

Introduction

Winery wastewater (WW) is characterized by high salinity and organic load with many different organic compounds, such as organic acids, sugars, alcohols, and polyphenols [1]. Its disposal in water courses poses a serious environmental concern, being required proper treatment.

Acetic acid bacteria are aerobic microorganism that can oxidize different substrates into CO₂ and H₂O [2]. The possibility that these bacteria can use different WW carbon sources, turns its applicability for WW treatment a possible option to be considered.

Aim of the Present Work

- To assess the ability of *Acetobacter aceti* to resist to WW constituents (alcohols, carboxylic acids, phenols)
- To investigate the feasibility of using *Acetobacter aceti* for WW biodegradation

Synthetic samples composition

Control		[g L ⁻¹]
Sodium sulfate		1.84
Calcium chloride		0.095
Potassium sulfate		2.25
Mannitol		6.70
Yeast extract		5.00
Peptone		3.00

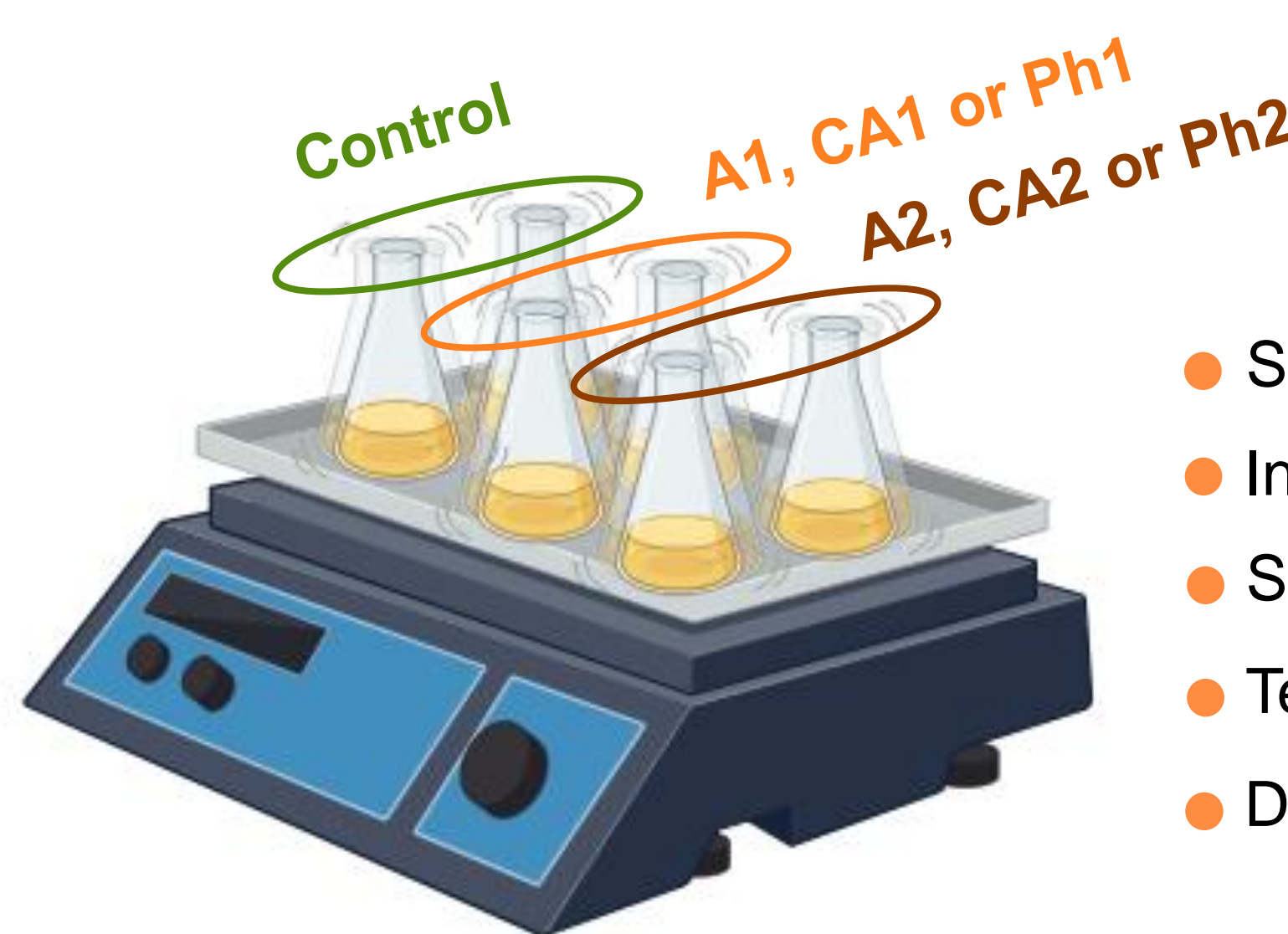
Alcohols			[g L ⁻¹]
		A1	A2
Ethanol		2.50	5.00
Glycerol		0.15	0.30
Methanol		0.0075	0.015

Phenols			[g L ⁻¹]
		Ph1	Ph2
Catechol		0.15	0.30
Tyrosol		0.15	0.30

Carboxylic acids			[g L ⁻¹]
		CA1	CA2
L(+)-tartaric acid		0.50	1.00
Lactic acid		0.50	1.00
Acetic acid		0.80	1.60
Succinic acid		0.13	0.26

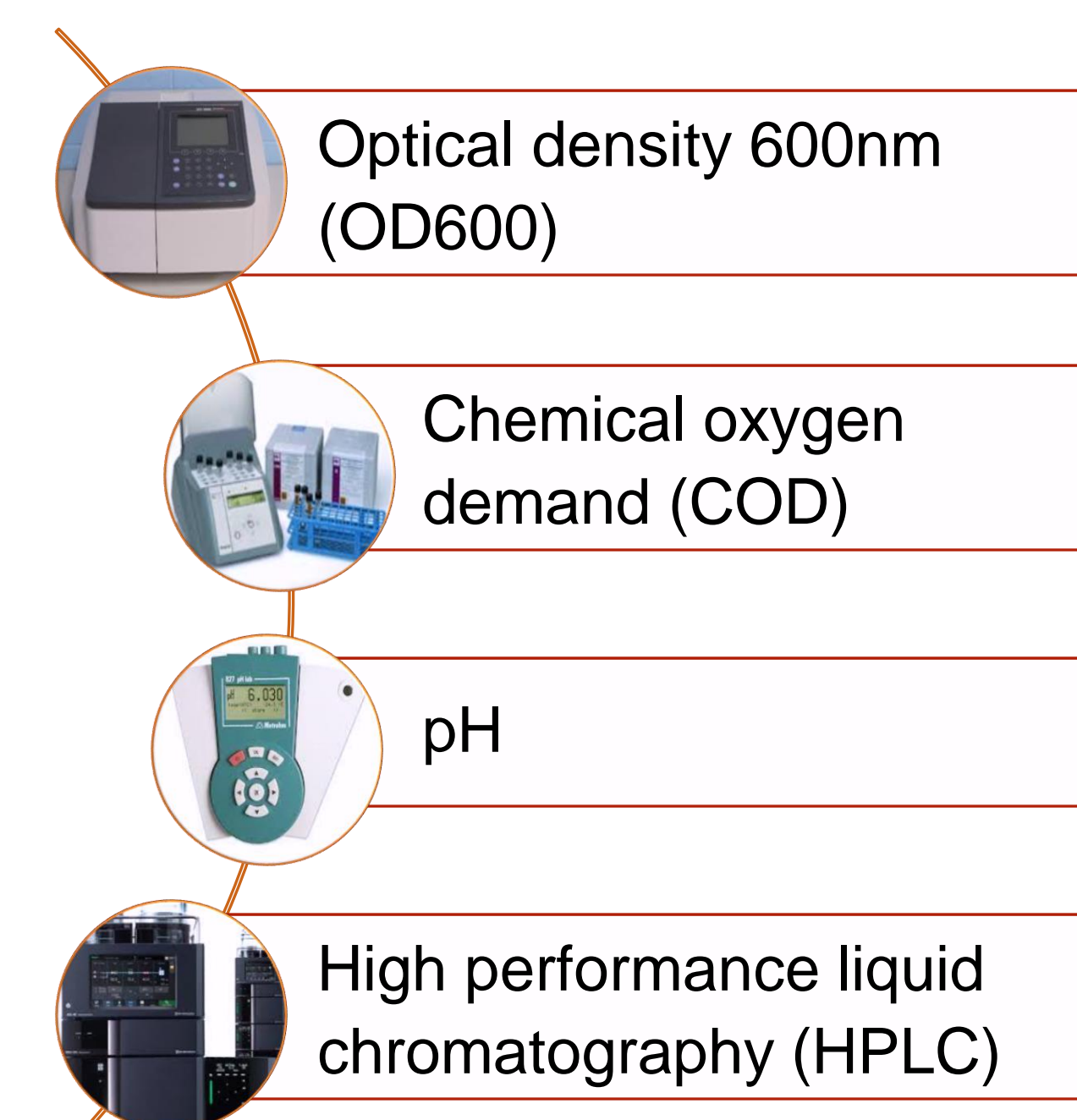
Methodology

Biodegradation experiments



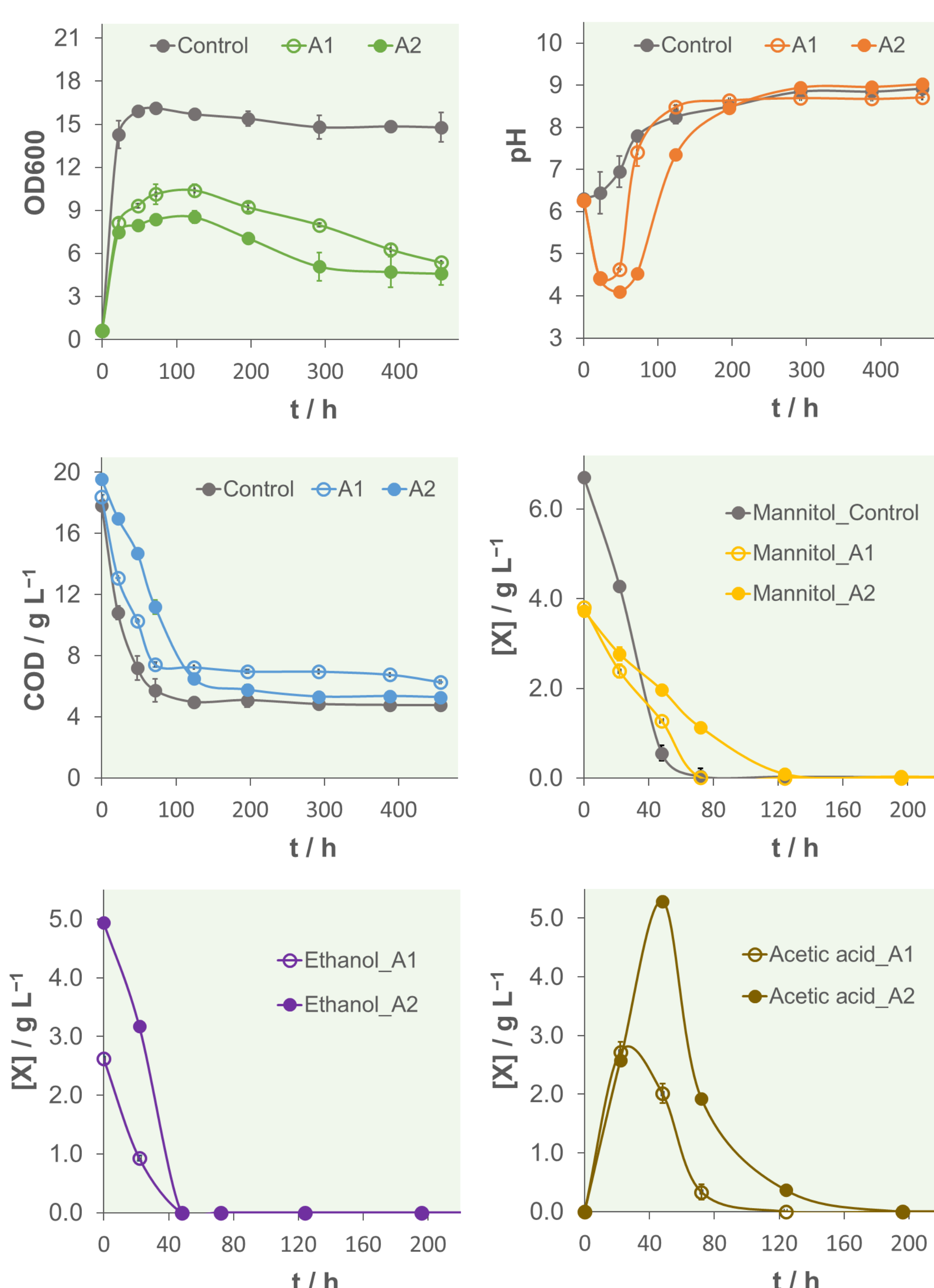
- Sample volume: 200 mL
- Inoculum volume: 10 mL
- Stirring speed: 200 rpm
- Temperature: 27 ± 1 °C
- Dark conditions

Experiments monitoring



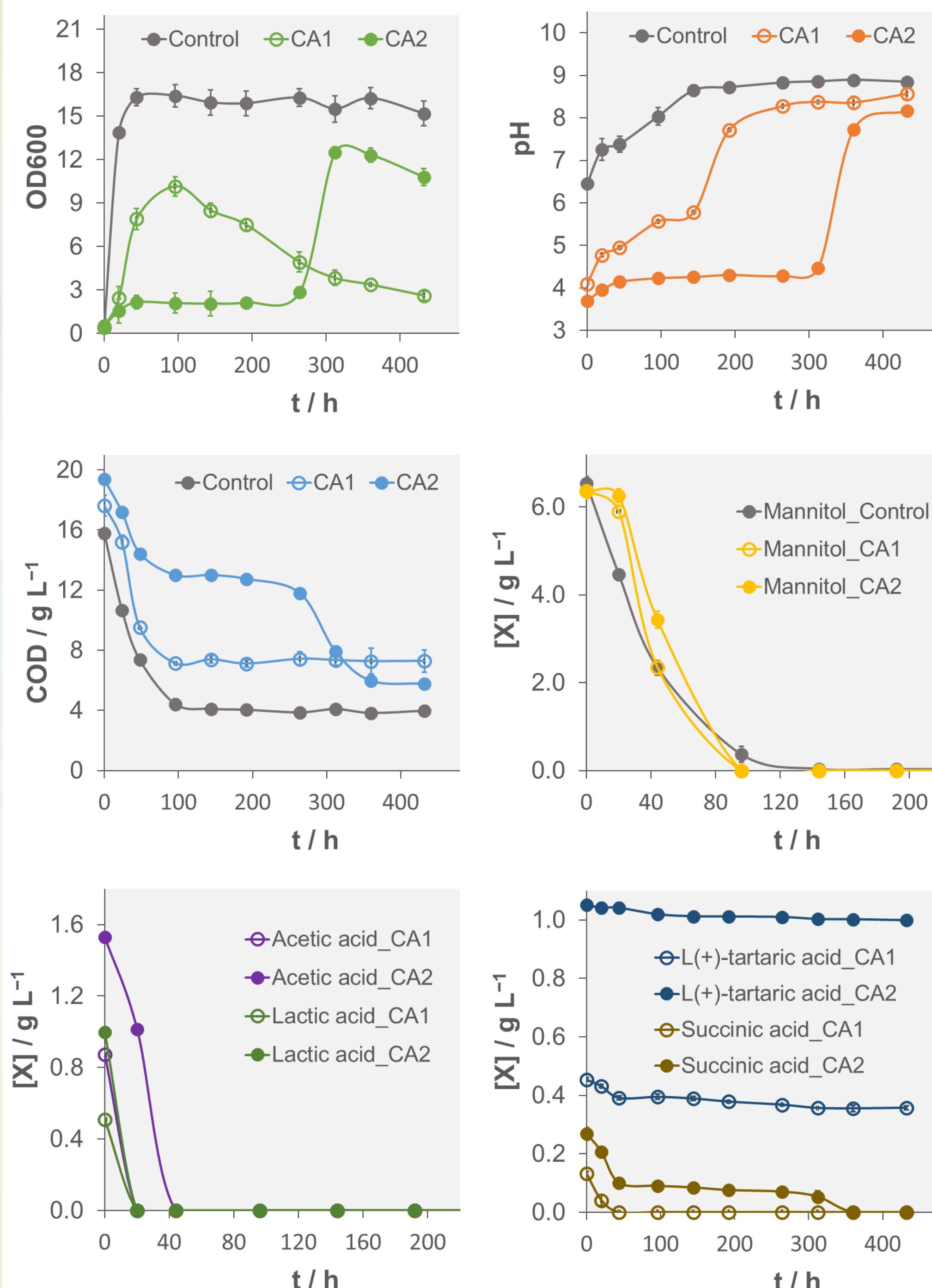
Results

Alcohols



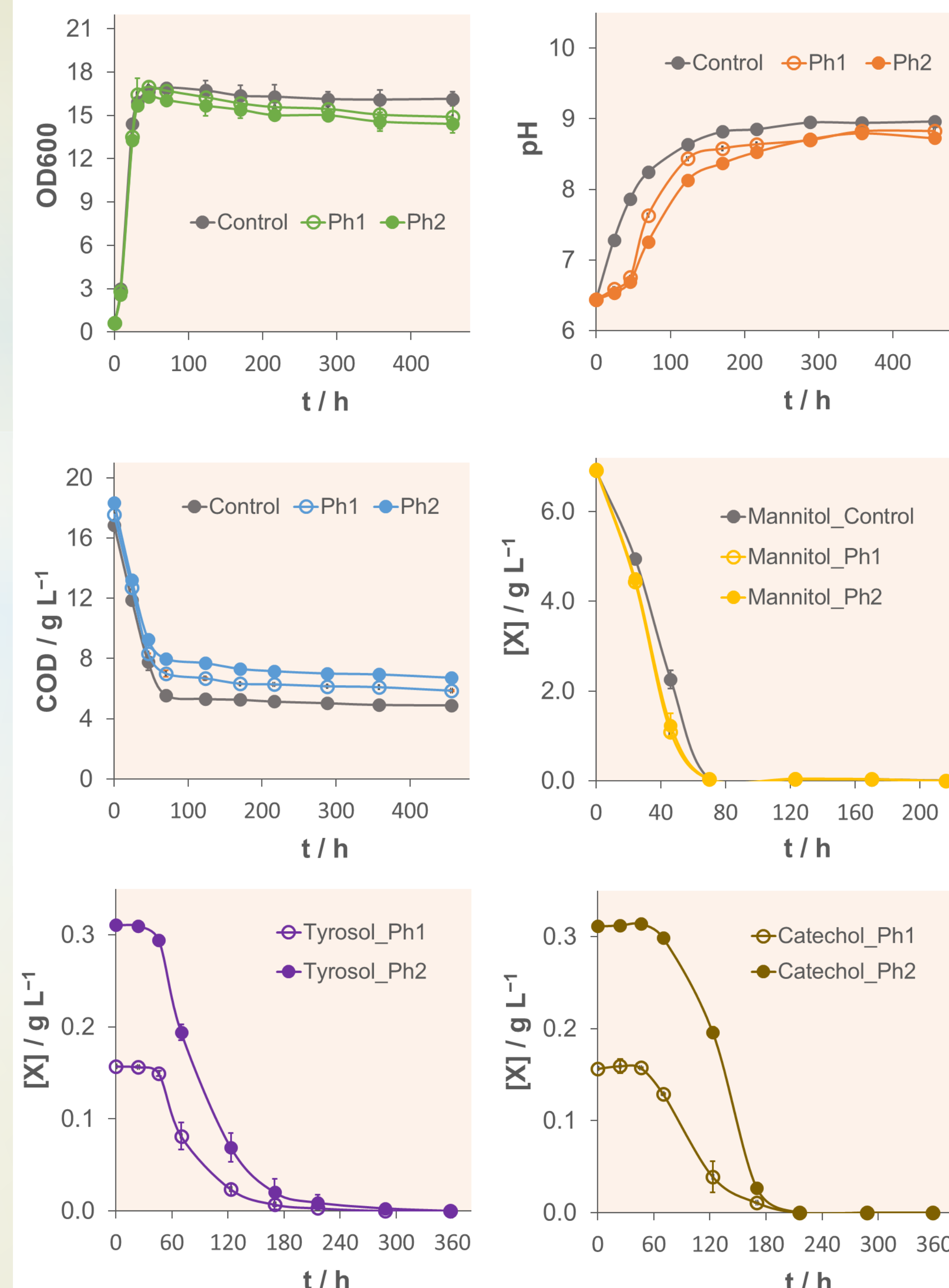
- ✓ *A. aceti* efficiently degrades the main alcohols present in WW: no ethanol, glycerol, or methanol were detected after 48 h
- ✓ The alcohols were oxidized to acetic acid, which was also degraded
- ✓ The alcohols studied slightly inhibit *A. aceti* growth

Carboxylic acids



- ✓ *A. aceti* growth is inhibited by the presence of the carboxylic acids
- ✓ *A. aceti* preferably utilizes acetic acid and lactic acid rather than mannitol
- ✓ L(+)-tartaric acid is not degraded by *A. aceti*

Phenols



- ✓ At the concentrations studied, the phenolic compounds are not inhibitors of the *A. aceti* growth
- ✓ *A. aceti* efficiently degrades the phenolic compounds studied: no tyrosol or catechol were detected after 250 h
- ✓ *A. aceti* preferably utilizes mannitol, starting the utilization of the phenolic compounds only when mannitol is not available

Conclusions

- In general, *Acetobacter aceti* is resistant to the constituents of winery wastewater, growing in their presence and being able to degrade them.
- The utilization of *Acetobacter aceti* for winery wastewater treatment is a feasible option, being this microorganism non-pathogenic to humans and readily available in winery effluents.

References / Acknowledgements

- [1] Baía, A. et al. Removal of recalcitrant compounds from winery wastewater by electrochemical oxidation. *Water* 14 (2022) 750.
[2] Rengasamy, K. & Berchmans, S. Simultaneous degradation of bad wine and electricity generation with the aid of the coexisting biocatalysts *Acetobacter aceti* and *Gluconobacter roseus*. *Bioresour. Technol.* 104 (2012) 388–393.

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