri de Fetească albă, din podgoria Cotnari. Au fost obținute 5 probe experimentale, astfel: FA M – vin nou brut, înainte de cleire; FA V1- după tratamentul cu sorbat de potasiu; FA V2 - după filtrarea tangențială; FA V3 - după tratamentul cu guma arabică; FA V4- după tratamentul cu guma celulozica CELSTAB® . Tratamentele de condiționare aplicate vinurilor de Fetească albă conduc la modificarea concentrațiilor compușilor de aromă, prin adsorbția lor sau prin catalizarea unor reacții de formare de compuși cu moleculă mai mare, cu amprentă senzorială diferită*
Cuvinte cheie*: vinuri locale, compuși de aromă, tratamente de condiționare*

INTRODUCTION

The wines of Cotnari have so far been praised by personalities from various fields of activity and will be praised still. This is also due to the fact that Cotnari

[1] University of Agricultural Sciences and Veterinary Medicine of Iasi, Romania
[2] Oenological Research Center, Iasi Branch of the Romanian Academy, Iasi, Romania

is a region full of culture, history and traditions. Cotnari winery is the only winery in Romania that has not changed its range of (local) wine varieties after the invasion of phylloxera, namely: Frâncuşă, Fetească albă, Grasă de Cotnari and Tămâioasă românească (Cotea, 1985).

Fetească albă has always been considered a grape variety that produces neutral wines. However, studies have shown that terpenic compounds can be found in both grapes and wines from the mentioned grape variety (Nechita, 2010).

MATERIAL AND METHOD

The main purpose of this research was to emphasize the importance of fining treatments in wines and mainly their influence upon some aroma compounds of wines obtained from Fetească albă grape variety from Cotnari winery.

FA M – new wine, before clearing;
FA V1- after treatment with potassium sorbate;
FA V2- after cross flow filtration;
FA V3- after treatment with Arabic gum;
FA V4- after treatment with cellulose gum CELSTAB®.

Gas-chromatography conditions
1000 µL extract, splitless were injected in the GC column:
Parameters of analisys was:
1. GC:
- oven temperature: 35 °C
- injector temperature: 220 °C
- injection mode: splitless
- gas: He
- gas flow: 1 mL/min
- temperature program of oven: 35 °C for 5 minutes, with a rate of 4 °C / minute up to 250 °C for 13,25 minutes
- ion temperature source: 250 °C
- interface temperature: 250 °C
- detector sensibility: 1,05 V
2.Injection parameters:
- 10 µL syringe
- prewashing syringe with solvent 3 times
- filling volume of syringe: 5 µL
- prewashing syringe with sample 2 times
- postwashing syringe with solvent 5 times

RESULTS AND DISCUSSIONS

Table 1 presents the values for some of the volatile compounds quantified in Fetească albă wine samples.

In the case of esters, the highest values is in the case of diethyl ester of butanedioic acid, with a slightly fruity aroma, of baked apples and ylang, as follows Fa M - 800,1 µg, Fa V1 - 1445,7 µg, Fa V2 - 1352,3 µg, Fa V3 - 1473,8 µg and Fa V4 - 856,2 µg. Ethyl ester of hexanoic acid, with a slightly sweet fruity, apples and bananas odour (Fa M - 274,6 µg, Fa V1 - 103,8279 µg, Fa V2 -

181,2402 µg, Fa V3 - 102,3366 µg and Fa V4 - 158,9186 µg), ethyl ester of octanoic acid (Fa M - 406,1 µg, Fa V1 - 225,3 µg, Fa V2 - 387,4 µg, Fa V3 - 212,7 µg şi Fa V4 - 316,3 µg) and ethyl ester of decanoic acid (Fa M - 59,7 µg, Fa V1 - 81,2 µg, Fa V2 - 109,4 µg, Fa V3 – 72 µg and Fa V4 - 85,2 µg) are enzimatically formed during yeast fermentation as well as during acylCoA ethanolysis, that is formed during fatty acids synthesis or degradation. Their concentration is dependent on several factors, mainly: yeast strain, fermentation temperature, aeration degree and sugar content (Etievant, 1991; Bakker and Clarke, 2011).

Quantified acetate esters are: isoamyl acetate (Fa M - 1289 µg, Fa V1- 819,3 µg, Fa V2 - 3040,6 µg, Fa V3 - 1802,1 µg, Fa V4 - 2066,9 µg) and hexyl ester of acetic acid, that was under the detection limit. They are the result of the eaction of acetyl-CoA with alcohols and are formed from degradation of amino acids acids and carbohydrates (Etievant, 1991). In general, acetate and ethyl esters contribute to the fruity aroma of wine (Gurbuz et al., 2006; Peinado et al., 2004; Tao and Zhang, 2010).

The acids with the highest concentrations were : acetic acid, butanoic acid, hexanoic acid (Fa M - 1392,2 µg, Fa V1- 691 µg, Fa V2 - 1161,1 µg, Fa V3 - 806,1 µg, Fa V4 - 1251 µg). Volatile acids are produced during alcoholic fermentation and the contribution for the aroma depends on their concentration range in wine (Etievant, 1991). Shinohara (1985) showed that at concentrations of up to 10mgL^{-1},C6 to C10 acids provide mild and pleasant aroma to wine. However, the impact of the presence of volatile acids may be negative when the concentration of these compounds is greater than 20 mg L^{-1} (Shinohara, 1985). In this study, no acids were found in concentrations that may negatively affect the wine aroma.

The terpenes analysed in Fetească albă wines were linalool (Fa M - 24,7 µg, Fa V1 - 16,4 µg, Fa V2 - 12,5 µg, Fa V3 - 12,04425 µg, Fa V4 - nd), beta-ionone (Fa M - 69,0214 µg). The absence of linalool in the last sample, the one treated with cellulosic gum CELSTAB®., is an alarm signal that must be pulled quickly. The presence of beta-ionone only in the control sample Fa M leads to the conclusion that the fining treatments have a negative influence on its presence. These compounds tend to contribute positively to the floral aromas to wine aroma and their odor description is also reported in Table 1. Terpenes and C13-norisoprenoids are part of the grape varietal aroma and may undergo fermentation without substantial changes. They may be found in grape skins and maceration is essential for the extraction of these compounds to the grape must (Bakker and Clarke, 2004). The presence of terpenic compounds in musts that are considered neutral should be the first step in re-thinking the classification of grape varieties from a sensorial point of view.

Among phenols, eugenol and isoeugenol were quantified, both having a spicy hue and nutmeg.

Table 1

Values of some volatile compounds quantified in Fetească albă wine samples

No.	Comp Name	Fa M	Fa V1	Fa V2	Fa V3	Fa V4	Sensorial descriptor
1	Acetic acid of butyl ester	nd	nd	nd	nd	nd	Ether, solvent, fruity, bananas; Luebke, William TGSC, (1989)
2	3-Pentanol	nd	nd	nd	nd	nd	Sweet, herbaceous, oily, nutty
3	2-Pentanol	nd	nd	nd	nd	nd	Green, fusel oil, fermented; Mosciano, Gerard, (2009)
4	Isoamyl acetate	1289	819,3	3040,6	1802,1	2066,9	Sweet, banana, fruity; Mosciano, Gerard P&F 16, No. 6, 43, (1991)
5	3-Hexanol	nd	nd	nd	nd	nd	Fusel oil, green, solvent, winey, tropical fruits, ananas, apples, rum; Mosciano, Gerard, (2009)
6	Ethyl ester of hexanoic acid	274,6	103,8	181,2	102,3	158,9	Sweet, fruity, ananas, waxy, green, bananas; Luebke, William TGSC, (1990)
7	Hexyl ester of acetic acid	nd	nd	nd	nd	nd	Fruity, green, apples, banana, sweet; Luebke, William TGSC, (1983)
8	3-Octanol	nd	nd	nd	nd	nd	Soil, mushroom, herbaceous, spicy, woody, minty; Mosciano, Gerard P&F 23, No. 5, 49, (1998)
9	2-Octanol	nd	nd	nd	nd	nd	Fresh, spicy, green, woody, herbaceous, soil; Luebke, William TGSC, (1986)
10	Ethyl ester of octanoic acid	406,1	225,2	387,4	212,7	316,3	Fruity, winey, waxy, sweet, apricots, banana, brandy, pears; Luebke, William TGSC, (1986)
11	1-Heptanol						Moldy, herbaceous, violets, green, sweet, woody, peony ; Luebke, William TGSC, (1984)
12	Acetic acid	232,6	204,1	228,5	210,4	263,4	Vinegary
	Furfural	nd	nd	nd	nd	nd	Sweet, woody, almonds; Luebke, William TGSC, (1995)
13	4-Nonanol	nd	nd	nd	nd	nd	
14	Ethyl ester of nonanoic acid	nd	nd	nd	nd	nd	Fruity, rose, waxy, rum, winey, natural, tropical; Luebke, William TGSC, (1984)
15	Linalool	24,7	16,4	12,5	12,0	nd	Citric, floral,sweet, rose wood, wood, green; Luebke, William TGSC, (1983)
16	5 metyl furfural	21,3	20,5	24,4	nd	nd	Sweet, caramel, coffee; Mosciano, Gerard P&F 17, No. 4, 33, (1992)

17	Butanoic acid	182,8	111,8	145,5	126,2	152,4	Acetic, cheese, buttery, fruity; Luebke, William TGSC, (1995)
18	Ethyl ester of decanoic acid	59,7	81,2	109,4	72,0	85,2	Sweet, waxy, friuty, apples, grapey, oily, brandy; Luebke, William TGSC, (1987)
19	Diethyl ester of butanedioic acid	800,1	1445,7	1352,3	1473,8	856,2	Fruity, baked apples, ylang; Luebke, William TGSC, (1994)
20	Linalyl propionate	nd	nd	nd	nd	nd	Fresh, bergamote, lily, woody, rose, rum; Luebke, William TGSC, (1996)
21	Citral	37,0	51,3	78,6	97,9	136,1	Lemon, sweet; Luebke, William TGSC, (1982)
22	Ethyl ester of dodecanoic acid	nd	nd	nd	nd	nd	Sweet, waxy, floral, soapy, clean; Luebke, William TGSC, (1987)
23	trans-Geraniol	nd	nd	nd	nd	nd	Sweet, floral, fruity, rose, citric, waxy; Luebke, William TGSC, (1981)
24	Hexanoic acid	1392,2	691	1161	806,1	1251	Rancid, sweet, cheese; Luebke, William TGSC, (1987)
25	α-ionone	nd	nd	nd	nd	nd	Sweet, woody, floral, violets, tropical fruits; Luebke, William TGSC, (1983)
26	1-Undecanol	nd	nd	nd	nd	nd	Fresh, waxy, floral, citric; Luebke, William, (1993)
27	Phenylethyl alcohol	17712,4	21789,8	12689,7	12069,6	12593,8	Sweet, floral, fresh, roses and honey tones; Mosciano, Gerard P&F 18, No. 4, 51, (1993)
28	β-Ionone	69,0214	nd	nd	nd	nd	Floral, woody, sweet, fruity, forest fruits, tropical, beeswax; Luebke, William TGSC, (1983)
29	Eugenol	22,1	89	183,5	164,5	88,3	Sweet, spicy, nutmeg, woody; Luebke, William TGSC, (1984)
30	n-decanoic acid	78,5	122,7	161,4	133,3	151,8	Acrid, rancid
31	isoeugenol	22,5	47,2	52,9	42,6	75,8	Spicy, nutmeg

Among the quantified superior alcohols, phenylethylalcohol has strong nuances of roses and honey and registered the following values: Fa M - 17712,4 µg, Fa V1 - 21789,8 µg, Fa V2 - 12689,7 µg, Fa V3 - 12069,6 µg, Fa V4 - 12593,8 µg.

CONCLUSIONS

The fining treatments lead to a change in the aroma compoundsţ concentrations, through their adsorbtion or through the catalysis of some new reactions that form bigger molecule compounds, with a different sensorial print.

In the case of Fetească albă wine samples, phenylethylalcohol registers the highest concentration in the sample where pottasium sorbate treatment was applied (FA V1 – 22 mg).

The terpene β-Ionone quantified in Fetească albă wine samples is only present in the control samples, thus an alarm signal appears regarding the dosage of the fining treatments.

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