Comparative Studies on Organoleptic Properties of *Ogiri-Ahuekere* and *Ogiri-Egusi* Condiments

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Abstract
The production and sensory evaluation of ogiri-ahuekere-fermented groundnut (Arachis hypogaea Linn) and ogiri-egusi-fermented melon seed condiments were studied. The groundnut seeds were sun-dried for 8 hours, dehulled and boiled for 8 hours. The cooked cotyledons were milled manually into a paste and wrapped in small portions (30g) with blanched plantain leaves. The wrapped samples were fermented in a container for 8–10 days while the 5 days fermented ogiri-egusi was used as a control. The effects of fermentation time on the organoleptic characteristics of fermented condiment samples were evaluated. The best 3 ogiri-ahuekere samples were compared to 5 days fermented ogiri-egusi (as control) by sensory evaluation. Statistical analyses of the data were carried out using ANOVA method with the application of SPSS Version 20. The significant difference between the mean values was determined by Tukey's test at 95% level of confidence. Comparison of ogiri-egusi (control) with 8-10 days fermented ogiri-ahuekere samples showed that the overall acceptability of organoleptic properties of ogiri-egusi was liked very much (approximately 8.0) while ogiri-ahuekere fermented for 10 days was liked moderately (approximately 7.0). Soup prepared with 5 days fermented ogiri-egusi was more acceptable than 8-10 days fermented ogiri-ahuekere soup samples by the panelists.

Keywords: *Condiment, Ogiri, Groundnut, Egusi, Fermentation and Organoleptic Properties.*

Introduction

Ogiri generally refers to as oily paste made from oil seeds in West Africa. They are also used as soup condiments with strong smell. It is a product of fermentation of melon seeds (*Citrullus vulgaris*). *Ogiri egusi* is a food flavouring condiment prepared by traditional methods of uncontrolled solids state fermentation of melon seeds involving the use of chance fermentation (Akinyele and Oloruntoba, 2013). *Ogiri-ahuekere* is food condiment prepared traditionally by uncontrolled solid state fermentation of groundnut (*Arachis hypogaea* L.) seeds (Chukwu *et al*., 2017). Proteinous oil seeds like castor oil seeds (*Ricinus communis*), melon seeds (*Citrullus vulgaris*) and fluted pumpkin seeds (*Telferia occidentalis*) apart from serving as sources of fats and oils, have been processed by cooking and microbial fermentation into a local food seasoning called *ogiri*. It is usually employed in small proportion in food/soup preparations but indispensible. It does not only enrich the soups with proteinous meaty taste, it also gives some health benefits (Nzelu, 2006).

Fermented condiments help to reduce high cholesterol levels in the blood. It strengthens and

supports our digestive and immune system thereby helping our bodies to fight and prevent diseases like cancer, tuberculosis, and cardiovascular complication. Fermented condiments improve nutritive values of foods as well as sensory properties as taste enhancers. Fermentation increases the phenolic content and antioxidant capacity of fermented Bambara groundnut, and condiment produced from Bambara groundnut seeds could serve as a cheap functional food. Traditionally, legumes and oil seeds are usually fermented into local condiments which serve as soup thickeners and flavour enhancers in food preparation. Fermentation is being shown not only to improve the nutritional quality of legume seeds but also to increase the antioxidant properties by increasing their potentials as functional foods (improvement of conventional foods with added health benefits) and nutraceutical sources (Ademiluyi and Oboh, 2011).

The methods employed in the manufacture of fermented condiment differ from one region to another because these processes are based on traditional systems. According to local custom, climate conditions and the type of substrates used, specific process variation occurred (Achi, 2005). In general, fermentation takes place under conditions which the producers have found to be favourable for appropriate growth and activity of microorganisms.
African locust bean (*Parkia filicoidea*) seeds are boiled for 12-24h to soften the hard testa after which they are dehulled by hand. Antai and Ibrahim (1986) also stated that the separated cotyledons are boiled for another 2hours to soften them. At this stage, the cotyledons of locust bean, soybean (*Glycine max*) and bambara nut (*Virgna subterranea*) are spread in a raffia basket lined with banana leaves and then covered with several layers of the banana leaves (Omafuvbe *et al*., 2000). Barimalaa *et al*. (1989) stated that the cotyledons are left to ferment for 2-3 days and wood ash may be added. The fermented product is then sun-dried for 1-2 days to yield a dark brown or black product (*Dawadawa*/*Iru*) and form into irregular small pieces.

Dehulled melon (*Citrullus vulgaris*) seeds are boiled for 2-3 hours. The seeds are ground into a paste. Ash from burnt palm bunch is added which impart a grey colour to the paste, the paste is wrapped in small portions with leaves and left in a warm place until the characteristic aroma of the condiment (*Ogiri-egusi*) is developed. It is further sun-dried for 7 days on straw mats (Odunfa, 1985).

Groundnut is an important oil crop of Brazilian origin, is cultivated in tropical and warm temperate climates. The crop is grown usually as a component of a variety of crop mixtures including sorghum, millet, cowpea and maize (Missari *et al*., 1988). Groundnut is an important oil seed and cash crop accounting for more than one-third of the total oil seeds in the world (Sahayaraj and Martin, 2003). *Arachis hypogaea*, commonly referred to as groundnut, is known in India as *cheenabadam*, in Ghana as *dagomba* and in Nigeria as *ahuekere (Ibo, jada (Hausa)* (Musa *et al*., 2010). In history, the domesticated peanut is an amphidiploids alloteraploid, meaning that it has two sets of chromosomes from two different species, thought to be *Arachis duranensia* and *Arachis ipaensis*. Thought that these likely combined in the wild to form the teraploid species (*Arachis monticola*) which gave rise to the domesticated peanut (Seijo *et al*., 2007). This domestication might have taken place in Paraguay and Bolivia where the wildest strain grows today. Sahayaray and Martin (2003) reported that groundnut is an important oil seed and cash crop accounting for more than one third (1/3) of the total oil seeds in India. Beside income for farmers, it provides an inexpensive source of high quality dietary protein and oil (Butherwort and Wu, 2004)
Groundnuts are particularly susceptible to contamination during growth and storage. Poor storage of groundnut can lead to an infection by the mould fungus *Aspergillus flavus*,

releasing the toxic and highly carcinogenic substance called aflatoxin. The aflatoxin producing mould exists throughout the groundnut growing areas and may produce aflatoxin in the groundnuts when the conditions are favourable to fungal growth (Nevius, 2003).

Thompson *et al.* (2010) reported that groundnuts seeds can be eaten raw, cooked, use in recipes, made into solvents and oil, used in make-up, medicine, textile materials, groundnut butter as well as many other uses. It used to help fight protein malnutrition because it has high protein, high energy, and high nutrient groundnut based pastes that were developed to aid in famine relief. Low grade or culled groundnuts, not suitable for the edible market, are used in the production of groundnut oil. The protein cake (oil cake meal) residue from oil pressing is used as an animal feed and as soil fertilizers. The low grade groundnuts are also widely sold as garden bird feed. Groundnut can be used like other legumes and grains to make lactase-free milk like beverages and peanut milk.

Treatment of hemophilia and other inherited blood disorders such as nose bleeding and excessive menstruation bleeding in women (Houribane *et al*., 1997). They are easily digested and could serve as a mild laxative. It is also known to boost the immune system because they build resistance against diseases such as hepatitis and tuberculosis (Hoffman and Collins-Williams, 1994). Nutritionists have also recommended that diabetic patients should see groundnut as a boom because it addresses niacin deficiency and also minimizes the risk of cancer and cardiovascular complications (Handy, 1985). Groundnut has also been proven effective in treatment of obesity. Roasted groundnut could be taken before launch because they do a good job in lowering appetite which could contribute to weight loss (Nevius, 2003). Many families in West Africa often use fermented condiments as low cost meat substitute. Condiments are primarily used as flavour intensifiers for soups and to enhance sweetness. The liberal use of condiments is expected to increase the intake of high levels of protein, minerals and vitamins. It could be used to produce complementary food supplements which add advantage over seasoning salts that now tend to replace the local condiments in our kitchen (Giami and Barber, 2004). Most commercial seasonings including magi are expensive due to the high cost of raw materials used for their preparation. While castor seeds and melon seeds are also costly, the fluted pumpkin seeds are very scarce and in short supply (Umeh *et al*., 2013).

This work is aimed at producing *ogiri-ahuekere* and *ogiri-egusi* condiments from groundnut and melon seeds respectively as well as comparing the organoleptic properties of soups prepared with both fermented condiment samples.

Materials and Methods

Collection of Materials

The groundnuts seeds and soup recipe were bought from a local market at Aba, Abia State, Nigeria.

Production of *Ogiri-ahuekere* Samples from Raw Groundnut Seeds

Ogiri-ahuekere samples were produced according to Chukwu *et al*. (2017). Figure 1 shows the flow diagram for the production of *ogiri-ahuekere*.

Production of *Ogiri-egusi* from Shelled *Egusi* Melon Seeds

The cotyledons were boiled for eight (8) hours. After which the water was drained–off and allowed to cool. The cooked cotyledons were milled into a paste manually using pestle and mortar. The paste was wrapped in small portions of approximately 30g with blanched

plantain leaves and left to ferment in a container for 5 days at about 28^{o}C (Omafuvbe *et al*., 2003; Chukwu *et al*., 2017). The samples were put in the oven at 50^{o}C-70^{o}C to dry. Figure 2 shows the flow diagram for the production of *ogiri-egusi*.

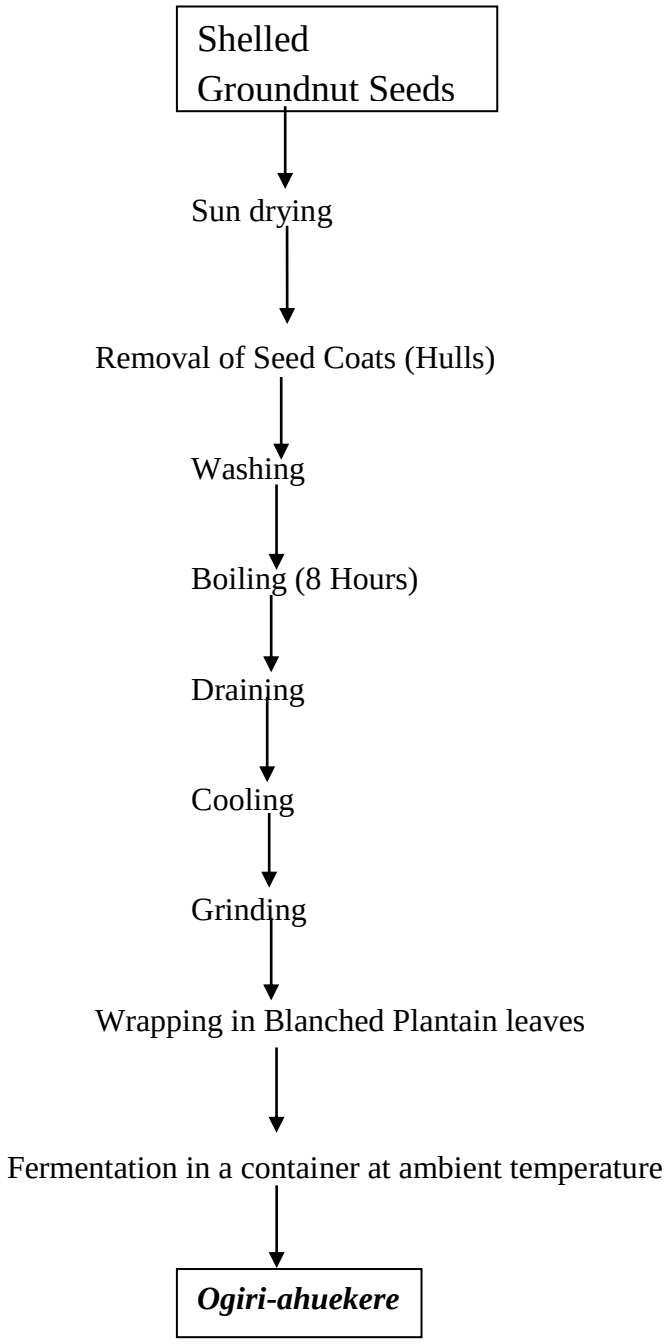

Fig 1: Flow Chart for the Production of Fermented *Ogiri–Ahuekere* Samples.

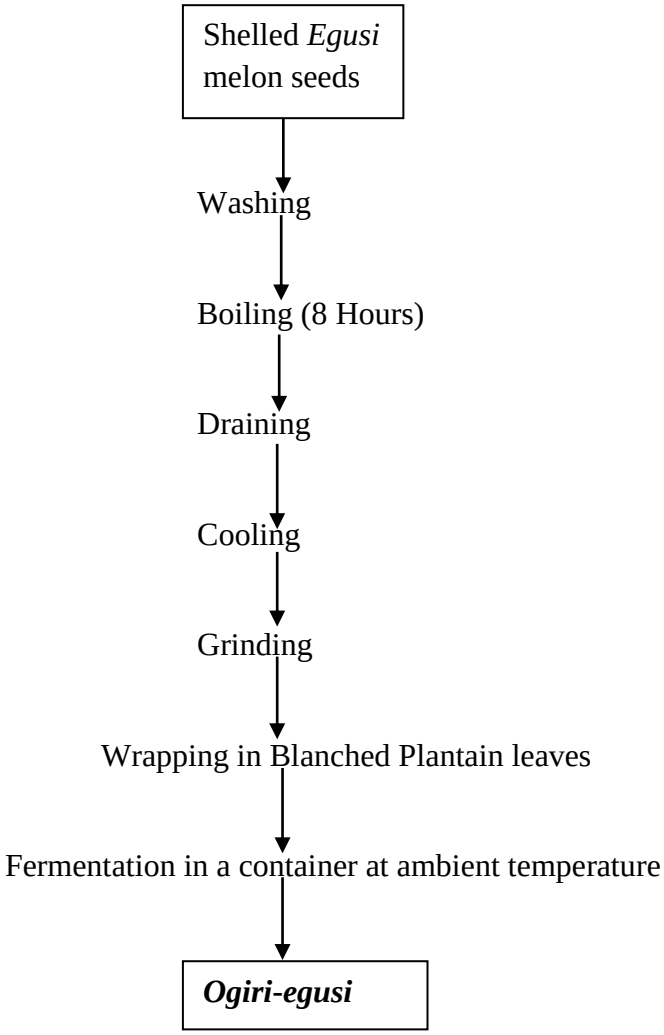

Fig 2: Flow Chart for the Production of Fermented *Ogiri-egusi* Samples.

Sensory Evaluation of *Ogiri-Ahuekere*

Preparation of *Oha* Soups with *Ogiri* Condiments

The recipe of the soup used for preparation of *oha* soup is outlined according to Wokoma and Aziagba (2001) and Chukwu *et al*. (2017). The soups were prepared according to Chukwu *et al*. (2017).

Sensory Evaluation of *Oha* Soups Prepared with *Ogiri-egusi* and the Three Most Acceptable *Ogiri-ahuekere* Samples

The panelists were semi-trained and drawn where the work was carried out in Abia State Polytechnic, Aba, Abia State, Nigeria. The four samples used for this analysis were coded in order to hide their identity as A, B, C and D; A, B, C represented its fermentation time in days and D was used as the control. The panelists were separated from each other so that none of them could influence each other's judgements of the samples. Water was also provided for rising of their mouth after tasting each sample. The sensory attributes of the samples tested were appearance, aroma, taste, texture and overall acceptability. A nine-point hedonic scale was used for the rating of the sensory attributes of the sample (Ihekoronye and Ngoddy, 1985; Onwuka, 2005; Chukwu *et al*., 2017)

Where

9	=	like extremely
8	=	like very much
7	=	like moderately
6	=	like slightly
5	=	neither like nor dislike
4	=	dislike slightly
3	=	dislike moderately
2	=	dislike very much
1	=	dislike extreme

Statistical Analysis

The data obtained from the analyses were analysed statistically using the Analysis of Variance (ANOVA) method with the application of SPSS Version 20. The difference between the mean values was determined by Tukey's test. Significance was accepted at 5% probability level (Pallant, 2004).

Results and Discussion

Comparison of Organoleptic Attributes of *Ogiri-Egusi and Ogiri-Ahuekere* Samples

Table 1 shows the comparison of organoleptic attributes of soups prepared with 5 days fermented *ogiri-egusi* and the three best *ogiri-ahuekere* (8, 9 and 10 days fermentation) samples according to Chukwu *et al*. (2017).

Appearance of the Soups

Table 1 shows that there was no significant difference in the appearance of soups prepared with 5 days fermented *ogiri-egusi* and 10 days fermented *ogiri-ahuekere* but *ogiri egusi* sample was liked very much (scored approximately 8.0) while 10 days fermented *ogiri-ahuekere* sample was liked moderately (scored approximately 7.0) according to the panelist (Chukwu *et al*. (2017). Soup prepared with 5 days fermented *ogiri-egusi* was significantly different from that of *ogiri-ahuekere* samples fermented for 8 and 9 days whose appearances scored approximately 5.0 (neither like nor dislike) and 6.0 (like slightly) respectively.

Aroma of the Soups

There were significant differences among the aroma of the soups at 95% level of confidence (Table 1). The soups prepared with 5 days fermented *ogiri-egusi* had approximately 8.0 (like very much), followed by 10 days fermented *ogiri-ahuekere* which scored approximately 7.0 (like moderately), followed by 9 days fermented *ogiri-ahuekere* which scored approximately 6.0 (like slightly) and 8 days fermented *ogiri-ahuekere* which scored approximately 4.0 (dislike slightly). *Ogiri-egusi* of 5 days fermentation had a better aroma but 10 days fermented *ogiri-ahuekere* samples could be accepted if consumers become familiar with the products of Chukwu *et al*. (2017).

Taste of the Soups

showed that there was no significant difference between the soups of 8 and 9 days fermented *ogiri-ahuekere* which were neither liked nor disliked (mean score approximately 5.0) at 95% level of confidence. The soups prepared with 10 days fermented *ogiri-ahuekere* were liked slightly (mean score approximately 6.0) and was significantly different from the soups prepared with 8 and 9 days fermented *ogiri-ahuekere* as well as the soup of 5 days fermented *ogiri-egusi* sample. *Ogiri-egusi* soup was liked very much (8.0) which could be the fact that the test panel was more familiar with the taste of *ogiri egusi* than the best three *ogiri-*

ahuekere samples of Chukwu *et al*. (2017).

Texture of the Soups

There were significant differences among the soups in term of texture at 95% level of confidence. The soups prepared with 5 days fermented *ogiri-egusi* had the mean score approximately 7.0 (like moderately) followed by 10 days fermented *ogiri-ahuekere* which had mean score approximately 6.0 (like slightly), while the soup prepared with 9 days fermented *ogiri-ahuekere* sample had approximately 5.0 (neither like nor dislike) which was significantly different from the soup prepared with 8 days fermented *ogiri-ahuekere* sample (4.0 = dislike slightly).

Overall Acceptability of the Soups

There were significant differences among the soups samples (Table 1). Soup prepared with 5 days fermented *ogiri-egusi* sample had an overall acceptability approximately 8.0 (like very much) followed by by 10 days fermented *ogiri-ahuekere* sample which had mean score approximately 7.0 (like moderately). Moreover, 9 days fermented *ogiri-ahuekere* soup had approximately 6.0 (like slightly) which was significantly different from the soups of 8 days fermented *ogiri-ahuekere* (5.0 = neither like nor dislike) and other soup samples. Therefore, soup prepared with 5 days fermented *ogiri-egusi* had better overall acceptability than *ogiri-ahuekere* soup samples of Chukwu *et al*. (2017).

Conclusion and Recommendation

The data obtained from organoleptic characteristics shows that there were significant ($p \leq 0.05$) differences in the soups prepared with *ogiri-egusi* and *ogiri-ahuekere* samples. Soup prepared with 5 days fermented *ogiri-egusi* was more acceptable than 8-10 days fermented *ogiri-ahuekere* soup samples by the panelists. *Ogiri-egusi* soup was liked very much (8.0) which could be the fact that the test panel was more familiar with the organoleptic properties of *ogiri egusi* than those of the best three *ogiri-ahuekere* samples.

Groundnut seed could be fermented into an acceptable *ogiri* condiment that can be used in place of other condiments in the market. The production of *ogiri-ahuekere* would give value addition to groundnut and as source of income to both farmers and producers. The use of starter culture could be applied to reduce fermentation time and probably improve the quality of the product. The study of the flavour components of *ogiri-ahuekere* and their relationship with the fermenting microorganisms is also recommended.

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Table 1: Mean Score of Organoleptic Attributes of Soups Prepared with *Ogiri-egusi* and *Ogiri-ahuekere* Samples

Sample	Appearance	Aroma	Taste	Texture	Overall Acceptability
A	4.93 ± 0.35^{c}	4.23 ± 0.25^{d}	5.33 ± 0.15^{c}	3.90 ± 0.10^{c}	4.77 ± 0.21^{d}
B	5.83 ± 0.21^{b}	5.80 ± 0.20^{c}	5.10 ± 0.30^{c}	4.70 ± 0.27^{c}	5.97 ± 0.25^{c}
C	6.97 ± 0.06^{a}	6.67 ± 0.15^{b}	6.23 ± 0.06^{b}	6.40 ± 0.17^{b}	7.08 ± 0.08^{b}
D	7.47 ± 0.50^{a}	8.10 ± 0.20^{a}	8.07 ± 0.15^{a}	6.97 ± 0.06^{a}	8.10 ± 0.36^{a}
LSD	0.783	0.852	0.871	0.561	0.922

Means with the different superscripts are significantly different from each other ($p \geq 0.05$) in the same column.

KEY:

A= *Ogiri-ahuekere* fermented for 8 days

B = *Ogiri-ahuekere* fermented for 9 days

C = *Ogiri-ahuekere* fermented for 10 days

D = *Ogiri egusi*