



Tropentag, September 17-19, 2018, Ghent

“Global food security and food safety:
The role of universities”

Effects of Temperature and Concentration of Osmotic Solution on Osmotic Dehydration Kinetics of Cassava

OLUWATOYIN AYETIGBO¹, SAJID LATIF¹, ADEBAYO ABASS², JOACHIM MÜLLER¹

¹University of Hohenheim, Inst. of Agric. Sci. in the Tropics (Hans-Ruthenberg-Institute), Germany

²International Institute of Tropical Agriculture (IITA), Tanzania

Abstract

Dehydration of dices ($11 \times 11 \times 10$ mm) 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°e/sol of $1:20$). Kinetics of water loss (WL) and solids gain (SG) was observed from 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 by using 70°Brix salt-sugar solution at 45°C , where estimated WL was 0.5220 g g^{-1} and 0.7197 g g^{-1} , estimated SG was 0.2934 g g^{-1} and 0.2778 g g^{-1} , 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. Generally, Peleg parameters reduced, while Azuara parameters increased, with increase in temperature at selected conditions. Multiple linear regression equations of high R^2 (0.6368 – 0.9988) and adjusted R^2 , and low MAPE (0.67 – 11.49%) were derived to estimate WL and SG. Trends in diffusivity, and Page model fit of moisture ratio and solids ratio, and normalised moisture and normalised solids contents, were also observed. Over the 300-minute OD process at selected conditions, water activity 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; and from 0.96 to 0.74 , 0.98 to 0.76 and 0.99 to 0.78 , respectively for yellow-flesh cassava. The CIE 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 reduced total cyanogenic glucosides (assayed as total HCN equivalents) in the white-flesh cassava from $72.6 \mu\text{g g}^{-1}$ to $27.9 \mu\text{g g}^{-1}$. Osmotic dehydration may thus be useful for reducing water activity of cassava prior to drying.

Keywords: Cassava dice, diffusivity, moisture ratio, osmotic dehydration, water activity