

The Effect of High Pulsed Electric Field Pre-treatment on the Characteristics of Basil Essential Oil Through Steam Distillation

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ABSTRACT

*This study aims to analyze the effect of High Pressure Electric Field (HPEF) treatment on the steam distillation of basil (*Ocimum basilicum* L.) essential oil through mass balance, energy balance, energy efficiency analysis, and compound characterization using Gas Chromatography–Mass Spectrometry (GC-MS), as well as statistical analysis using SPSS with Duncan’s multiple range test. The GC-MS analysis results showed that the essential oil was dominated by compounds such as linalool, eugenol, and methyl chavicol. The HPEF treatment increased the intensity of volatile compounds without significantly altering the chemical composition. Statistical analysis indicated that HPEF treatment had a significant effect on increasing essential oil yield ($p < 0.05$), which was further confirmed by Duncan’s test showing significant differences among treatments. The mass balance showed that the total mass input of 22.000 kg was equal to the total mass output of 22.000 kg. The energy balance indicated that the total energy input was 16,427.13 kJ, with useful energy of 1,267.41 kJ and energy loss of 15,159.72 kJ. The energy efficiency of the process was 7.72%. The results demonstrate that HPEF treatment can improve the performance of essential oil extraction, although the energy efficiency of the steam distillation process remains relatively low.*

Keywords: *HPEF, GC-MS, SPSS, Duncan test, mass balance, energy balance, energy efficiency, essential oil.*