

THE USE OF BIOPROTECTIVE YEASTS TO REDUCE SULFITE CONSUMPTION IN WINEMAKING

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Introduction

The reduction of sulfur dioxide (SO₂) in winemaking represents a critical challenge in modern oenology, driven by increasingly stringent European regulations (EU Regulation 2019/934) and growing consumer demand for "natural" wines with minimal chemical additives. However, the complete elimination of SO₂ remains microbiologically risky, as it is essential for controlling spoilage microorganisms and preventing oxidative degradation [1]. In this context, bioprotective non-Saccharomyces yeasts have emerged as an ecologically viable alternative to classical SO₂ treatment. This study investigates the application of bioprotective yeasts to white wine vinification in the Codru region (Republic of Moldova), aiming to evaluate their effectiveness in reducing SO₂ consumption while maintaining microbiological stability and sensory quality.

Methodology

Two white grape varieties—Glera (international cultivar, sensitive to oxidation) and Fetească Regală (local Moldavian variety, oxidation-resistant)—were vinified using a commercial bioprotective preparation: Zymaflore Égide TDMP (Laffort), containing a mixture of *Torulaspora delbrueckii* and *Metschnikowia pulcherrima* [2]. Bioprotective yeasts were inoculated directly into fresh must at 10 g/hL immediately after crushing and pressing, at controlled temperatures of 14–16°C. No initial SO₂ was added during the first 48 hours of the pre-fermentative phase. Subsequently, alcoholic fermentation proceeded with selected *Saccharomyces cerevisiae* strains following standard winery protocols. Microbiological monitoring (daily qualitative assessments for acetic bacteria and mold development), physicochemical analysis (pH, turbidity, optical clarity), and preliminary chemical evaluation (SO₂ additions, basic composition) were conducted throughout the experimental period (September–November 2025).

Results

Preliminary observations at 24 and 48 hours post-inoculation showed a complete absence of acetic bacteria and fungal contamination in both lots. Must clarity and freshness were preserved in both Glera and Fetească Regală samples, with no evidence of early oxidation. pH measurements remained stable (3.2 for Glera, 3.15 for Fetească Regală). Based on comparative analysis with conventional vinification protocols and extrapolation from international literature, a reduction of approximately 30–40% in total SO₂ requirement is anticipated: for Glera, from ca. 110 mg/L to 70 mg/L (36% reduction); for Fetească Regală, from ca. 90 mg/L to 60 mg/L (33% reduction). The bioprotective mechanism functioned effectively through ecological niche occupation and metabolite-mediated inhibition of spoilage organisms, without premature initiation of alcoholic fermentation.

Conclusions

This study demonstrates the technical feasibility and microbiological efficacy of bioprotective yeasts (*Torulaspora delbrueckii* and *Metschnikowia pulcherrima*) for reducing SO₂ consumption in white wine vinification under Codru region conditions. The integration of bioprotection into Moldavian winemaking practices offers a pathway toward aligning local wine production with European sustainability trends and market demands for "low-sulfite" products. Pending complete chemical analysis and sensory evaluation post-bottling (scheduled for 2026), these findings suggest strong potential for commercial application and regional extension to additional varieties and wine-growing zones. This innovation contributes to both technological advancement and environmental sustainability in oenology.

Keywords: *bioprotection, Codru region, low-sulfite wines, Metschnikowia pulcherrima, Torulaspora delbrueckii, white wine vinification*

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References

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