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The implications of terroir on the phenolic composition of red wines in the context of sustainable oenology

Implicațiile terroir-ului asupra compoziției fenolice a vinurilor roșii în contextul oenologiei durabile

The phenolic composition of red wines represents a key indicator of chromatic, structural, and biological quality, being contoured by the interaction between grape variety, pedoclimatic conditions, and winemaking. Within the framework of sustainable winemaking in Republic of Moldova, understanding the relationship

between terroir and phenolic composition supports the optimization of viticultural practices adapted to local conditions. Experimental data focused on dry red wines produced from the indigenous cultivars Fetească Neagră and Rară Neagră, harvested from the Bugeac, Mircești, Leova, and Purcari regions. Physicochemical analyses, performed according to the methods recommended by the OIV, revealed comparable values for the same cultivar grown in different areas. These findings indicate relative stability of the basic compositional parameters, while territorial differences are more pronounced at the phenolic and sensory levels. Total phenolic content varied according to both variety and geographical origin. Fetească Neagră exhibited higher values, reaching by 42 % more in the Mircești area, whereas Rară Neagră showed lower concentrations, with a minimum in Bugeac region. Anthocyanin concentration followed a similar trend, with Fetească Neagră attaining a maximum in Mircești by 48 % compared to Purcari, while Rară Neagră wines had an insignificant difference. Color intensity reached 0.67 in Fetească Neagră from Mircești, while Rară Neagră consistently displayed lower values of approximately 0.23, irrespective of region. Hue values indicated territorial variability in Rară Neagră, with 1.05 in Mircești and 0.861 in Bugeac. These results confirm that cultivar is the primary determinant of phenolic potential, whereas terroir modulates its expression by influencing the accumulation and stability of phenolic compounds. Pedological and climatic variability contribute to the differentiation of chromatic and structural profiles without substantially altering fundamental physicochemical parameters. The valorization of indigenous varieties such as Fetească Neagră and Rară Neagră contributes to the preservation of viticultural biodiversity and the consolidation of geographical identity. Correlating phenolic profiles with geographical origin provides a foundation for enhancing the competitiveness of the national wine sector in alignment with bioeconomy principles and climate change adaptation strategies.

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