

INFLUENCE OF PULSATING ELECTRIC FIELD (PEF) PRE-TREATMENT ON THE EXTRACTION EFFICIENCY OF PHENOLIC COMPOUNDS FROM GRAPE MARC

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The extraction efficiency of bioactive compounds (CBA) can be increased by using the pulsating electric field (PEF) due to the electroporation phenomenon, which influences the permeability and rupture of cell membranes. This phenomenon facilitates the extraction of soluble intracellular compounds without significant increase in temperature, without chemical or physical changes in the plant matrix. The aim of the research was to establish the influence of PEF and extraction temperature (t) on tannins content extraction (CT), antioxidant activity (AA) and the composition of red grape seed extracts (EtOH, 60% (v / v)).

It has been shown that PEF parameters, especially the voltage (U) have influenced the rate of tannins extraction, due to the increased permeability of cell membranes. The number of pulses (n) had a lower influence than U. The t had a synergistic effect with the PEF parameters on the tannins yield, as it significantly influenced the fluidity and stability of the cell membrane in the grape seed matrix. At 30°C the phospholipids are packaged in a gel-like structure and their order of extraction decreases with increasing t of the extractant. At 65 ° C the structure of phospholipids changes from the gel phase to a liquid crystalline structure, affecting the stability of the cell membrane. Extraction at 65°C assisted by PEF (U = 165 V, n = 900) contributed to the increase of tannins yield 2.45 times compared to the conventional extraction method.

The AA of grape seed extracts corresponds to the extraction yield of tannins and constitutes 80.13 – 92.70% of inhibited DPPH. The correlation between CT-AA is $R^2 = 0.928$, demonstrating that the evolution of AA depending on the PEF and t extraction parameters is synergistic with the tannins extraction rate. Phenolic compounds extracted from grape seeds were identified and quantified (HPLC). Experimental data show the presence of 10 identified phenolic compounds: vanillin, resveratrol, qercetin and cinnamic acids, p-hydroxybenzoic, floretic, vanillic, gallic, p-coumaric and caffeic. Another 7 present phenolic compounds could

not be identified. The presence of catechin and epicatechin, as well as conjugated polyphenols and their ester derivatives were not attested in this study. Resveratrol (0.047mg/g) was also extracted from grape seeds. The predominant compounds, in descending order, are: vanillic acid – 0.413 mg/g; caffeic – 0.183 mg/g and gallic acid- 0.107 mg/g. This composition reflects a high biological activity of phenolic compounds in grape seeds.

In order to establish the combined influence of t , n and U on CT and AA, the sensitivity analysis was used by applying the first-order Sobol index. Temperature has the greatest influence on CT and AA, n and U is lower than t . The three factors (t , n and U) have more influence on CT and AA at low temperatures (here at 30°C). According to the results of the study, PEF technology presents a promising alternative for CBA extraction from grape seeds, compared to the conventional extraction method.

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