Can acetaldehyde-reactive polyphenols (ARPs) be assayed?
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Introduction

Oxygen consumption rates (OCRs) have been consistently found to be negatively correlated to the initial content of total acetaldehyde in wine [1, 2], which suggests that directly or indirectly, polyphenolic composition by defining a discrete ARP category.

OBJECTIVE

The main purpose of the present work was to assess whether the kinetics of acetaldehyde consumption in red wines can provide a new polyphenol index which should be linked to wine oxygen consumption kinetics and to the maximum oxygen that each wine can consume.

Material and methods

Wines and synthetic wines with polyphenol extracts have been spiked with different levels acetaldehyde inside of an oxygen-free chamber.

HPLC determination of acetaldehyde with previous derivatization with DNP[4]

Results

1. 70 °C

Preliminary results suggested that to have a quick measurement of ARPs, the wine should be spiked with 300 mg/L of acetaldehyde and the reaction performed at relatively large temperatures.

2. 25 °C vs 45 °C

We found that at 70 °C it is possible to get precise measurements of the amount of acetaldehyde consumed by a wine during 4 days, and that different wines have large differences in this parameter. However, for out distmas, this parameter was perfectly correlated to TPI.

We tried then smaller temperatures and higher times (74days), and observed that at 45 °C the amount of acetaldehyde consumed by wines was no longer correlated to TPI.

Conclusions

1. Although it is true that different wines consume acetaldehyde at different rates, acetaldehyde consumption at room or low temperatures is quite imprecise, which makes impractical the use of acetaldehyde consumption rates as index to categorize wine

2. Although acetaldehyde consumption rates become more precise at 70 degrees, it has been found that at such temperature, this parameter is essentially another measurement of the Total Polyphenol Index of the wine, having therefore nothing to do with the parameters determining oxygen consumption rates or ARPs.

3. Kinetically, acetaldehyde consumption rates are too complex, showing a high order dependence towards acetaldehyde concentration and a equilibrium concentration. Such concentrations was found to depend on the previous uptake of acetaldehyde by the polyphenolic fraction, but it was too imprecise to extract clear conclusions.

4. In any case, measured acetaldehyde consumption rates are smaller than expected attending to known oxygen consumption kinetics and acetaldehyde accumulation rates.

5. Our results, therefore, do not completely support the existence of a well-defined category of Aldehyde Reactive Polyphenols, as previous results had suggested. This unexpected outcome could suggest that during oxidation, it is not acetaldehyde the reactive species, but one of their radical precursors. Additional research should be carried out to verify this.

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