Tropentag, September 17-19, 2018, Ghent

"Global food security and food safety:
The role of universities"

Optimisation of Cassava Foaming for Foam-Mat Drying, and Use in Cream-Based Foods

Oluwatoyin Ayetigbo[1], Sajid Latif[1], Adebayo Abass[2], Joachim Müller[1]

[1] *University of Hohenheim, Inst. of Agric. Sci. in the Tropics (Hans-Ruthenberg-Institute), Germany*
[2] *International Institute of Tropical Agriculture (IITA), Tanzania*

Abstract

Cassava foam was produced from cassava pulp (ca. 1.5°Brix, 1.005 g mL^{-1}) by whipping two varieties of cassava (white-flesh from Costa Rica, & yellow-flesh, IITA-TMS-IBA 011368) with foaming agent (20 % w/w GMS colloid) and stabiliser (NaCMC). Cassava foam was optimised for three independent variables: concentration of foaming agent (5 %, 10 %, 15 %), concentration of stabiliser (0.2 %, 0.4 % 0.6 %), and whipping time (2 min, 4 min, 6 min). Using a Box-Behnken experimental design, two responses were measured: foam expansion (%) and foam density (g mL^{-1}). Foam collapse (%) was also determined. Based on optimisation criteria of maximum foam expansion and minimum foam density, white-flesh cassava pulp required 14.97 % GMS, 0.51 % NaCMC, and 2.07 min to yield a foam of 52.63 % expansion, and density of 0.75 g mL^{-1}. Also, yellow-flesh cassava pulp required 14.29 % GMS, 0.6 % NaCMC, and 2 min to yield a foam of 48.25 % expansion, and density of 0.76 g mL^{-1}. Responses were adequately predicted by quadratic regression equations of the response surface method as 54.9 % foam expansion and 0.73 g mL^{-1} foam density for white-flesh cassava foam; and 49.86 % foam expansion and 0.73 g/mL foam density for yellow-flesh cassava foam. White-flesh and yellow-flesh cassava foams were stable, and both had low foam collapse of 1.79 % and 1.26 %, respectively. Foam produced was used to completely substitute milk cream in making of ice-cream; and as complement in salad mayonnaise. The cassava foam could also be dried into a foam powder for reconstitution. Preliminary results reveal foaming and drying white-flesh cassava foam powder at 55°C reduced total cyanogenic glucosides (assayed as total HCN equivalents) from 141.5 μg g^{-1} to 20.5 μ g^{-1}. Cassava foam substitution/complementation may be a healthy option suitable for vegetarians and vegans, and reduce need for animal fat in cream-based foods.

Keywords: Cassava foam, foam-mat, optimisation, response surface method, stabiliser

Contact Address: Oluwatoyin Ayetigbo, University of Hohenheim, Inst. of Agric. Sci. in the Tropics (Hans-Ruthenberg-Institute), Garbenstr. 9, 70599 Stuttgart, Germany, e-mail: ayetigbo_oluwatoyin@uni-hohenheim.de