# Shedding light on metal extraction from chestnut wood fragments to wine spirit

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### Introduction

The mineral composition of wine spirits (WSs) influences their quality in terms of physicochemical stability, sensory characteristics, safety, and legal limits (1). In particular, iron (Fe) and copper (Cu) can act like catalysts in oxidation reactions. The Fe concentration in WSs is normally < 1 mg/L, while Cu concentrations often range between 1-3 mg/L mainly deriving from distillation devices (1,2,3). Traditionally, the ageing of WSs is performed in oak barrels, but recently in order to meet sustainability criteria, innovative alternative ageing technologies have lately been introduced (e.g. use wood fragments) (3).





Figure 2: Contents of iron and copper in the aged WSs according to the ageing modalities and the ageing time.

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#### **Materials and Methods**

**Research Methodology**: A wine distillate produced by Adega Cooperativa da Lourinhã (Lourinhã, Portugal), was aged with Portuguese chestnut wood (*Castanea Sativa Mill.*) staves, in 50 L demijohns, under different MOX modalities (**O15, O30 and O60**) and one modality with nitrogen application (**N, control**), in two replicates, during 12 months. The WSs were sampled at **0, 8, 21, 60, 180, 270 and 365 days** of ageing and evaluated in terms of their Cu and Fe contents.

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**Fe and Cu Analysis:** Fe and Cu contents were evaluated by FAAS using a Perkin-Elmer Analyst 100, equipped with an air-acetylene burner and appropriate hollow cathode lamps (6).

Statistical Analysis: One-way ANOVA was performed to examine the effect of the MOX level (**015, 030, 060**, **N**), as a fixed factor, on Fe and Cu contents of aged WSs in each sampling time. A second One-way ANOVA was carried out to assess the effect of ageing time on WSs Fe and Cu concentrations.

#### **Objectives**

Investigate the use of chestnut staves in combination with micro-oxygenation (MOX) and its effect on Fe and Cu contents of WS.

## Conclusions

- Fe and Cu total concentrations found in WSs were low, of 0.086-0.28 mg/L and 0.939-0.320 mg/L, respectively.
- Time had a significant effect on Fe and Cu contents. A slight and progressive increase was observed for Fe until 270 days of ageing, while for Cu a progressive decrease until 180 days of ageing was verified.
- For both Fe and Cu, no significant effect of ageing modality was noticed.
- Investigation on the relationship between the metal oxidation forms and WS compounds (e.g. ethanol, phenolics) in a model WS system, would provide a comprehensive insight into the reactivity of Fe and Cu.



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