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MICROWAVE DRYING OF TOMATO SLICES: AN EVALUATION OF ARTIFICIAL NEURAL NETWORK (ANN) AND ADAPTIVE NEURO-FUZZY INFERENCE SYSTEM (ANFIS) MODELS

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ABSTRACT

This study used two methodologies to model microwave drying kinetics of tomato slices: artificial neural networks (ANN) and the adaptive neuro-fuzzy inference system (ANFIS). The tomatoes were pre-treated with water blanching (WBP), ascorbic acid (AAP), and sodium metabisulphite (SBP). The tomatoes were then dried in the microwave at 90, 180, and 360 W after being sliced into 4-, 6-, and 8-mm thicknesses. After fitting ANN and ANFIS models to the experimental drying data, the optimal model topology was identified. The predictive accuracy of these models was assessed through these metrics: the coefficient of determination (R^2), mean squared error (MSE), root mean squared error (RMSE), and mean absolute error (MAE), by contrasting the projected results with experimental data. The results showed a range of 0.92 to 3.75 h for drying time, 0.28 to 2.86 x 10^{-8} m^2/s for D_{eff}, and 0.0027 to 0.0063 kWh/kg for SEC. The results indicated a high-performance capacity of ANFIS compared to ANN, with a higher R^2 of 1.0000 and a lower MSE of 0.9999 to 1.0000, an RMSE of 1.45x10^{-11} to 0.00309, and a MAE of 1.15x10^{-11} to 0.00296. Consequently, the ANFIS model demonstrated superior predictive capabilities compared to the ANN model, achieving a strong fit with the observed data.