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Linking consumer preferences, processing performance and demand-driven cassava breeding for inclusive food systems in sub-Saharan Africa

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Abstract

Cassava is an essential staple crop that contributes substantially to food security and rural livelihoods in sub-Saharan Africa. Building on earlier gains in yield, diseases resistance, and adaptation, cassava breeding programs are increasingly prioritizing consumer- and processing- relevant quality traits to support adoption, value addition, and market competitiveness. This requires reliable and scalable methods to measure the traits that matter to end users, while also recognizing that preferences are socially differentiated by gender, age, ethnicity, livelihood role and consumption practices. This study examined how consumer-informed quality traits can support demand-driven cassava breeding, strengthen value chain and improve livelihoods. Eighty cassava genotypes grown across three agroecological zones in Nigeria were processed into gari using participatory methods that reflect local practices. The final product (gari/eba) quality was assessed using both instrumental and sensory descriptive methods, including high-throughput near-infrared spectroscopy (NIRS), which offers a non-destructive and rapid multi-traits analysis method using the principle of interaction of chemical component of a material with light. A large-scale consumer study ($n = 600$) captured preferences across diverse social and cultural groups. Results indicate that key attributes such as colour parameters (a^* and b^*), gari solubility, textural cohesiveness drive consumer acceptance and are closely linked to processing efficiency, consistency and market competitiveness. Significant correlations were observed between instrumental and sensory attributes of gari/eba including hardness ($r = 0.79$) and cohesiveness ($r = 0.75$). NIRS also showed high prediction performance ($r^2 = 0.94$) for some traits, demonstrating potential for rapid screening and scalability in breeding programmes. By linking measurable quality traits with consumer preferences, this study provides cassava breeders a data-driven pathway for developing varieties with greater potential for adoption, thereby supporting inclusive value addition, improved livelihoods and enhancing food security through consumer-aligned breeding.

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Keywords: Cassava, cassava value addition, consumer preference, food security, rural livelihood

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