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Characterisation of Slovak varietal wine aroma compounds by gas chromatography mass spectrometry

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Abstract: The formation of 13 volatile compounds was studied. Significant differences were registered in the production of isoamyl acetate, 1-hexanol and 1-heptanol. The maximum content of isoamyl acetate (7,58 mg/l) was identified in Chardonnay, vintage 2010 and minimum concentration (0,59 mg/l) was registered in Riesling, vintage 2009.
Keywords: wine, aromatic compounds, gas chromatography, solid phase microcolumn extraction

INTRODUCTION

Aroma is the most important distinctive characteristic of wine (**Lambrechts, 2000; Rodríguez et al., 2010**). The aromatic compounds determine the quality of wines (**Mamede, 2005**), especially the esters and higher alcohols produced during alcoholic fermentation (**Valero et al., 2002; Mamede, 2005**).

The aroma of wine is a result of the presence of volatile compounds, which make an impression on the olfactory system, which is extremely sensitive and can sense thousands of compounds. Sensory analyses allow us to study quality of wines (**Mamede, 2005**), classification or study of sensual properties (**Lakatošová, 2010**).

Wine is a complex mixture of hundreds of compounds, many of which contribute substantially to the colour, mouth feel or aromatic properties of this drink **(Sumby, 2010; Kobayashi, 2008)**. Yeasts contribute to wine flavour in three main ways: they influence the ecology of the winemaking process, the metabolism and enzymatic activities and the organoleptic impact of individual species or combinations of species on wine flavour **(Bamforth, 2009).**

The characteristic fruit flavours of wines are primarily effected by a mixture of hexyl acetate, ethyl caproate, ethyl caprylate, isoamyl acetate and 2-phenylethyl acetate **(Falqué et al., 2001; Clemente-Jimenez et al., 2005)**. Some of these aroma compounds have specific functions in the yeast´s cells, while functions of others are still speculative **(Lambrechts, 2000; Clemente-Jimenez et al., 2005)**. The aroma is also a very important component of the organoleptic quality of wines. The total content of aromatic compounds in wines is 0.8–1.2 g/l. Most of these compounds are produced during must fermentation and are especially important in the formation of flavour of young wines. Acetic acid, acetaldehyde, ethyl acetate, propanol, isobutanol, 2- and 3-methylbutanol account for more than half of these volatile compounds, the other half being distributed among 600–800 minor volatile compounds present in very low amounts (acetals, organic acids, alcohols, phenolic and heterocyclic compounds, esters, lactones, terpenes and sulfur-containing compounds) **(Lakatošová, 2011; Regodón Mateos, 2006).**

The analyse of aromatic compounds of Slovak varietal wines Riesling, Chardonnay, Cabernet Sauvignon and Sauvignon, made in 2009 and 2010 was used to confirm the analytical description with sensorial evaluation. This measurement was the aim of this study.

MATERIAL AND METHODS

The identification of aromatic compounds was performed by using the analytical method developed by LAKATOŠOVÁ J., SÁK M., DOKUPILOVÁ I., and JAKUBÍK T. 2012. Analýza aromatických látok vo víne pomocou HS-SPMCE-GCMS. *Chem. Listy* 106 (S), 303-306.

The identification of some peaks was performed by using these 13 standards: n-propyl acetate (Fluka), isobutyl acetate (Chem Service), ethyl butanoate (Fluka), butyl acetate (Z. D. Chemipan), isoamyl acetate (Merck), 1-butanol (Z. D. Chemipan), amyl acetate (Merck), ethyl hexanoate (Merck), hexyl acetate (Fluka), 1-hexanol (Fluka), ethyl octanoate (Merck), 1-heptanol (Fluka), ethyl decanoate (Merck). Quantitative evaluations of standards were measured by using model samples, which are used for generation of calibration curve.

RESULTS AND DISCUSSION

All the samples were analysed by gas chromatography, preextracted with microcolumn filled with Tenax. More than 50 compounds were identified in aromagram, of which 13 were determined as significantly important sensorial active compounds. The aromatic profile of four Slovak wines – Sauvignon, Cabernet Sauvignon, Chardonnay and Riesling, made in 2009 and 2010 was analysed. The highest concentration of 1-hexanol was measured (8,63 mg/l) in Cabernet Sauvignon, which was produced in 2009. The content of 1-hexanol varies with the other analyzed wines ranging from 1,48 – 5,97 mg/l. Presence of not yet identified compounds and interactions between different substances were also confirmed.

The Riesling wine, vintage 2009 was characterized by higher concentration of 1-heptanol (3,35 mg/l), but Riesling wine vintage 2010 was characterized by higher concentration of isoamyl acetate (5,80 mg/l). No butyl acetate, 1-butanol and amyl acetate were detected in varietal Riesling wines. The Riesling wine, vintage 2010 contains 0,37 mg/l of n-propyl acetate, but no n-propyl acetate was detected in Riesling wine, vintage 2009.

No butyl acetate and amyl acetate were detected in all analyzed samples. No 1-butanol was detected in studied wines, the only exception was Cabernet Sauvignon vintage 2010. Cabernet Sauvignon contains 9,24 mg/l of 1-butanol. Cabernet Sauvignon 2009 was characterised by higher concentration of 1-heptanol (6,47 mg/l), on the other hand Cabernet Sauvignon 2010 contains only 0,50 mg/l of 1-heptanol.

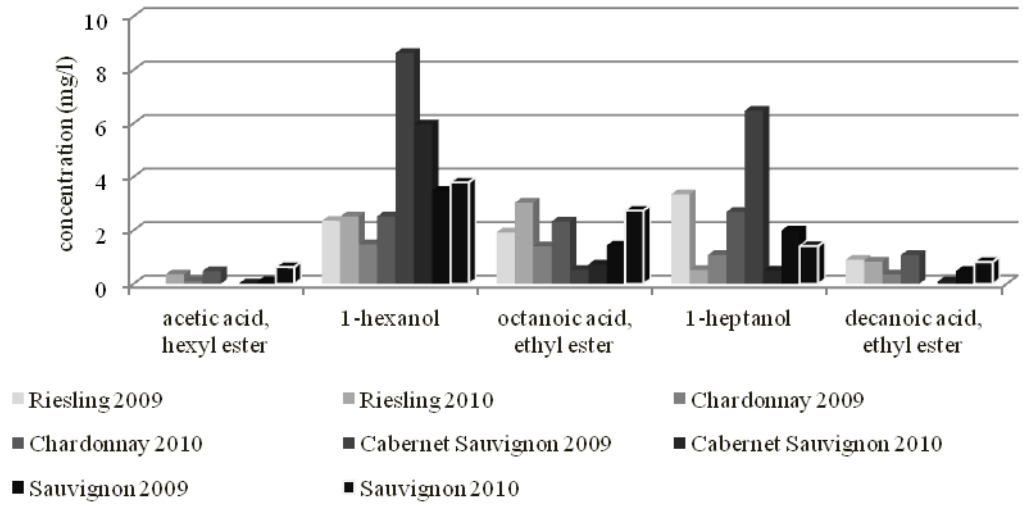

Figure 1 Concentrations of aromatically compounds measured in Slovak wines.

CONCLUSION

Aromagrams of volatile compounds are characteristic odour imprints, usually acquired using chromatographic methods. Authentication of particular aromatic substances in typical Slovak wines and its saving in newly founded database can help to prevent wine falsification, increase quality of wines or significantly reduce negative economic impact on honest wine producers.

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