Investigating the influence of novel drying methods on sweet potato (Ipomoea batatas L.): kinetics, energy consumption, color, and microstructure

ABSTRCT

This study investigated the drying kinetics, specific energy consumption (SEC), color, and microstructural changes of sweet potato (Ipomoea batatas L.) based on experimental set-up of convective hot-air drying (CHAD), infrared drying (IRD), and combined infrared and convective-hot-air drying (IR-CHAD). The experiments were carried out at three air temperatures (50, 60 and 70 °C) and two IR intensities (1,100 and 1,400 W/m2) for sweet potato slices of 4 and 6 mm, respectively. The experimental results showed that the drying kinetics and mass transfer characteristic were significantly affected by drying air temperature, IR intensity, and thickness of the product. Combined IR-CHAD provided a higher drying rate with the shortest drying time when compared with CHAD and IRD. The IRD resulted in the lowest SEC values. The combined IR-CHAD resulted in 69.34–85.59% reduction in the SEC of CHAD. For combined IR-CHAD, an increase in the IR intensity at each temperature and slice thickness caused a decrease in the total SEC value. Dried sweet potato slices using CHAD and IR1-CHAD at intensity of 1,100 W/m2 showed the best color attributes. Combined IR-CHAD proved to be a very efficient drying method for the drying sweet potato and can be used for both industrial and commercial purposes.

Keyword: Specific energy consumption (SEC); Sweet potato (Ipomoea batatas L.); Convective hot-air drying (CHAD); Infrared drying (IRD).