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Comparative Analysis of the Acceptability and Nutritional Value of Fresh Tomato and Cucumber Stew among Households in Ekpoma, EDO

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Abstract

This research comparatively ranked the acceptability and nutritional value of fresh tomato and cucumber stews, popular vegetable-based sauces eaten by people in Nigeria. An experimental study design was implemented among 26 adult subjects from Ekpoma households, Edo State. 100% standardized preparations of 100% tomato stew and 100% cucumber stew were evaluated using sensory analysis on a 5-point hedonic scale and nutritional analysis conducted in a certified analytical laboratory using AOAC (2019) methodology. Results indicated that fresh tomato stew was rated as significantly more acceptable in flavor, odor, texture, and overall liking ($p < 0.05$). It contained more protein (50.6%) and carbohydrate (19.2%) and important micronutrient vitamin C and lycopene. Both stews contained lower nutritional values except that cucumber stew maintained appreciable protein (48.5%) and fat (20.1%) content as well as offered potential health effects from its hydration and low-calorie properties. The study recommends that although fresh tomato stew is the most acceptable option, cucumber stew is a good, nutritious alternative worthy of culinary creativity and public education. The research emphasizes dietary diversification using edible local resources as means of enhancing nutritional status as well as food acceptability among people residing in households of Nigeria.

Keywords: Acceptability; cucumber stew; food diversification; Fresh tomato stew; nutritional quality; sensory evaluation.

Introduction

The growing global focus on health-oriented diets has accentuated local demand for affordable, locally accessible, and nutritionally dense food. In Nigeria, where vegetables are the main component of stews, the focus is growing on experimenting with both culinary and non-conventional foods that provide nutrients and are favored by the consumer. The situation necessitates the review of foods that are popular as stews and their alternatives to facilitate healthier eating and resolve public health issues including micronutrient deficiencies and diet diseases.

Tomatoes (Solanum lycopersicum) are one of the most farmed and eaten vegetables globally and form a pillar in family cooking habits. Tomato stew made from fresh tomatoes, especially, is entrenched within Nigerian culinary heritage as a result of their intense flavor, good color, and complementarity when paired with staples including rice, yam, and beans. Fresh tomatoes are noted to possess high vitamins A and C and lycopene, an antioxidant that is linked to heart disease and some cancers (Tyssandier et al., 2021; Eke & Balogun, 2021; Okeke & Johnson, 2022).

Alternatively, cucumbers (Cucumis sativus), while being readily available and affordable, are usually eaten raw as a salad or snack. Cucumber stew is relatively an innovative concept within the context of the Nigerian diet. Cucumbers are, nonetheless, nutritionally beneficial, providing hydration from their high water content and providing micronutrients required by the body, including potassium and vitamin K (Abulude & Adeleke, 2022; Okafor & Adeola, 2023). Basing stews on cucumbers is, however, underused despite these qualities, and little documentation is available of their acceptability and nutritional performance compared to their tomato-based counterparts. Vegetables' role in human diets is established, particularly among developing nations where they are important sources of vitamins, minerals, and fiber. Tomatoes and cucumbers are among the most widespread vegetables eaten in Nigeria, and they each provide unique nutritional values and culinary uses.

Tomatoes (Solanum lycopersicum) are part and parcel of the diet in Nigeria, particularly when it comes to the cooking of stews, sauces, and jollof rice. Eke and Balogun (2021) posit that tomatoes are high in vitamins A and C as well as having lycopene, an active antioxidant responsible for fighting off free radicals and maintaining cardiovascular health. Likewise,

Willcox et al. (2018) observe that the consumption of tomatoes as part of regular diets can account for lower rates of chronic diseases including heart disease and particular cancers. Based on the work of Okeke and Johnson (2022), the high nutrient and moisture content of tomatoes makes them ideal for various culinary applications, especially stews that are both acceptable and palate-friendly in the majority of homes in Nigeria.

On the other hand, cucumbers (Cucumis sativus), although commonly planted and easily accessed, are not exploited much in cooked foods in the Nigerian context. Abulude and Adeleke (2022) point out that cucumbers are high in water content (more than 90%) and are good sources of hydration and detox. They are also calorie-free and possess moderate vitamin K and potassium content. Although their consumption without cooking (e.g., salads, smoothies) is common, their usage in cooked foods like stews is not documented. Omole and Okafor (2023) identify this research gap, pointing to the fact that there are no empirical studies on the sensory acceptability and nutrient content of stews made from cucumbers.

Sensory-wise, Chike and Eze (2022) stipulate that acceptability of food is influenced by taste, aroma, texture, and appearance, especially among households in Nigeria. Familiar flavor and texture may become an impediment to the uptake of alternative vegetable-based stews, including simple cucumber sauces. This contention is corroborated by Okeke and Ayodele (2022), whose research reported that consumers rated standard tomato stews significantly more than experimental versions of the product during sensory assessment trials.

Nutritively, they both provide required diet components. Tomatoes are rich sources of ascorbic acid, beta-carotene, and lycopene (Eke & Balogun, 2021), while cucumbers are prized for hydration and weight maintenance due to their low energy value (Okafor & Adeola, 2023). Obinna and Adeyemi (2021) opine, however, that nutritional value alone cannot drive the utilization of any vegetable in culinary preparations; consumer acceptability cannot be overlooked.

Alternatively, Olaoye (2022) suggests that food research and nutrition education be utilized to promote the use of more unconventional vegetables like cucumbers as part of staple foods. This would not just enhance dietary diversity but also offer cost-effective alternatives during times of hardship and seasonal shocks to food supplies.

Together, these studies emphasize the necessity of an extensive comparison of tomato and cucumber stews, assessing both their nutritional contents and acceptability to consumers. Such comparison is crucial as it would help shape dietary recommendations, direct public health policy, and encourage the consumption of underused but nutritious vegetables in Nigerian diets.

There is a notable research gap. Previous research conducted in Nigeria has mainly focused on recent tomato-based stews from the perspectives of sensory acceptability and nutritional value (Obinna & Adeyemi, 2021; Eze & Balogun, 2020). Less consideration has been paid to alternatives to tomato stews, including those containing cucumbers, especially when assessing their acceptability and their ability to make meaningful contributions to local diets. This shortage of comparative information constrains the capacity of nutritionists, educators, and policy developers to recommend diversified diets including foods less commonly practiced but otherwise nutritious. In addition, where food options are frequently limited by cost and availability, as is often the case in Ekpoma, Edo State, incorporation of nutritionally supportive alternatives may significantly impact diets.

This research, therefore, focuses on comparative assessment of acceptability and nutritional value of cucumber and tomato stews. In particular, it examines sensory properties of taste, smell, texture, appearance, and overall acceptability, as well as a lab analysis of major nutrients, including moisture, protein, fat, fiber, carbohydrate, vitamin C, vitamin E, iron, and caloric values. The research is underpinned by the hypothesis that the acceptability and nutritional values of the two stews are not significantly different.

The relevance of this study lies in its ability to shape household nutrition, public health education, and food policy. Through its evidence-based analysis of the comparative merit of cucumber and tomato stews, the study contributes to enhancing knowledge of how underutilized vegetables can be incorporated into established meal habits. Of particular relevance is the role this plays in encouraging sustainable food systems and dietary diversification among populations in Nigeria. In addition, the findings can be used to support targeted interventions to enhance food security, nutritional literacy, and consumer acceptance of new food products.

Preceding this article is an experimental study of sensory and laboratory assessment of stew samples made according to standard conditions. Results are anticipated to guide practical meal planning, food processing, and policy-making recommendations to promote the nutritional value of various Nigerian daily foods.

Research Purpose

The general purpose of this study is the 'Comparative Analysis of the Acceptability and Nutritional value of Fresh Tomato and Cucumber Stew. Specifically, the study tends to:

- Find out the nutritional value of fresh tomato and cucumber stew.
- Find out the level of acceptability of fresh tomato and cucumber stew.

Research Questions

- What is the difference between the nutritional value of fresh tomato and cucumber stew?
- What is the difference in the level of acceptability of fresh tomato and cucumber stew

Materials and Methods

Study Design

An experimental study was used to determine acceptability and nutritional value of stews made from cucumber and tomato. The two stew samples were cooked under standardized conditions and evaluated using sensory and analytical nutritional assessments. The study was carried out at Esan West Local Government Area, Edo State, Nigeria.

Population and Sample

Participants comprised households located at Ekpoma, Edo State. A purposive sample of 26 adults was obtained and consisted of 13 males and 13 females from 13 households. These adults were selected on the basis of their cooking experience and understanding of Nigerian stew preparations. Furthermore, five panelists of expertise were recruited from three lecturers and two students studying at the Department of Vocational and Technical Education, Ambrose Alli University, Ekpoma, due to their background on food.

Sample Preparation

Two versions of stew, 100% cucumber stew and 100% fresh tomato stew, were cooked. The identical sets of ingredients and cooking processes were utilized for both the stews, and the only difference was the main vegetable base being cucumber or freshly harvested tomatoes. Both the stews were cooked according to popular Nigerian culinary practices to make them culturally relevant and authentic.

Sensory Evaluation

Structured sensory analysis in a controlled environment was carried out utilizing a 5-point hedonic scale that spanned from 1 ("dislike extremely") to 5 ("like extremely"). Each of the stew samples was evaluated by panelists for flavor, odor, texture, sight, and acceptability. To avoid bias, samples were randomized and coded. Palate cleansing between the samples was instructed to panelists using water to prevent flavor carryover.

Instrument Validity and Reliability

Experts in food science evaluated and validated the sensory evaluation scorecard for clarity, relevance, and measurement accuracy. Reliability was established by using the test-retest method. Twice under the same conditions, the panelists filled out the same evaluation tool, and the results reflected high response agreement.

Nutritional Analysis

After preparation, samples of the stew were packaged and dispatched immediately to an Edo State certified food and nutrition laboratory. Proximate analysis was carried out to obtain moisture, protein, fat, fiber, carbohydrate, and ash contents. Vitamin C, vitamin E, iron, and lycopene micronutrients were among the micronutrients that were analyzed. The analyses were carried out according to the official AOAC (2019) procedures.

Data Analysis

Sensory trial data were collated as means and standard deviations. Independent t-tests were conducted to ascertain mean scores between the cucumber and fresh tomato stews for every sensory attribute. Statistically significant differences were established by one-way analysis of variance (ANOVA), and pairwise comparisons were effected by applying Tukey's post-hoc when appropriate. Nutritional make-up information was analyzed by using descriptive statistics and t-tests to ascertain differences between nutrient content. A $p < 0.05$ significance level was used in all the statistical tests.

Results and Discussion

Nutritional Content

Table 1 provides the nutrient analysis of stew samples. The highest protein (50.6%), carbohydrate (19.2%), and fat (20.2%) contents were noted in the case of fresh tomato stew (Sample A), reflecting its richness in macronutrients. Cucumber stew (Sample B) had relatively high protein (48.5%) and fat (20.1%) but lower carbohydrate (14%) and micronutrient contents, especially vitamin C (0.6%) and vitamin E (2.8%).

These results are consistent with those of Adebayo and Ogunleye (2023) and those of Okafor and Adeola (2023), who indicated that cucumbers, though they are hydrating and contain negligible calories, are relatively poor in micronutrient density when compared to tomatoes. Likewise, Eke and Balogun (2021) established the occurrence of lycopene and other antioxidants among fresh tomatoes, hence their nutritional significance.

Table 1: Stew Sample Nutrient Content (per 100g)

Sample	CHO (%)	PROT (%)	FAT (%)	FIBER (%)	VIT C (%)	VIT E (%)	IRON (%)	CAL (kcal)
A (Tomato)	19.2	50.6	20.2	7.9	2.8	6.2	7.4	493
B(Cucumber)	14.0	48.5	20.1	5.8	0.6	2.8	7.1	456

Sensory Evaluation

Table 2 shows sensory analysis results. Tomato stew (Sample A) obtained the highest acceptability values among all the traits, specifically texture (9.69 ± 0.97), taste (8.27 ± 0.72), and general acceptability (8.27 ± 0.72). Cucumber stew (Sample B) obtained moderate values, where the score on general acceptability was 7.08 ± 1.52.

Table 2: Sensory Evaluation of Stew Samples

Characteristic	A (Tomato)	B (Cucumber)	p-value
Taste	8.27 ± 0.72	6.69 ± 1.12	< 0.05
Aroma	7.90 ± 0.94	6.92 ± 1.79	< 0.05
Texture	9.69 ± 0.97	6.65 ± 1.55	< 0.05
Appearance	8.04 ± 0.87	6.19 ± 2.04	< 0.05
General Acceptability	8.27 ± 0.72	7.08 ± 1.52	< 0.05

Statistical analysis established that there was a significant difference ($p < 0.05$) between the two stews across all sensory areas. These findings support those of Chike and Eze (2022), who asserted that taste, aroma, and visual attractiveness are all important factors when it comes to food acceptability. The increased ratings of the fresh tomato stew are potentially due to its familiar taste and cultural inclusion into the menu of Nigerian foods.

Discussion

These results affirm that although both stews are of high nutritional value, fresh tomato stew is much more acceptable to the consumer as far as sensory properties are concerned. This reinforces the conclusion drawn by Okeke and Ayodele (2022) that traditional foods are always more sensory in their preference than their novel counterparts, even when nutritional values are similar.Its relatively lower sensory scores indicate that it requires more culinary modification to make it more acceptable. Yet, its hydration capacity, caloric density, and moderate protein value (Bello et al., 2014; Omole & Okafor, 2023) make it possible as a healthy alternative, especially where body weight control and blood pressure are concerned (Okafor & Adeola, 2023).

Notably, this research bridges an important gap by presenting comparative information that favors diversified dietary advice. In areas like Ekpoma, whose food availability might be inadequate, promotion of underexploited vegetables such as cucumber can help enhance food security as well as public health (Adebayo and Obinna, 2021; Olaoye, 2022).

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Conclusion

This study comparatively evaluated the acceptability and nutritional quality of fresh tomato stew and cucumber stew among households in Ekpoma, Edo State. The results demonstrated that while both stews offer significant nutritional benefits—particularly in protein and fat content—fresh tomato stew was more highly rated across all sensory attributes, including taste, texture, and general acceptability. Cucumber stew, although nutritionally viable and lower in calories, received moderate acceptability scores, likely due to its less familiar flavor profile and texture.

The findings affirm that fresh tomato stew remains the preferred choice among Nigerian consumers, reflecting its strong cultural and culinary integration. However, cucumber stew presents a promising alternative that, with appropriate culinary innovation and public awareness, could support dietary diversification and promote healthier eating practices, especially in regions facing food affordability and accessibility challenges.

Overall, the study contributes valuable insights into how locally available ingredients can be optimized to meet nutritional needs while maintaining sensory appeal. It highlights the importance of comparative food analysis in informing household dietary decisions, public nutrition education, and policy planning.

Recommendations

Based on the findings of this study, the researchers recommend that individuals and government should;

1. **Promote Fresh Tomatoes for Balanced Nutrition:** Given its high acceptability and rich macronutrient profile, fresh tomato stew should be emphasized in dietary guidelines aimed at improving nutritional intake in Nigerian households.
2. **Encourage Culinary Innovation with Cucumbers:** Food processors, chefs, and nutrition educators should explore seasoning techniques and complementary ingredients to enhance the sensory appeal of cucumber stew.
3. **Strengthen Nutrition Education:** Public health campaigns should raise awareness about the nutritional potential of underutilized vegetables like cucumber, especially their role in hydration and weight management.
4. **Support Local Agriculture and Accessibility:** Policymakers should encourage the cultivation and distribution of both tomatoes and cucumbers to ensure year-round availability, affordability, and dietary inclusion.
5. **Further Research on Stew Combinations:** Additional studies should investigate optimal ratios of cucumber and tomato in blended stews to strike a balance between nutrition and acceptability, potentially enhancing the adoption of healthier stew options.

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