VARIETAL THIOLS IN WHITE WINES FROM PORTUGUESE GRAPE VARIETIES

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INTRODUCTION

Sulphur compounds, especially volatile thiols, make a positive contribution to the varietal aroma of certain fruits and wines. Since the 1990s, several highly odoriferous thiols have been identified in wines. The first molecule identified as a characteristic component of Sauvignon blanc wine aroma was 4-mercapto-4-methyl-pentan-2-one (4MMP) (1). This compound has a characteristic aroma described as black currant, boxwood and broom. In certain Sauvignon blanc wines, the 4MMP revealed concentrations as high as 40 ng/l, considerably higher than the perception threshold (0.8 ng/l in model solution, 3 ng/l in white and red wines), confirming its decisive organoleptic role in wines (2). Other volatile thiols were later identified in Sauvignon blanc wines: 3-mercaptohexyl acetate (3MHA), 4-methyl-4-mercaptopentan-2-ol and 3-mercaptohexan-1-ol (3MH), smelling of boxwood and zest, citrus zest, and grape fruit and passion fruit, respectively. These compounds were also identified as a key odorant of Gewürtraminer, Riesling, Petit Manseng, Semillon, Sauternes and Cabernet Sauvignon wines (3-5). The 3MH presents an odour detection threshold of 60 ng/l in aqueous ethanol (2).

AIMS

The aim of this study was to evaluate the presence of these volatile thiols in wines produced from Portuguese white grape cultivars (Antão Vaz, Arinto, Fernão Pires, Verdelho da Madeira and Viosinho). Besides sensory analysis, the wines were analyzed using gas chromatography coupled to different detectors, namely flame photometric detector (FPD), flame ionization detector (FID), mass-spectrometry (MS) and by olfactometry (O).

MATERIALS AND METHODS

Grape musts

Experiments were carried out with white musts obtained from grapes of the *Vitis vinifera* varieties of Sauvignon blanc, Antão Vaz, Arinto, Fernão Pires, Verdelho da Madeira and Viosinho. All wines were produced in 2009. The Arinto and Fernão Pires wines were also produced in 2010.

Analytical determinations

Sulphur compounds were determined by gas chromatography with flame photometric detection (GC/FPD), according to the method described by Moreira *et al.* (7). The methods reported by Oliveira e Silva *et al.* (8) were used to perform GC-mass spectrometry (GC-MS) and GC-O analysis. A Hewlett–Packard 5890 gas chromatograph, equipped with a flame ionization detector was also used, according to the method described by Moreira *et al.* (9).

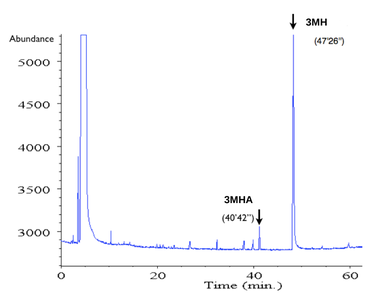
Sensory analysis

Wines were tested randomly regarding their aromatic composition. The panel was composed by 10 experienced wine tasters.

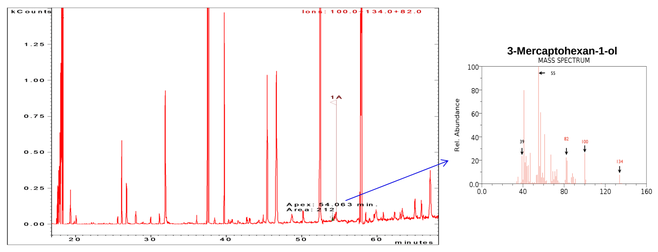
RESULTS

Gas Chomatography

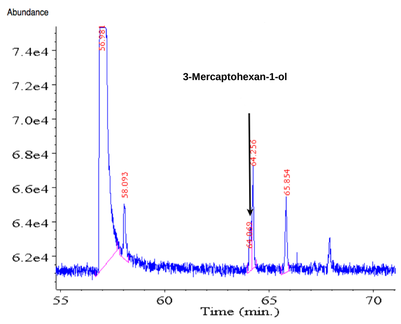
FID



MS

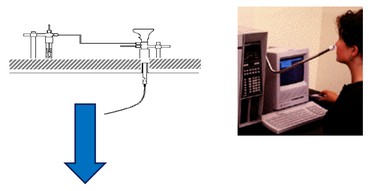


FPD



Sensory analysis

GC-olfactometry



Olfactory zones

Table 1. Kovats retention index, descriptor/olfactory zone, chemical compound, and aroma intensity of different wines.

KRI (I)	KRI (II)	Descriptor/Olfactory zone	Chemical compound	Antão Vaz	Arinto	Fernão Pires	Sauvignon blanc	Verdelho da Madeira	Viosinho	Arinto (2010)	Fernão Pires (2010)
1398	1394[A]	Black current/ box	4MMP	1	1	1	3	2	1	1	2
1741	1735[A]	Box/passion fruit	3MHA	0	0	0	0	0	0	2	1
1883	1872[B]	Sweaty/passion fruit	3MH	3	3	2	2	2	3	3	3

KRI (I): Kovats retention index calculated; KRI (I): Kovats retention index obtained from literature; [A]Ferreira *et al.* (9); [B]Cullere *et al.* (10).
4MMP: 4-mercapto-4-methyl-pentan-2-one, 3MHA: 3-mercaptohexyl acetate, 3MH: 3-mercaptohexan-1-ol.
0: not detected, 1: low intensity, 2: medium intensity, 3: high intensity.

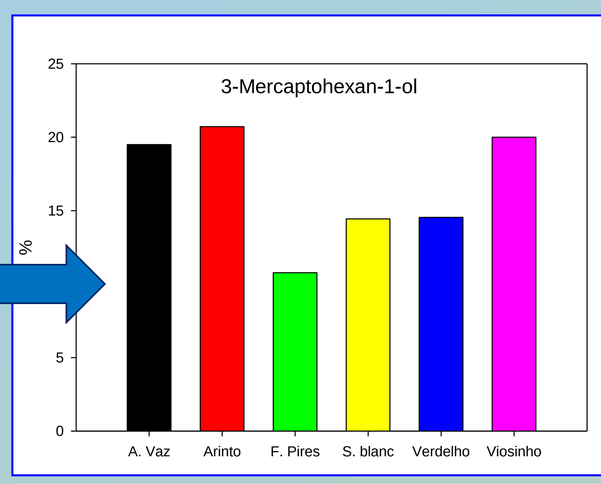


Fig. 1. Percentage of 3-mercaptohexan-1-ol level in wines (Antão Vaz, Arinto, Fernão Pires, Sauvignon blanc, Verdelho da Madeira e Viosinho) obtained from GC-FPD analysis.

CONCLUSIONS

This work highlights the presence of volatile thiols (4MMP, 3MH, 3MHA) in wines from Antão Vaz, Arinto, Fernão Pires, Verdelho da Madeira and Viosinho varieties.

The GC-FPD methodology used in this work allows obtaining some interesting results on the 3MH level in wines. Further work is needed to quantify volatile thiols in other Portuguese white wines.

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