VOLATILE PROFILES OF SEASONED STAVES USED IN BALKAN COOPERAGE

FoodEnTwin
-omics technologies bridging food and environmental sciences

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INTRODUCTION

- The ageing in contact with wood is an important process for improving the aroma, color, taste and astringency of some high-quality alcoholic beverages.
- Some of the important changes are release of extractable compounds (non-cell wall small molecules) as well as the gradual transformation (decomposition) of the wooden constituents as a result of the contact between the alcoholic beverages and the wood surface [1,2].
- Recently, the International Organization of Vine and Wine (OIV) approved the use of wood fragments (wood staves or sticks) to accelerate the brandies aging process [3].
- There are no available data about the volatile profile of Myrobalan plum.

METHODS

- The aim of this research was to assess the differences and similarities in the volatile profiles of the seasoned wood staves locally sourced in Balkan countries.
- The following species were investigated: mulberry (*Morus alba* L.), Myrobalan plum (*Prunus cerasifera* Ehrh.), black locust (*Robinia pseudoacacia* L.), wild cherry (*Prunus avium* (L.) L.) and oak (*Quercus petraea* (Matt.) Liebl., and *Q. robur* L.).
- Hydroalcoholic extracts were made according to a procedure reproducing the conditions of spirits maturation [4].
- Gas chromatography with flame ionization detection (GC-FID) and gas chromatography with mass spectrometry (GC-MS) were used for qualitative and quantitative analyzes of volatiles in the wood extracts, respectively.

CONCLUSION

- Some compounds were identified only in one wood specie and therefore can contribute to the identification of the specific wood as well as aged brandy.
- Flavonoids were dominant in wild cherry wood extract.
- Sakuranin could be considered as potential marker for wild cherry.
- Our findings could be used for authenticity of wood species used for cooperage, as well as for reducing fraudulent production.

RESULTS

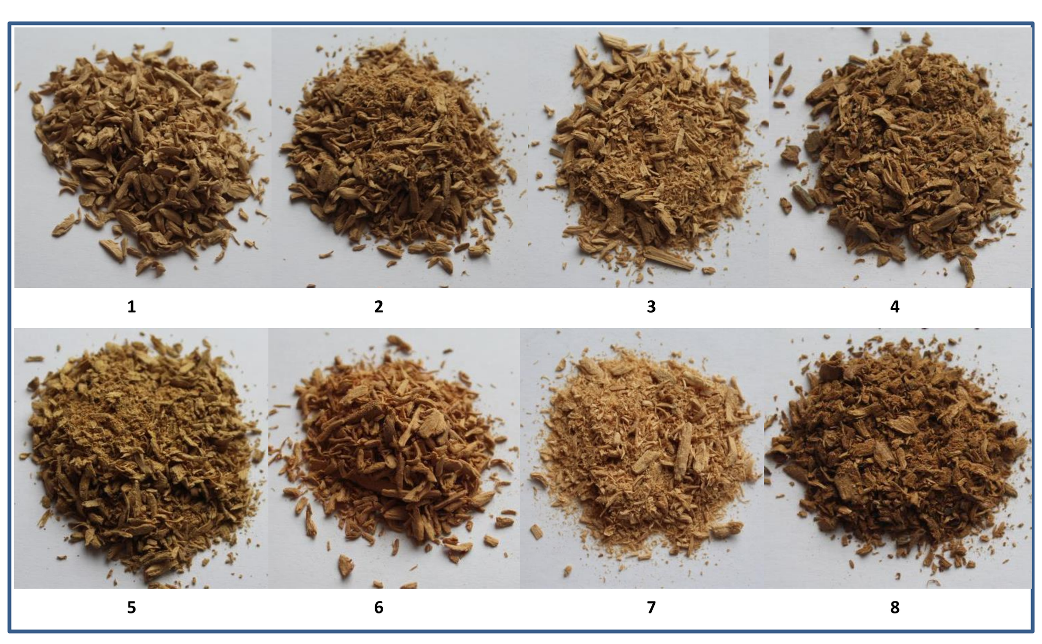

Figure 1. Wood samples: pedunculate oaks (1-3), sessile oak (4), black locust (5), Myrobalan plum (6), wild cherry (7), mulberry (8)

Figure 2. Wood extracts: pedunculate oaks (1-3), sessile oak (4), black locust (5), Myrobalan plum (6), wild cherry (7), mulberry (8)

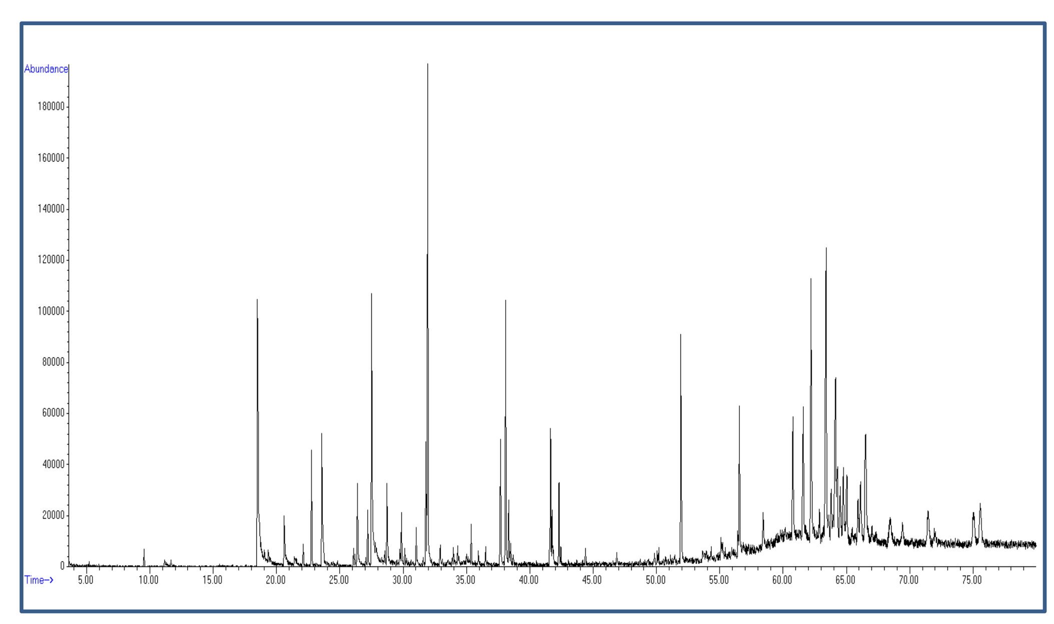

Figure 3. GC chromatogram of black locust (sample 5).

- The most abundant compounds:
- Oak: coniferyl (23.14-26.60 μg/g) and synapyl (23.56-25.82 μg/g) alcohols;
- Black locust: resorcinol (10.07 μg/g);
- Myrobalan plum: limonene (0.49 μg/g));
- Mulberry: resorcinol (62.00 μg/g);
- Wild cherry: sakuranin (896.65 μg/g), chrysin (467.22 μg/g), tectochrysin (220.15 μg/g); total flavonoids (1585.12 μg/g).

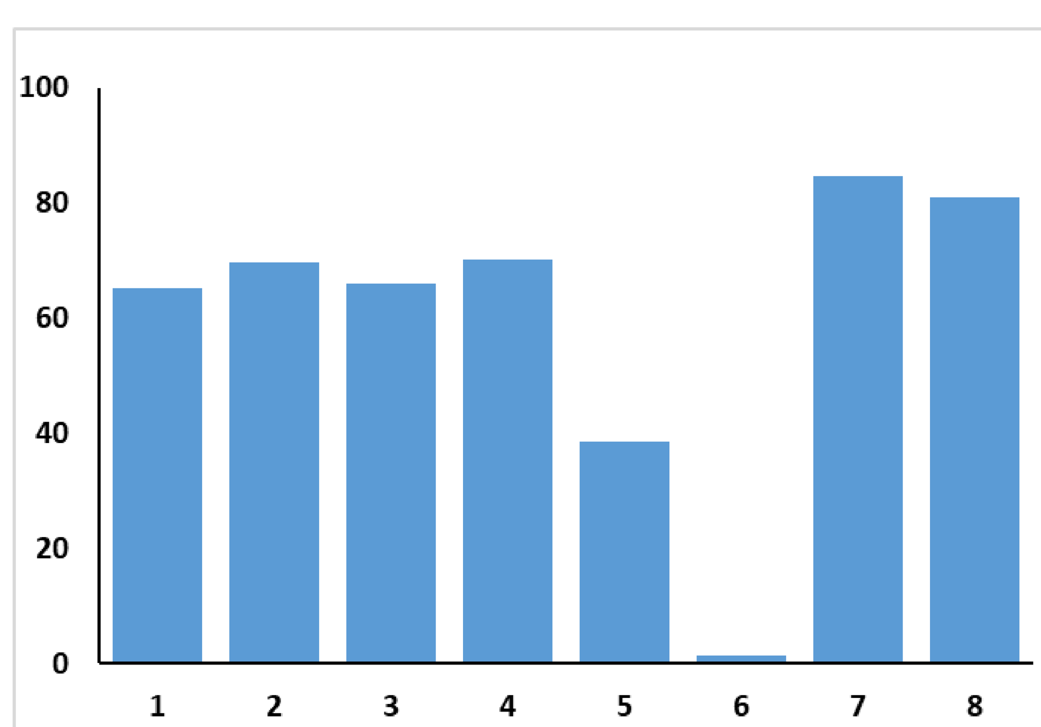

Figure 4. Total volatile compounds* (μg/g) of wood extracts: pedunculate oaks (1-3), sessile oak (4), black locust (5), Myrobalan plum (6), wild cherry (7), mulberry (8).
* The results were presented without flavonoids, which were detected only in wild cherry wood (1585.12 μg/g).

- Compounds characteristic of oak samples: oak lactones, vinylguaiacol, eugenol, vanillin, propiovanillone, homovanillic acid, methyl homovanillate, syringyl propan-2-one, butyrosyringone and dihydrosynapil alcohol.
- Isoeugenol was characteristic for pedunculate oak from Gornji Radan (sample 2).
- Compounds characteristic of other wood samples:
- Mulberry: methylresorcinol and coumaran;
- Black locust: resacetophenone and o-acetyl-p-cresol;
- Myrobalan plum: benzoic acid, 4-hydroxy-3,5-dimethoxybenzoic acid and scopoletin;
- Wild cherry: sakuranin, chrysin, tectochrysin, naringenin, pinocembrin, 2,6-dimethoxy-benzoquinone and acetophenone.

References:
1. S. Cernîsev, 2017, Food Contr 73, 281.
2. J.R. Mosedale, J.L. Puech, 1998, Trends Food Sci Technol, 9, 95.
3. T.E. Coldea et al., 2020, Food Chem, 320, 126643.
4. A. Smailagić et al., 2019, Ind Crops Prod, 132, 156.

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