COMPOUNDS WITH SENSORIAL CHARACTER OF TAMAIOASA ROMANEASCA WINES OBTAINED THROUGH DIFFERENT MACERATION TECHNOLOGIES

COMPUŞI CU CARACTETR OLFACTIV DIN VINURILE DE TĂMÂIOASĂ ROMÂNEASCĂ OBŢINUTE PRIN DIVERSE TEHNOLOGII DE MACERARE

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Abstract. *The volatile compounds in local origin Romanian wines represent an insufficiently researched domain. This study wants to identify aroma substances in Tămâioasă românească wines from Cotnari vineyard, in the northeast of Romania. During 2007 harvest, different maceration technologies were applied to Tamâioasă românească grapes like: classical maceration, cryo-maceration, ultrasound maceration and microwave maceration. A SPE extraction prior to gas-chromatography mass-spectrometry was used to determine individual aroma compounds. As expected, Tamâioasă românească has terpenes, acids, alcohols and esters that form its highly appreciated aroma. At the same time, the variation of these compounds according to the used maceration method is described.*

Key words: Tamâioasă românească wines, maceration technologies, aroma compounds

Rezumat. *Compuşii aromaţi din vinurile romaneşti reprezintă un domeniu puţin studiat. Această lucrare are ca obiectiv principal identificarea substanţelor ce imprimă note senzoriale vinurilor obţinute din struguri de Tămâioasă românească recoltaţi din podgoria Cotnari, în anul 2007. Vinurile au fost procesate prin aplicarea diverselor tehnologii de macerare (macerare pe boştină, criomacerare, macerare cu ultrasunete, macerare cu microunde). Vinurile au fost analizate prin gazcromatografiere cuplată cu extractie in faza solida, identificandu-se astfel compuşi (terpene, acizi, alcooli şi esteri) ce concură la formarea aromei. Este, de asemenea, descrisă şi variaţia diverşilor compuşi identificaţi în funcţie de metoda de macerare utilizată.*

Cuvinte cheie: vinuri Tămâioasă românească, tehnologii de macerare, compuşi de aromă

INTRODUCTION

Aromatic wines represent a very narrow segment on the Romanian and international wine market, defavoured because of the small production yields and bad marketing. Tămâioasă românească, Muscat Ottonel and Busuioacă de Bohotin are the main three grape varieties used in the production of aromatic

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wines. A fourth variety, Gewürztraminer, is cultivated only in the west of the country.

Up to the present, the technology for obtaining these wines was not efficiently researched. This article studies the processing of Tămâioasă românească wines in order to diversify and enlarge the aromatic wine segment on the market.

The aromatic profile of wines is determined by the combined effects of hundreds of chemical compounds (Cabaroglu, T, 1997; Cotea D.V., 1985, Cotea, 1988). The formation of the aroma bouquet depends on many factors that are dependent on the cultural conditions of the vineyard but also on the production technologies, fermentation conditions and aging of the wine (Marais J., 1988, Günata Y.Z, 1993).

Although there are many data concerning the type and chemical composition of aromatic substances, at present, little is known about the optimisation of maceration technologies for an improved extraction of volatile compounds. Evaluation of the maceration methods for a higher extraction degree becomes an essential objective in optimisation of wine production technologies.

This study is focused especially on the firts part of the wine-making process – maceration – analysing in parallel both classical tendencies (skin contact maceration, enzymatic maceration) as well as modern technologies: ultrasound maceration, microwave maceration and cryomaceration.

This article tries to make some light on the effect of different maceration technologies on the aromatic compounds extraction and presence in Tămâioasă românească wines.

MATERIAL AND METHOD

Variant V0. Control sample: Tămâioasă românească grapes were processed by observing the stages of the general technological flux for white non-aromatic wines. As such, after crushing and de-stemming, the must was pressed directly, without any contact with the grape skins. Fermentation occurred as a result of the activity of the indigenous yeasts. The wines were racked, conditioned, filtered and bottled.

Variant V1. Enzymatic maceration: Maceration with/by means of enzymes was performed by using two commercial enzymatic products, ZYMARÔME G® and ZYMOCLAIRE Muscat®. Three aromatic wines-specific yeasts were also used (FERMOL AROMATIC®, FERMACTIVE MUSCAT® and FERMOL GRAND ROUGE NATURE®) and non-aromatic wines-specific yeasts (FERMACTIVE AP®) were added in the control sample.

Variant V2. Classical maceration: The de-stemmed and crushed grapes underwent classical maceration, i.e., 12 and 48 hours respectively, following which fermentation took place for two weeks at low temperatures, 15°C maximum.

Variant V3. Microwave maceration: Microwave maceration was performed by means of the microwave oven from the Oenology Laboratory. The must was radiated at 350W and 650 W.

Variant V4. Ultrasound maceration: Ultrasound maceration was carried out with the help of the ultrasound bath from the Oenology Laboratory (45 kHz frequency, 160W power).

Variant V5. Criomaceration : The grape samples were stored in the freezer at

ca. –20 °C and then crushed while still frozen.

All of the musts obtained as described above were pressed with a hydraulic press and then moved to glass containers to complete alcoholic fermentation with Fermactive Ap® yeast. The wines were racked, conditioned, filtered and bottled.

The samples obtained through the process described above were subjected to the SPE extraction by means of LiChrolut EN/RP-18 (40-120 µm) 100 mg and RP (40-63 µm) 200 mg, 6mL Standard PP and LiChrolut EN (40-120 µm) 500 mg, 6 mL Standard PP cartridges.

20 mL wine samples were passed through a C^{18} bed SPE cartridge. The adsorbant bed was first conditioned with 10 mL dichlormethane, 10 mL metanol and 10 mL aquaeous solution of ethanol 13% v/v. The adsorbant bed was dried up by means of a 20-minute forced air jet. The compounds retained in the adsorbant layer were then recovered by percolating the bed with 2 mL diclormethane. The resulting extract was sealed hermetically and then injected into the Shimadzu GC-2010 gas-chromatograph coupled with a QP2010 Plus mass spectrometer.

1000 µL extract were injected splitless into the chromatographic pipe. The duration of the analysis/test was 72 minutes for each wine sample. The aroma compounds were determined by means of the NIST 08, Wiley 08 and SZTERP spectrum library. The acceptable resemblance percentage was fixed to no less than 70%. The area of the representative peak for each compound is considered to be a direct proportion of the amount of the respective substance in the wine sample.

RESULTS AND DISCUSSIONS

The compound linalool from the control sample of Tămâioasă românească from 2007 is generally in smaller quantities than the same compounds indetified in wines obtained through different maceration methods (fig. 1).

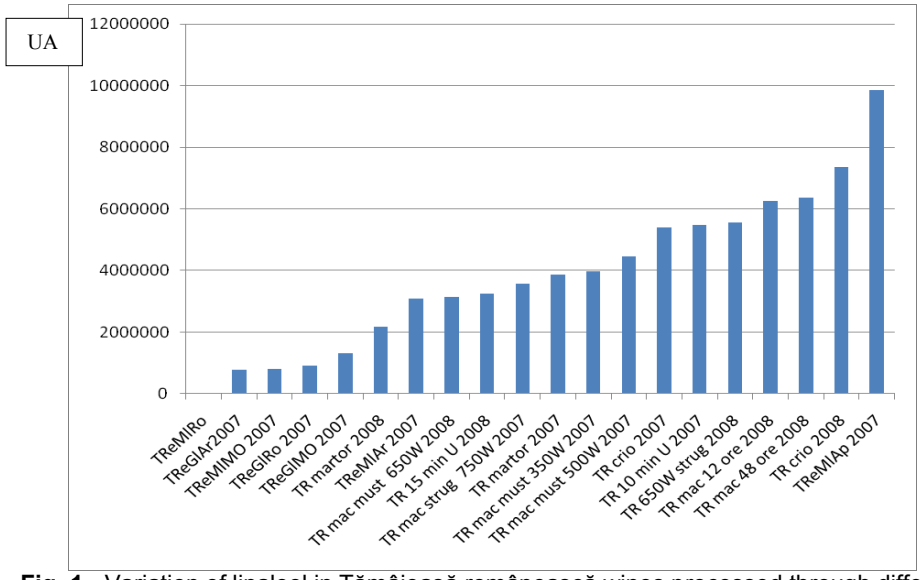

Fig. 1 - Variation of linalool in Tămâioasă românească wines processed through different maceration technologies

The highest quantities are found in wine samples processed with Zymoclaire M® and Fermactive Ap®, but also Fermactive Aromatic®. In the sample that was obtained by adding the yeast Grand Rouge Nature®linalool was beyond detection levels. The highest quantity of linalool among all the samples obtained by microwave maceration was found in the wine variant processed through irradiation of the garpe berries at 650W. Classical skin contact maceration for 48 hours does not extract more linalool than the 12 hours skin contact variant.

The highest quantity of hexanoic acid (compound with a fould odour, of stables and goats) is found in Tămâioasă românească wines obtained by enzymatic maceration with Zymoclaire M® and Fermactive Ap® as well as in Tămâioasă românească processed through cryomaceration. Average quantities of hexanoic acid are identified in wines processed by enzymatic treatments with Fermol Aromatic®, Fermactive Muscat® and Fermol Grand Rouge Nature®, as well as in samples obtained through ultrasounds for 10, respectively 15 minutes, and, finally, in the control sample from 2008. In the rest of the wine samples, hexanoic acid decreases, being under the detection limit in TreMlAr (fig. 2).

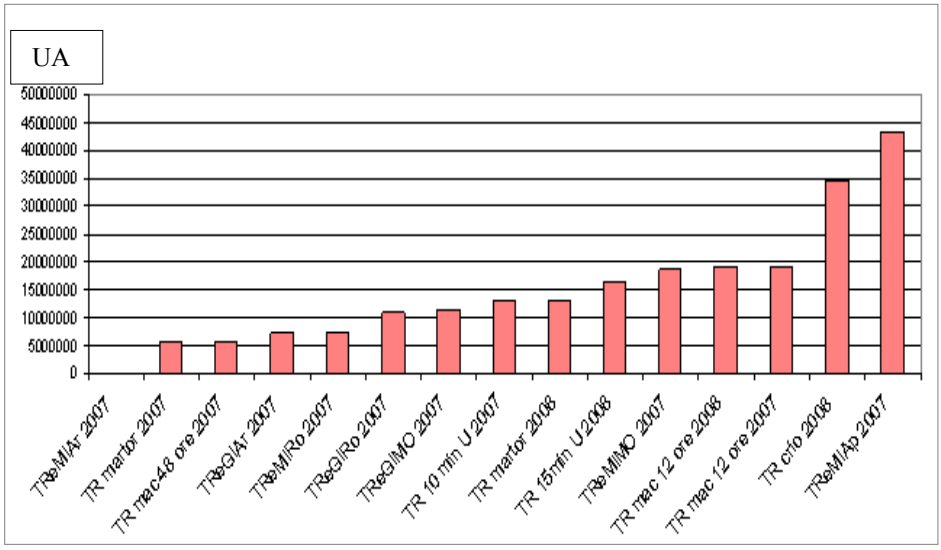

Fig. 2 - Variation of hexanoic acid in Tămâioasă românească wines processed through different maceration technologies

Phenylethylalcohol, a compound smelling of roses, identified in essential oils of roses and neroli flowers (*Citrus auranthium*) has been found in maximum amounts in the Tămâioasă românească sample obtained through enzymatic maceration with enzyme Zymoclaire M® and Fermactive Ap® yeast. The lowest results are registered in the samples treated with Zymarome G® and yeasts Fermol Aromatic®, Fermol Grand Rouge Nature® as well as Fermactive Muscat®. Average quantities of phenylethyl alcohol are registered in control samples, cryomaceration samples and microwave maceration too (fig. 3).

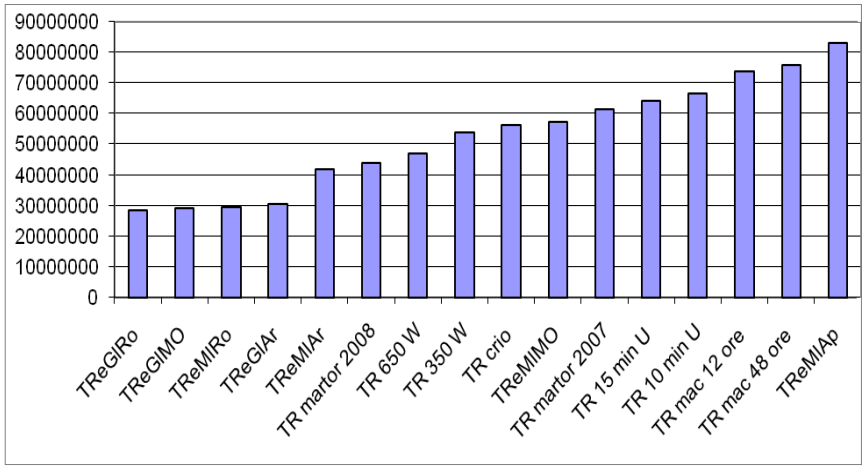

Fig. 3 - Variation of phenylethyl alcohol in Tămâioasă românească wines processed through different maceration technologies

Isoamylic acetate, with its powerful banana aroma is well represented in Tămâioasă românească wines obtained by different maceration methods. The highest quantity is found in the sample processed through criomaceration and the variant treated with the enzyme Zymoclaire Muscat® and the yeast Fermactive Ap® . Small quantities were found in control samples and the wine samples processed through ultrasounds maceration for 10 minutes and skin contact maceration for 48 hours (fig. 4).

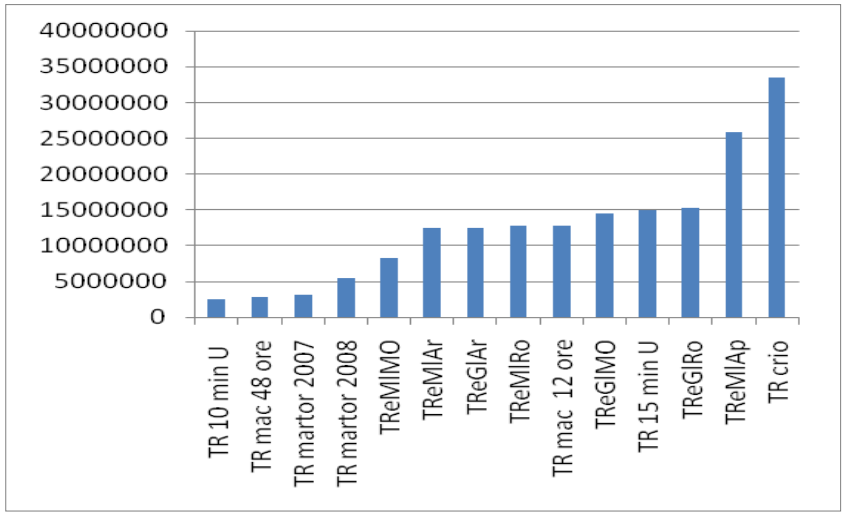

Fig. 4 - Variation of isoamylic acetate in Tămâioasă românească wines processed through different maceration technologies

CONCLUSIONS

1. In Tămâioasă românească wine samples processed through cryomaceration and enzymatic maceration are registered the highest amounts of linalool.

2. Phenylethyl alcohol was identitifed in maximum quantity in the Tămâioasă românească sample obtained by enzymatic maceration with Zymoclaire M® and yeast Fermactive Ap®.

3. The highest amount of hexanoic acid was identified in the Tămâioasă românească wine sample processed with Zymoclaire M® and Fermactive Ap® and the sample obtained through cryomaceration .

4. Classical skin contact maceration leads to the formation of a reduced number of esters, while cryomaceration favours the increase in esters' number. During ultrasounds maceration, the identified esters decrease in number and quantity.

5. The results of this study represent the first scientific based steps of creating methods for modulating the sensorial characteristics of wine, through the maceration phase.

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