

# INFLUENCE OF FERMENTATION TEMPERATURE ON THE VOLATILE COMPOUNDS - CONSTITUENTS OF WINES AROMA

## INFLUENȚA TEMPERATURII DE FERMENTARE ASUPRA COMPUȘILOR VOLATILI CONSTITUENȚI AI AROMEI VINURILOR

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**Abstract.** *The white wines distinguish through compositional and sensorial characteristics. The white wines obtaining with certain typical features require the utilization some technology in elaboration process and a some conservation and stabilization techniques for flavors. From this standpoint, the fermentation temperature has a particularly important role in preserving primary flavors and secondary flavors. Fermentation of musts in different thermal regimes put in evidence considerable influence on volatile composition and the sensory characteristics of wines.*

**Key words:** white wines, sensorial characteristics, volatile compounds, temperature

**Rezumat.** *Vinurile albe se disting prin compoziție și caracteristici senzoriale specifice. Obținerea vinurilor albe cu anumite caracteristici tipice necesită utilizarea unor tehnologii în procesul de elaborare și a unei anumite tehnici de conservare și de stabilizare a aromelor. Din acest punct de vedere, temperatura de fermentare deține un rol deosebit de important în conservarea aromelor primare dar și în formarea aromelor secundare, de fermentație. Fermentarea musturilor în regimuri termice diferite a pus în evidență influența considerabilă asupra compoziției volatile și asupra însușirilor organoleptice ale vinurilor.*

**Cuvinte cheie:** vinuri albe, caracteristici senzoriale, compuși volatili, temperatură

### INTRODUCTION

Freshness and fruitiness, naturalness and hygiene-alimentary value, characteristics more strongly demanded by consumers approved wines, at national and international, can not only get through a rational vinification, which requires, among others, a careful handling of alcoholic fermentation (Elena Heroiu, 1998).

Getting white wines of high quality, whose taste reminds of taste and flavor of fresh grapes, is conditioned by a number of factors involved in the technology to produce these wines (Popescu T. et al., 1989, Felicia Stoica, 2003).

Fermentation temperature is one of the most important factors influencing the sensory quality of wines and activity of the years used in fermentation (Felicia Stoica, 2008).

## MATERIAL AND METHOD

The experience has been effectuated on a must obtained from grapes varieties Sauvignon, cultivated in the pedo-climatic condition of Dragasani vineyard.

Fermentation was headed to "dry" in the following variants:

V<sub>1</sub> – fermentation temperature 28°C

V<sub>2</sub> – fermentation temperature 24°C

V<sub>3</sub> – fermentation temperature 19°C

V<sub>4</sub> – fermentation temperature 15°C

V<sub>5</sub> – fermentation temperature 11°C

To put in evidence the loss of volatile compounds involved in carbon dioxide during alcoholic fermentation were captured the products by cooling at – 40°C in a hatch connected to the exit of the fermentation tank.

Of the condensed a microlitru was injected into gas-chromatograph equipped with F.I.D. detector and column filling with Reoplex 400. Compounds were identified using reference substances of high purity (standards) according to retention times.

Tests were performed using gas chromatography - method accepted by the national and international plan.

## RESULTS AND DISCUSSIONS

Fermentation temperature has an important role in conservation the primary flavors and formation of fermentation flavors. Duration of fermentation was dependent on the temperature of fermentation. So, the variants V<sub>1</sub> and V<sub>2</sub> was fermented for 4 (four) days, V<sub>3</sub> for 7 (seven) days, V<sub>4</sub> for 8 (eight) days and V<sub>5</sub> for 10 (ten) days.

Fermentation musts in different thermal regimes put in evidence the considerable influence of these temperatures on the volatile composition and the sensorial characteristics of wines.

From Table 1 data may find that as in the volatile composition of wines and also the sensory, variant V<sub>4</sub> who was fermented at 15°C are included in the best followed closely by variant V<sub>3</sub>. Wine obtained by fermentation of grape must at 28°C was the least successful in terms of organoleptic.

The data confirm those noticed in practice, according to which lower heating values during alcoholic fermentation is favorable to obtain wines with characteristics superior flavor and freshness.

It may be noted that the highest content in superior alcohols were recorded in the variant V<sub>1</sub> who was fermented at 28°C. Contents esters increase considerably when the fermentation temperature must decrease from 28°C to 15°C, so that the wine derived from fermented at lower temperature is the most rich in these compounds.

The wine content in volatile organic acids, decreases, overall, the fermentation temperature decreases from 28°C to 11°C (Table 2).

Table 1

**Influence of fermentation temperature on the content  
in volatile compounds (mg/L)**

No. crt	Chemical composition	Fermentation temperature (°C)				
		28	24	19	15	11
1	n-propanol	0,170	0,153	0,148	0,153	0,162
2	isobutanol	5,22	4,90	4,75	4,20	4,30
3	n-butanol	0,390	0,285	0,367	0,548	0,440
4	alcohol isoamilic	108,3	95,9	83,3	67,9	70,3
5	hexanol	0,640	0,620	0,696	0,787	0,740
6	alcohol $\beta$ phenyl etilic	13,9	13,1	15,6	12,9	12,3
7	Isoamil acetate	0,203	0,356	0,370	0,500	0,470
8	Ethyl caproat	0,290	0,318	0,355	0,358	0,330
9	Ethyl caprilat	0,590	0,615	0,740	0797	0,425
10	Ethyl succinat	0,188	0,251	0,197	0,74	0,190
11	Ethyl caprinat	0,045	0,090	0,138	0,160	0,142
12	$\beta$ phenyl ethyl acetate	0,290	0,263	0,683	0,612	0,600
13	Ethyl laurat	0,271	0,252	0,347	0,370	0,357

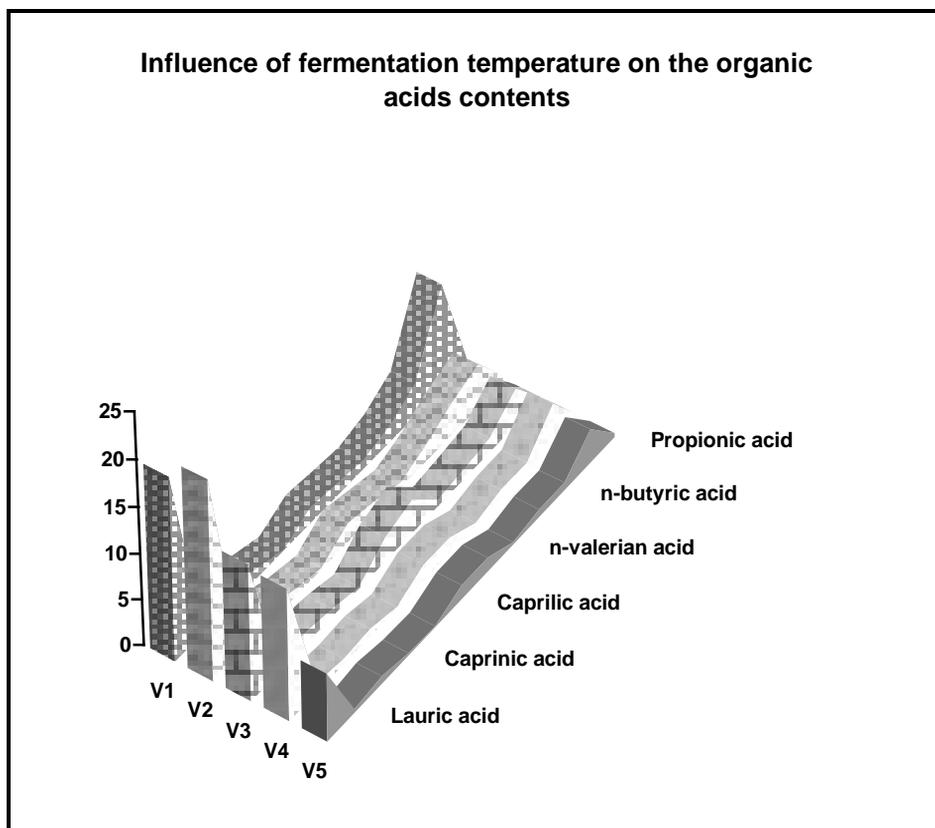
Table 2

**Influence of different fermentation temperatures on volatile acids  
content (mg/L) in the dry white wines – Sauvignon**

No. crt	Volatile organic acids	Fermentation temperature (°C)				
		28°C	24°C	19°C	15°C	11°C
1	Propionic acid	0,69	0,68	0,40	0,44	0,38
2	Isobutyric acid	11,50	4,76	4,16	4,53	3,75
3	n-butyric acid	3,60	3,50	1,63	0,98	0,84
4	Isovalerianic acid	1,77	1,74	1,10	0,96	0,87
5	n-valerian acid	0,98	0,55	0,73	0,28	0,25
6	Caproic acid	1,35	1,37	3,73	1,68	1,59
7	Caprilic acid	1,70	2,08	2,64	1,69	1,57
8	Pelargonic acid	0,05	0,117	0,117	0,101	0,15
9	Caprinic acid	0,98	0,76	0,84	0,76	0,30
10	Acid ethyl succinate	1,98	1,83	1,29	0,59	0,87
11	Lauric acid	0,35	0,43	0,58	1,01	0,42
12	2 hidroxicaproic acid	19,90	21,70	14,88	14,40	7,50

The lower fermentation temperature lower change the levurian metabolism, leading to the transformation of unsaturated fatty acids with long chain in fatty acid with shorter chain  $C_6$ ,  $C_8$ ,  $C_{10}$ ,  $C_{12}$ .

The Variant  $V_3$  has a higher content in caproic acid, caprylic acid and caprinic acid (Figure 1).



**Fig. 1.** Influence of fermentation temperature on the organic acids contents

According to the mechanism of esterification can be assumed that this wine will be rich in esters of the corresponding acids.

According the specialty literature ethyl caproat, ethyl caprilat and ethyl caprinat play most important role in white wine flavor being responsible for their freshness and fruitiness.

The low temperature fermentation produces a decrease of the amount of carbon dioxide that train with him and a remarkable amount of volatile products

To put in evidence the loss of volatile compounds involved in carbon dioxide during alcoholic fermentation we used the variant  $V_3$  – must by Sauvignon grapes fermentated at  $24^{\circ}\text{C}$ .

Table 3 content the dates regarding the volatile compounds which appear in different condensate samples at the alcoholic fermentation of must at the 24°C.

Table 3

**The average values of the volatile compounds involved in CO<sub>2</sub>**

<b>NO. crt.</b>	<b>Volatile compounds</b>	<b>Average values, mg/100 ml liquid</b>
1.	n-propanol	1,30
2.	Isobutanol	2,10
3.	Metil-2 butanol-1	0,90
4.	Metil-3 butanol-1	2,70
5.	Hexanol	0,80
6.	Ethyl acetate	0,31
7.	Ethyl capronate	0,13
8.	Acetate hexil	0,11
9.	Ethyl caprilate	0,08
10.	Ethyl caprinat	0,03

Training component of the carbon dioxide in the largest proportion was ethylic alcohol but its concentration was not quantified because alcohol isn't a compound of the wine aroma.

Compounds eliminated by the training were related to their concentration in wine. The propanol, isobutanol and methyl 3 butanol 1 are the alcohols which re found in high concentration in wine. The alcohols were quantitatively more important than the esters in the condensed sample.

A fermentation temperature of less lead to decrease the amount of carbon dioxide eliminated, and consequently a much lower volatile compounds.

## CONCLUSIONS

- Fermentation temperature exerts a significant influence on the content of volatile compounds in wines and in their quality.
- The wine obtained by fermentation of grape must at high temperature has the greatest content in superior alcohols and is the least appreciated the quality of point of wieu.
- By fermentation of grape must at relatively low temperatures are obtained wines with superior characteristics in terms of flavor.
- These wines have high contents in esters that are easily volatile compounds.
- The value of low temperature fermentation leads to lower quantity of carbon dioxide formed and consequently a lower amount of volatile compounds involved.

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