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Acceptability of Novel and Underutilized Staple Foods in Nigeria: A Scoping Review of Sensory Evaluation Studies

Abdullahi A. Bello

babdullahi867@gmail.com

Bayero University, Kano https://orcid.org/0009-0008-6842-0075

Abdulmalik O. Abdulwasiu

Bayero University, Kano

Systematic Review

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Abstract

Background

Despite the nutritional advantages of novel and underutilized staple foods—such as sweet potato garri, biofortified cassava, and composite flours—their successful adoption depends critically on consumer acceptability. In Nigeria, sensory evaluation studies provide valuable insights into which product attributes drive acceptance or rejection. However, these studies have not been systematically synthesized to guide product development and public health messaging.

Objective

This scoping review maps available evidence on the sensory acceptability of novel and underutilized staple foods in Nigeria, identifies key drivers and barriers to acceptability, and derives recommendations for promoting sweet potato garri and similar innovations.

Methods

A systematic search was conducted in PubMed, Google Scholar, and African Journals Online for sensory evaluation studies of staple foods conducted in Nigeria. Studies reporting hedonic ratings (e.g., 9-point scale), preference rankings, or willingness to consume were included. Data were extracted on product type, sensory attributes tested, panel characteristics, acceptability scores, and factors influencing acceptance.

Results

Seventeen studies met the inclusion criteria. Products evaluated included biofortified cassava (provitamin A), composite flours (cassava–soy, wheat–sweet potato), fermented cereal beverages (kunu, ogi), and sweet potato products (boiled, fried, chips). Across studies, **taste** was the strongest predictor of overall acceptability, followed by **texture** (especially for granular products like garri) and **color** (yellow/orange hues were acceptable when explained). **Familiarity** and **price** were key external factors. Sweet potato products generally scored ≥ 6 on 9-point scales (like slightly to like moderately), with lower scores when products deviated significantly from traditional appearance or taste. No published study has directly evaluated the sensory acceptability of sweet potato garri in Nigeria.

Conclusion

Sweet potato garri is likely to be acceptable to Nigerian consumers if it closely mimics traditional cassava garri in texture and taste, while the natural yellow/orange color can be framed positively as a

sign of vitamin A content. Sensory evaluation of sweet potato garri should be an immediate research priority. Successful promotion will require taste tests, positive messaging about health benefits, and price parity with cassava garri.

1. INTRODUCTION

Nutritionally improved staple foods - whether biofortified crops, alternative root products, or composite flours - offer a sustainable strategy to combat malnutrition (Nair, 2015). However, their public health impact depends entirely on adoption and sustained consumption. Even the most nutritious food will fail if consumers reject it due to unfamiliar taste, texture, color, or odor (Bechoff et al., 2015; Tomlins et al., 2017).

In Nigeria, several novel or underutilized staple foods have been developed: provitamin A-biofortified cassava, sweet potato garri, soy-enriched maize meal, and orange-fleshed sweet potato (OFSP) products. Sensory evaluation studies have assessed consumer responses to these products, but the findings are scattered across journals and have not been systematically synthesized.

The original comparative study (Bello et al., 2026) identified that sweet potato garri has significantly higher fibre and energy content than cassava garri, and may also deliver provitamin A if made from orange-fleshed varieties. However, the authors explicitly noted the absence of acceptability data as a limitation. Will Nigerian consumers accept a garri made from sweet potato, which differs in color (yellow/orange vs. white/cream) and possibly taste? This question must be answered before large-scale promotion.

This scoping review aims to: (i) identify and map all published sensory evaluation studies of novel or underutilized staple foods in Nigeria; (ii) extract key findings on acceptability levels and drivers; (iii) identify factors that predict consumer acceptance or rejection; and (iv) derive evidence-based recommendations for the development and promotion of sweet potato garri.

2. METHODS

2.1 Search Strategy

A scoping review was conducted following the PRISMA-ScR framework (Tricco et al., 2018). Searches were performed in PubMed, Google Scholar, and African Journals Online (AJOL) using keywords: “sensory evaluation” OR “acceptability” OR “consumer preference” OR “hedonic rating” AND “Nigeria” AND “staple” OR “cassava” OR “sweet potato” OR “garri” OR “maize” OR “yam.” No date restrictions were applied (up to March 2026).

2.2 Inclusion Criteria

- Studies reporting original sensory evaluation data (hedonic scales, preference ranking, willingness to pay/consume) for staple foods.
- Studies conducted in Nigeria with Nigerian consumers (adults or children).
- Products that were novel, biofortified, composite, or underutilized (not traditional white cassava garri or white rice as a control).
- Full-text available in English.

2.3 Exclusion Criteria

- Studies on non-staple foods (e.g., juices, snacks, biscuits unless specifically relevant).
- Studies with only objective (instrumental) texture/color analysis without consumer panels.
- Reviews, conference abstracts, or studies without quantitative acceptability scores.

2.4 Data Extraction

Data were extracted on: product description, processing method, panel size and characteristics, sensory attributes tested (taste, texture, color, aroma, overall), scale type, mean acceptability scores, and factors significantly affecting acceptability.

3. RESULTS

3.1 Study Selection and Characteristics

The search yielded 214 records. After screening, 17 studies met the inclusion criteria. The majority were conducted in southern (cassava- and yam-growing) regions, with a few from northern Nigeria. Panel sizes ranged from 20 to 120 participants, mostly semi-trained or untrained consumers. Nine-point hedonic scales (1 = dislike extremely, 9 = like extremely) were most common, followed by 5-point scales and ranking methods. Table 1 summarizes the included studies..

Table 1
Summary of sensory evaluation studies on novel/underutilized staples in Nigeria.

Product category	Specific product	Panel size	Key finding (acceptability)	Reference
Biofortified cassava	Provitamin A cassava (gari)	80	Acceptable when color explained; scores 6.5–7.2/9	Ilona et al., 2017
Biofortified cassava	Yellow cassava (boiled)	60	Similar to white cassava if texture not mealy	Oparinde et al., 2016
Composite flours	Cassava–soy garri	50	Acceptable up to 20% soy (7.1/9); >20% reduced taste	Okaka& Okechukwu, 2019
Composite flours	Wheat–sweet potato bread	100	Acceptable up to 30% sweet potato (6.5/9)	Okafor & Eze, 2018
Composite flours	Maize–soy ogi (pap)	45	Acceptable with sugar; scores 6.0–7.0/9	Akinwale et al., 2015
Sweet potato products	Boiled OFSP (whole)	120	Highly acceptable (7.5–8.0/9) across ages	Laurie et al., 2015 (Nigeria site)
Sweet potato products	Fried sweet potato chips	60	Acceptable; preferred to potato chips when sweeter	Nwachukwu et al., 2020
Sweet potato products	OFSP puree in baked goods	80	Acceptable up to 40% puree; color acceptable	Adebayo & Ogunlade, 2021
Fermented beverages	Kunu from sorghum–millet blends	100	Traditional vs. fortified; fortified acceptable (7.0/9)	Gaffa et al., 2002
Fermented beverages	Ogi from maize–soy	75	Soy up to 20% acceptable (6.5/9)	Okafor et al., 2012
Yam products	Yam flour (elubo) with OFSP	50	Acceptable up to 30% OFSP; texture concerns beyond	Ugwu & Okafor, 2019

3.2 Key Drivers of Acceptability

Across the 17 studies, several consistent drivers of acceptability emerged:

1. **Taste (overwhelmingly most important)**In every study where multiple attributes were compared, taste correlated most strongly with overall acceptability (r = 0.70–0.90). Sweetness was generally preferred, but excessive sweetness reduced acceptability for non-dessert staples (e.g., garri should not be sweet). Bitterness or off-flavors (from fermentation or oxidation) were strongly rejected.
2. **Texture (especially for granular products)**For garri and fufu, texture was the second most important attribute. Acceptable garri should have a granular, slightly crunchy texture when soaked. Mushy or pasty textures were rejected. For boiled yam and plantain, mealiness (soft, not fibrous) was preferred.

3. **Color (context-dependent)**White or cream color was traditionally preferred for cassava garri and fufu. However, several studies (Ilona et al., 2017; Oparinde et al., 2016) demonstrated that when the yellow/orange color of provitamin A cassava or OFSP was explained as a sign of health benefits, acceptability increased significantly. Without explanation, yellow color reduced acceptability.
4. **Familiarity**Novel products that closely resembled traditional products in appearance, taste, and preparation method were more acceptable. Radical changes (e.g., purple sweet potato garri, very sweet garri) were rejected.
5. **Price**In studies that included willingness-to-pay measures, consumers accepted novel products if priced equal to or only slightly higher than traditional equivalents. A premium > 20% reduced acceptability significantly.

3.3 Acceptability of Sweet Potato Products in Nigeria

Several studies evaluated sweet potato products (boiled, fried, puree, chips) and consistently found high acceptability (scores ≥ 7/9). However, none evaluated **sweet potato garri** specifically. The closest were composite flour studies where sweet potato was mixed with wheat or cassava, but these produced bread or fufu, not granular garri.

Importantly, the yellow/orange color of OFSP was not a barrier when consumers were informed about vitamin A benefits. This suggests that sweet potato garri made from OFSP would likely be acceptable if the taste and texture are similar to traditional garri.

3.4 Predicting Acceptability of Sweet Potato Garri

Based on the drivers identified, we can predict the likely acceptability of sweet potato garri:

Attribute	Likely consumer expectation	Sweet potato garri (typical)	Predicted effect
Taste	Neutral to slightly sour (fermented), not sweet	Slightly sweeter than cassava garri	Acceptable if sweetness is mild
Texture	Granular, crunchy when dry, soft when soaked	Similar if processed identically	Acceptable
Color	White/cream (traditional)	Yellow/orange (if OFSP)	Reduced if unexplained; enhanced if explained as healthy
Aroma	Fermented, slightly nutty	Similar but slightly different	Likely acceptable
Familiarity	High	Low (new product)	Needs sampling and education

Generally, sweet potato garri is **likely to be acceptable** if:

- Processed to match the granular texture of cassava garri.

- Not excessively sweet (choose low-sugar sweet potato varieties or blend).
- Consumers are informed about the health benefits (vitamin A, fiber) before tasting.
- Priced similarly to cassava garri.

4. DISCUSSION

4.1 Main Findings

This scoping review identifies a substantial body of sensory evaluation research on novel staple foods in Nigeria, but also a critical gap: **no published study has evaluated the acceptability of sweet potato garri**. Findings from studies on related products (OFSP boiled, composite flours, biofortified cassava garri), sweet potato garri is likely to be acceptable if key conditions are met: taste and texture closely mimic traditional garri, the color is explained as beneficial, and price is competitive.

4.2 Comparison with Similar Interventions Elsewhere

In Uganda, Kenya, and Mozambique, OFSP was successfully introduced as boiled or mashed products, with acceptability scores > 8/9 (Low et al., 2017; Laurie et al., 2015). The key success factors were: (i) involving consumers in product development, (ii) providing nutrition education, and (iii) ensuring adequate supply of planting materials. In Nigeria, similar approaches have worked for provitamin A cassava (Ilona et al., 2017). There is no reason to believe sweet potato garri would fail, provided a well-designed sensory study confirms acceptability.

4.3 Recommendations for Promoting Sweet Potato Garri

Based on the evidence, we propose the following strategies:

Phase 1: Product optimisation (laboratory)

- Produce sweet potato garri using optimized processing (short fermentation, moderate roasting and optional palm oil).
- Adjust sweetness by blending sweet potato with cassava (e.g., 50:50) if needed.
- Ensure texture identical to traditional garri.

Phase 2: Sensory evaluation (consumer panels)

- Conduct a 9-point sensory evaluation with 60–100 regular garri consumers.
- Test at least three formulations: 100% sweet potato, 50:50 blend, 100% cassava (control).
- Include both blind tasting (no information) and informed tasting (with health benefit explanation) to assess the color effect.
- Measure willingness to pay.

Phase 3: Community-based trials

- Distribute sweet potato garri in selected communities.
- Measure repeated purchase and consumption over 4–8 weeks.
- Collect qualitative feedback (focus groups).

Phase 4: Scaling up

- If acceptability ≥ 6.5/9, partner with local garri processors.
- Develop marketing messages emphasizing fiber, vitamin A, and energy benefits.
- Price at parity with cassava garri (subsidize initially if needed).

4.4 Knowledge Gaps

The most urgent gap is the absence of a direct sensory evaluation of sweet potato garri. Additionally:

- No studies have compared different sweet potato varieties (white vs. orange) for garri acceptability.
- No studies have evaluated children's acceptability (key target for vitamin A).
- No studies have assessed long-term (repeated) acceptance beyond a single tasting.

4.5 Limitations of This Review

This is a scoping review, not a systematic review with meta-analysis. Some included studies had small panels ($n < 50$) or lacked statistical reporting. Publication bias may exist (studies with negative results less likely published). Nonetheless, the patterns are clear and sufficient to guide action.

5. CONCLUSION

Consumer acceptability is the bridge between nutritional innovation and public health impact. In Nigeria, a substantial body of sensory evaluation research demonstrates that novel staple foods including biofortified cassava, composite flours, and sweet potato products - can be acceptable if taste and texture are preserved, color is explained positively, and price is competitive. However, **sweet potato garri has not yet been subjected to sensory evaluation**. This is a critical evidence gap that must be filled before widespread promotion.

Given the high acceptability of other sweet potato products in Nigeria and the successful introduction of provitamin A cassava garri, sweet potato garri is likely to be acceptable, especially if:

- Texture matches traditional garri.
- Sweetness is controlled.
- Consumers are informed about vitamin A and fiber benefits.

We recommend an immediate sensory evaluation study of sweet potato garri as a priority follow-up to the proximate analysis. Once acceptability is confirmed, sweet potato garri can be promoted as a viable,

acceptable, and nutritious alternative to cassava garri, contributing to dietary diversification and the reduction of vitamin A deficiency and low fiber intake in Nigeria.

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