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Microwave vacuum drying and multi-flash drying of pumpkin slices

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ABSTRACT

In this study, the effect of different drying methods on the drying kinetics, product structures, rehydration kinetics and rehydration indices of dehydrated pumpkin slices was evaluated. For that, pumpkin slices were dehydrated by five different methods: i) Microwave multi-flash drying (MWMFD), ii) Microwave vacuum drying (MWVD), iii) Conductive multi-flash drying (KMFD), iv) Freeze-drying (FD), and v) Air-drying (AD). For reaching a moisture content of 0.022 g g⁻¹ (dry basis, db) and water activity of 0.438, the drying times were 1.28 h for MWVD, 1.32 h for MWMFD, 3.50 h for KMFD, 16.33 h for AD and 16.67 h for FD. All the drying methods presented a constant drying rate period and a falling rate period. The highest constant drying rate was observed for MWVD, which was 1.3, 8, 22 and 53 times higher than the observed for MWMFD, KMFD, AD, and FD, respectively. Stereo micrographs of samples from multi-flash drying processes (KMFD and MWMFD) and from MWVD showed large pores in a highly porous structure. Rehydration of dried pumpkin slices was studied at 25°C and 80°C. Water temperature influenced samples rehydration ratio ($RR = \text{mass of rehydrated sample}/\text{mass of dried sample}$). RR up to 15 was observed at 25°C, while RR up to 12 was observed at 80°C. Samples from MWMFD and MWVD, rehydrated at 25°C presented higher moisture after rehydration than those observed from AD, FD and KMFD samples. At 80°C, FD samples showed the highest RR . From the whole results, one can conclude that MWVD and MWMFD are the suitable processes for producing dehydrated pumpkin slices in very short drying times.

Keywords: drying; microwave; vacuum; multi-flash; freeze-drying; rehydration.

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