Tropentag, September 16-18, 2026, hybrid conference

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

Relating phenotypic traits, aroma and untargeted metabolomes of boiled sweet potato from Uganda

Ayetigbo Oluwatoyin[1], Mariam Nakitto[2], Edward Wake[3], Edwin Serunkuma[2], Theo Troncho[1], Otmane Ghanem[1], Julien Petit[1], Santiago Arufe-Vilas[1], Christophe Bugaud[1], Zoe Deuscher[1], Gabriela Burgos[4], Hannele Lindqvist-Kreuze[4], Reuben Tendo Ssali[2], Laura Perez-Fons[3], Marc Lebrun[1], Paul Fraser[3], Dominique Dufour[1]

[1] *French Agricultural Research Centre for International Development (CIRAD), France*
[2] *International Potato Center (CIP), Uganda*
[3] *Royal Holloway University of London, United Kingdom*
[4] *International Potato Center (CIP), Peru*

Abstract

Boiled sweet potato (SP) produced from nine sweet potato varieties harvested in Iganga and Buyende districts of Uganda were freeze-dried and milled into flour. The texture of boiled sweet potato was analysed by a standard texture profile analysis (TPA) procedure. Trained panellists rated boiled SP for twenty-two sensory attributes on ordinal intensity scales ranging from 0 (lowest) to 10 (highest). Microstructure, dry matter (DM), pasting properties, total pectin, swelling power, and solubility were determined in the raw and cooked states. Aroma composition was obtained by dynamic headspace-GCMS analysis and untargeted metabolomes were analysed by LCMS analysis.

Results show that instrumental hardness was associated with sensory hardness and mealiness, dry matter, swelling power, solubility, and paste viscosities (peak, trough, final), most evidently with genotype UGP202000232–12 of notable SP-like aroma and chalky appearance. Instrumental cohesiveness was associated with the genotype D20 which sensorially exhibited pumpkin-like aroma and odour and intense orange colour. Instrumental resilience and springiness was associated with a purple-fleshed genotype that was sensorially fibrous and had good recovery after deformation. Instrumental chewiness was associated with the genotype UGP202000296–42 which had high DM, sensory bitterness and hardness, and paste breakdown. Tanzania, NAROSPOT 7, UGP202000302–12, and UGP202000161–16 were sensorially moist and smooth. Pectin has no correlations with other phenotypic traits.

Scanning electron microscopy (SEM) showed that only UGP202000302–12 and UGP202000232–12 retained intact cells after cooking, with others having a continuous matrix indicative of cell-wall disruption and starch release. Boiled SP released 41 untargeted aromatic compounds including Ethanol, Toluene, Hexanal, m-xylene, Heptanal, D-Limonene, Eucalyptol, Octanal, Furfural, Benzaldehyde, Linalol, Isopropyl myristate, Phenol and trans-Geranylgeraniol.

Untargeted analysis of the SP panel indicates changes in metabolome composition after cooking, linked to the phenotypic classification based on texture parameters.

SP metabolome was strongly correlated with textural hardness, gumminess and flour solubility particularly after cooking.

Contact Address: Ayetigbo Oluwatoyin, French Agricultural Research Centre for International Development (CIRAD), 34398 Montpellier, France, e-mail: oluwatoyin.ayetigbo@cirad.fr

Strong correlations were observed between the metabolome of both raw SP and, particularly, cooked SP flour and textural hardness, gumminess and flour solubility. Over 150 chemical features were identified as robust differentiators for these textural parameters. These were putatively characterised as phenylpropanoids, monosaccharides and nitrogen-containing compounds.

Keywords: Aroma, boiled sweet potato, sensory, texture, untargeted metabolomics