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Phenotypic association of textural, sensory, physicochemical, and untargeted aroma of boiled yam in Nigeria

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Abstract

This study aimed to elucidate the relationships among the textural and physicochemical properties of boiled yam (BY) and to identify untargeted aroma features associated with BY quality. Twelve yam varieties harvested in Nigeria were freeze-dried, milled, and analysed using standard protocols. Texture was assessed through a penetration test, while nineteen trained panelists evaluated five 'champion' genotypes for two key sensory attributes of boiled yam: *yammy* and *earthy/woody* aroma. Dry matter (DM) content and colour parameters were measured in both raw and cooked samples. Aroma profiles were obtained using dynamic headspace GC–MS.

Dry matter content showed a significant correlation with penetration parameters associated with hardness. Principal component analysis (PCA), explaining 71.3 % of total variation, revealed that hardness was primarily associated with several *Dioscorea rotundata* genotypes, including Igangan, Meccakusa, TDr21002085, TDr1830024, and TDr1741006. In contrast, *D. alata* genotypes (Akuabata, Va yam, Ewura), the *D. rotundata* genotype Sharp Sharp, and the *D. dumentorum* genotype Esuru were more strongly linked to the fracturing/crumbling characteristics. Colour attributes also varied among genotypes: yellowness (b*) aligned with Igangan and TDr21002085, brownness (a*) with Sharp Sharp and TDa1665001, and lightness (L*) with Akuabata.

Sensory evaluation associated the *D. rotundata* genotypes Meccakusa and Favourite with the highest yammy aroma, whereas the *D. alata* genotype Akuabata had the least yammy aroma. More than 162 aroma compounds were detected, of which 43 were validated using the NIST20 spectral library and considered relevant to boiled yam quality. Some of these include furfural, ethyl acetate, pentanal, 2-pentylfuran, cyclohexanone, benzaldehyde, trans-2-nonenal, acetophenone, acetamide, phenol, and toluene.

Overall, the findings highlight the importance of integrating textural, physicochemical, sensory, and aroma data to better understand the quality attributes and underlying diversity of yam genotypes.

Keywords: Fracturing, hardness, penetration, sensory, untargeted aroma

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