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CHEMICAL PROFILE ANALYSIS AND ANTIOXIDANT POTENTIAL OF MALBEC WINE FERMENTED WITH HANSENIASPORA VINEAE

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During vinification, sugars are converted into ethanol and other metabolites through the metabolic activity of yeasts, traditionally *Saccharomyces cerevisiae* [1]. In recent years, non-*Saccharomyces* species have gained attention for their ability to metabolize diverse aromatic precursors [2]. Among these, *Hanseniaspora vineae* has emerged as a promising alternative for modulating wine composition [2]. This study aimed to characterize the chemical profile and evaluate the antioxidant potential of wines from the Malbec cultivar using two vinification strategies: inoculation with *S. cerevisiae* alone (T3) and co-inoculation with *H. vineae* and *S. cerevisiae* (9:1, T4). Physicochemical characterization was performed by FT-IR. Total phenolic compounds, flavonoids, proanthocyanidins, anthocyanins, and antioxidant activity (DPPH• and ABTS•$^{+}$) were determined spectrophotometrically. Antioxidant capacity was also assessed by electroanalytical methods. Volatile profiles were analyzed by HS-SPME-GC-MS using CAR/PDMS fiber and the NIST11s library. Data were processed by PCA and Venn diagrams. The fixed profile was analyzed by HPLC-ESI-(+)-MS/MS and submitted to GNPS. Sensory analysis was conducted with 25 wine experts. Physicochemical analyses showed faster malolactic fermentation in T4, with increased pH (3.80), higher lactic acid (2.20 g/L), reduced total acidity (6.90 g/L), and lower malic acid (0.50 g/L). Spectrophotometric results indicated higher phenolic compounds (1048.41 mg GAE/L) and proanthocyanidins (252.90 mg CE/L), but lower flavonoids (355.79 mg QE/L) and anthocyanins (586.00 mg Mv-3G/L). Targeted analysis identified seven compounds, mainly flavonoids such as quercetin-hexoside (*m/z* 465.1028) and the tannin procyanidin B2 (*m/z* 579.1498). Twenty-three volatile compounds were detected, predominantly acetate esters (e.g., phenylethyl acetate) and alcohols (e.g., hexanol), associated with fruity and floral notes. PCA and Venn diagrams revealed that *H. vineae* enhanced the production of highly aromatic esters. Sensory evaluation indicated that T4 had greater intensity of ripe black fruit, stewed black fruit, and dried fruit notes, suggesting that co-inoculation favored acetate ester production. Overall, *H. vineae* co-inoculation modulated Malbec wine composition, increasing aromatic complexity and potential functional properties.

Keywords: *Aromatic profile, H. vineae, Malbec wine, co-inoculation, HS-SPME-GC-MS*

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