

BIOPROTECTIVE NON-SACCHAROMYCES YEASTS AS AN ALTERNATIVE TO SULFUR DIOXIDE IN WINEMAKING

Nicolai CUPCEA* , Rodica STURZA 

Department of Oenology and Chemistry, Technical University of Moldova, Chisinau, Republic of Moldova

*Corresponding author: nicolae.cupcea@doctorat.utm.md

<https://doi.org/10.52757/bsd26.32>

Background: Sulfur dioxide has served as the main antimicrobial and antioxidant agent in winemaking for more than two millennia. However, the increasing consumer demand for “low-sulfite” wines requires alternative strategies for the microbiological stabilization of wines. The use of yeasts with bioprotective activity presents an alternative for winemakers, with the aim of limiting the development of spoilage microorganisms and preserving the sensory quality of the products. Non-*Saccharomyces* yeasts (*Metschnikowia pulcherrima* and *Torulaspora delbrueckii*) suppress spoilage organisms through bioprotection, without compromising fermentation.

Aim of the study: The objectives of the study were to quantify the results of reducing sulfite content in wines, present chemical and microbiological safety profiles, and demonstrate the practical applicability of bioprotective yeasts in Moldovan winemaking conditions.

Materials and methods: Two dry still white wines were produced during the 2025 vintage in the Codru wine region (Glera and Feteasca regală). For bioprotection, the commercial preparation Zymaflore Égide TDMP (Laffort Groupe, Bordeaux, France) was used, consisting of a certified mixture of *Torulaspora delbrueckii* and *Metschnikowia pulcherrima*, intended for environmental colonization, with no fermentation activity detected. All analytical measurements of wines were performed according to the methods approved by the Technical Regulation "Analysis methods in the field of wine production".

Results: The results demonstrated a 32-50% reduction in sulfites compared to traditional methods, while maintaining volatile acidity at only 40% of the EU threshold. The levels of heavy metals and sodium remained well below the regulatory limits, confirming the wine's compliance with market requirements and the potential for premium positioning of Moldovan wines with low sulfite content. The antimicrobial activity of *Metschnikowia pulcherrima* yeasts is mediated by iron sequestration, limiting the growth of iron-dependent spoilage microorganisms. Oxygen consumption by bioprotective yeasts further contributes to the early establishment of quasi-anaerobic conditions, restricting aerobic spoilage metabolism before active alcoholic fermentation. Sequential inoculation of *Saccharomyces cerevisiae*, 24-48 hours after the addition of bioprotective yeasts, proved to be essential for the success of the fermentation.

Conclusions: Bioprotective yeasts application provides a scientifically validated pathway for Moldavian producers to meet the growing global demand for "low-sulfite" and natural wines. This strategy aligns environmental sustainability with high-quality enological standards, ensuring competitive positioning in premium international markets.

Keywords: wines, bioprotection, sulfur dioxide, spoilage microorganisms, sensory quality.

Acknowledgments: The research was funded under the institutional project, subprogram 020405 "Optimization of food processing technologies in the context of circular bioeconomy and climate change", Bio-OpTehPAS.