Characteristic Aroma Compounds in Grape Juice (*Vitis Vinifera*) via SDE-GC/MS

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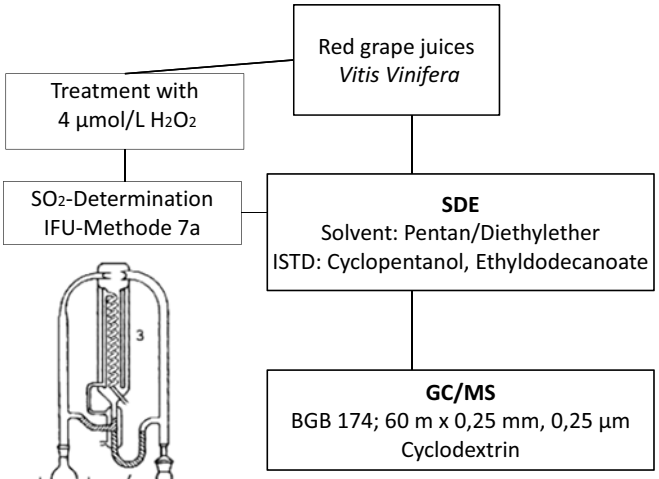
Introduction

Red grape juices in Europe are in majority made from grapes of variety *Vitis Vinifera*. In other regions grape varieties such as *Vitis Labrusca* and *Vitis Rotundifolia* are used as well, where main aroma compounds e.g. *o*-Aminoacetophenon and Furaneol [1] have been identified. Also literature of Muscat grape juice exist (white grape juice) [2]. In contrary valid data about aroma substances in grape juice of the variety *Vitis Vinifera* are only partially known.

In this study aroma compounds in grape juice and grapes of the variety *Vitis Vinifera* were investigated and a characteristic aroma profile was defined. For sample preparation and recovery of the aroma extract the simultaneous steam distillation and extraction (SDE) was used followed by concentration via vigreux column. The determination was performed by GC/MS.

Furthermore changes by oxidation processes in the aroma profile which may occur during storage and bottling were investigated by using H_2O_2.

Material and methods



Likens-Nickerson-Equipment
1-sample, 2-solvent, 3-reflux condenser, 4-separation part Fig. 2:

Results

In red grape juices more than 30 aroma compounds could be identified. In comparison to other fruits or other grape species no character impact compounds could be classified. Nevertheless a characteristic aroma profil of red grape juices *Vitis Vinifera* was definded including following compounds:

Alcohols:	1-propanol, 2-methylbutanol, 3-methylbutanol, 2-phenylethanol, benzylalcohol, 1-hexanol, trans-2-hexenol, cis-3-hexenol
Aldehyde:	phenylacetaldehyde
Monoterpene:	R/S-linalool, R/S-α-terpineol

2-phenylethanol with a concentration of app. 408 µg/kg is in the studied grape juices compared to other fruits the main flavor component. The analytical recovery of all aroma compounds except 1-propanol could be determined with app. 80 % or higher.

By investigation oxidative pathways in treated grape juice with hydrogen peroxide 3-furaldehyde was identified as a marker substance, fig.1. Other expected oxidative compounds like aldehydes or organic acids increased in their concentration, but a significant correlation between them could not been stated.

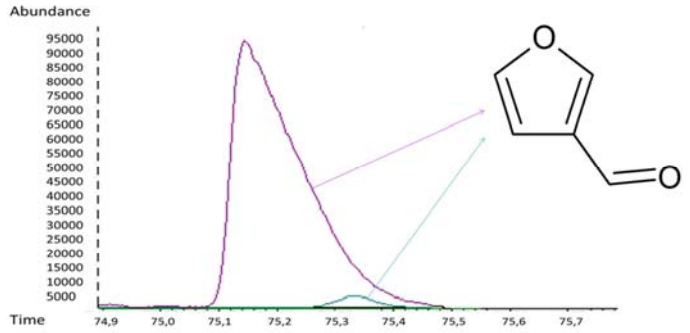


Fig. 1: Formation of the marker substance 3-furaldehyde in red grape juices at a concentration of hydrogen peroxide ; blue - 4 µmol/L, purple – 200 µmol/L

Further reactions of H_2O_2 in red grape juices occur e.g. changes in colour and a decrease of sulfur dioxide. A scheme is shown in fig. 3.

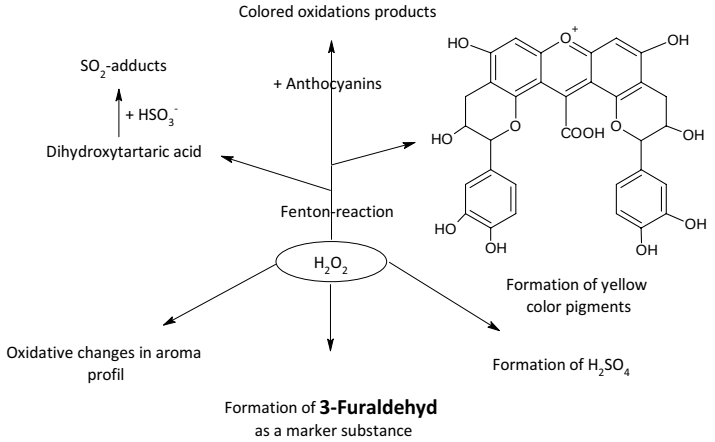


Fig. 3: General scheme for postulated reaction pathways of red grape juices treated with H_2O_2 [3,4]

Conclusion

In the red grape juices *Vitis vinifera* no character impact compounds were detectable, but a characteristic aroma profil including 10 compounds was defined, where 2-phenylethanol is the main component.

By treating grape juice with hydrogen peroxide some oxidative reaction pathways could be shown, where 3-furaldehyde was identified as a specific marker.

On the basis of the results the analysis procedure (SDE) can be considered a robust, reproducible and matrix-independent method which can cover routine aroma analysis in a wide range of products. Therefore the SDE is maybe recommended as an IFU reference method for quantification of aroma substances and fruit specific aroma profils. The only requirement of the SDE is the steam volatility of aroma substances.

References: [1] Baek et al, *J. of Food Science,* 1997, Vol.62, No.2, 249-252 , [2] Caven-Quantrill et al, *J. of chromatography A*, 2006, 1117, 121-131, [3] Clark, *European Food Research and Technology.,* 2008, Vol. 226, Issue 4, 925-931. [4] Danilewikz, J. *Am. J. of Enol. Vitic.,* 2003, 54, 73-85.