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Abstract

Modeling of the Fluidized Bed Drying Process of Pirul (*Schinus molle* L.) Leaves †

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The pirul tree (*Schinus molle* L.) is utilized for the recovery of essential oil obtained from its bark, leaves, and fruits, and the phenolic compounds contained in its leaves have demonstrated antimicrobial activity. For the extraction of these and other compounds of interest, a preliminary drying of the leaves is carried out, which promotes contact between the solvent and the vegetal material by maximizing the mass transfer area. Drying involves complex heat and mass transport phenomena, and a proper analysis of this process would allow for the optimization of this energy-intensive operation. An estimation of mass and energy transfer properties is required for the design of drying processes and equipment. The objective of this study was to estimate the diffusivity coefficients and activation energy during the fluidized bed drying process of pirul tree leaves. Drying was performed in a fluidized bed dryer at temperatures of 50, 60, and 70 °C. According to the results, the drying times ranged from 270 to 135 min. Effective diffusivity was determined by numerically solving Fick's second law, obtaining values from 1.64 to 3.03 $\times$ 10^{-11} m^2 s^{-1}, with an activation energy of 19.92 kJ mol^{-1}. Additionally, the retention of total flavonoids (TFs) during the drying process was evaluated using spectrophotometry with an Al_2Cl reagent, revealing that the drying process had no significant effect ($p < 0.05$) on the TF content, with values of 35.8 $\pm$ 0.7 mg quercetin equivalents/g leaf (d.b.). The obtained results will enable the design of processes for the drying of pepper tree leaves as a pretreatment for obtaining extracts with antimicrobial activity.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/proceedings2024105064/s1.

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