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SENSORY CHARACTERISTICS AND ACCEPTABILITY OF *ARACHIS HYPOGEAE-LACTOBACILLUS PARACASEI* PREPARED SEASONING

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ABSTRACT

The role of tasty food in optimum satisfaction cannot be overemphasized. However, the use of artificial spices in food preparation has been worrisome globally as shown in the high rate of organ failure attributed to artificial food sweeteners. Sourcing for natural alternatives has been prioritized in biomedical researches. This study was carried out to evaluate sensory characterization and acceptability of *Arachis hypogeae-Lactobacillus paracasei* prepared seasoning. Groundnut seeds (*Arachis hypogeae*) and dried tilapia fish were purchased at Eke Awka, Awka South L.G.A, Anambra State. The natural seasonings were prepared using solid state fermentation process while the fermenter was *Lactobacillus paracasei* obtained from Zaharm Analytical and Research Laboratory, Amawbia, Anambra State. The physical characteristic features of the prepared seasonings (colour, taste, odour, texture, shape, surface, weight, specific gravity, and water activity) were evaluated using physical method and microbiological standard equipment. The sensory characteristics of the prepared seasoning were evaluated using 9-point hedonic scale and team of twenty (20) validated panelists. The result revealed seasonings that had ideal and accepted physical characteristics while the sensory evaluation panelists liked the product moderately. Therefore, the seasoning is recommended to the general public in food preparation in place of artificial spices that are injurious to the body.

KEY WORDS: Seasoning; *Lactobacillus paracasei*; *Arachis hypogeae*; Sensory evaluation

1.0 INTRODUCTION

Arachis hypogaea is commonly referred to as groundnut or peanut (Akram *et al*., 2018). Peanut is a legume and the seed is highly consumed globally due to its high protein content (Akram *et al*., 2018). Cereal proteins have been recommended as the best source of protein that enhances overall health of humans (Akram *et al*., 2018). Most farmers cultivate peanut in large quantity to an extent that it is exported to other countries as source of revenue (Arya *et al.,* 2016).

Research has shown that fermentation of crops had been practiced in ancient days (Yin *et al*., 2014; Yang *et al*., 2016b; Sandya *et al*., 2021). Fermentation process involves conversion techniques which produce products with different physical and sensory properties (Yang *et al*., 2016b). Fermentation in ancient was achieved by indiscriminate exposure of crops to the atmosphere over a given period of time and microbes that fermented the crops are unknown (Yang *et al*., 2016b).

It is worthy to note that there are some crops that naturally contained tastes that are not accepted by most consumers (Sandya *et al*., 2021). Consumption of such food is minimized resulting in low income for the producers. The only remedy to such effect is transformation of the food to a new form which has a new taste that is favourable to consumers due to high satisfaction it offers and many researchers have reported that fermented food is highly enriched with nutrients due to enzymatic activities of microorganisms (Yin *et al*., 2014; Yang *et al*., 2016b; Sandya *et al*., 2021). This is basically the importance of microbial activities as had been isolated and characterized by several researchers (Iheukwumere *et al*., 2018; Sandya *et al*., 2021).

Fermentation of nuts, grains, vegetables, and fruits have been actualized using mainly lactic acid-producing bacteria such as *Lactobacillus* species and *Bacillus* species though fungal species such as *Saccharomyces cerevisiae* and *Aspergillus* species have been reported (Chi and Cho, 2016; Jazi *et al*., 2017a) as good fermenters.

Several researchers have studied sensory evaluation and acceptability of fermented crops (soybean, Bambara groundnut, sorghum, pea-protein, melon) using lactic acid bacteria and fungi such as Adedokun *et al*. (2013), Piotrowska *et al*. (2015) and Enidiok *et al*. (2017), Chukwu *et al.* (2017), Chude *et al*.

(2020), Day and Morawicki (2018) and El Youssef *et al*. (2020) but no studies are available on sensory evaluation and acceptability of seasonings produced using *Arahis hypogeae* and *Lactobacillus paracsei*. Hence, the aim of this study was to perform sensory evaluation and acceptability of seasonings produced using *Lactobacillus paracsei.*

2.0 MATERIALS AND METHODS

2.1 Study Area

The study was carried out at Amawbia, Awka South L.G.A. in Anambra State, Nigeria. Amawbia is 325m above sea level and lies between latitude 06°11.434'N – 06'11.643N and longitudes 07°03.649'E – 07°03.691'E. It falls within the humid tropical climate belt of Nigeria. There are two seasons which are well marked in this region where the maximum average rainfall is experienced during July and August. The mean annual rainfall is in range of 1500-2500 mm. Amawbia has a mean annual maximum temperature of 32.9°C, mean annual minimum temperature of 23.4°C, while the soil monthly mean temperature is 30°C. The major anthropological activities are farming and hunting. Amawbia is situated along Enugu-Onitsha express road. It is about 35 km from Onitsha and it has boundaries with Awka on the west, Nawfia, Umuokpu on the south, and on the North, Enugu Agidi.

2.2 Sample Collection

Groundnut seeds were purchased at Eke Awka, Awka South L.G.A. Anambra State. The seeds were put in a sterile polyethylene bag, and appropriate label was placed on top of the bag for easy identification before transporting to the laboratory for analysis. Similarly, dried fish samples (Tilapia) were purchased at Eke Awka Market and put into polyethylene bag with appropriate label for easy identification before transporting to the laboratory for analysis. The *Lactobacillus paracasei* used as fermenter was obtained at Zaharm Analytical and Research Laboratory, Amawbia, Anambra State, Nigeria.

2.3 Preparation of *Arachis hypogea* Seeds

Five hundred grams (500 g) of the groundnut seeds were weighed using an analytical weighing balance (JJ224BC). The seeds were sundried for 72 h to facilitate removal of the outer layers. The seeds were ground using an electric blender (SC-1589) which had been disinfected using 70% ethanol. The

dried fish samples were descaled and deboned using a sterile kitchen knife before blending using the same electric blender mentioned above. The blended groundnut seeds and dried fish were put in a sterile container and covered tightly.

Plate 1: Seeds of *Arachis hypogeae*

2.4 Formulation of the Seasoning

2.4.1 Solid state fermentation of *Arachis hypogea*

The powdered form of the seed was stored in a sterile rubber container prior to fermentation. Similarly, the dried tilapia fish which had been deboned and descaled was blended using the same electric blender and was stored in a sterile rubber container prior to fermentation. Fermentation was carried out using the method described in a study published by Chude *et al.* (2020). The starter culture (*Lactobacillus paracasei*) was washed using sterile water and normal saline (0.85% NaCl) in a centrifuge (80-1) five times in order to remove odour. The cells were obtained in a sediment form and normal saline was added to obtain a liquid preparation which was used for solid state fermentation. The fermentation was done using sterile beakers (250 mL). Twenty grams (20 g) of the powdered groundnut were weighed out using an analytical weighing balance (JJ224BC) and put into the fermenting beakers. Likewise, the same quantity of the powdered groundnut was added into the beakers. Then, 5 mL of the *Lactobacillus paracasei* was measured using a sterile syringe and put into the beakers. Additional 10 mL of sterile water was added into the beakers. The content of the beakers was thoroughly mixed using a sterile glass rod. Then, the preparation was allowed to ferment at 30±2^{o}C for 96 h.

After fermentation process, other excipients such as salt, vitamins, magnesium, potassium, and calcium were added in minute quantity (0.1 g per 100 g of the seasoning) and the product was thoroughly mixed together using a sterile spoon. The product was dried using an electric oven at 80^{o}C for 7 days**.** After drying, water activity of the fermented samples was determined, then, it was ground into powder, and stored in a sterile screw capped container for subsequent analysis. Packaging of the product was done using a manual moulder into colourful shape and wrapped using a sterile coloured aluminum foil.

2.5 Sensory Characteristics and Acceptability of the Seasoning

Sensory evaluation: To evaluate the sensory features of the seasoning, an in-house consumer-oriented test was conducted to determine product acceptability using scoring test with the aid of 9-points hedonic scale with little modification in the studies published by Adedokun *et al*. (2013), Piotrowska *et al*.

(2015) and Enidiok *et al*. (2017). The sensory characteristics of the seasoning such as colour, odour, taste, and general acceptability were examined by the team of twenty (20) validated panelists, which were drawn from microbiology students of Chukwuemeka Odumegwu Ojukwu University, Uli and Nnamdi Azikiwe University, Awka. The panelists were validated in such a way that they were able to detect little perceptible changes in the sensory attributes mentioned. Each panelist was asked to score each coded sample based on a nine point hedonic scale (like extremely, like very much, like moderately, like slightly, neither like nor dislike, dislike slightly, dislike moderately, dislike very much, dislike extremely)

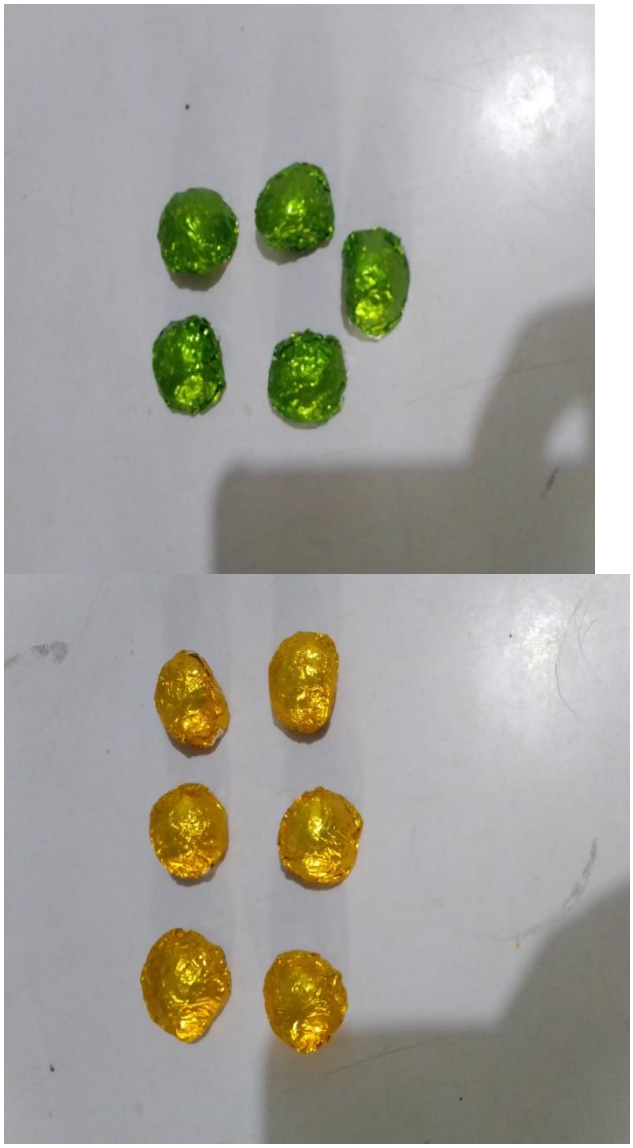
3.0 RESULTS

Characteristic Features of the Prepared Seasonings

The characteristics of the prepared seasonings are presented in Table 1. The result revealed that the colour of both AHS and AHSC was dark brown. The taste of AHS was nutty (indicating the presence of groundnut) while the taste of AHSC was fishy (indicating the presence of dried fish and crayfish). Meanwhile, the two seasonings had granular texture due to the presence of coarse particles that were visible to the naked eye. The shape of the seasonings after moulding was semicircular due to the shape of the manual moulder used. The surface of the seasonings after moulding was rough due the presence of particles formed during drying process. Meanwhile, the weight of the seasonings varied as AHS weighed 6.00 g while AHSC weighed 6.50 g. The specific gravity of the two seasonings was greater than the specific gravity of water. AHS recorded 1.38 while AHS recorded a specific gravity of 1.48. The water activity of the seasonings was low, though AHSC recorded a lower water activity of 0.17 while AHS recorded a water activity of 0.19.

Table 1: Characteristics of the prepared seasoning

Parameter	AHS	AHSC
Colour	Dark Brown	Dark Brown
Taste	Nutty	Umami
Odour	Nutty	Fishy
Texture	Granular	Granular
Shape	Semicircle	Semicircle
Surface	Rough	Rough
Weight (g)	6.0	6.5
Specific gravity	1.38	1.48
Water activity	0.19	0.17



A B

Plate 1: Seasonings prepared using peanut (A: AHS; B: AHSC)

Sensory Evaluation of the Prepared Seasoning

The Sensory evaluation of the prepared seasoning is presented in Table 2. The result showed that the colour, taste, odour and general acceptability of the prepared seasoning were within dislike, slightly and like very much. The colour of AHSC was 0.72±0.07 while AHS was 0.61±0.03 using hecdonic scale indicating like. Similarly, the taste of AHSC (0.62±0.07) was more acceptable compared to AHS (0.58±0.01S). The odour of AHSC was 0.56±0.01 while AHS recorded 0.51±0.01 indicating like slightly. The general acceptability of the products showed that AHSC recorded higher

acceptability (0.84±0.03) compared to AHS (0.81±0.07) which indicating moderately like but there was no significant difference (P>0.05).

Table 2: Sensory parameters of the prepared seasoning

Parameter	AHS	AHSC
Colour	0.61±0.03	0.72±0.07
Taste	0.58±0.01	0.62±0.01
Odour	0.51±0.01	0.56±0.01
Acceptability	0.81±0.07	0.84±0.03

4.0 RESULTS

Consumption of food is enhanced by the satisfaction or the taste of the food. During food preparation, different artificial additives are extensively used without considering the health impacts. Ideally, there should a balance between taste enhancers and safety of the food to the consumers. The seasoning prepared in this study using groundnut and *Lacticaseibacillus paracasei* exhibited similar characteristic features (such as colour, taste, odour, water activity, and texture) of condiments produced by several researchers using peanuts and *Lactobacillus* species (Yang *et al.*, 2016b; Chukwu *et al*., 2017; Chukwu *et al.,* 2018b; Chude *et al*., 2020; Sandya *et al.,* 2021; Chawafambira *et al.,* 2022). Meanwhile, condiments had been produced by several researchers using different substrates of plant origin and microorganisms such as Chi and Cho (2016), who optimized the fermentative potentials of *Bacillus amyliliquefaciens, Lactobacillus* species, and *Saccharomyces cerevisiae* in soybean. Yin *et al*. (2014) also optimized *Lactobacillus* species in the fermentation of soybean. Jazi *et al*. (2017a) optimized *Bacillus subtilis, Aspergillus niger*, and *A. oryzae* in the fermentation of cottonseed, while Li and Wang (2021) fermented chickpeas using only *Bacillus subtilis* Iwo. Similarly, Day and Morawicki (2018) fermented sorghum using *Saccharomyces cerevisiae* and *Lipomyces* species.

The sensory evaluation of the seasonings provided vital information on the physical appearance of the product to the final consumer and their acceptability. The colour, odour, and taste evaluated showed that the students that participated in the panel accepted the product using moderately like. Moreover, there is conformity of the prepared seasoning to the standard as stipulated by the ISO and supported by other researchers (Adedokun *et al.,* 2013; Enidiok *et al*., 2017).

Conclusion

This study has revealed that natural seasonings have more palatable taste and odour compared to artificial spices that are saturated with artificial flavours. The high acceptability of the microbial-fermented seasonings indicates that it could be used to replace artificial spices in food preparation for an optimum health and satisfaction.

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Conflict of Interest

The authors declared that there was no conflict of interest in the study.

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