BIO-SUSTENTABILIDADE E BIO-SEGURANÇA ALIMENTAR, INOVAÇÃO E QUALIDADE ALIMENTAR

23-26 de outubro de 2022

Castelo Branco

Sociedade Portuguesa de Química

Instituto Politécnico de Castelo Branco

Instituto Politécnico de Castelo Branco
Escola Superior Agrária

Câmara Municipal
Castelo Branco

EuChemS
European Chemical Society
Division of Food Chemistry

Livro de Resumos

XVI Encontro de Química dos Alimentos

Ficha Técnica

Título

Livro de Resumos do XVI Encontro de Química dos Alimentos - Bio-Sustentabilidade e Bio-Segurança Alimentar, Inovação e Qualidade Alimentar

Autores

Ofélia Anjos, Soraia I. Pedro, Carlos Antunes

Edição

Ofélia Anjos, Soraia I. Pedro, Natália Martins Roque, Carlos Antunes

Outros colaboradores:

Fátima Peres

Cecília Gouveia

Cláudia Adriana Fernandes Vitória

Ilustrações

Luísa Ferreira Nunes

Editor

Sociedade Portuguesa de Química

Esta publicação reúne os trabalhos apresentados no XVI Encontro de Química dos Alimentos: Bio-sustentabilidade e Bio-segurança alimentar, Inovação e qualidade alimentar, Castelo Branco 2022, e inclui ainda o programa científico do encontro.

As doutrinas expressas em cada um dos resumos são da inteira responsabilidade dos autores.

ISBN

978-989-8124-36-4

Data

Outubro de 2022

Changes of the physicochemical characteristics of aged wine spirits during the storage in bottle

Lourenço S.,[1] Soares A.,[1] Mota D.,[1] Anjos O.,[2,3] Caldeira I.,[1,4] Oliveira-Alves S.,[1] Canas S.[1,4]

[1] *Instituto Nacional de Investigação Agrária e Veterinária, Pólo de Dois Portos/Estação Vitivinícola Nacional, Quinta de Almoinha, 2565-191 Dois Portos, Portugal*

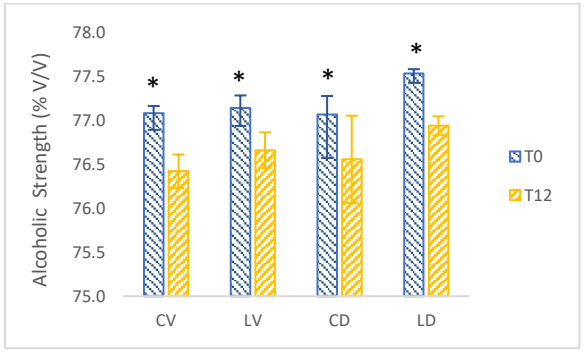
[2] *Instituto Politécnico de Castelo Branco, Quinta da Senhora de Mércules, 6001-909 Castelo Branco, Portugal*

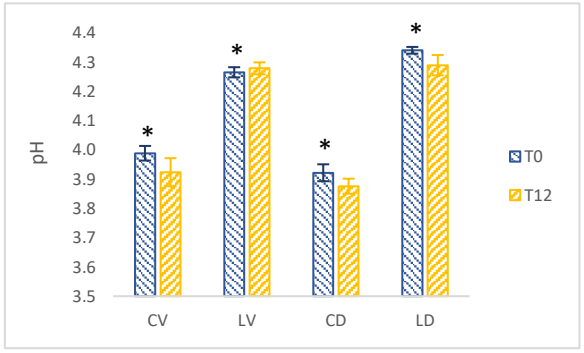
[3] *CEF, Instituto Superior de Agronomia, Universidade de Lisboa, Tapada da Ajuda, 1349-017 Lisboa, Portugal*

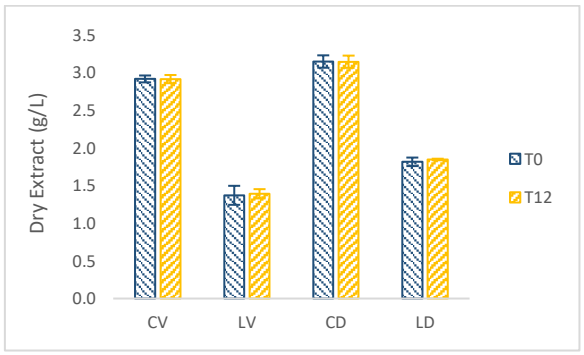
[4] *MED – Mediterranean Institute for Agriculture, Environment and Development & CHANGE – Global Change and Sustainability Institute, Instituto de Investigação e Formação Avançada, Universidade de Évora, Pólo da Mitra, Ap. 94, 7006-554 Évora, Portugal*

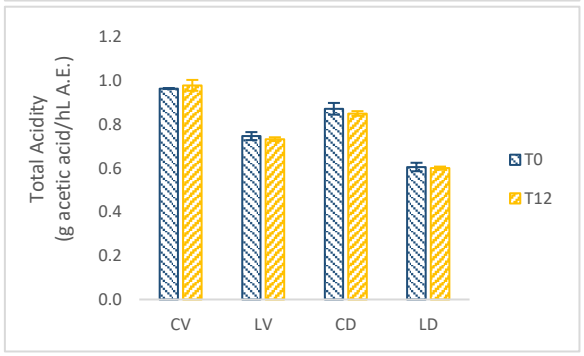
Email: silvia.lourenco@iniav.pt

The wine spirit (WS) is a specific beverage obtained by the distillation of wine. Initially, the wine distillate is essentially made up of ethanol and water, and its physicochemical characteristics mainly result from the wine and distillation system used. During the ageing process, the distillate contacts with the wood and, with the mediation of oxygen, organic compounds are extracted from the wood and undergo several reactions over time, thus altering the sensory and physicochemical characteristics of this spirit beverage. Traditionally, ageing is carried out in barrels, which is an expensive and time-consuming technology.[1] To overcome these drawbacks, alternative technologies for a sustainable ageing of WS using wood staves combined with micro-oxygenation (MOX) has been studied by our team. In the Project CENTRO-04-3928-FEDER-000001, the wine distillate was aged for 18 months in 250 L wooden barrels of chestnut and Limousin oak (traditional technology), and in 1000 L stainless steel tanks with staves of the same kinds of wood combined with MOX - flow 2 mL/L/month (alternative technology) to compare the physicochemical characteristics acquired by the WS as a result of the different ageing technologies.[2] The alcoholic strength by distillation was analysed by electronic densimetry, pH by potenciometry, dry extract by weighing the residue left by evaporation at 100 ºC and total, fixed and volatile acidity by colorimetric titration. The low molecular weight phenolic compounds were analysed by a HPLC method developed and validated in our laboratory, the total phenolics index was determined by the absorbance measurement at 280 nm, the chromatic characteristics were determined according to the CIELab method and the dissolved oxygen was monitored *in situ* during the ageing period. At the end of this project, it was found that the WS's ageing was faster by the alternative technology, which also allowed obtaining high quality WSs compared to the traditional one. Within the scope of the Project Centro-04-3928-FEDER-000028, our team is studying the storage in bottle of such aged WSs in order to assess whether or not their physicochemical characteristics are preserved during this step. In this work, results of the basic chemical parameters were examined. Thus, eight aged WSs (n=2) from four ageing modalities [chestnut barrels (CV), Limousin oak barrels (LV), stainless-steel tanks with chestnut staves and MOX (CD) and stainless-steel tanks with Limousin oak staves and MOX (LD)] were bottled on the same day in amber glass bottles of 750 mL (n=2). The bottles were stored in the cellar of the INIAV-Polo de Dois Portos (Dois Portos, Portugal). Sampling was performed at the beginning and after 12 months of storage and the following parameters were analysed in duplicate: alcoholic strength, pH, dry extract and acidity (total, fixed and volatile). Among the studied parameters, only the alcoholic strength and pH were influenced by the storage in bottle. The ANOVA results revealed that they decreased significantly after 12 months (**Figure 1**). Some factors, including the closure and the permeability of the stopper (such as the effective diffusion coefficient) may have contributed to low values of the alcoholic strength[3] (reduction of 1% in the WSs from all modalities); therefore, it should be considered as a loss of the system and as a result of the physicochemical phenomena that may occur during storage in bottle. Conversely, the oxidation and condensation reactions of low molecular weight compounds may cause the decrease of pH value, but without increasing the total acidity. In summary, the differences between the WSs from the four ageing modalities (kinds of wood combined with technologies) remained during the storage in bottle, suggesting that the wine spirit quality was preserved. Further studies are required to understand the overall effect of this production step on the aged WSs' features.


Alcoholic Strength (% V/V)
78.0
77.5
77.0
76.5
76.0
75.5
75.0
CV
LV
CD
LD
T0
T12


pH
4.4
4.3
4.2
4.1
4.0
3.9
3.8
3.7
3.6
3.5
CV
LV
CD
LD
T0
T12


Dry Extract (g/L)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
CV
LV
CD
LD
T0
T12


Total Acidity
(g acetic acid/hL A.E.)
1.2
1.0
0.8
0.6
0.4
0.2
0.0
CV
LV
CD
LD
T0
T12

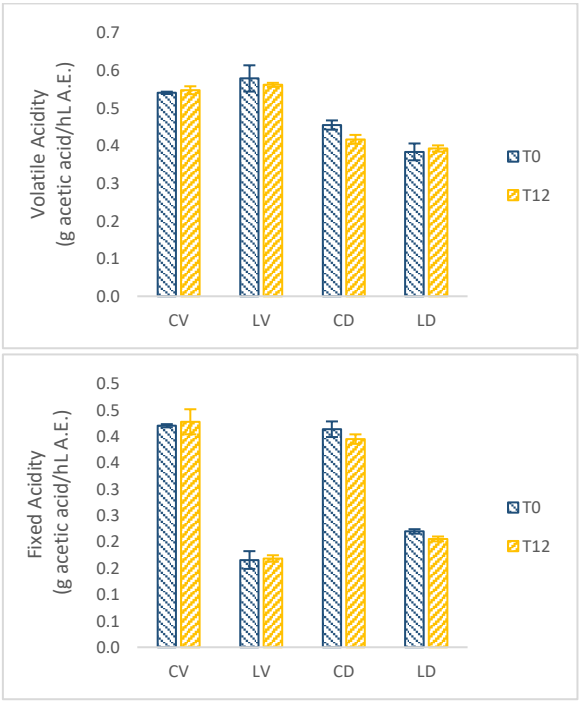


Figure 1: Physicochemical characteristics of the aged WSs after 12 months of storage in bottle (CV – chestnut barrels, LV – Limousin oak barrels, CD - stainless-steel tanks with chestnut staves and MOX, LD - stainless-steel tanks with Limousin oak staves and MOX). A.E. – absolute ethanol. The one-way ANOVA (significance of means comparison by Fisher's test; $p < 0.05$).

Acknowledgements: The authors thank Adega Cooperativa da Lourinhã and Tanoaria J.M. Gonçalves.
Funding: The authors thank the financial support of the Project CENTRO-04-3928-FEDER-000028. This work is also funded by National Funds through FCT - Foundation for Science and Technology under the Projects UIDB/05183/2020[MED] and UIDB/00239/2020 [CEF].

References:

1. S. Canas, I. Caldeira, T.A Fernandes., O. Anjos, A.P Belchior., S. Catarino, Chapter 14 - Sustainable use of wood in wine spirit production. *In: Improving Sustainable Viticulture and Winemaking Practices*, J.M. Costa, S. Catarino, J.M. Escalona, P. Comuzzo, Elsevier, London, 259-280, **2022**.
2. S. Canas, O. Anjos, I. Caldeira, A.P. Belchior, *LWT*, 111 (**2019**), 260-269.
3. Karbowiak, T., Crouvisier-Urion K., Lagorce A., Ballester J., Geoffroy A., Roullier-Gall C., Chanut J., Gougeon R.D., Schiitt-Kopplin P., Bellat JP., *npj Science of Food*, 14 (**2019**).