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IDENTIFICATION OF SEVERAL VOLATILE COMPONENTS FROM RED WINES

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Abstract

This study presents the possibility of separating and concentrating the volatile flavors from red wines and to analyze by gas chromatography the content of volatile flavors and to determine the flavors substances by mass spectrometry analysis.

***Keywords**: wine, volatile flavor, wine flavor, GS-MS.*

Introduction

Due to its origin wine has a complex composition that varies in correspondence with various factors. These factors influence the quality and quantity of the grapes and therefore of the wine: soil and climatic factors, agro-technical conditions, means of making the wine. In the composition of wines are found: alcohols, acids, sugars, phenols, nitrogen substances, mineral substances and vitamins, odoriferous substances that determine the organoleptic and physical-chemical characteristics of the wine.

The accumulation of these substances takes place during the ripening of the grapes but not at the same intensity as the accumulation of sugars. Generally and according to the variety the content in aromas can precede, coincide or supercede the maximal content in sugars. At the majority of grapes the odoriferous substances are found in the skin of the grape and less in the seeds and the pulp (Pomohaci, 2000).

The chemical nature of the odoriferous substances from the grapes is very complex. It is generally admitted that the aroma of the grapes is mainly due to the ether oils. For the varieties with Muscat aroma the main role is assumed by the terpenes along with other oxygenated derivates of them: alcohols, aldehydes, phenols, etc (Ceausescu, 1988).

In wine along with the substances that come from the grapes are also found substances that result during the alcoholic fermentation or are formed during the storage of the wine.

Thus the odoriferous substances that came from grapes form the main aroma while the substances formed during the alcoholic fermentation are responsible for the secondary aroma or the fermentation aroma. This last one gives the so-called "winy" character, specific to wine and missing from the unfermented juice and the grapes (Tardea, 2001).

The odoriferous substances that appear during the aging of the wine due to certain processes that take place like oxidations, reductions, hydrolysis, acetification, esterification, form the so-called maturation bouquet (Ceausescu, 1988).

Keeping the wine in bottles causes a slight modification of the content in odoriferous substances that leads to the appearance of the aging bouquet, characteristic to collection wines.

Experimental

The hydro-distillation of several quantities of red wines, superior quality, of the varieties Merlot, Cabernet Sauvignon and Pinot Noir, was used to obtain the hydro-distillates that were then subjected to hexane extraction. Due to the hydro-distillation a separation of the volatile aromas was made while the extraction allowed the identification by gas chromatography coupled with mass spectrometry of a number of components out of the total substances that were extracted (Balaban, 1983; Oprean, 1974).

To realize the analyses a capillary gas chromatography HP 5890 series II, with mass spectrometry detector HP 5972 MSD was used.

Experimental conditions were as follows:

Chromatograph: HP 5890 series II

- Injection: split-split less; injector temperature 180^{o}C, injected sample volume: 1μl; valve opening time 0,75 min;
- Capillary column HP-SM5, length 30 m, Φ = 0,53 mm.
- Carrier gas: He, pressure 3,0 psi

– Temperature programming: initial temperature 50°C; solvent elimination 5 min; temperature gradient 2°C/ min; final temperature 250°C.
– Interface: temperature 280°C

Mass spectrometer: HP 5972

– Ionization source: EI
– Working method: SCAN
– Mass channels: 20-350
– Optimization of the working parameters: ATUNE

Processing unit: HP 486s/20 Vectra

– HP 9133 Chemstation
– Wiley Mass Spectral Library

Results and Discussions

The gas-chromatograms of the hexane extract obtained from studied wines are presented in figure 1 (for Merlot wine), figure 2 (for Cabernet Sauvignon wine), and figure 3 (for Pinot Noir wine). Also, the volatile aromas from chromatogram are identified.

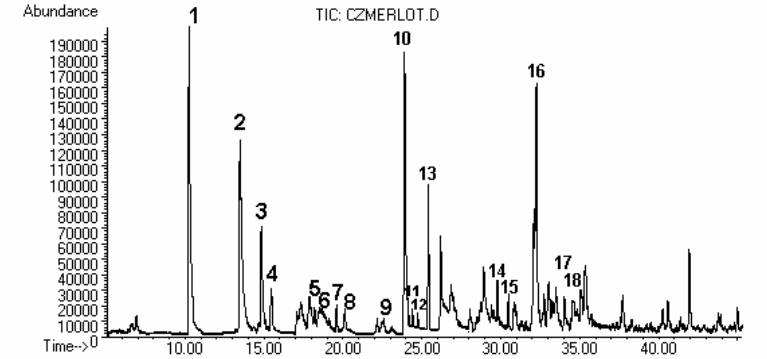

Fig. 1. Gas chromatogram of the hexane extract obtained from Merlot wine

1	trans-sabinen hydrate	10	Geranil acetate
2	Ipsdienol	11	β-Mircen
3	α-Terpineol	12	izo-Cariofilen
4	Linalool	13	trans-Cariofilen
5	2,5-Dimetil-2-cilclohexen-1-ona	14	Cadinen

6	3-Penten-2-ona	15	di-hydro-carvil acetate
7	Linalil acetate	16	trans-Izolimonen
8	Nerol	17	Cedren
9	Citronelil propionate	18	Cadinen

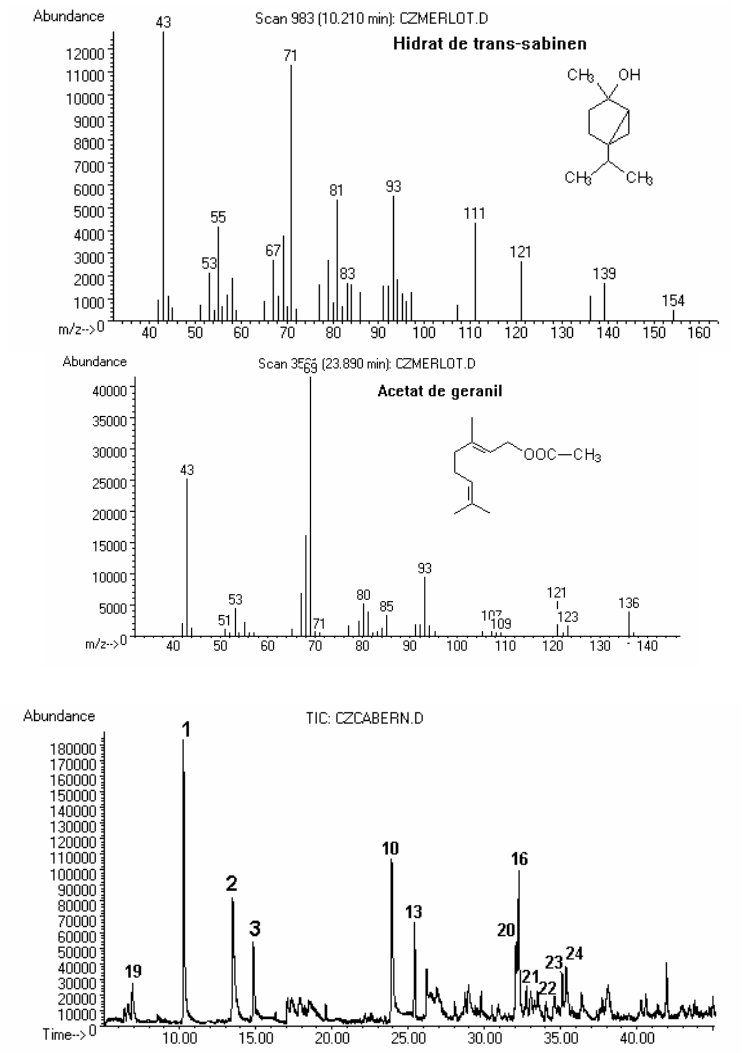

Fig. 2. Gas chromatogram of the hexane extract obtained from Cabernet Sauvignon wine

1 trans-sabinen hydrate
2 Ipsdienol
3 α-Terpineol
10 Geranil acetate
13 trans-Cariofilen
16 trans-Izolimonen
19 1-(1-etoxietoxi)- pentane
20 Cariofilen oxide
21 Hexyl –pentil -ether
22 Neorilatol
23 Izocamfan
24 Ciclocitral

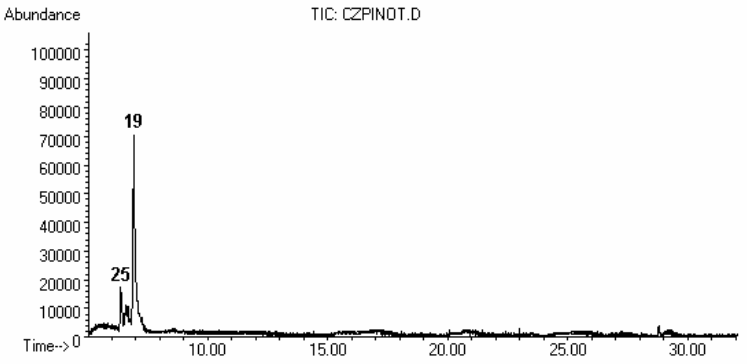

Fig. 3. Gas chromatogram of the hexane extract obtained from Pinot Noir wine

19 1-(1-etoxietoxi)- pentane
25 1,1-dietoxi-3-metil-butan

Conclusions

After realizing the gas chromatograms and the identification of the main aroma components as well as the verification of the computerized spectra attributing for the base aroma components the following conclusions were drawn:

1. The method of pre-concentration of the volatile aromas allowed the identification of the main components and also of a significant number of minor components;
2. The identification of the volatile components by GC-MS represents a quick method, precise and with a high sensibility while requiring little amounts of substances. Can be applied to all types of aromatic wines.
3. A far as the quality of the analyzed wines is concerned it is noted that the Pinot Noir wine has acetified aldehydes while the Merlot and Cabernet Sauvignon are more aromatic with terpenic compounds.

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