UNIVERSITÀ DEGLI STUDI FIRENZE
DAGRI Dipartimento di Scienze e Tecnologie Agrarie, Alimentari, Ambientali e Forestali

Enoforum 2023 VICENZA 16 - 18 MAGGIO

Exploitation of innovative technique to produce wine without sulfite added.

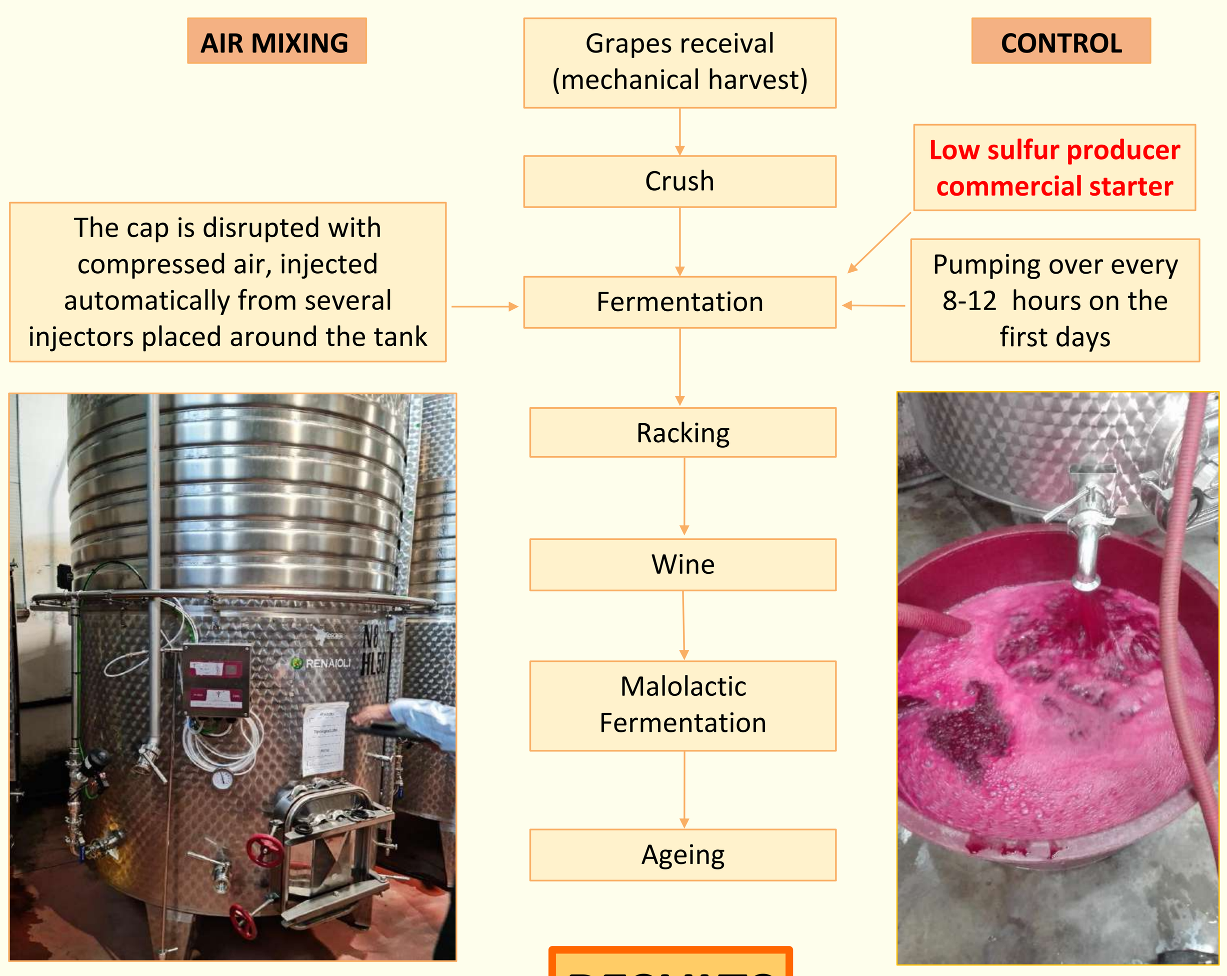
Mari Eleonora[a], Barbato Damiano[a-b], Ganucci Donatella[a], Buscioni Giacomo[b], Mangani Silvia[b], Guerrini Simona[b], Granchi Lisa[a].

a) University of Florence, Department of Agriculture, Food, Environment and Forestry (DAGRI), Via S. Bonaventura 13, 50145 Firenze
b) Foodmicroteam, Spin-Off Accademico dell'Università degli Studi di Firenze, Via di Santo Spirito 14, 50125 Firenze
eleonora.mari@unifi.it

INTRODUCTION. Sulfur dioxide (SO_2) is one of the most versatile and efficient additives used in winemaking for its antiseptic and antioxidant properties [1,2,3,4]. The reduction of the sulfur dioxide content in wine is a goal sought in recent years with the aim to limit the toxic effects on human health and increase environmental sustainability by containing the use of chemical compounds, as required by the European Green Deal [5,6].

AIM. To employ an innovative soft maceration technique of vinification for the production of a high-quality wine without sulfide added.

PRODUCTION PROCESS



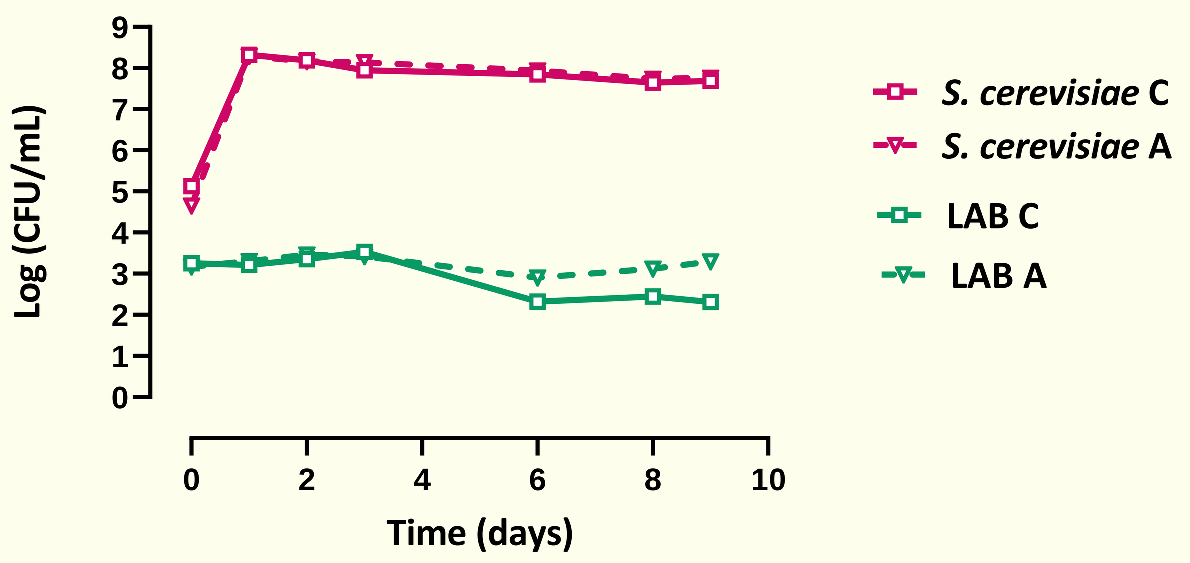
Materials and Methods

Microbiological analysis: *Saccharomyces cerevisiae* were enumerated on WL nutrient agar (Oxoid), containing sodium propionate (2 g/L) and streptomycin (0.3 g/L). Non *Saccharomyces* yeasts were quantified on Lysine medium (Oxoid) containing sodium propionate (2 g/L) and streptomycin (0.3 g/L). Lactic acid bacteria were enumereted on MRS ISO agar (Oxoid), with the addition of fructose (5 g/L), cysteine (0.5 g/L), tomato juice broth (2.5 g/L), agar (6 g/L) and pimaricin (0.05 g/L). Yeasts were counted after incubation for 3-5 days at 30°C under aerobic conditions, LAB were counted after incubation for 7 days at 30°C under anaerobic conditions.

Chemical analyses: Malic acid was determined enzymatically through a Hyperlab automatic multiparametric analyser (Steroglass, San Martino). The total polyphenol index (TPI), colour intensity (CI), glucose, fructose, ethanol, glycerol, acetic, lactic acid, free polymeric phenolic compounds, free and polymeric anthocyanins were determined according to Mangani et al., 2020 [7]. SO_2 was determined by distillation according to the official OIV method [8].

RESULTS

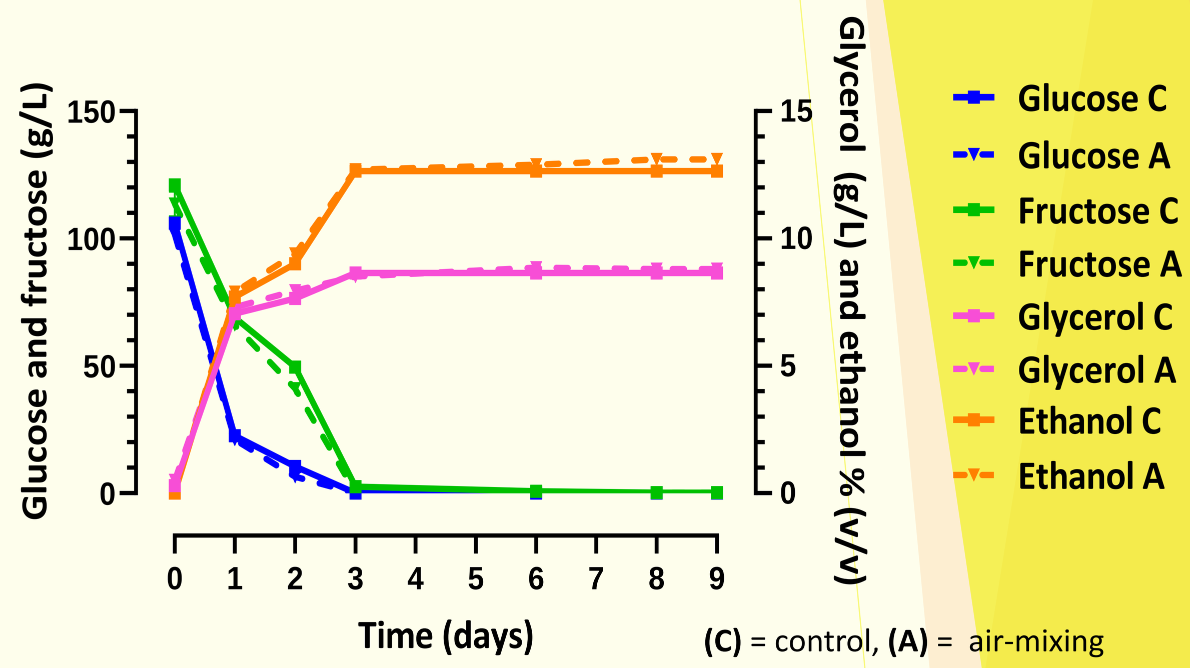
EVOLUTION OF MICROBIAL POPULATIONS



(C) = control, (A) = air-mixing

- ✓ ***Saccharomyces cerevisiae*** **growth did not show significant differences in both fermentations.**
- ✓ **At the end of the alcoholic fermentation lactic acid bacteria started growing in the air-mixing trial.**

FERMENTATION KINETICS

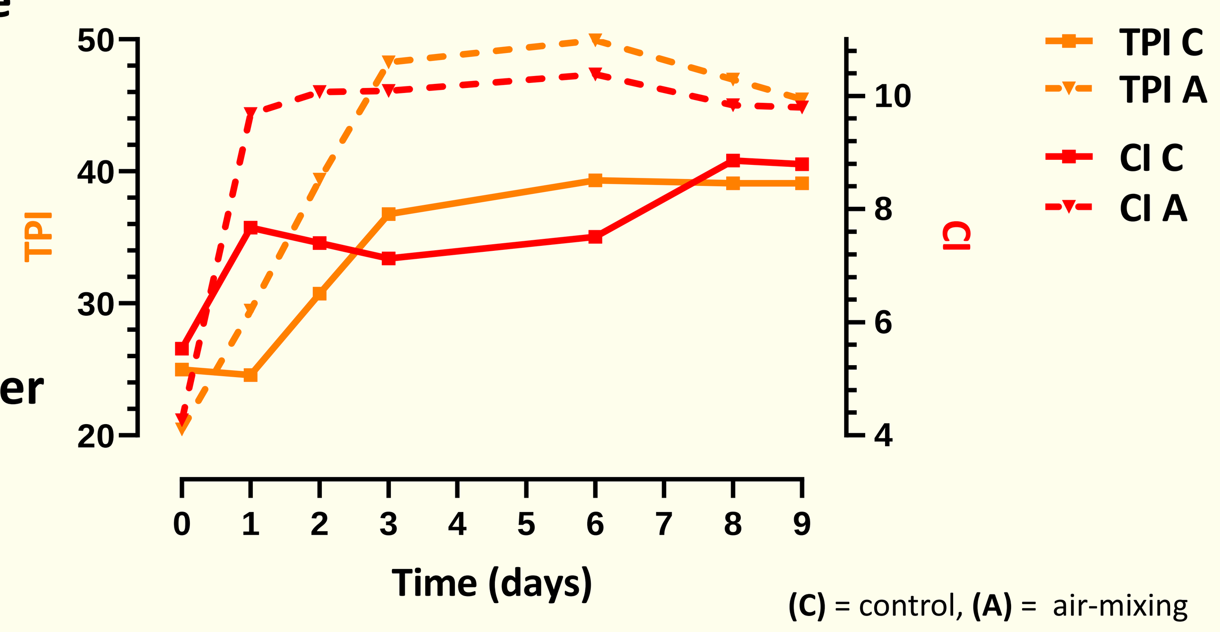


(C) = control, (A) = air-mixing

✓ **The two trials showed the same fermentation kinetic.**

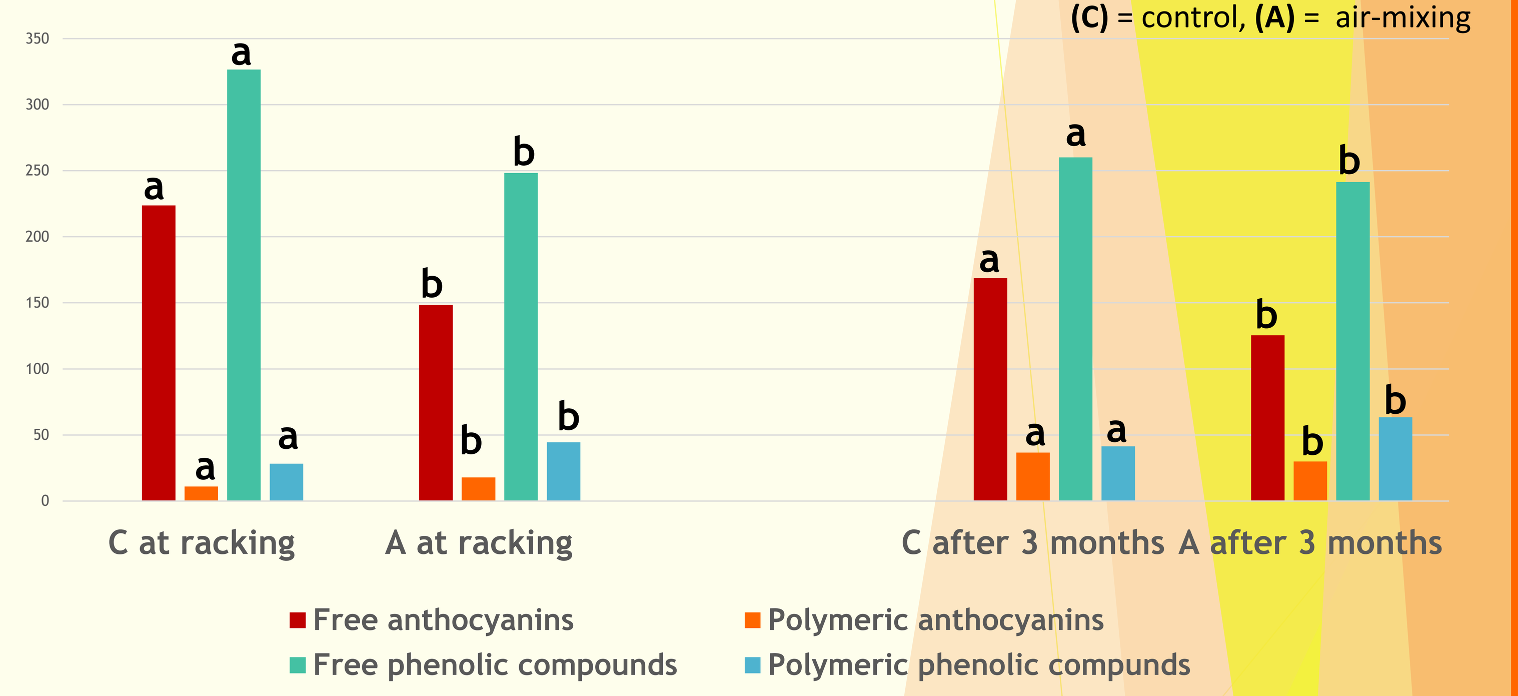
EXTRACTION KINETICS OF PHENOLIC COMPOUNDS

✓ **The extraction kinetics of the phenolic compounds, evaluated as color (CI) and total polyphenol index (TPI), were different between the two fermentations, with the air-mixing trial showing higher values of both parameters from the first days.**



(C) = control, (A) = air-mixing

Phenolic compounds at racking and after 3 months (mg/L)
t test p<0,05



(C) = control, (A) = air-mixing

✓ **The wine obtained with the air-mixing technique showed higher contents of the polymeric phenolic and anthocyanin compounds both upon racking and after 3 months of ageing.**

AT RACKING (day 9)	Control	Air mixing	T-test p<0,05
pH	3.51	3.67	s
Total acidity (g/L)	5.3	5.3	ns
Total SO_2 (mg/L)	<10	<10	ns
Ethanol (%, v/v)	12.8	13.1	ns
Acetic acid (g/L)	0.27	0.36	s
Malic acid (g/L)	0.80	0.75	ns
Lactic acid (g/L)	0.18	0.11	s
Color intensity (CI)	8.8	9.8	s
Total phenol index (TPI)	39.1	45.4	s

✓ **Upon racking, both wines showed SO_2 values below the limit value for indication on the label of 10 mg/L.**

CONCLUSIONS

- ✓ **The innovative air-mixing technique can be considered a suitable tool to produce wines without sulfites added.**
- ✓ **The air-mixing technique seemed to accelerate the maturation of the wine.**

ACKNOWLEDGEMENT
«Utilizzo di un sistema innovativo per produrre vini senza aggiunta di solfiti (NOSO2)»
Progetto Regionale 6 «Sviluppo Rurale e Agricoltura di qualità»; - Interventi a sostegno dei processi di innovazione organizzativa e di processo produttivo nel settore della cooperazione agricola e nei consorzi forestali.
REGIONE TOSCANA

References.
[1] Santos, M. C., Nunes, C., Saraiva, J. A., & Coimbra, M. A. (2012). Chemical and physical methodologies for the replacement/reduction of sulfur dioxide use during winemaking: Review of their potentialities and limitations. European Food Research and Technology, 234, 1-12.
[2] Ribe´reau-Gayon, P., Glories, Y., Maujean, A., Dubourdieu, D. (2006) Handbook of enology: the chemistry of wine stabilization and treatments, vol 2, 2nd edn. Wiley, Chichester
[3] Bakker, J., Bridle, P., Bellworthy, S.J., Garcia-Viguera, C., Reader, H.P., Watkins, S.J. (1998) Effect of sulphur dioxide and must extraction on colour, phenolic composition and sensory quality of red table wine. J Sci Food Agric 78(3):297–307
[4] Oliveira, C.M., Ferreira, A.C.S., De Freitas, V., Silva, A.M.S. (2011) Oxidation mechanisms occurring in wines. Food Res Int 44(5):1115–1126
[5] Vally, H., Misso, N.L.A., Madan, V. (2009) Clinical effects of sulphite additives. Clin Exp Allergy 39(11):1643–1651
[6] Heuser, I. (2022). Soil Governance in current European Union Law and in the European Green Deal. Soil Security, 6, 100053.
[7] Mangani, S., Buscioni, G., Guerrini, S., & Granchi, L. (2020). Influence of sequential inoculum of Starmerella bacillaris and Saccharomyces cerevisiae on flavonoid composition of monovarietal Sangiovese wines. Yeast, 37(9-10), 549-557.
[8] OIV-MA-AS323-04A : R2012