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# Physical properties of foam powder produced from white-fleshed and yellow-fleshed cassava (*Manihot esculenta*) varieties

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**Abstract**

Cassava is susceptible to accelerated physiological deterioration after harvest, and when stored in the fresh state, it may result in huge economic losses and food insecurity among 500 million people who depend on it for food and livelihood in Africa, South America and Southeast Asia. Processing cassava by foam mat drying (FMD) has shown important advantages in previous studies such as improved carotenoids retention, reduction of cyanogenic glucosides to safe levels, improved functional properties and improved colour. The cassava foam powder (CFP) produced by FMD can be regarded as a stable, functional cassava product that may be reconstituted in food preparations.

Until now, no study about physical properties of CFP came to our knowledge. Therefore, this study evaluated the physical properties of CFP produced from white and yellow cassava varieties, and compared them with cassava pulp powder (CPP) i.e. non-foamed powder. Cassava foams prepared under optimal conditions were dried and milled to foam powder. The white CFP and yellow CFP had true density of 1.466 g $cm^{-3}$ and 1.534 g $cm^{-3}$, respectively, and porosity of 59.0 % and 62.8 %, respectively. The flow properties determined include Carr's index (CI), Hausner ratio (HR), angle of repose ( ) and coefficient of static friction ($\mu$s). The CFPs had better flow properties compared to the CPPs. Electron micrographs of the CFPs revealed that the foam powders were irregular, coalesced, and larger in particle size than CPPs, which were regular, discrete and smaller in particle size. All the powders had normal probability distribution in particle sizes. The rehydration kinetics simulated by the Azuara model showed an estimated equilibrium water gain (WGeq) of 0.760-1.429]g $g^{-1}$ at temperatures between 30 °C and 70 °C. The CFPs had a higher rehydration capacity than CPPs. Rehydration capacity of the powders increased with temperature. Adsorption isotherm of the powders was best fit by the Halsey model, and revealed type III sorption isotherm profiles. The Guggenheim-Anderson-De Boer (GAB) monolayer moisture content of the powders ranged between 0.036-0.092 g $g^{-1}$ db. FMD may have improved flow properties and rehydration of cassava.

**Keywords:** Adsorption isotherm, cassava, foam mat drying, foam powder, physical properties, rehydration

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