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Fermentative volatile compounds and chromatic characteristics can contribute to Italian white wines diversity

Perceived aroma plays an important role in wine quality, and it depends mainly on the volatile composition. Volatile organic compounds (VOCs) from grapes and those formed during winemaking are involved in the sensory complexity of wines. In aroma-neutral winegrape varieties, the winemaking process itself, and particularly alcoholic fermentation (AF), impacts strongly on the organoleptic characteristics of wines due to the formation of volatile alcohols, acids, and esters. In addition, phenolic compounds could contribute not only to the wine color but also to VOCs evolution during AF.

The main aim of the present study was to evaluate the differences in the concentration of fermentative VOCs among varieties from different Italian geographical zones. For this aim, 246 monovarietal white wines (vintage 2019) from 18 varieties cultivated in 9 different Italian regions were selected. Fermentative alcohols, acids, and esters were extracted by LLME and analyzed by GC-MS. Standard physico-chemical parameters, total polyphenol index, DPPH antioxidant activity, and chromatic characteristics including absorbance at 420 nm and CIELab coordinates were also determined.

Fermentative VOCs are ascribed to the management of FA, therefore the differences observed could be due to both the grape juice composition and the several factors driving FA (yeasts, nutrients, temperature). The results obtained show that fermentative compounds allow to differentiate some monovarietal wines. Albana wines were characterized by the highest average concentrations of total fermentative VOCs, particularly alcohols and ethyl esters, the latter reaching the highest value also in Fiano, Greco, and Pallagrello bianco. In turn, Fiano and Pallagrello showed the highest concentrations of aromatic alcohols. Falanghina and Vermentino wines contained the highest amount of acetates whereas Fiano was the richest in methyl esters. Gewürztraminer wines were the most abundant in volatile acids, followed by Ribolla gialla, Vermentino, Garganega, and Pinot grigio. In addition, Müller Thurgau and Verdicchio wines showed the lowest concentrations of total fermentative VOCs, particularly alcohols. Nosiola wines were characterized by the lowest abundance in acids and acetates, while Pinot grigio and Müller Thurgau wines contained the lowest amount of ethyl and methyl esters, respectively. Regarding chromatic and phenolic characteristics, Pallagrello and Albana wines were characterized by the highest total phenolic content and antioxidant activity, but also were the darkest wines showing the highest value of b^* color coordinate (yellowish). Conversely, Pinot grigio wines showed the lowest antioxidant activity and total phenolic compound concentration. Pinot grigio and Cortese wines had the lightest color and the lowest contribution of the yellow color component (b^* coordinate and absorbance at 420 nm).

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