

Intensification of the Solvent Extraction of *Rhus tripartitum* Bioactive Molecules Using Instant Controlled Pressure Drop (DIC)

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Abstract:

This article discusses the use of Instant Controlled Pressure Drop (DIC) as a pre-treatment stage to intensify the solvent extraction of total phenols and more especially tannins from the bark of African sumac (Tunisian *Rhus tripartitum*). Total phenol and tannin contents were determined using the spectrophotometric Folin–Ciocalteu method and external calibration with Gallic acid. We used DIC with two processing parameters in a 5-level central composite Design of Experiment to study the yields of total phenol and tannin as the dependent variables. The results obtained confirmed that the DIC operating parameters, which were saturated steam pressure and total heating time, were significant for both dependent variables. The optimum predictive values for DIC treated bark were 280.66 Gallic Acid Equivalent/g dry basis (GAE/g db) for total phenol and 51.79mgGAE/g db for tannins, compared with 207.5 and 33.4mg GAE/g db with untreated raw material. In terms of total phenol extraction kinetics, the starting accessibility δX_s and effective diffusivity D_{eff} were calculated to be 0.17gGAE/g db and $1.26 \times 10^{-10} \text{m}^2 \text{s}^{-1}$, respectively, for DIC treated material at a steam pressure of 0.37 MP and a processing time of 37s, compared with 0.15 g GAE/g db and $1.18 \times 10^{-10} \text{m}^2 \text{s}^{-1}$ for raw material. Moreover, all DIC treated samples exhibited higher antioxidant activity compared to the raw material. A positive correlation was established between the total phenol content and the % DPPH free radical scavenging activity. The overall findings demonstrate that DIC increases the extraction efficiency for both total phenols and tannins, thus rendering *Rhus tripartitum* bark a promising source of natural antioxidants.