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Osmotic Dehydration Kinetics and Effects on Desorption Isotherms, Color, Shrinkage and other Properties of White-Flesh and Biofortified Yellow-Flesh Cassava during Dehydration

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Dehydration of dices of white-flesh and yellow-flesh cassava varieties from high to intermediate water activity was conducted using osmotic solutions of salt, sugar, and salt-sugar at different temperatures (30-60°C), and concentrations (10-70°Brix) Kinetics of water loss (WL) and solids gain (SG) was observed by fitting data to four osmotic dehydration (OD) models (Page, Weibull, Azuara, and Peleg). The best conditions selected for OD, judged by highest WL and WL/SG ratio, was obtained by using 70 °Brix salt-sugar solution at 45°C, where estimated WL was 0.5220 g/g and 0.7197 g/g, estimated SG was 0.2934g/g and 0.2778 g/g, and WL/SG ratio was 1.779 and 2.591, for white-flesh and yellow-flesh cassava, respectively. Estimated WL, SG, and WL/SG ratio increased with concentration of salt-sugar solution, but varied with temperature. Multiple linear regression equations of high R^2 (0.6368-0.9988) and adjusted R^2 (0.5642-0.9979), and low MAPE (0.67-11.49%) were derived to estimate WL and SG. Over 300-minute OD process at selected conditions, water activity (a_w) at 23°C, 34°C and 45°C reduced from 0.94 to 0.75, 0.98 to 0.78, and 0.99 to 0.78, respectively, for white-flesh cassava; whereas a_w reduced from 0.96 to 0.74, 0.98 to 0.76 and 0.99 to 0.78, respectively, for yellow-flesh cassava. Sorption isotherm models were also used to fit moisture sorption data and to explain a_w-moisture content relationships during OD. Net isosteric heat of desorption data were calculated. The surface colour lightness, L*, and whiteness, W, reduced significantly, while yellowness, b*, increased significantly for white cassava at selected OD conditions. Preliminary results also revealed OD and subsequent drying significantly reduced total cyanogenic glucosides (assayed as total HCN equivalents). Shrinkage of yellow-flesh cassava was more than for white-flesh cassava, as also observed from scanning electron images. Osmotic dehydration may be useful for reducing water activity of cassava prior to drying.

Keywords: Cassava dice, Diffusivity, Moisture ratio, Osmotic dehydration, Water activity

Biography:

Oluwatoyin Ayetigbo is working as a junior researcher in the Universität Hohenheim, Germany. His main specialization in the Agricultural engineering and basically his researches and publications are on the Agricultural Engineering in the tropics and sub tropics.