

Study of the Effect of High Pulsed Electric Field (HPEF) on Antioxidant Activity in Robusta Coffee (Coffea canephora).

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ABSTRACT

Robusta coffee contains phenolic compounds and flavonoids that act as natural antioxidants; however, the roasting process can reduce antioxidant activity due to the thermal degradation of bioactive compounds. This study aimed to determine the effect of High Pulsed Electric Field (HPEF) treatment on the antioxidant activity of Robusta coffee, applied either before roasting (HPEF-BR) or after roasting (HPEF-AR). An experimental method using a factorial Completely Randomized Design (CRD) was employed, involving three factors: HPEF application timing, electrode distance (0.5 cm and 1.5 cm), and treatment duration (1, 3, and 5 minutes). Antioxidant activity was assessed using the DPPH method, while bioactive compounds were analyzed via UV-Vis spectrophotometry. The HPEF treatment utilized a voltage of 15 kV. The results indicated that HPEF treatment facilitated the extraction of antioxidant compounds, resulting in higher measurable antioxidant yields. The highest antioxidant activity was observed in the AR treatment with a distance of 0.5 cm and a duration of 3 minutes ($41.24 \pm 0.692\%$), compared to $13.12 \pm 0.449\%$ for the untreated coffee. Post-roasting HPEF treatment also yielded higher levels of flavonoids, phenols, tannins, and caffeine compared to the control. The enhancement in antioxidant activity was attributed to HPEF-induced electroporation and the formation of melanoidin compounds during roasting.

Keywords: *robusta coffee, HPEF, antioxidant, DPPH, bioactive compounds.*