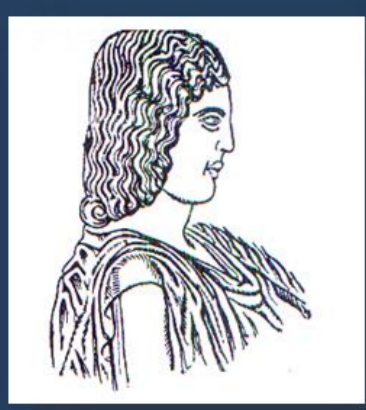


Impact of packaging materials on selected white Greek wines flavor profile evolution during time



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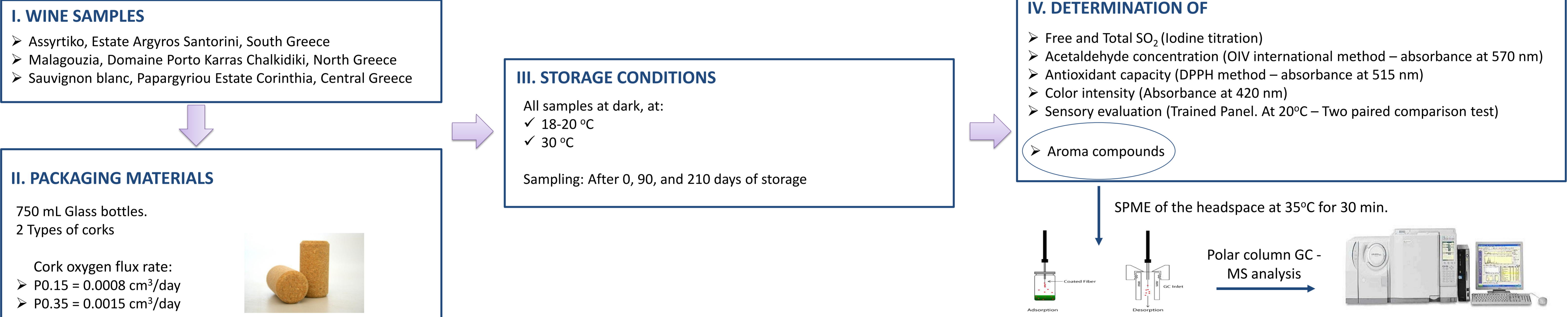
ABSTRACT

The flavor profile evolution and its rate may indicate the cohesions existing in a packed wine-storage-environment system. The objective of this project was to identify the characteristic of flavor and off-flavor compounds that could be used as oxidation markers, the recording of their evolution and their impact on consumer perception. Quality parameters, evolved in glass-bottled wines, closed with two types of corks differing in their oxygen permeability properties, were in focus. Wines varieties and origin (winery) were: Assyrtiko, Malagouzia and Sauvignon blanc, all harvested, extracted and bottled in fall of 2014. Two bottles of each variety/winery were withdrawn from each of the storage areas (18-20 and 30°C, all at dark) every 3 months. Isolation, detection and quantification of aroma compounds were performed by a SPME/GC-DBWAX-MS system. Resistance to oxidative degradation (absorbance at 420nm), acetaldehyde concentration, total and free-sulfur dioxide content (by iodine titration), and antioxidant potential (by resistance to oxidation) were also tested. A panel of 25 trained persons performed the organoleptic examination of all samples in order to provide the "quality limits", i.e. the acceptance of the samples and to recognize the detection threshold of un-favored aroma notes. Analysis of samples at the beginning of the storage period, showed that presence of specific flavor compounds in certain samples only. Evolution of new flavor compounds was not apparent during the first 3 months of storage, independent of the type of the corks and temperature of storage, very much in accordance to sensorial remarks. Physicochemical analysis indicated the absence of significant oxidative degradations, supporting the aforementioned conclusion regarding absence of off flavors. Samples stored for 7 months had a rather significant alteration in their flavor profile. Results will be reported and interpreted using the root cause analysis versus packaging and storage conditions.

OBJECTIVES

This work has considered the wine-packaging-environment of storage system to study the different compositional changes during storage. We have in particular, focused on the oxidative spoilage of white wines of Greek origin. The aim was to characterize the complicated transformations of aroma compounds that lead to the loss of characteristic bouquet of wines, and subsequently to the formation of new aromas of mature wines or typical aromas associated with wine deterioration. Furthermore, phenomena of browning and oxidation reactions in white wines during storage were inter-correlated, due to their influence on wine organoleptic characters and antioxidant status.

MATERIALS AND METHODS



RESULTS

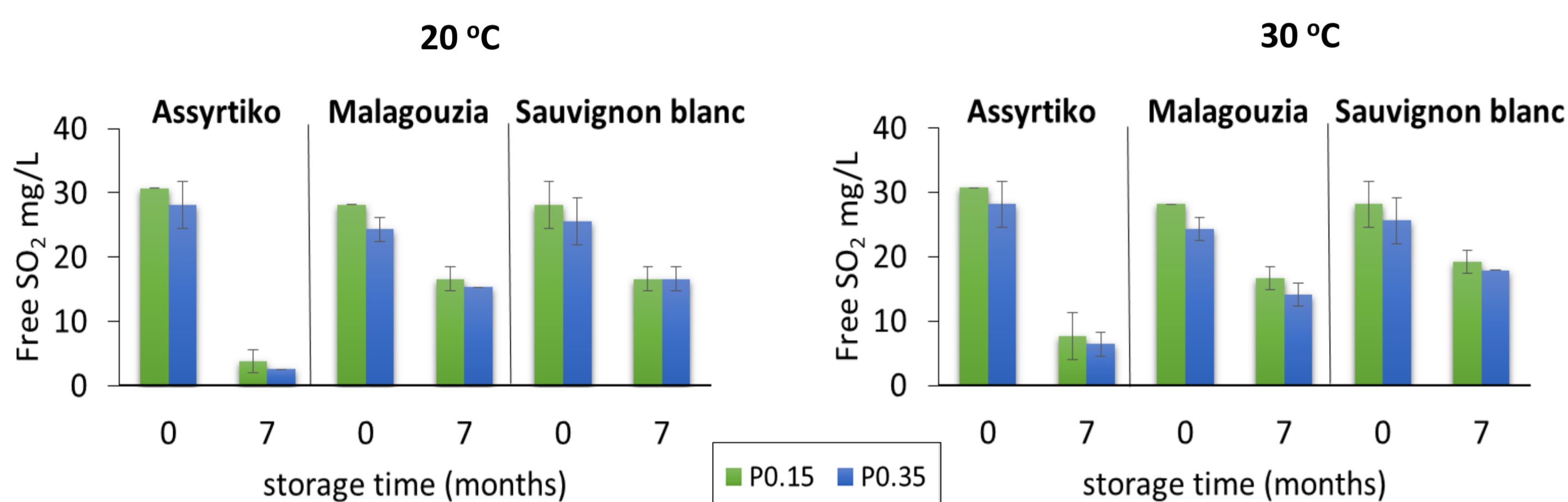


Figure 1. Values of free SO₂ for 3 white wine varieties over time, as a function of packaging materials at each storage temperature.

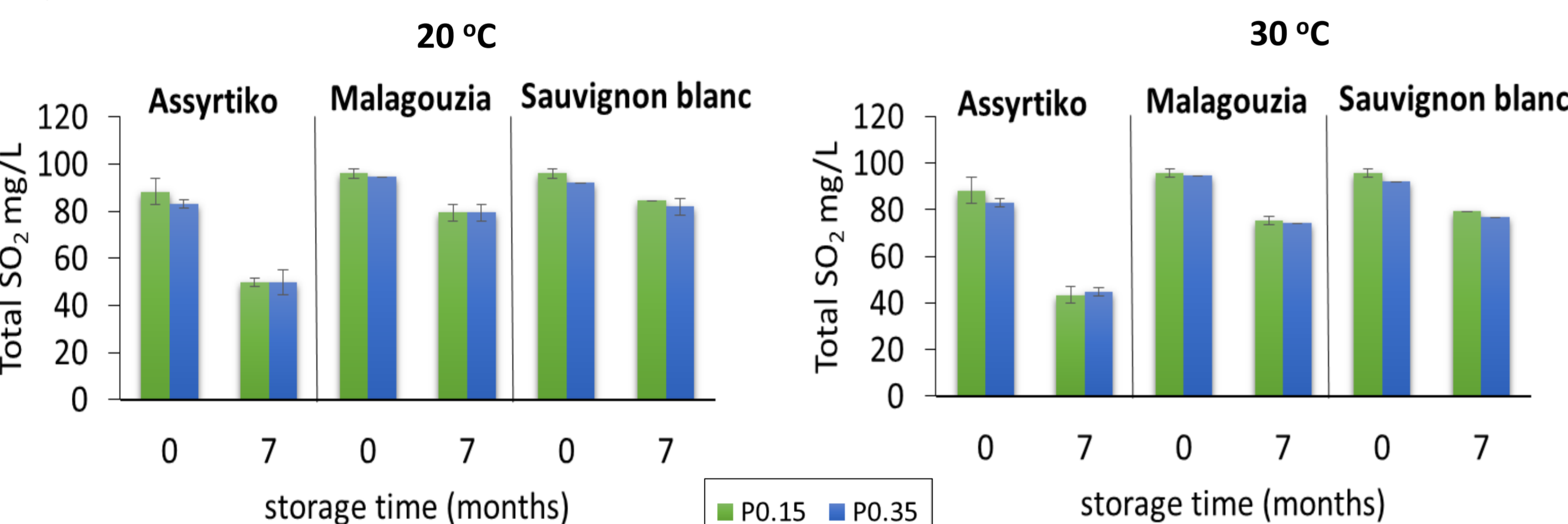


Figure 2. Values of total SO₂ for 3 white wine varieties over time, as a function of packaging materials at each storage temperature.

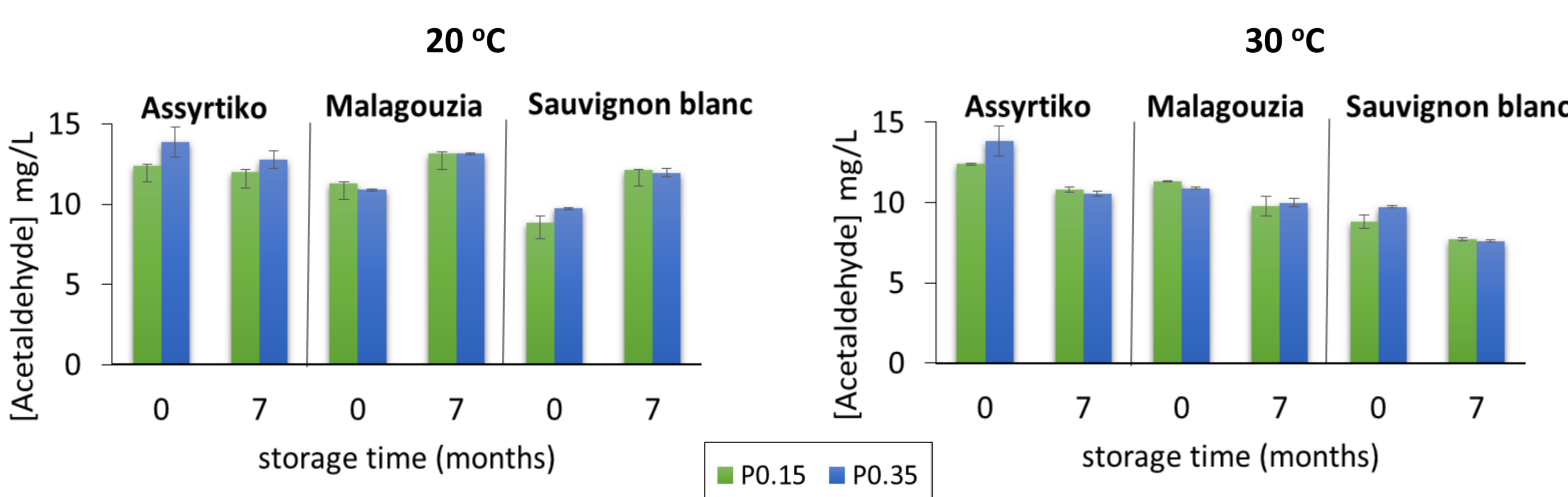


Figure 3. Acetaldehyde concentrations in white wine varieties over time, as a function of packaging materials at each storage temperature.

Table 1. DPPH. Antioxidant capacity of white wines stored at dark. Values are expressed as mM trolox equivalents ±standard error.

Storage temperature	20 °C		30 °C
Time (months)	0	7	7
Assyrtiko			
P0.15	1.157±0.007	0.432±0.045	0.358±0.000
P0.35	1.164±0.005	0.480±0.019	0.341±0.018
Malagouzia			
P0.15	0.690±0.006	0.237±0.062	0.257±0.014
P0.35	0.702±0.009	0.282±0.028	0.424±0.038
Sauvignon blanc			
P0.15	1.018±0.019	0.476±0.000	0.458±0.030
P0.35	0.995±0.038	0.466±0.035	0.493±0.080

Table 2. Color intensity of white wines stored at dark. Values are expressed as absorbance units at 420 nm ±standard error.

Storage temperature	20 °C		30 °C
Time (months)	0	7	7
Assyrtiko			
P0.15	0.054±5.000	0.079±0.001	0.114±0.001
P0.35	0.053±0.001	0.079±0.000	0.112±9.999
Malagouzia			
P0.15	0.086±0.003	0.088±0.001	0.151±0.001
P0.35	0.079±0.000	0.085±0.000	0.153±0.000
Sauvignon blanc			
P0.15	0.053±0.003	0.096±0.018	0.117±0.000
P0.35	0.058±0.002	0.085±0.000	0.121±0.000

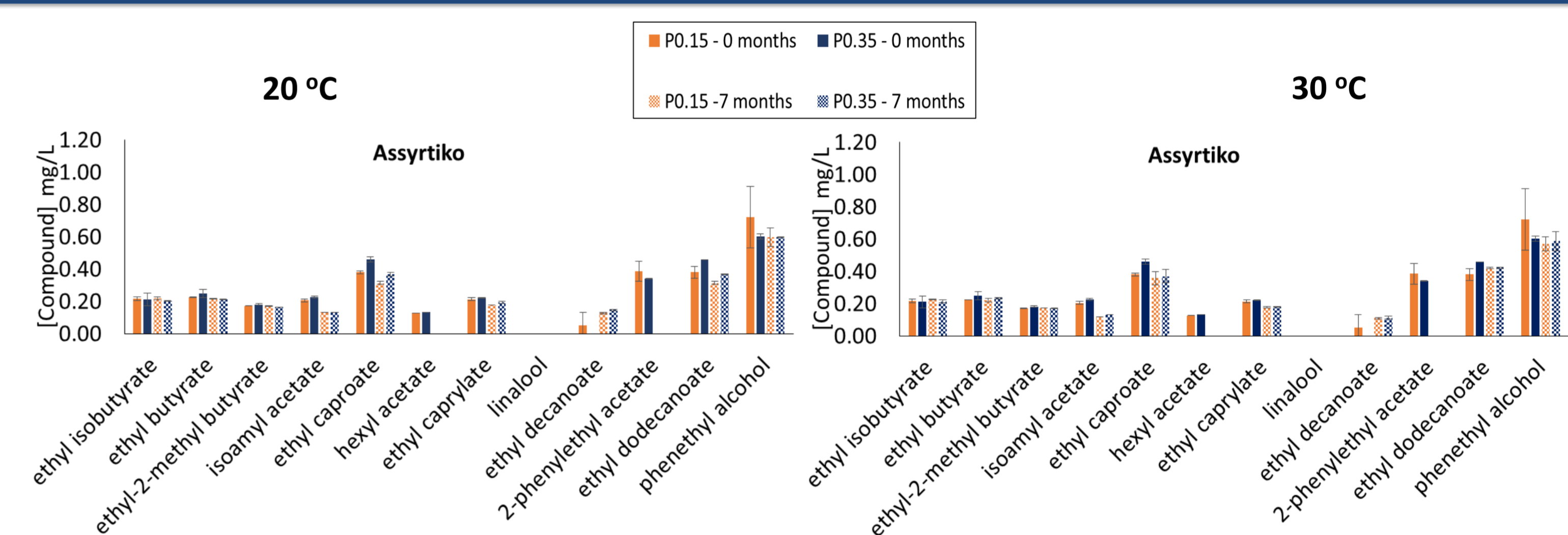


Figure 4. Concentrations (mg/L) of volatile compounds (relative to IS) for Assyrtiko variety up to 7 months storage for every storage condition. Each value is the mean of duplicate analysis.

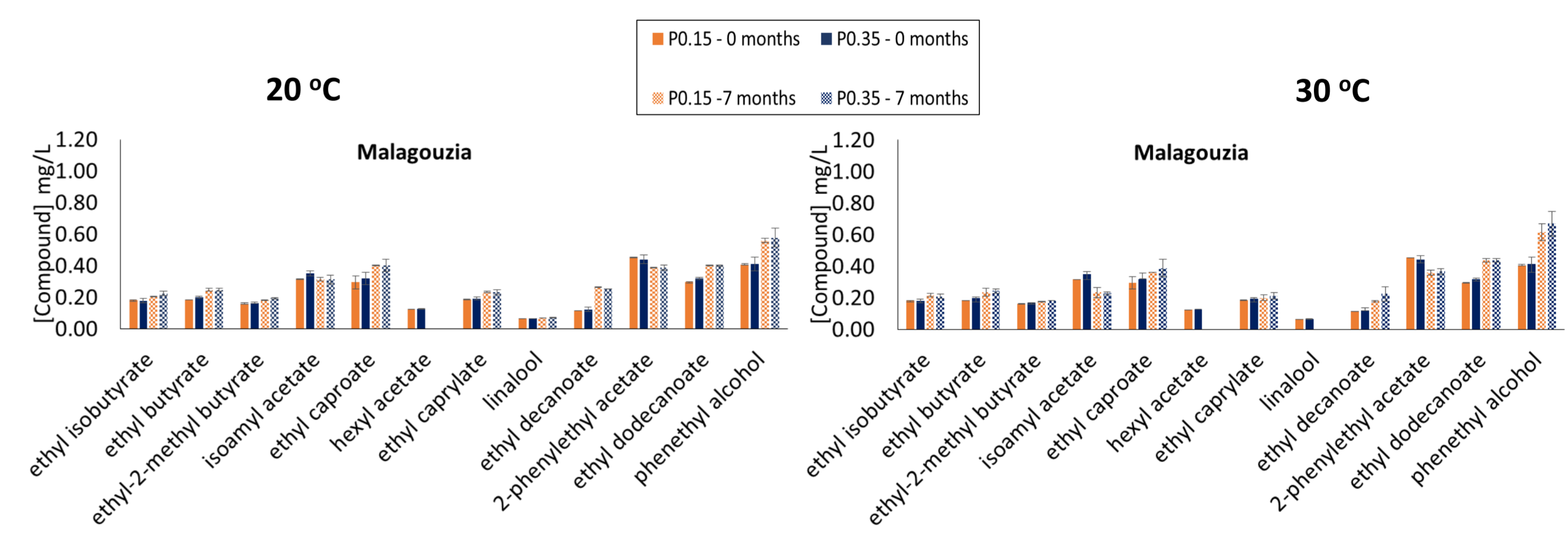


Figure 5. Concentrations (mg/L) of volatile compounds (relative to IS) for Malagouzia variety up to 7 months storage for every storage condition. Each value is the mean of duplicate analysis.

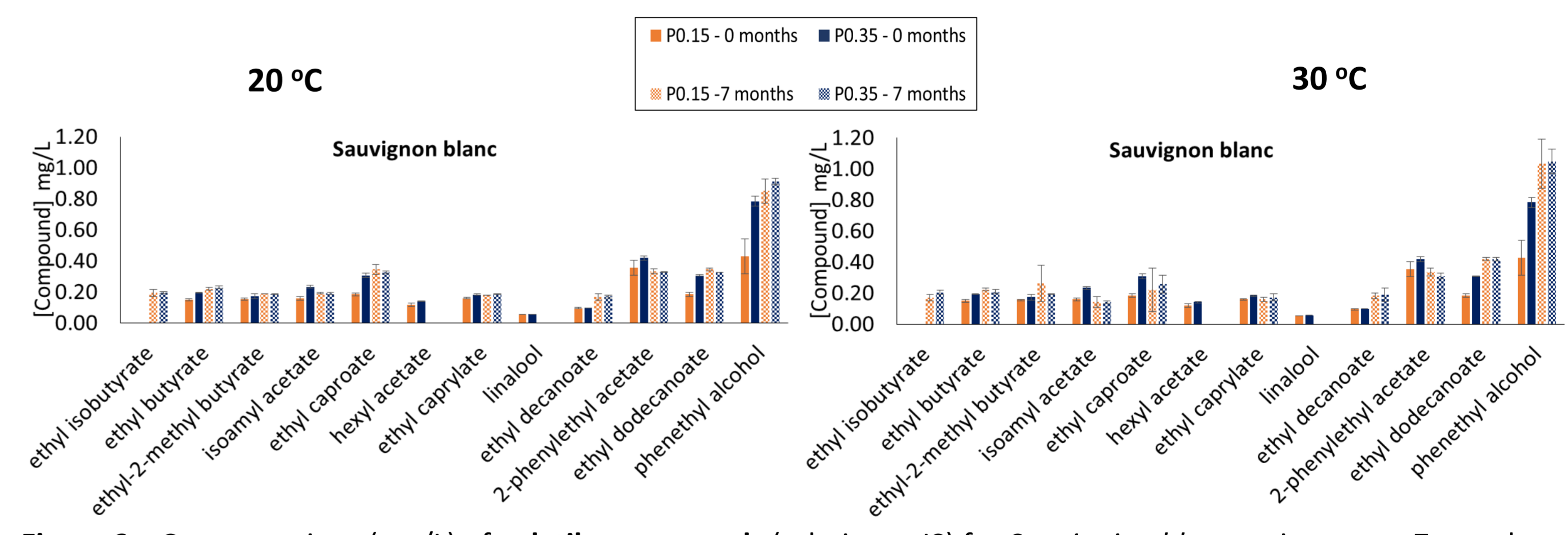


Figure 6. Concentrations (mg/L) of volatile compounds (relative to IS) for Sauvignon blanc variety up to 7 months storage for every storage condition. Each value is the mean of duplicate analysis.

CONCLUSIONS

- Free and Total SO₂ showed a reduction trend, similarly to their antioxidant capacity, over time, in all wines tested.
- Statistically significant differences were reported for the oxidation indicators, such as acetaldehyde and color intensity, after 7 months storage.
- A significant reduction of volatile compounds was recorded over time, while certain compounds had an apparent increase in their concentrations, over time.
- No distinct differences were recorded for wines packed with the two types of corks at all storage conditions.
- Organoleptic tests did not reveal any significant differences among wines at all packing versions, over 7 months storage.
- Packaging has a rather significantly limited role on chemical and sensorial alterations of white wines, up to 7 months.
- The impact of packaging materials on white wines at longer storage times is under a currently ongoing investigation.

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