Modelling effective moisture diffusivity of pumpkin (Cucurbita moschata) slices under convective hot air drying condition

ABSTRACT

This study seeks to investigate the effects of temperature (50, 60, 70 and 80 °C) and material thickness (3, 5 and 7 mm), on the drying characteristics of pumpkin (*Cucurbita moschata*). Experimental data were used to estimate the effective moisture diffusivities and activation energy of pumpkin by using solutions of Fick's second law of diffusion or its simplified form. The calculated value of moisture diffusivity with and without shrinkage effect varied from a minimum of 1.942×10^{-8} m^2/s to a maximum of 9.196×10^{-8} m^2/s, while that of activation energy varied from 5.02158 to 32.14542 kJ/mol with temperature ranging from 50 to 80 °C and slice thickness of 3 to 7 mm at constant air velocity of 1.16 m/s, respectively. The results indicated that with increasing temperature, and reduction of slice thickness, the drying time was reduced by more than 30 %. The effective moisture diffusivity increased with an increase in drying temperature with or without shrinkage effect. An increase in the activation energy was observed due to an increase in the slice thickness of the pumpkin samples.

Keyword: Mathematical modelling; Pumpkin; Thin layer drying; Moisture diffusivity; Shrinkage