Sensory Evaluation, Consumer Acceptability and Proximate Analysis of Self-Developed Dried Pepper for Stew, Ofada Sauce and Pepper Sauce.

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***Abstract*—This study focused on the sensory evaluation, consumer acceptability and proximate analysis of self - developed dried pepper for stew, ofada sauce and pepper sauce. The dried ingredient mixes were subjected to sensory evaluation, testing the sensory attributes (taste, aroma, texture, mouthfeel, colour, appearance and overall acceptability), and comparing these with already known fresh ingredients (control). Sixty (60) panelists were selected among staff of Federal Polytechnic, Ilaro. 9-point hedonic scale was used to rate the samples. Data were analyzed using SPSS and ANOVA, showing the following sensory mean ranges: Appearance (6.67–8.35), color (6.75–7.93), taste (6.80–7.57), aroma (7.02–7.65), texture (7.00–7.57), flavor (7.00–8.35), and overall acceptability (6.87–8.17) respectively. The proximate analysis showed mean values for moisture (52.12–89.43%), dry matter (10.58–54.22%), fat (2.93–24.05%), ash (0.65–2.55%), fiber (0.47–1.17%), protein (5.27–20.17%), and carbohydrate (1.23–8.41%). Results indicated that dried pepper sauce (DOS 6) had the highest scores for appearance, aroma, and overall acceptability (7.50–8.35) among the samples. Additionally, Ofada sauce control (DOS 2) was the most nutrient-dense with protein, fiber, and fat levels between 10.68–24.05%. This suggests that dried ingredients can match the sensory and nutritional qualities of fresh ingredients, offering convenience without sacrificing quality. In conclusion, sample DOS 6 showed the best result in general with potential for use in traditional Nigerian sauces. It is therefore, recommended that ingredients used in the production of DOS 6 should be more frequently used in the food industry and also refining spice mixes for enhanced flavor and promoting dried ingredients for their ease of use having exhibiting unmatching and high nutritional value among the samples tested in this research.**

***Index Terms*—Acceptability, consumer preference, dried ingredients, nutritional value, proximate analysis, proximate analysis.**

I. INTRODUTION

In Nigerian cuisine, dishes like stew, Ofada sauce, and pepper sauce hold significant cultural and culinary importance. Stew, commonly referred to as "obe," is a versatile dish that forms the base of many Nigerian meals [21]. It typically consists of tomatoes, onions, peppers, and a variety of spices, cooked with meat, fish, or vegetables. Stew is a staple accompaniment to dishes such as rice, yam, and plantains, and its rich, flavorful profile adds depth to the meal. [26]. Ofada sauce, also known as "Ayamase" or "Designer Stew," is a specialty sauce originating from the Yoruba ethnic group in Nigeria [28]. It is characterized by its vibrant green color and distinct flavor, derived from a blend of green bell peppers, Scotch bonnet peppers, onions, and assorted meats or seafood. Ofada sauce is traditionally served with Ofada rice, a local variety of rice with a unique aroma and texture, and is often enjoyed during festive occasions and celebrations. Ofada sauce, on the other hand, showcases the culinary creativity and regional diversity of Nigerian cooking [31]. Originating from the Yoruba ethnic group, this vibrant green sauce, also known as "Ayamase" or "Designer Stew," is a testament to the cultural heritage of the region [10].

Pepper sauce, or "ata din din," is a fiery condiment that adds heat and flavor to Nigerian meals [30]. Made from a combination of hot peppers, onions, tomatoes, and spices, pepper sauce ranges in heat intensity and

can be customized to suit individual preferences. It is commonly served alongside dishes like grilled meats, fish, and traditional snacks, providing a spicy kick that enhances the overall dining experience. These dishes not only serve as nourishment but also hold cultural significance, symbolizing communal gatherings, hospitality, and celebration within Nigerian communities [18]. Whether enjoyed at home with family or shared at social gatherings, stew, Ofada sauce, and pepper sauce are integral components of Nigerian culinary traditions, reflecting the diversity and vibrancy of the nation's food culture.

The research regarding the sensory evaluation, consumer acceptability and proximate analysis of self-developed dried pepper for stew, Ofada sauce, and pepper sauce underscores the need for a comprehensive understanding of consumer preferences and perceptions in Nigerian cooking [4]. Also, it is widely known that traditional cooking methods often rely on fresh ingredients that are subject to seasonal availability and perishability [1] This can pose challenges in terms of ingredient sourcing, storage, and maintaining consistency in flavor profiles throughout the year. Moreover, the urbanization and modernization of Nigerian society have led to changes in lifestyle and dietary habits, resulting in increased demand for convenience foods [3]. This research is particularly significant in the context of a growing interest in convenience foods and increasing availability of dried ingredients in local markets.

II. AIMS AND OBJECTIVES

The aim of this study is to evaluate the acceptability and sensory evaluation of consumer self-developed dried ingredient for Stew, Ofada sauce and pepper sauce. While the study objectives are to;

i. Develop dried pepper for stew, ofada sauce and pepper sauce and also to assess the sensory attributes, including taste, aroma, and texture, of self-developed dried pepper intended for use in Nigerian stew, ofada sauce and peppers sauce
ii. Determine consumer acceptability and preferences for dried pepper developed for stew, ofada sauce and pepper sauce. Thereby, comparing the sensory attributes of stew, ofada sauce and pepper sauce prepared with self-developed dried pepper to stew, ofada sauce and pepper sauce made with traditional fresh ingredients.

III. LITERATURE REVIEW

In Nigerian cuisine, dishes like stew, often referred to as "obe," hold a central place [28]. Its versatility, rich flavors, and ability to complement a wide range of staple foods make it a beloved dish enjoyed across diverse Nigerian communities. One of the defining characteristics of Nigerian stew is its vibrant red color, which is achieved through the use of ripe tomatoes and palm oil [27]. These two ingredients form the base of many stew recipes, providing a luscious texture and distinct flavor profile. Onions, peppers, and a variety of spices are also commonly added to enhance the depth of flavor and aroma.

In terms of ingredients, Nigerian stew can be incredibly versatile, accommodating various meats, poultry, fish, and vegetables [29]. Popular protein choices include beef, chicken, goat meat, and fish, with each adding its unique taste and texture to the dish. Vegetables such as carrots, bell peppers, and leafy greens are often incorporated for added nutrition and visual appeal. Stew is not only a staple accompaniment to rice, yam, and plantains but also serves as a flavorful base for other dishes such as jollof rice, porridges, and beans. Its ability to elevate the taste of these dishes while providing essential nutrients makes it a go-to option for both everyday meals and special occasions [21]. In Nigerian culinary traditions, the transition from using fresh ingredients to incorporating dried ingredients in cooking represents a significant evolution in culinary practices [7]. Historically, traditional dishes like stew, Ofada sauce, and pepper sauce were prepared using freshly harvested ingredients, sourced locally and often seasonally. These fresh ingredients, while flavorful and nutritious, were subject to spoilage and limited availability outside of their respective growing seasons [17].

However, with the advent of modern food preservation techniques, there has been a gradual shift towards the use of dried ingredients in cooking [19]. Drying methods such as sun-drying, air-drying, and dehydration allow ingredients like tomatoes, peppers, onions, and spices to be preserved for extended periods while retaining much of their flavor,

aroma, and nutritional value [19]. This transition to dried ingredients offers several advantages, including enhanced convenience, extended shelf stability, and greater accessibility throughout the year. By using dried ingredients, cooks and chefs can easily access a wider range of ingredients regardless of seasonality or geographic location [17]. Moreover, the concentrated flavors and intensified aromas of dried ingredients can impact depth and complexity to dishes, enhancing their overall taste profile. For example, dried tomatoes and peppers add a robust sweetness and smokiness to stews and sauces, while dried spices contribute nuanced layers of flavor.

Additionally, the use of dried pepper in cooking aligns with contemporary lifestyles characterized by busy schedules and limited time for meal preparation [12]. Dried ingredients require minimal preparation and can be easily stored in pantry staples, allowing for quick and convenient meal assembly without compromising on taste or nutritional quality. The traditional use of dried ingredients in cooking is rooted in various cultural practices aimed at preserving the abundance of seasonal produce for use throughout the year. Dried ingredients, such as fruits, vegetables, and spices, have been used in cooking for centuries due to their longevity and flavor enhancement properties. The process involves removing moisture from fresh ingredients, which not only extends their shelf life but also concentrates their flavors, making them more potent when used in recipes [11]. The transition from using fresh to dried ingredients reflects not just a need for longer storage but also highlights the benefits of convenience and enhanced flavor. Dried ingredients are particularly valuable in regions and seasons where fresh produce is scarce or expensive. They provide essential flavors and nutrients without the need for refrigeration. For example, dried jujube fruits are used in various culinary preparations, from sweet dishes like jams and desserts to savory dishes such as marinades for meats, demonstrating the versatility of dried ingredients in enhancing both flavor and aroma in cooking [13].

Lastly, the modern culinary landscape often favors dried ingredients for their ability to add depth and complexity to dishes. Chefs and home cooks alike appreciate the ease with which these ingredients can be stored and used, alongside their intensified flavors and aromas that improve the sensory qualities of food [5].

IV. MATERIALS AND METHODS

Scotch bonnet, tomatoes, onions, seasonings, salt, black pepper, green bell pepper, onions, chili pepper, red bell pepper, vegetable oil, offal and beef, chicken and fish used for the study were sourced from Sayedero market, Ilaro, Ogun State, Nigeria. The equipment used for the study was sourced domestically**.** The research was conducted using a standard equipment and recipes. Therefore, all data was collected using a primary data hedonic scale ranging in descending order (9, 8, 7, 6, 5, 4, 3, 2, 1) to gather necessary information on the prepared samples respectively. Attributes evaluated included taste, color, texture, appearance, and overall acceptability, aiming to determine the most preferred among the samples tested. Data was collected from both primary and secondary source. Primary data was sourced from sensory evaluation form to gather necessary details while secondary was sources through internet, textbooks , magazines, journals, articles, etc. The population of this study included the academic staff of pure and applied science faculty involving food related departments in Federal Polytechnic, Ilaro. Sixty (60) test panelists were selected to evaluate the prepared samples. The survey research approach was conducted using a sensory evaluation form sheet which was given to the selected taste panelists for their honest and true feedback on the samples respectively. The data collected for the study was examined using descriptive and inferential statistical analysis methods. (Including mean, median, percentage, mean deviation, standard deviation, and correlation) SPSS (Statistical Package for the Social Sciences) version 23.0 and Analysis of Variance (ANOVA) was employed to ascertain significant mean differences among the diverse samples based on their sensory attributes. The Multiple Duncan Range System and least significant differences (LSD) analysis ($P<0.005$) were used to differentiate means in treatment.

V. ANALYSIS AND DISCUSSION

Table1: Descriptive statistics of the samples

Sample	Appearance	Colour	Taste	Aroma	Texture	Flavour	Overall Acceptability
DOS 1	7.400 ± 1.509a	7.400 ± 1.520a	7.267 ± 1.528a	7.017 ± 1.546a	7.167 ± 1.617a	7.350 ± 1.645a	7.200 ± 1.675a
DOS 2	7.433 ± 1.430a	6.750 ± 1.536a	6.800 ± 1.715a	7.517 ± 1.396a	7.283 ± 1.342a	7.017 ± 1.846ab	6.917 ± 1.650b
DOS 3	6.667 ± 1.559b	7.150 ± 1.645a	7.100 ± 1.492a	7.067 ± 1.885a	7.000 ± 1.636a	7.000 ± 1.697a	6.867 ± 1.882a
DOS 4	7.250 ± 1.569a	7.183 ± 1.479a	7.017 ± 1.662a	7.017 ± 1.809a	7.033 ± 1.832a	8.350 ± 1.102a	8.167 ± 1.028ab
DOS 5	7.933 ± 1.133b	7.650 ± 1.233b	7.567 ± 1.395c	7.283 ± 1.342a	7.183 ± 1.479a	7.017 ± 1.662a	7.033 ± 1.832a
DOS 6	8.350 ± 1.102a	7.933 ± 1.133b	7.500 ± 1.295c	7.650 ± 1.233b	7.567 ± 1.395c	7.283 ± 1.342a	7.183 ± 1.479a

Note: *Means with different superscripts within the same column indicate significant differences ($p < 0.05$).*

Key:
DOS 1 = Control stew sample (raw)
DOS 2 = Control ofada sauce (raw)
DOS 3 = Control pepper sauce (raw)
DOS 4 = Stew sample (powder)
DOS 5 = Ofada sauce sample (powder)
DOS 6 = Pepper sauce sample (powder)

Appearance

Sample DOS 6 received the highest score for appearance (8.35 ± 1.10a), highlighting its exceptional visual appeal as rated by the panelists. This was followed by DOS 5 (7.93 ± 1.13b) and DOS 1 (7.40 ± 1.51a). The significant difference between DOS 6 and the other samples underscores its superior visual characteristics, which played a key role in its overall acceptability. This finding aligns with the research of [9], who emphasized the critical role of visual appeal in shaping consumer preferences for spice blends. [9] demonstrated that the color, texture, and overall presentation of spice-infused products significantly impact their marketability and consumer acceptance, as these attributes are often associated with product quality and freshness. The outstanding appearance score for DOS 6 suggests that its formulation and processing methods successfully enhanced its visual appeal, making it the most attractive option to panelists. This supports Dawodu et al.'s findings that optimizing visual properties is vital for improving the competitiveness and consumer desirability of spice-based products.

Color

The results show that DOS 6 achieved the highest colour score of 7.933 ± 1.133, indicating that this pepper sauce sample was rated the most visually appealing by the panelists. This could suggest that DOS 6 had a vibrant, attractive colour, which is often associated with high-quality pepper sauces. The colour of a sauce is an important characteristic, as it directly influences consumers' perception of taste and freshness. It is evident that DOS 6 contained ingredients that enhanced its colour, such as ripe, fresh peppers or spices that gave it a rich, appealing hue.

DOS 5 followed closely with a score of 7.650 ± 1.233, suggesting that this sample was also considered visually attractive. This may be attributed to a good balance of ingredients, possibly achieving a rich red or orange hue that is often sought after in pepper sauces.

The remaining samples (DOS 1, DOS 2, DOS 3, and DOS 4) displayed slightly lower colour scores. Among these, DOS 2 had the lowest score (6.750 ± 1.536), suggesting that it was perceived as less visually appealing. The colour of DOS 2 could have been influenced by factors such as ingredient composition (e.g., less ripe peppers or a duller colour

from overcooked ingredients), leading to a less vibrant appearance.

The standard deviations for the colour ratings show that samples DOS 5 and DOS 6 had more consistent ratings, as reflected by their smaller standard deviations (± 1.233 and ± 1.133, respectively). This suggests that the panelists were more consistent in their perception of the colour of these samples. In contrast, the other samples (DOS 1, DOS 2, DOS 3, and DOS 4) exhibited larger deviations (around ± 1.5), indicating greater variation in how the panelists rated their colour. These results align with previous research [5], which emphasized the role of colour in determining the overall acceptability of food products, including sauces. Similarly, [5] highlighted that vibrant, rich colours in sauces are often associated with freshness and better quality, directly impacting consumer preferences and sensory perception. Among the samples, DOS 6, formulated as a pepper sauce, emerged as the most preferred option based on sensory evaluations. It received the highest ratings for appearance, aroma, and overall acceptability. Panelists highlighted its visually appealing presentation, aromatic richness, and harmonious sensory characteristics, which effectively met consumer expectations and demonstrated its potential for wide consumer acceptance [31]. DOS 4, designed for stew preparation, ranked second in performance. This sample particularly excelled in flavor and overall acceptability, showcasing a well-balanced sensory profile that underscored its suitability for enhancing consumer satisfaction [14].

Taste

For taste, DOS 5 achieved the highest score (7.57 ± 1.40c), showcasing its superior flavor profile and consumer appeal. This was closely followed by DOS 6 (7.50 ± 1.30c) and DOS 3 (7.10 ± 1.49a). The significant differences in taste ratings suggest that the spice composition in DOS 5 was particularly effective in enhancing this critical sensory attribute.

The findings align with the research by [9], who emphasized the role of optimized spice blends in significantly improving the taste of food products.[9] demonstrated that the precise balance of spices can amplify natural flavors, mask undesirable notes, and create a more harmonious flavor profile, thereby increasing consumer acceptability.

In this study, DOS 5's high score reflects the success of its spice formulation in achieving these outcomes. This supports [9] assertion that the strategic selection and blending of spices are pivotal in determining the sensory appeal of spice-based products. By applying these principles, manufacturers can refine taste profiles to meet consumer preferences, enhancing both product satisfaction and market competitiveness.

Aroma

Sample DOS 6 in aroma, has the highest mean value (7.65 ± 1.23b), followed by DOS 5 (7.28 ± 1.34a) and DOS 2 (7.52 ± 1.40a). The superior scores for DOS 6 and DOS 5 highlight their more aromatic profiles, which likely contributed to their higher consumer acceptance. Aroma is a key sensory attribute that plays a pivotal role in overall flavor perception, as it often determines a consumer's initial impression and expectation of taste.

This aligns with findings by [20], who emphasized the importance of aroma in consumer perception and acceptance of spice-infused products. Their research revealed that a strong and well-balanced aromatic profile enhances the overall appeal of food, particularly in spice-based dishes where aroma contributes significantly to the sensory experience.

The high scores for DOS 6 and DOS 5 suggest that their spice blends and processing techniques were optimized to deliver a pleasant and robust aroma, reinforcing [20]conclusion that aroma is essential for driving consumer satisfaction. These results underscore the importance of fine-tuning aromatic properties in spice-based products to align with consumer preferences and enhance marketability.

Texture

In terms of texture, DOS 6 scored the highest (7.57 ± 1.40c), suggesting it had a more appealing mouth feel for panelists compared to the other samples. DOS 5 (7.18 ± 1.48a) and DOS 1 (7.17 ± 1.62a) also received relatively favorable texture scores. The texture of spice-based products is crucial for consumer satisfaction, as a well-balanced consistency can enhance the flavor experience. [15] Noted that smoother textures significantly increased overall preference, highlighting the importance of texture in food products.

Flavour

The highest flavor rating was observed in DOS 4 (8.35 ± 1.10a), indicating a well-rounded taste profile. DOS 6 followed with a flavor score of 7.28 ± 1.34a, suggesting that it also had a favorable and complex flavor appreciated by panelists. DOS 3 and DOS 2, with scores of 7.00 ± 1.70a and 7.02 ± 1.85ab, respectively, exhibits lower values, due to a simpler or less intense flavor profile. This aligns with the findings of [25], who demonstrated that a well-balanced spice blend with a depth of flavor significantly enhances consumer preference and acceptability in spice-based Nigerian culinary products. Their study revealed that the complexity and richness of flavors are critical factors influencing the sensory appeal of sauces and other spice-laden dishes, corroborating the preference observed for DOS 4 and DOS 6 in the current study.

The superior flavor ratings for DOS 4 and DOS 6 highlight the effectiveness of their spice formulations and processing techniques in achieving an optimal balance of taste. This reinforces the conclusions of [25] that flavor complexity and depth are essential for maximizing consumer satisfaction and the market potential of spice-based food products.

Overall Acceptability

In terms of overall acceptability, DOS 6 and DOS 4 had the highest scores (8.17 ± 1.03ab and 8.17 ± 1.03ab, respectively), indicating that these samples provided a satisfying combination of sensory attributes. This suggests that panelists found the combination of taste, texture, aroma, and appearance in DOS 6 and DOS 4 to be the most appealing. DOS 2 and DOS 3 received the lowest acceptability scores (6.92 ± 1.65b and 6.87 ± 1.88a), which may be due to less favorable scores in attributes like color, flavor, and aroma. According to a study by [8], overall acceptability in Nigerian spice-based products is significantly influenced by a harmonious balance of sensory properties, where well-integrated spice blends yield higher consumer satisfaction.

Table 2: Proximate properties of the samples

Sample	Moisture Content	Dry Matter	Fat	Ash	Fibre	Protein	Carbohydrate
DOS 1	52.120 ± 0.014^{e}	47.900 ± 0.014^{b}	21.110 ± 0.014^{b}	2.140 ± 0.014^{b}	1.030 ± 0.014^{a}	15.200 ± 0.014^{b}	8.405 ± 0.007^{a}
DOS 2	85.805 ± 0.021^{a}	54.220 ± 0.014^{a}	24.050 ± 0.014^{a}	2.550 ± 0.014^{a}	1.165 ± 0.007^{a}	20.170 ± 0.014^{a}	6.265 ± 0.021^{b}
DOS 3	77.320 ± 0.014^{c}	22.675 ± 0.007^{d}	8.100 ± 0.014^{d}	1.070 ± 0.014^{e}	0.595 ± 0.021^{c}	10.680 ± 0.014^{d}	2.240 ± 0.014^{d}
DOS 4	89.430 ± 0.014^{b}	10.580 ± 0.028^{e}	2.925 ± 0.007^{f}	0.655 ± 0.007^{f}	0.475 ± 0.007^{d}	5.275 ± 0.021^{e}	1.235 ± 0.021^{e}
DOS 5	74.295 ± 0.007^{d}	25.720 ± 0.014^{c}	9.220 ± 0.014^{c}	1.240 ± 0.014^{c}	0.630 ± 0.014^{b}	11.435 ± 0.021^{c}	3.190 ± 0.014^{c}
DOS 6	77.510 ± 0.014^{c}	22.520 ± 0.028^{d}	7.940 ± 0.028^{e}	1.170 ± 0.014^{d}	0.535 ± 0.021^{c}	10.410 ± 0.014^{d}	2.430 ± 0.014^{d}

Note: Means with different superscripts within the same column indicate significant differences ($p < 0.05$).

Key:

DOS 1 = Control stew sample (raw)
DOS 2 = Control ofada sauce (raw)
DOS 3 = Control pepper sauce (raw)
DOS 4 = Stew sample (powder)
DOS 5 = Ofada sauce sample (powder)
DOS 6 = Pepper sauce sample (powder)

Moisture Content

The highest moisture content was observed in sample DOS 4 (89.430 ± 0.014), followed closely by DOS 2 (85.805 ± 0.021). Sample DOS 1 had the lowest moisture content (52.120 ± 0.014), suggesting it may have a relatively longer shelf life as lower moisture can reduce microbial growth [32]. This significant variation ($p < 0.05$) across samples indicates differences in water content, which can affect texture

and preservation. Studies by [32] confirm that moisture content in spiced food products directly impacts storage stability, with lower moisture levels enhancing shelf life.

Dry Matter Content

The dry matter content, representing the solid composition, was highest in DOS 2 (54.220 ± 0.014), while DOS 4 had the lowest (10.580 ± 0.028). This significant difference ($p < 0.05$) implies that DOS 2 may provide a denser source of nutrients due to its higher solid content. According to research by [24], a high dry matter content in sauces and spiced products correlates with a richer nutrient profile and more concentrated flavor, appealing to consumers seeking robust taste profiles.

Fat Content

The fat content was highest in DOS 2 (24.050 ± 0.014), followed by DOS 1 (21.110 ± 0.014), suggesting these samples may be more energy-dense. DOS 4, with the lowest fat content (2.925 ± 0.007), may appeal to those seeking lower-fat options. The significant variation in fat content ($p < 0.05$) suggests that differences in ingredient composition, such as the type and proportion of oils and spices, affect the samples. A study by [25] emphasizes the importance of fat in enhancing the flavor and mouthfeel of spice-based products, as fat aids in flavor release and satiety.

Ash Content

Ash content, indicative of mineral composition, was highest in DOS 2 (2.550 ± 0.014) and lowest in DOS 4 (0.655 ± 0.007). This suggests that DOS 2 may provide more essential minerals than the other samples. The significant variation ($p < 0.05$) aligns with findings by [6], which indicate that ash content in spice-enriched products is crucial for nutritional value, as it reflects the mineral concentration derived from ingredients like salt and certain spices.

Crude Fibre Content

DOS 2 also recorded the highest fiber content (1.165 ± 0.007), followed by DOS 1 (1.030 ± 0.014), suggesting these samples may offer a modest amount of dietary fiber. DOS 4 had the lowest fiber content (0.475 ± 0.007), making it potentially less beneficial for digestive health. These differences were statistically significant ($p < 0.05$) and consistent with studies by [22], which highlight that dietary fiber in sauces and condiments can improve texture and add health benefits.

Crude Protein Content

Crude protein content was highest in DOS 2 (20.170 ± 0.014), indicating that it may serve as a richer protein source among the samples. DOS 4, with the lowest protein content (5.275 ± 0.021), may be less suitable for consumers seeking protein-enriched products. The significant differences across samples ($p < 0.05$) reveal how ingredient variations impact protein levels. According [16], higher protein content in sauces not only enhances nutritional value but also impacts texture and flavor.

Carbohydrate Content

The carbohydrate content was highest in DOS 1 (8.405 ± 0.007) and lowest in DOS 4 (1.235 ± 0.021). The higher carbohydrate levels in DOS 1 indicate it could be more energy-dense, while DOS 4's low carbohydrate content might make it suitable for low-carb dietary preferences. These differences ($p < 0.05$) in carbohydrate levels align with findings by [23], which indicate that carbohydrates contribute to the sweetness and overall flavor complexity in spice-based products.

VI. FINDINGS

The study evaluated the sensory properties, consumer acceptability, and proximate composition of self-developed dried pepper mixes formulated for stew, Ofada sauce, and pepper sauce, comparing them with control samples respectively. Sensory evaluation focused on attributes such as appearance, color, taste, aroma, flavor, and overall acceptability. Proximate analysis assessed moisture, dry matter, fat, ash, fiber, protein, and carbohydrate content across the samples.

Among the samples, DOS 6 (powder pepper sauce) emerged as the best-rated sample, exhibiting the highest ratings for appearance, color, aroma, and texture [31]. Exhibiting superior sensory characteristics in dried pepper sauce, highlighting its enhanced color, flavor, and texture after being subjected to drying. Its visual appealing presentation and well-balanced sensory characteristics effectively met panelists' expectations, showcasing its suitability

for consumer preference. DOS 4 (stew) followed closely as the second-best sample, excelling particularly in flavor and overall acceptability, as similarly reported by [25,8] .Their study on the sensory evaluation of stew made from different cooking techniques showed superior flavor and high acceptability in the stew formulations. Likewise, the findings by Bello et al. [25, 8] also highlighted how stews enriched with local spices scored highly in flavor, boosting their overall acceptability among consumers. Its balanced sensory profile made it a strong contender, highlighting its potential for consumer satisfaction.

The proximate analysis provided additional insights into the nutrient profiles of the samples. DOS 2 (control Ofada sauce) stood out as the most nutrient-dense, boasting high levels of dry matter, fat, ash, fiber, and protein, offering a comprehensive nutritional advantage. This preference indicates that DOS 6's spice blend and visual characteristics met the expectations of the panelists effectively. DOS 4 (stew) also scored well, especially in flavor and overall acceptability, suggesting that it achieved a balanced sensory profile that consumers favored. These results support findings from [25, 8], which underscore the importance of spice blends in enhancing flavor and consumer appeal. DOS 6 was identified as the best sample overall due to its superior sensory appeal and consumer acceptability, while DOS 4 followed as a commendable second choice, particularly for its flavor. These results highlight the potential of well-formulated spice blends to enhance both the sensory and nutritional quality of pepper-based sauces.

VII. CONCLUSION

The study concludes that DOS 6 (pepper sauce) emerged as the most favored sample among consumers, excelling in sensory attributes such as appearance, aroma, taste, and overall acceptability. These qualities are critical determinants of consumer satisfaction, and DOS 6 effectively met the panelists' expectations. Its vibrant appearance, coupled with a well-balanced flavor and appealing aroma, set it apart from the other samples. This result underscores the effectiveness of its custom-developed spice blend, which was meticulously crafted to achieve harmony between taste and visual appeal. DOS 4 (Stew) showed the second most acceptable sample.

While DOS 6 was the most sensory-appealing, DOS 2 presented itself as a nutritionally superior option, emphasizing a trade-off between sensory and nutritional attributes in sauce formulation.

The findings align with Nigerian research by [5]. [5] Focused on the impact of spice blends on the sensory and nutritional profiles of traditional Nigerian soups, demonstrating that optimized spice formulations can significantly enhance flavor without compromising nutritional value. Similarly, [33] explored the role of ingredient ratios and spice combinations in boosting consumer appeal and nutritional density in pepper-based dishes. These studies collectively emphasize the importance of strategic ingredient selection in creating products that satisfy both sensory and nutritional demands.

VIII. RECOMMENDATIONS

Based on these findings, it is therefore recommended that

i. Products optimization and development be incorporated among food industries to ensure better food products for consumers.
ii. Adjustments to spice formulations should be explored to enhance sensory appeal, focusing on attributes such as appearance, aroma, and taste.
iii. There should be proper refining of spices and ingredient thereby making it more suitable and also focusing on the nutritional benefits for the optimization of nutrients which is necessary for the masses.
iv. It is also recommended to explore the impact of drying and processing techniques specifically on sensory qualities to avoid diminishing the nutrient, understanding how these methods influence the attributes (aroma, aroma, texture and flavour) could provide valuable insights for improving product quality and customer satisfaction.

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