Tropentag, September 16-18, 2026, hybrid conference

"Towards multi-functional agro-ecosystems
promoting climate resilient futures"

Nutritional, pasting, and sensory attributes of some ghanaian cereals-, root-, tuber-, and plantain-based complementary blends as influenced by spontaneous fermentation

Richard Atuna[1], Fortune Akabanda[2], Jan Makurat[3], Ursula Bordewick-Dell[4], Matthias Lamping[5], Guido Ritter[6], Francis Kweku Amagloh[7]

[1] *University for Development Studies, Food Science and Technology, Germany*
[2] *University for Development Studies, Food Science and Technology,*
[3] *Muenster University of Applied Sciences, Department of Food-Nutrition-Facilities,*
[4] *Muenster University of Applied Sciences, Department of Food-Nutrition-Facilities, Germany*
[5] *Muenster University of Applied Sciences, Department of Food-Nutrition-Facilities, Germany*
[6] *Muenster University of Applied Sciences, Food Science and Technology, Germany*
[7] *University for Development Studies, Ghana*

Abstract

Despite the potential of spontaneous fermentation (SF) to enhance food quality, there is a gap in understanding its impact on the nutritional, rheological, functional, and sensory properties of Ghanaian cereal-, root-, tuber-, and plantain-based complementary blends. This study investigated the influence of SF on these qualities in these blends formulated from selected cereals, roots, tubers, and plantain. Complementary blends were formulated using unfermented or fermented cereals (maize, sorghum, millet), sweetpotato, cassava, and plantain. Nutritional, antinutrients, pasting, and functional properties were determined using standard protocols. Gruels from formulations underwent consumer acceptability tests with 210 untrained panellists. Sensory attributes, including appearance, aroma, taste, mouthfeel, and overall acceptance, were evaluated using a 9-point hedonic scale (1 = extremely dislike to 9 = extremely like). SF did not significantly alter crude protein content ($p = 0.182$), though slight increases were observed. SF significantly decreased ($p < 0.01$) crude fibre content across all blends, except for millet- and sorghum-based blends. The calorific value did not differ much after SF, except for the millet-based blend, which showed a 3.2 % decline. A slight increase in iron was observed in starchy roots, tubers, and plantain-based formulations after SF. However, SF led to a 43.6 % decrease ($p < 0.001$) in the sorghum mix. Zinc levels increased 20.4 % in the cassava-based, 57.7 % in sweetpotato-based, 113.0 % in plantain-based, 21.9 % in sorghum, and 13.6 % in millet blends after SF. Phytate levels were reduced by 26.1 %, 40.0 %, and 27.9 % in maize, millet, and sorghum mixes, respectively. The phytate/minerals molar ratios declined significantly with SF across the blends. Although the sweetpotato-based blends showed no aflatoxin contamination, the aflatoxin levels in millet and sorghum mixes declined by 1.5- and 1.03-fold, respectively, following SF. The setback, peak, trough, and final viscosities increased substantially ($p < 0.001$) in all blends following SF, except cassava- and plantain-based blends. Unfermented gruels generally received higher median scores in consumer acceptance than fermented products, with cereal-based gruels scoring higher than the cassava-

Contact Address: Richard Atuna, University for Development Studies, Food Science and Technology, Niesingstraße 53, 48151 Münster, Germany, e-mail: ratuna@uds.edu.gh

and plantain-based gruels. SF improved key nutritional (phytate reduction, slight protein increase) and functional attributes of the blends, highlighting its value for local complementary foods.

Keywords: Cassava, cereal, complementary blend, phytate, spontaneous fermentation, sweetpotato