ANALYSIS OF VOLATILE COMPOUNDS IN ALIGOTÉ, OBTAINED BY DIFFERENT FERMENTATION VOLUMES

ANALIZA UNOR COMPUŞI VOLATILI DIN VINURILE DE ALIGOTÉ, OBŢINUTE PRIN DIFERITE VOLUME DE FERMENTAŢIE

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Abstract. *Volatile compounds are an important factor in defining the quality of wines. Of these, the most important are: alcohols, acids, esters, ketones and terpenes. The purpose of this paper is the determination the aromatic profile of the wine obtained from the Aligoté variety, in Bucium vineyard, from Iasi. Processing of the samples was made by the stages specific to the production of quality white wines and the volatile compound determination was performed with Shimadzu HS20trap - GC 2010plus - MS040TQ, by gas chromatographic method.*

Key words: Aligoté, volatile compounds, esters, alcohols, acids

Rezumat. *Compuşii volatili reprezintă un factor important în definirea calităţii vinurilor. Dintre aceştia, cei mai importanţi sunt: alcoolii, acizii, esterii, cetonele şi terpenele. Scopul acestei lucrări îl reprezintă determinarea profilului aromatic al vinului obţinut din soiul Aligoté, din centrul viticol Bucium, podgoria Iaşi. Prelucrarea probelor a fost făcută urmând etapele specifice obţinerii vinurilor albe de calitate, iar determinarea compuşilor volatili a fost efectuată cu Shimadzu HS20trap – GC 2010plus – MS040TQ, prin metoda cromatografică în fază gazoasă.*

Cuvinte cheie: Aligoté, compuşi volatili, esteri, alcooli, acizi

INTRODUCTION

Numerous factors such as environmental conditions (light, heat, water, nutrient availability), vineyard works and harvest time contribute to the modification of the composition of the grapes that further influence volatile wine compounds (Keyzers and Boss, 2010). Flavor formation during fermentation is a dynamic process that depends on the interactions between many variables. This results in concentrations of volatile compounds ranging from <0.1 to 300 mg/L, having olfactory perception thresholds ranging from 50 µg to 100 mg/L (Grainger and Tattersall, 2016).

Interestingly, aromatic features are not essential for cell survival (Carrau *et al*., 2017).

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Aligoté, the subject of this scientific article, is originally from France, where it has expanded to culture in our country after the invasion of filoxera has occurred.

This article aims to identify and quantify the main volatile compounds that give the flavor specific to this variety from Bucium-Iasi vineyard.

MATERIALS AND METHOD

The grapes of the Aligoté variety were manually harvested from the vineyard owned by S.C. "Casa Olteanu" S.R.L, harvest of 2017. The obtaining of samples was made using the specific methods for quality white wines. The manually harvested grapes were subjected to quantitative and qualitative reception, followed by crushing, destemming, prefermentative maceration (for two hours) and pressing. The resulting must was separated into two fractions (free-run and press), following a separate fermentation. Research turned towards free-fall must, which was subjected to gravitational settling with low temperature for a period of 24 hours. The must thus obtained was divided into containers with different volumes ranging from 50 L demijohns (A2) to 1000 L tanks (A3) that were fermented with selected yeasts. The third variant was fermented with the help of spontaneous yeasts (A1). The fermented variant at the tank has benefited from the thermal temperature control throughout the fermentation of the must. The same nutrients, activators and enzymes were applied to all variants in similar concentrations for all samples analyzed. At the end of the fermentative process, wines were treated with bentonite and isinglass. The volatile compounds were determined by gas-chromatography using a Shimadzu HS20trap - GC 2010plus - MS040TQ.

When preparing the samples, glass vials were used with a volume of 20 mL, in which: 6 mL of the analyzed sample was added + 60 µL of standard solution + salts (sodium chloride (NaCl), sodium sulfate (Na_2SO_4) and potassium acid phosphate (H_2PO_4)).

In organoleptic testing, 11 specialized tasters, familiar with wine tasting and scoring techniques attended. The notation was made by giving bonus points from 1 to 9.

RESULTS AND DISCUSSIONS

From the determination of the volatile compounds, 15 main compounds have been identified in Table 1.

The aroma of wine is dependent on various environmental factors, cultural management of the vines, variety and maturity of grapes, method of harvesting, technology used in winemaking and, last but not least, the yeasts used.

The main group of volatile compounds is alcohols (Cheng *et al.*, 2015). Superior alcohols are a major part of the by-products of levurian metabolism. They can have a significant influence on the quality and sensory character of wine (Capece and Romano, 2019), being considered contributors to the complex flavor of wines (Bakker and Clarke, 2012). The physiological function of higher alcohol production by yeasts is still being studied (Capece and Romano, 2019).

The main volatile compounds that have been identified in the samples taken in the study are shown in table 1:

Table 1

The results obtained regarding the main productivity elements

No.	Variants analyzed	Class	Volatile compounds	Aroma	References
1.	A1, A2, A3	Alcohols	isoamyl alcohol	Fruity, apple, pears, banana, fusel oil	Waterhouse *et al*., 2016
2.	A1, A2, A3		phenethyl alcohol	a rosey honey nuance	Waterhouse *et al*., 2016
3.	A1, A2, A3		3-methyl-1-pentanol	Pungent, cognac and wine, cocoa	Rapp, 1988
4.	A1, A2, A3		isobutyl alcohol	Ethereal winey cortex	Waterhouse et al., 2016
5.	A1, A2, A3	Acids	octanoic acid	Fatty, waxy, rancid, oily, vegetable, cheesy	Vararu, 2016
6.	A1, A2, A3		decanoic acid	Rancid, sour, fatty, citrus	Furtuna, 2015
7.	A1, A2, A3		hexanoic acid	Fatty, sweaty, cheesy	Nechita, 2010
8.	A1, A2, A3		dodecoic acid	Fatty, coconut, bay	Furtuna, 2015
9.	A1, A2, A3	Esters	ethyl octanoate	Fruity, wine, waxy, sweet, apricot, banana, brandy, pear	Rapp, 1988
10.	A1, A2, A3		ethyl decanoate	Sweet, waxy, fruity, apple, grape, oily, brandy	Nechita, 2010
11.	A1, A2, A3		ethyl dodecanoate	Sweet waxy floral fruity	Cotea *et al*., 2009
12.	A1, A2, A3		ethyl hexadecanoate	Waxy, fruity, creamy, milky, balsamic	Nechita, 2010
13.	A1, A2, A3		ethyl tetradecanoate	Sweet, waxy	Rapp, 1988
14.	A2	Aldehydes	benzaldehyde	Sharp, sweet, bitter, almond, cherry	Furtuna, 2015
15.	A1, A2	Ketone	2,6-dimethyl-4-heptanone	Pineapple, banana	Yang *et al*., 2015

A1 - fermented with spontaneous yeasts (50 L)
A2 - fermented with selected yeasts (50 L)
A3 - fermented with selected yeasts (1000 L)

The isoamilic alcohol may represent 30 – 50% of the total quantity of superior alcohols (Cotea *et al.*, 2009), being found in the highest quantity in all variants analyzed.

2-phenylethanol occupies a special place, being part of the category of superior alcohols with significant grapes, which is encountered in all variants in the study, being the most important phenolic alcohol (Jackson, 2020).

Acids influence both the quality and the character of the wine. They are key components, as they reflect the wine production process, including the variety of grapes, the used yeasts, the volume of the containers used for fermentation and storage (Robles *et al.*, 2019). During the alcoholic fermentation, fatty acids are produced by yeasts and bacteria, contributing to the formation of the wine bouquet.

Esters are part of significant sensory components that contribute to the formation of the fermentation bouquet (Furtuna, 2015).

The control variant (A1) presents the most intense feeling, this variant having a more pronounced texture and persistence, being characterized as sweet by the evaluators (fig. 1). The A1 sample also has a higher onctuosity. Sample A3, a variant fermented in the tank, is distinguished by flavors that are similar to field flowers exotic fruits and spice, having a more acidic sensation.

The A2 sample is distinguished by the specific notes, being the lowest in intensity in terms of green notes, exotic fruits, honey and a lower phenolic character.

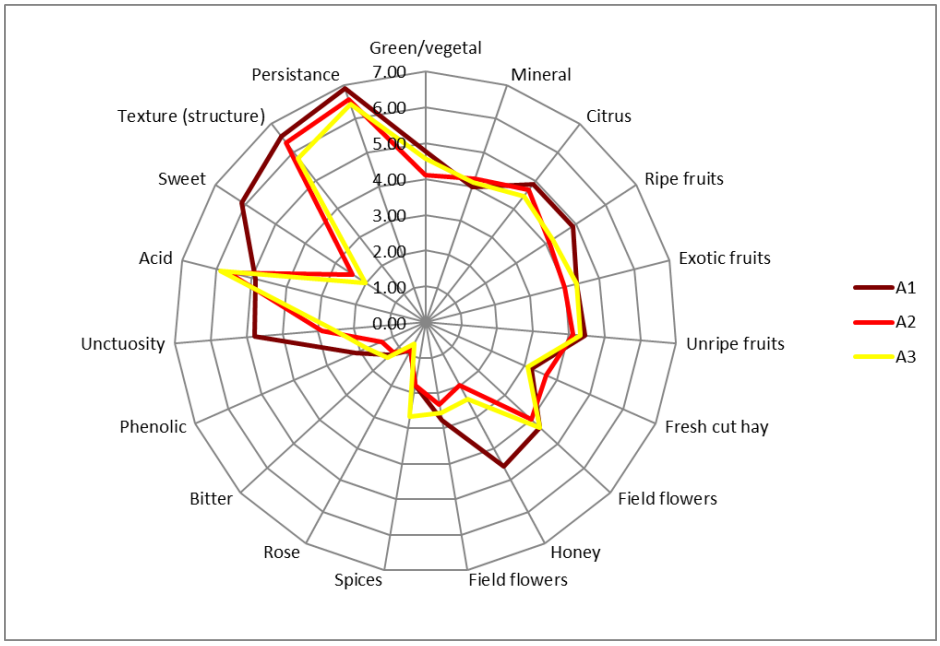

Fig. 1 Comparative sensory charts at Aligoté wines

CONCLUSIONS

1. The aromatic profile is influenced by both the work of the yeasts and the volume of fermentation, the results obtained confirming this.

2. The three analyzed samples show a similar aromatic profile, where the same compounds were identified: alcohols (isoamyl, 2-phenylethanol, 3-methyl-1-pentanol and isobutyl alcohol), esters (ethyl octanoate, ethyl decanoate, ethyl dodecanoate, ethyl hexadecanoate, ethyl tetradecanoate), acids (octanoic acid, decanoic acid, hexanoic acid, dodecanoic acid), but in different proportions, exception making ketones and aldehydes.

3. The only ketone identified in the wine was 2,6-dimethyl-4-heptanone which was identified in fermented variants in demijohns.

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