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Drying Kinetics and Characterisation of Dried Osmotically Pretreated White-Flesh and Yellow-Flesh Cassava (*Manihot esculenta*)

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Abstract

Cassava is subject to rapid post-harvest physiological deterioration. Therefore, there is a need to process cassava into other shelf-stable forms. Dehydration by osmotic process followed by drying was conducted as a means to achieve this. In this study, the drying conditions for previously osmotically dehydrated (OSD) cassava was optimised. White-flesh and yellow-flesh cassava cubes were dehydrated at 45 °C in a 70 o brix salt-sugar osmotic solution and dried in a precision dryer at different temperatures (50, 65, 80 °C) and air velocities (0.5, 0.9, 1.3 m s^{-1}). Based on a 3-level factorial experimental design with optimisation criteria of minimum dryer energy consumption, shrinkage, drying energy, drying time (to 10 % moisture content) and maximum diffusivities, the optimum conditions for drying of pre-dehydrated (PDH) cassava of both varieties of was 80 °C at 0.5 m s^{-1}. The quadratic and linear models generated from the response surface were significant ($P1, = 1, < 1, 0.0001$ to 0.0142) and had insignificant lack of fit ($p = 0.1605$ to 0.2266). During drying, moisture ratio (MR) of PDH cassava cubes decreased with increase in drying temperature, while drying air velocity did not considerably affect MR. By fitting MR data to logarithmic, two-term, Henderson-Pabis, and Newton models, the Newton model was considered preferable to describe the MR. Diffusivities increased significantly with drying air temperature and air velocity during drying. Drying rate versus time, and drying rate versus moisture content relationships was fitted best by Peleg model. The colour, shrinkage, total cyanogenic potential and total carotenoids contents were significantly influenced by drying conditions. Electron micrographs of dried cassava cubes reveal cell wall collapse and loss of granular starch compared to the relatively intact cellular structure and starch granules of dried non-dehydrated (NDH) cassava.

Keywords: Air velocity, cassava, drying rate, moisture ratio, response surface method

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