Vibrations damping for wine bottles

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BACKGROUND

The vibrations that occur in bottled wines can create an economic loss for the winery, especially when the wine is transported over a long distance (Tchouakeu Betnga et al., 2021). Jung et al., (2014) showed how the combination of vibration and movement at high temperature (40°C) led to lower wine quality. Creadles et al., (2016) studied the effect of transport and vibration on white wines. The authors reported problematic changes in sensory attributes: wines subjected to high levels of vibration had lower concentrations of propanol and isoamyl alcohol. Furthermore, vibrations of 2-5 Hz can be dangerous for fragile products, such as glass bottles. For these reasons it is important to control vibrations during storage and transport. In this study, we tested the quality of a red premium wine stored in bottles on shelves with repelling magnets to reduce vibrations occurring after twelve months of storage.

MATERIAL AND METHODS

Bottles of a premium South Tyrolean Pinot noir wine sealed with the screw cap were placed on 4 different standing wine racks (ABCD) (Wineleven, I) to obtain 4 different effects over time: T0, T1 (after 30 days), T3 (3 months), T6 (6 months), T12 (12 months) as described in **Figure 1**. A sound diffusion system was set up under shelf B to constantly reproduce a series of attenuated low frequency sounds in order to create micro-vibrations on the shelves.

The wine samples were profiled by;

1. HS-SPME GCxGC-ToF/MS (volatile compounds)
2. HPLC DAD/FLD and LC-QqQ-MS (phenolics)
3. Quantitative Descriptive Analysis (QDA®) with a trained panel (using the Cysensy webapp developed by UNIBZ)
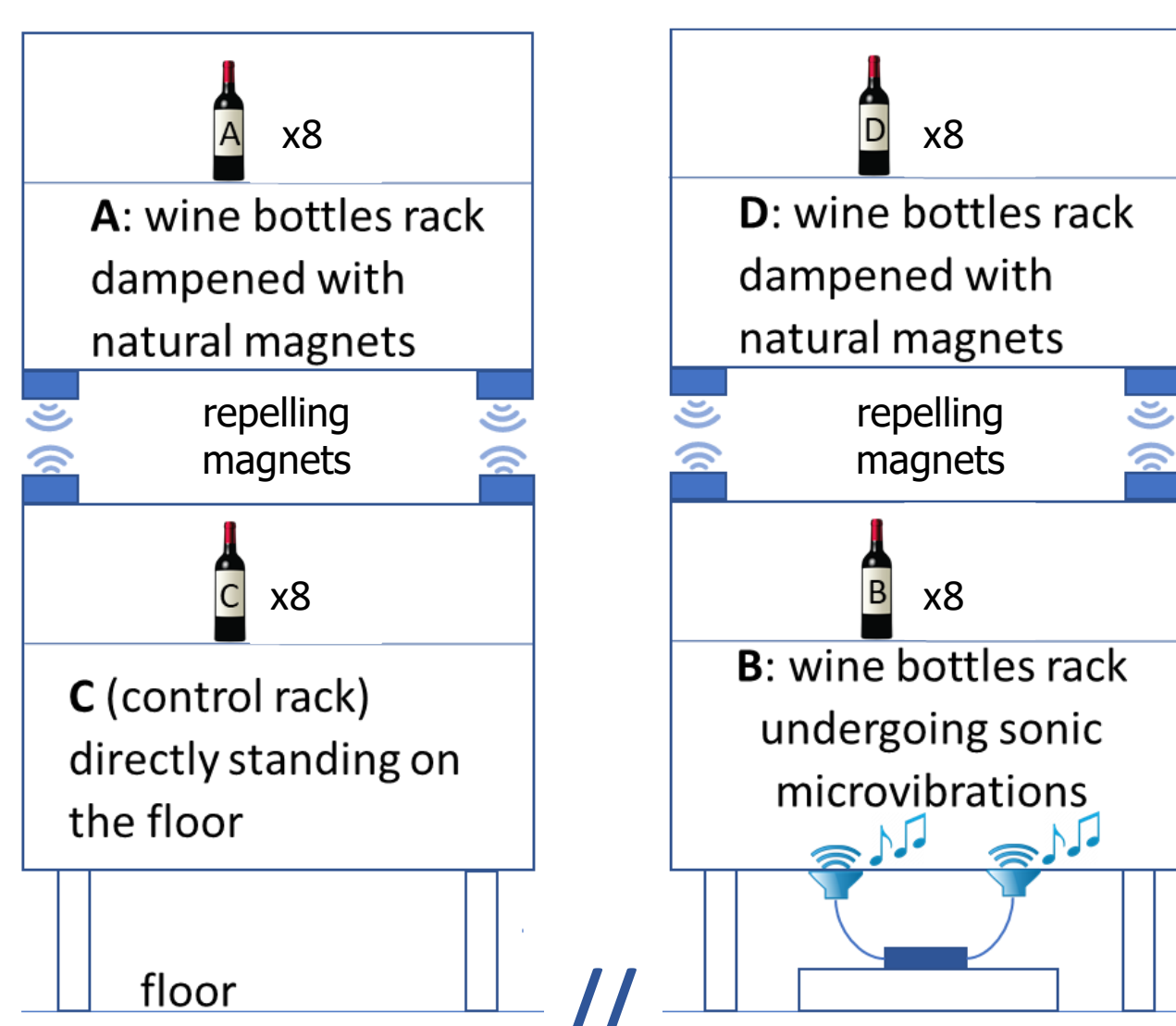

Figure 1. Wineleven prototype racks equipped with natural repelling magnets

RESULTS

In **Figure 2,** the PCA of sensory profile (**I-II**) and volatile compounds (**III-IV**) are reported. The time factor (T0-T12) differentiated the samples the most, especially for volatile compounds. **Figure 2V** shows the one-way ANOVA (α 90%) considering the type of shelf (ABCD) as a qualitative factor over 12 months of storage (with Duncan test). Significant variables were red fruit (aroma), unpleasant odours, bitterness, red fruity (flavour), and overall quality judgment.

CONCLUSION

- Pinot Noir stored on shelf A (bottles damped using natural magnetic levitation) maintained its characteristics closest to those of wine at time 0, considering certain sensory descriptors
- The use of screw caps instead of natural cork presumably reduced the effect of the treatment on the wine profile of Pinot Noir during the storage in bottles
- The management of the vibrations can improve the wine quality according to the oenological goals and the profile of the wine to be subjected to the storage
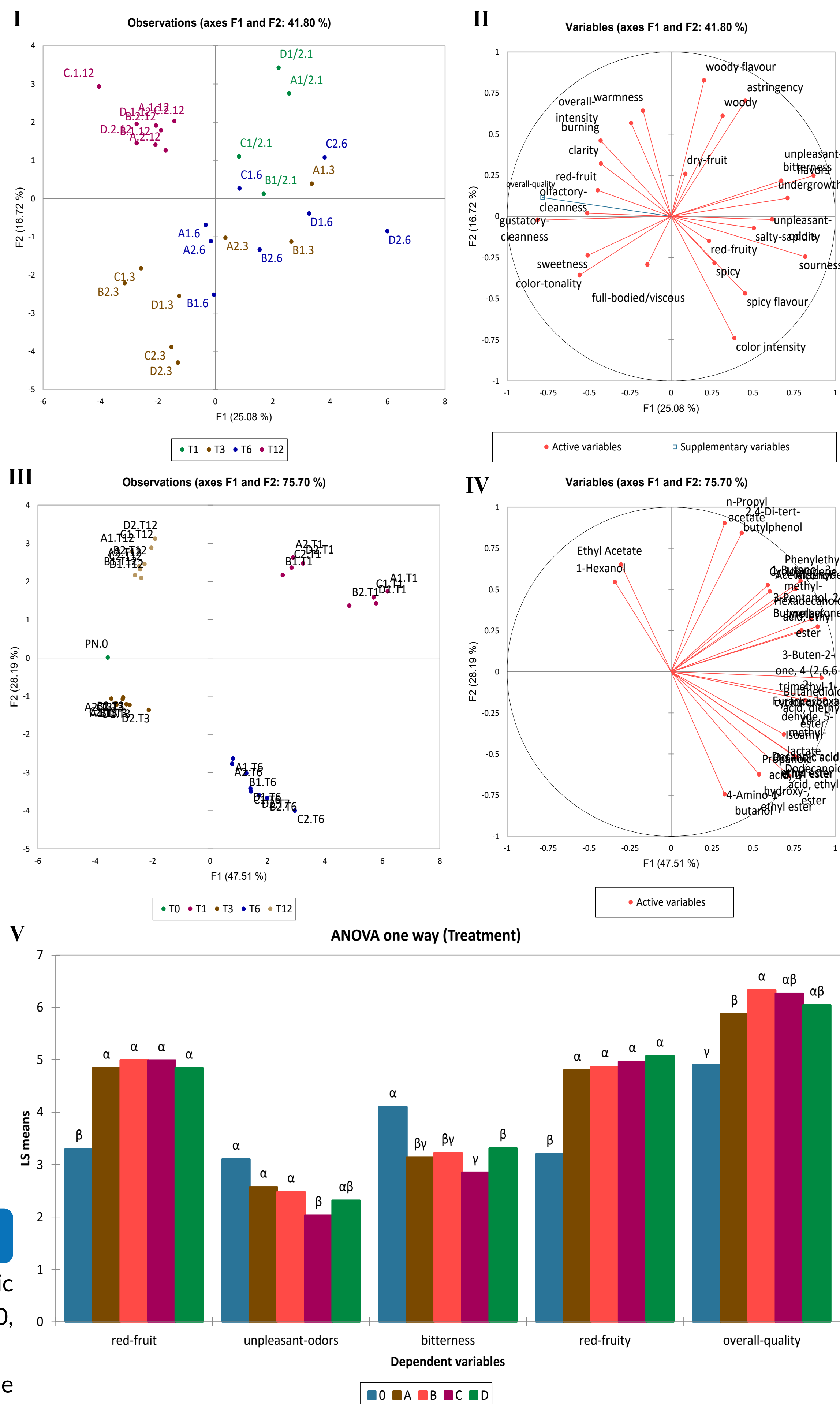

Figure 2. PCA observation and variables plots for sensory analysis (I-II), and volatile compounds (III-IV), and one way ANOVA (α 90%) on the treatment factor (Duncan test) for the sensory data from T0 to T12 .

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Reference:
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