

# Relation of volatile compounds detected by gas chromatography and sensorial characteristics of monovarietal white wines

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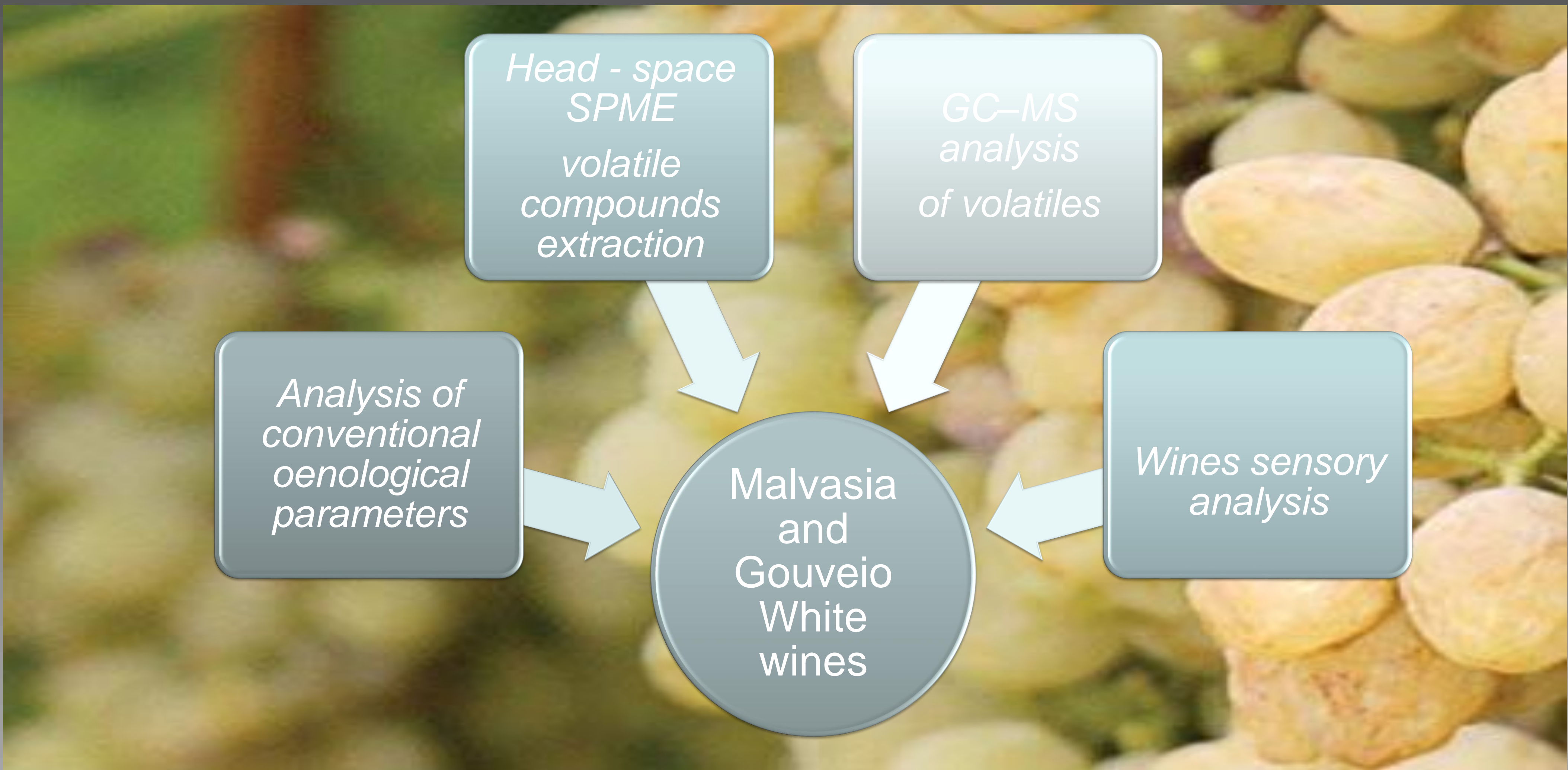
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## Abstract

Wine aroma is generated by several classes of compounds such as alcohols, esters, organic/volatile acids, aldehydes, ketones, lactones, sulphur, nitrogen compounds, and terpenes. Their combination and concentration differentiate aromatically one wine from another. All these parameters contribute to the complexity of wine aroma and can be analysed by gas chromatography coupled to mass spectrometry (GC-MS). Therefore, the aim of this work was to analyse by GC-MS the volatile compounds extracted by solid phase microextraction of the headspace from two (Gouveio and Malvasia Fina) Portuguese monovarietal white wines produced in stainless steel vessels and in oak vessel, and to relate the detected compounds with the perceived flavour profiles percept by the panellists. The sensory attributes, referred to appearance, smell, taste and mouth feel perceptions, were quantified using a five-point intensity scale. The sensory selected descriptors were associated to the volatile compounds, in order to better understand the compounds responsible for the sensorial characteristics of these wines. The sensory profile allowed identifying the differences among the different wine samples underlined by Principal Component Analysis applied to mean values of sensory and volatile compounds data. This knowledge is important as may be used to optimize the vinification process for different grape varieties, thus obtaining wines with higher quality standards.

## Material and methods



## Results

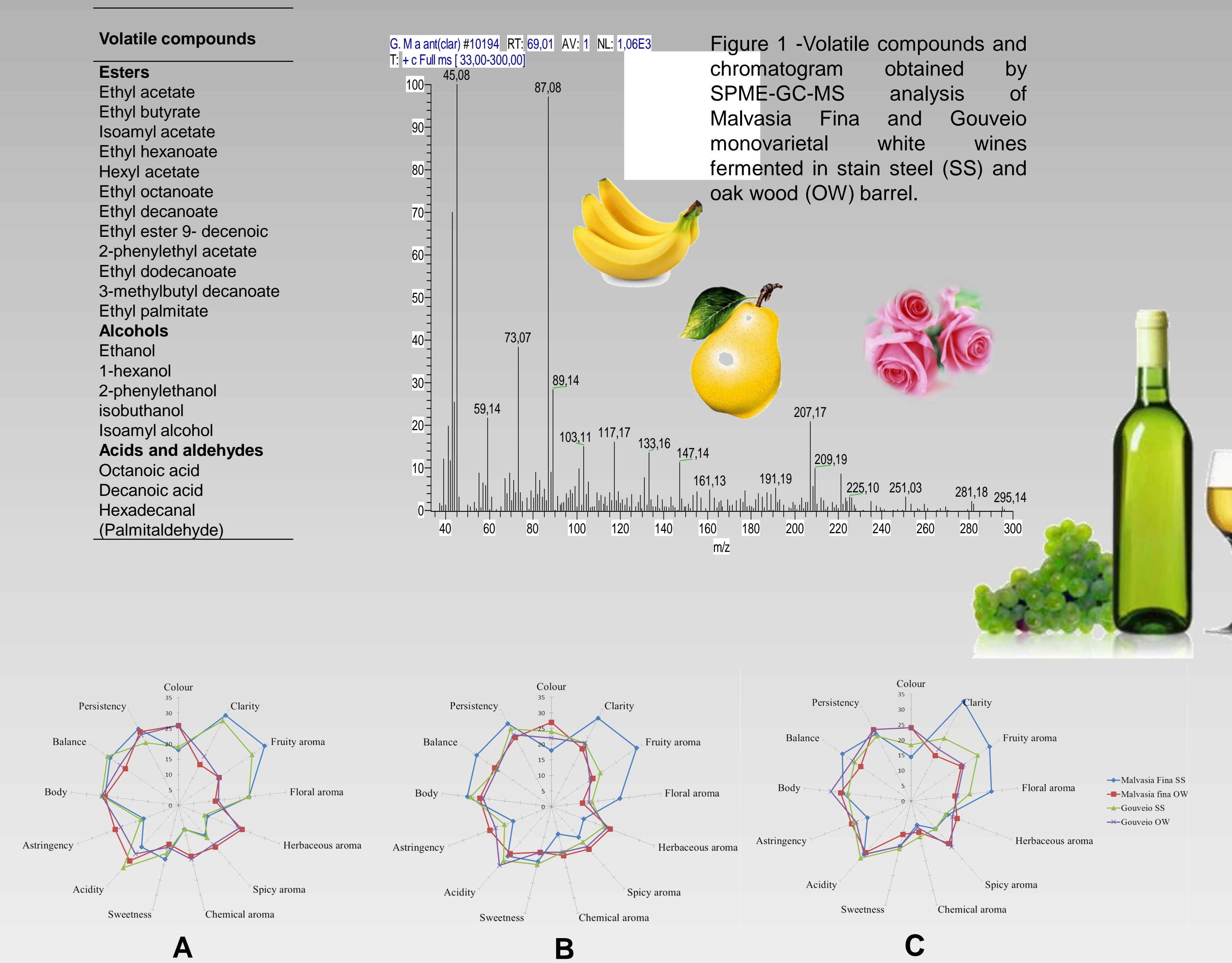


Figure 2 – Sensory profile of the wines from Malvasia Fina and Gouveio monovarietal white wines fermented in stainless steel (SS) steel) and oak wood (OW) before (A), after clarification (B) and three months after clarification (C)

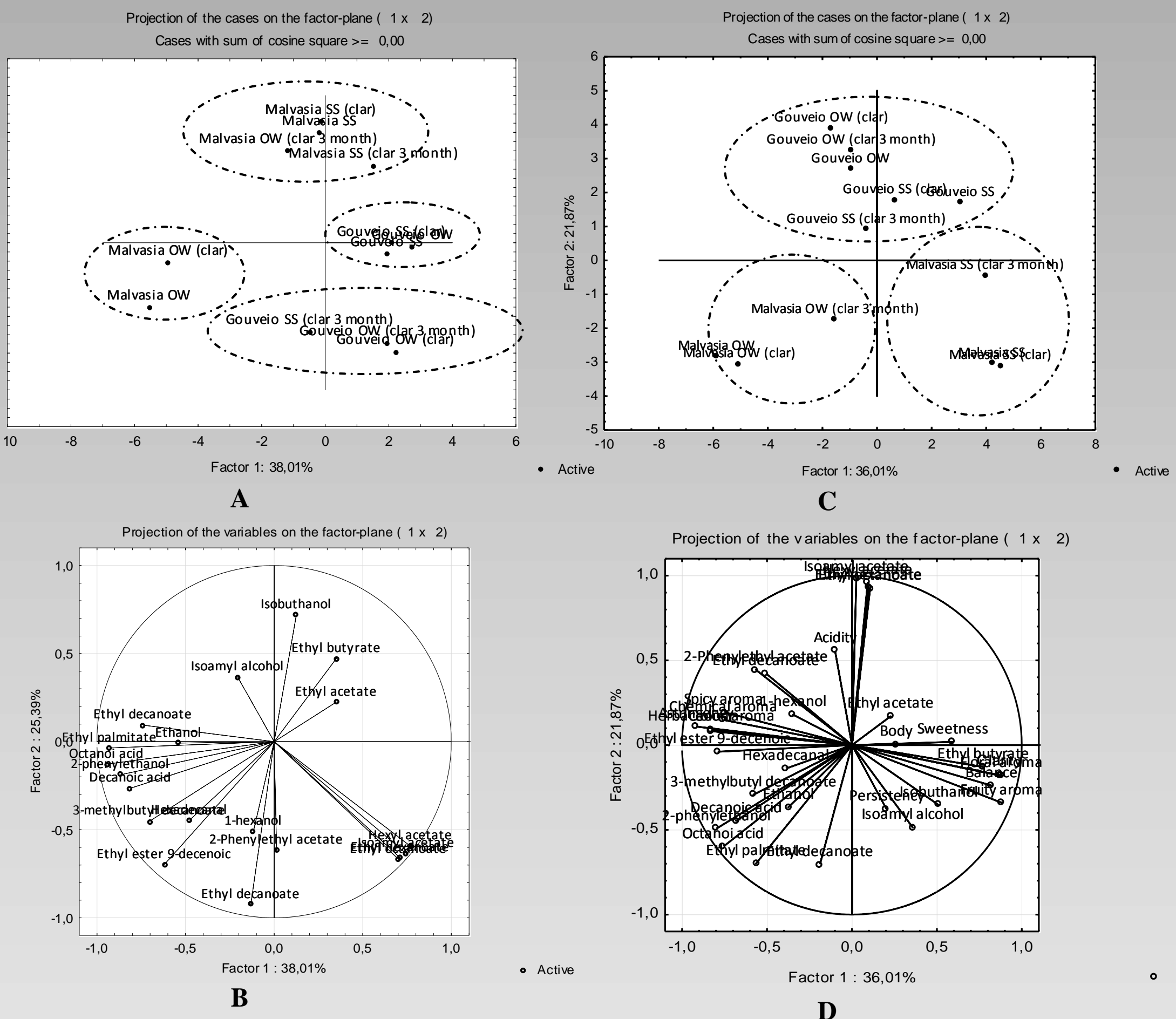


Figure 3- Projections of PCA data analysis of the wines samples when only GC-MS data was used (A-B), GC-MS data is integrated with sensory data (C-D).

From Figure 1 we observed that esters represented the largest group in terms of number of aroma compounds identified, in all twelve wines, followed by alcohols and fatty acids. Isoamyl acetate (banana aroma) and Hexyl acetate (pleasant fruit aroma or pear aroma) are in higher concentrations in Malvasia and Gouveio wines fermented in stainless steel vats.

The analysis of the Figure 2 shows that the Malvasia and Gouveio grape-wines fermented in stainless steel are distinguished by the descriptors “clarity”, “fruity aroma” and “floral aroma”, however, these descriptors remain in Malvasia wines, independently of clarification and time, while in Gouveio wines they decrease slightly after clarification, but, also increase three months after clarification. The wines fermented in wood, independently of the variety, at the end of three months are more astringent and more pronounced in terms of “body” character and “spicy aroma”.

To better understanding the effect of variables analyzed in the white wines from the two varieties (Malvasia and Gouveio), we performed two PCA analysis. On the first one we included only the aromatic compounds determined by SPME-GC-MS. The results obtained show as that 63.4% of the total variability can be explained by the two firsts PCA components (Figure 3 – A and B). Is interesting to observe that distribution of aromatic compounds by these two factorial axes perfectly discriminates the wines into four distinct groups were the discriminating factors seems to be the grape variety (Malvasia and Gouveio) and the fermentation vat (oak or stainless steel).

The second PCA analysis (Figure 3 – C and D) was performed integrating the aromatic and sensory data. The projections obtained show as that independently of the fermentation vessel and the absence or presence of clarification, Gouveio variety forms one major group of wines. These wines are more influenced by the second factorial axis (PC2 – 21.87%). The other two groups include the wines of Malvasia variety were the fermentation vat seems to be the cause of the distinctiveness. These wines are more influenced by the first factorial axis (PC1- 36.01%) and the parameters therein. The two factorial axes integrated 57.88% of the total variability, a value closer to those found in related works (Cristovam et al., 2000).

## Conclusions

- In terms of aromatic and sensory characteristics we found that fruity aromas like banana (Isoamyl acetate) and pear (Hexyl acetate) are in higher concentrations in Malvasia and Gouveio wines fermented in stainless steel vats. These pleasant fruity aromas don't change after the clarification of wine and appear to persist with time. Moreover, the temperature during the vinification process might have contributed to the formation of these acetate esters (Molina et al. 2007).
- The panellists found that the “herbaceous” character of the wines was accentuated by the presence of wood in both grape varieties, before clarification. This descriptor can be related with the alcohol 1-haxanol and, also, with the aromatic aldehyde hexadecanal, with an oily scent (Kohara et al., 2006), that it was only present in oak wood fermented wines before clarification. But, after clarification, only appears in Gouveio fermented in stainless steel.
- In PCA analysis, when only aromatic compounds were included, the wines were perfectly discriminates into four distinct groups were the discriminating factors was the grape variety (Malvasia Fina and Gouveio) and the fermentation vat (oak or stainless steel). But, when we included the aromatic the projections obtained showed as that independently of the fermentation vessel and the absence or presence of clarification, Gouveio wines formed one major group, while Malvasia wines were divided into two groups, according to the fermentation vat.
- In summary, Malvasia Fina wines are more influenced by the fermentation vat (oak wood or stainless steel) in terms of aromatic and sensory attributes than the wines from the Gouveio variety. This knowledge may help the winemakers to make a more conscientious option when deciding the type of fermentation vat adequate, also, to the consumer's preference.

## References

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