Abstract

Button mushroom slices were dried using freeze-drying (FD) and freeze-drying combined with microwave vacuum drying (FD + MVD) methods. Drying parameters including drying temperatures (20, 30, and 40 °C), chamber pressures (70, 100, and 130 Pa) and material layer thicknesses (single, double, and triple) during FD process, and microwave power densities (20, 40, and 60 W/g) and material layer thicknesses (single, double and triple) during MVD period of FD + MVD process, were investigated for their drying characteristics. The FD and FD + MVD products were then rehydrated at two temperatures (20 and 70 °C).

Different mathematical models were tested with the drying and rehydration behaviors of button mushroom slices, and the effective diffusivities (D_{eff}) in the FD and FD + MVD processes were also calculated. The results indicated that based on the statistical tests, the Page model and logarithmic model provided the best fit for FD (in both FD and FD + MVD processes) and MVD (in FD + MVD process) curves, respectively. The regression equations obtained from selected models can accurately predict the relationships between moisture ratio (MR) and time (t).

Furthermore, the D_{eff} values of the MVD period in FD + MVD process ($2.318–5.565 \times 10^{-5}$ m^2/s) were about ten times greater than those in FD process ($1.291–3.389 \times 10^{-6}$ m^2/s). In addition, the Peleg model gave a better fit for rehydration conditions applied in both FD and FD + MVD products. The values of equilibrium moisture content (W_e) of FD + MVD products were almost similar to those of FD products, which indicated that the rehydration capacities of the two dehydrated products were comparable.