F.26. DIFFERENTIAL IMPACT OF SULFUR DIOXIDE ON PHENOLIC EXTRACTION AND STABILITY IN LOCAL RED WINES UNDER VARIABLE CONDITIONS

NATALIA VLADEI*, ALEXANDRA ARSENI

Technical University of Moldova, 168 Stefan cel Mare Blvd., Chisinau, Republic of Moldova
email: natalia.vladei@ffta.utm.md

Abstract. Sulfur dioxide (SO_2) is widely used in red winemaking due to its antioxidant and antimicrobial properties, with a direct impact on phenolic extraction, oxidation control and color stabilization. The efficiency of SO_2 depends on variety specific phenolic potential and technological conditions, particularly temperature. Rară Neagră and Fetească Neagră varieties exhibit distinct phenolic profiles, which may respond differently to sulfiting strategies. This study aims to quantify the influence of SO_2 on chromatic parameters. Experimental variants included wines from Rară Neagră and Fetească Neagră obtained under two conditions: spontaneous and controlled (25 °C) temperature, with and without SO_2 addition. Spectrophotometric measurements led to color intensity (Ic) and hue (Hc) calculation, as well as percentage of red, yellow and blue color.

Color intensity showed a consistent increase in the presence of SO_2, with cultivar- and condition-specific responses. In Rară Neagră wines, SO_2 addition led to an increase in color intensity up to 7% under laboratory conditions and up to 10% at 25°C. This enhancement was primarily driven by a significant increase in absorbance at 520 nm (anthocyanin fraction), which rose by 20% at 25°C, indicating improved extraction and protection against oxidation.In Fetească Neagră wines, the effect of SO_2 was more variable. Under laboratory conditions, color intensity increased with 12%, with a 10% increase in anthocyanin-related absorbance. However, at 25°C, the increase in overall color intensity was up to 2%, while the absorbance at 520 nm decreased by 7%, suggesting partial degradation or altered equilibrium between free and polymerized anthocyanins under these conditions.Regarding both varieties, SO_2 contributed to enhanced absorbance at 420 nm (yellow-brown fraction), with increases ranging between 6% and 18%, which confirms the stabilizing role of SO_2 against oxidative browning. Variations at 620 nm (blue fraction) were less consistent, indicating a limited impact on polymeric pigment formation in early stages. These findings support the hypothesis that SO_2 acts not only as a protective agent but also as a modulator of

phenolic equilibrium. Optimizing SO_2 dosage according to cultivar and temperature conditions is essential for maximizing phenolic quality while minimizing chemical inputs, particularly in the context of sustainable red wine production.

Keywords: antioxidant, anthocyanins, phenolic compounds, wine.

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