

F.2. OPTIMIZING PHENOLIC EXTRACTION AND FERMENTATION DYNAMICS IN AUTOCHTHONOUS RED WINES THROUGH THE SOFT SYSTEM® APPROACH

**ALEXANDRA ARSENI*, NATALIA VLADEI, RODICA STURZA, LARISA
NECULA, GEORGETA MOGA, ELENA BALANUȚĂ, NICU CRUDU**

*Technical University of Moldova, 168, Stefan cel Mare bd, Chisinau, Republic of Moldova
email: alexandra.arseni@enl.utm.md*

Abstract. The maceration–fermentation stage represents a critical phase in red winemaking, governing the extraction dynamics of phenolic compounds, chromatic attributes and aroma precursors. Current oenological practices increasingly focus on process optimization to enhance both the qualitative and stability parameters of wines. Within this framework, the Soft System® method emerges as an advanced technological solution, integrating automated fermentation control, gentle cap management, and regulated oxygen exposure to maximize extraction efficiency while preserving phenolic integrity.

This study investigates the impact of the Soft System® maceration–fermentation approach on wines produced from two autochthonous red grape varieties, Băbească Neagră and Fetească Neagră, in comparison with conventional vinification techniques. Parallel experimental fermentations were carried out under standardized conditions, applying both technological variants to each grape variety, with subsequent evaluation of physico-chemical, phenolic, aromatic, and sensory parameters.

The findings demonstrate that the implementation of the Soft System® method promotes a more consistent and complete alcoholic fermentation, evidenced by lower residual sugar levels and an increased fermentation rate (by approximately 12–15%). Furthermore, enhanced phenolic extraction was observed, reflected in elevated total polyphenol content and higher anthocyanin concentrations, contributing to improved color intensity and chromatic stability.

In addition, wines obtained through the modern method exhibited a more refined aromatic profile, characterized by greater complexity, persistence, and varietal typicity. Sensory analysis supported these results, indicating superior balance, structural harmony, and overall quality.

In conclusion, the Soft System® method represents a highly effective and innovative approach in red winemaking, aligning with current trends focused on precision oenology, sustainability and production of high-quality wines with enhanced sensory expression.

Keywords: anthocyanins, aromatic profile, maceration–fermentation, red wine, Soft System®, phenolic compounds.

Acknowledgments: The research was supported by Institutional Project, subprogram 020405 “Optimizing food processing technologies in the context of the circular bioeconomy and climate change”, Bio-OpTehPAS, being implemented at the Technical University of Moldova.