The drying kinetics of kale (Brassica oleracea) in a convective hot air dryer

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Abstract

The effect of air temperature and sample thickness on the drying kinetics of kale was investigated using a convective air dryer at a fixed airflow rate of 1 m/s and drying air temperatures of 30, 40, 50 and 60 °C. The sliced kale leaves were dried in wire trays in 10, 20, 40 and 50 mm thick layers. The drying rate increased with drying air temperature but decreased with layer thickness. The effective diffusivity for 10 mm thick layers was found to increase with the drying air temperature and ranged between 14.9 and 55.9 × 10^{-10} m^2/s. The effect of temperature on diffusivity could be expressed by an Arrhenius type relationship with a high R^2 of 0.9989. The activation energy of kale was found to be 36.115 kJ/mol. When four drying models were developed using the experimental data the Modified Page model was found to be marginally better than the other models in estimating the drying curve over the experimental temperature range.

Keywords: Kale; Drying time; Modeling; Diffusivity; Activation energy