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ANTIOXIDANT ACTIVITIES OF WINE SPIRITS AGED BY A SUSTAINABLE TECHNOLOGY USING CHESTNUT WOOD STAVES AND MICRO-OXYGENATION

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The alternative ageing technology (AAT) using wood staves combined with micro-oxygenation (MOX) applied to wine spirit (WS) stored in stainless steel tanks intends to simulate the ageing process that occurs in wooden barrel (traditional ageing technology - TAT), but in a more sustainable way: less time, lower cost and lower environmental impact. During the ageing process, the oxygen entering through the barrel or applied by MOX plays a crucial role in oxidation, condensation and other reactions involving phenolic compounds extracted from the wood. As a result, the ageing process positively influences the colour, aroma and taste of WSs, which are decisive characteristics in consumer choice. In addition, consumers value foods and beverages with beneficial effects on health, namely the antioxidant compounds. TAT and AAT have been studied by our research team, but little has been investigated on the antioxidant activity and chemical evolution of the aged WS during storage in bottle.

Indeed, it is pivotal to assess the overall quality of the aged WSs during the storage in bottle in order to select the best MOX strategy from AAT. Some factors, including the closure, exposure to light, temperature, bottle position and the availability of oxygen in headspace height, may affect the characteristics of the aged WS during this stage. Thus, this study aimed to examine, for the first time, the influence of the storage in bottle over 12 months on the evolution of antioxidant activities (DPPH, FRAP and ABTS assays) and total phenolic content (TPI) of the WSs aged through three modalities (MOX levels: O15, O30 and O60) and one control (N) from AAT. The work was carried out under the Oxyrebrand project (https://projects.iniav.pt/oxyrebrand), which shows a detailed explanation about the experimental design). Briefly, the samples were aged with chestnut wood by an alternative technology, using 50 L glass demijohns with wood staves in a total of 48 samples (4 modalities × 2 replicates × 2 sampling bottles × 3 storage times).

The antioxidant activities and TPI of the WSs from the four ageing modalities were not different at the beginning of storage (t0). After 12 months of storage in the bottle (t12), the WSs from MOX modalities (O15, O30 and O60) showed higher antioxidant activities and TPI than the control modality (N) one. In addition, the TPI and antioxidant activities were not significantly different between the WSs from the MOX modalities, which showed similar evolution during storage time. This significant increase of the TPI and antioxidant activities for MOX modalities may derive from the hydrolysis of phenolic glycosides and hydrolyzed tannins giving rise to free forms. Thus, the MOX combined with staves resulted in higher preservation of WSs' phenolic contents, assuring the WS quality. The study reveals the efficiency of phenolic compounds from the aged WSs to scavenge free radicals during storage in bottle, suggesting that these antioxidant compounds are preserved after the ageing process, specifically using the AAT, and may have positive health benefits for the consumers.

Keywords: FRAP assay; DPPH assay; ABTS assay; Phenolics; wine spirit; Storage in bottle

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