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Foam Mat Drying of Yellow Cassava Using Egg Albumin and Properties of the Associated Products

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Abstract

The main challenges of the use of fresh cassava as food are the rapid post-harvest deterioration and the toxicity due to the presence of cyanogenic glucosides. Foam-mat drying (FMD) was considered to solve these problems. Response surface method was used to optimise the foaming variables. Five independent variables were considered including pulp concentration (20, 25, 30 %), holding time (1, 3, 5 days), concentration of foaming agent (egg albumin) (2, 16, 30 %), concentration of stabiliser (NaCMC) (0.1, 0.8, 1.5 %), and whipping time (1, 3, 5 min). Two responses were measured: foam overrun (FO) and air volume fraction (AVF). The optimum foaming variables were achieved when pulp concentration was 20 %, holding time was 1 day, concentration of egg albumin was 30 %, concentration of NaCMC was 0.1 %, and whipping time was 5 min. The predicted and validated FO were 33.9 % and 30.2 %, respectively, and the predicted and validated AVF were 0.25 and 0.23, respectively. Drying kinetics at 70 °C showed that Page model was the best model to describe moisture removal ratio, and cassava foam dried faster than the non-foamed cassava pulp. The total carotenoids content (TCC) reduced significantly with FMD. The cyanogenic glucosides content (CGC) of the cassava foam powder was 10.6 g/g. The foam air bubbles size and the pulp starch granules size had slight positive skew probability distribution. Luminosity (L^*) increased with FMD. The water absorption capacity (WAC) of the foam powder was 0.89 g/g and the oil absorption capacity (OAC) was 0.73 g/g. The swelling power (SP) and solubility of the foam powder was 966.9 % and 38.2 % respectively. The foam powder required a least gelation concentration of 6 % w/v and the pulp powder required 20 % w/v. Freeze thawing led to syneresis of 38.7 % water from the foam powder and 17.2 % from the pulp powder. The viscosity of the foam powder and the pulp powder at different temperatures (25, 55, 85 °C) and shear rates (100, 300, 500, 700, 900 s⁻¹) showed that the powders had pseudoplastic, non-Newtonian rheology.

Keywords: Carotenoids, cassava foam, egg albumen, foam mat drying, viscosity