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Effect of Groundnut and Tigernut Doughs on the Quality of 'Kilishi' Lates Niloticus

Magawata, I. and Faruk, S. U.
Department of Fisheries and Aquaculture, Faculty of Agriculture, Usmanu Danfodiyo, University, P.M.B. 2346, Sokoto, Nigeria
Email: dantsafe@yahoo.com

ABSTRACT
A *Lates niloticus* with an average weight of 13kg was purchased from Sokoto State Meat, Fish and Vegetable Market. The fish was descalled and washed thoroughly with clean water, after which it was cut into chunks, and into three treatments before slicing for *kilishi* production. The fresh sample was analysed for its proximate composition prior to application of slurry of ingredients. Three different doughs (Groundnut, Tigernut and combination) were used as major ingredients to prepare the 'Kilishi' *Lates niloticus.* All processes involved in *kilishi* preparation ranging from application of slurry of ingredients to roasting on glowing fire were followed. The three treatments were stored in a brown paper envelop in room temperature for a period of six weeks and on weekly intervals were subjected to sensory evaluation, chemical analysis and bacteriological assessment. The result of the present study revealed that there were significant differences ($P<0.05$) between the three treatments in the parameters tested. Crude protein and moisture values of the products during storage period ranged from 30.49±0.17 in *kilishi* Tigernut during the first week to 62.23±1.26 in *kilishi* of combined dough during the third week of storage. *Kilishi* formulated with groundnut dough was cherished more by panel of judges compared to the other two throughout the storage period. This research suggests a value addition to fish and is recommending further research to explore more ways of using local raw materials as ingredients for fish *kilishi* formulation.
Keywords: *Lates niloticus, Kilishi,* Dough, slurry of ingredients and Storage.

INTRODUCTION

Fish is an important component of the diet of an average Nigerian and constitute about 40% of the total animal protein intake (Adeneji, 1987). The short supply of animal protein and increase in human population has the combine effect of raising the cost of animal protein to a level almost beyond the reach of low-income people. Factors such as disease, drought and scarcity, high cost of feeds and low genetic potentials of indigenous breeds have reached its final points to reduce the population of livestock in the country. This situation has given rise to a considerable demand for fish to supplement animal protein. The search for a durable method have continued to work in this direction and several methods of preservation such as freezing, controlled smoking and canning among others have emerged. These methods however are not accessible to the local fishermen in Nigeria, either due to the cost involved or due to high technology behind the operation of such methods (Ipinjolu *et al.* 2004). To reduce postharvest losses, 'kilishi' a technique hitherto applied to the processing of animal meat (Igene *et al.,* 1989) in northern part of Nigeria was applied to the preservation of fish (Magawata and Oyelese, 1999 and Magawata and Oyelese, 2000). According to Igene *et al.* (1989) 'kilishi' is a Hausa word, which refers to beef, sheep or goat meat that is processed by dressing, slicing, sun drying, application of some slurry of spices and roasting on glowing fire. 'Kilishi' has appeared to have developed among the early Fulani and Hausa herdsmen as means of preserving meat in the absence of modern facilities, in order to enhance long storage and increase shelf life to address scarcity problem. Ketiku (1975) reported that addition of spices to 'kilishi' is also of health importance as this could be a check to stomach disorders, rheumatics and act as relaxers of the alimentary system. Fish 'kilishi' was tested not only as a good protein source but also as much acceptable means of preservation. Ibrahim *et al.* (2013)

MATERIALS AND METHODS

Experimental Fish

The fish species used for the study was *Lates niloticus.* It was chosen because of its availability, acceptability and in addition it is greatly relished by majority of the population.

Sample Collection

One sample of *Lates niloticus* weighting 13kg was purchased from Sokoto State Meat, Fish and Vegetable Market and transported to the Departmental Laboratory of the Department of Forestry and Fisheries, Usmanu Danfodiyo University, Sokoto where it was subjected to the following activities:

Dressing of the Fish

The fresh fish sample was thereafter descaled, degutted, washed and deboned with sharp sterilized knife according to the method adopted by Ibrahim *et. al.* (2013).The muscles were then sliced while they were still in fresh state.

Preparation of Fish *Kilishi*

A total of ten (10) spiced ingredients and water (with each having its proportion) were used to prepare the slurry of ingredients (Table 1). The conventional stages of processing 'kilishi' as outlined by Magawata and Oyelese (1999) was followed as clearly shown in Fig 1.

Storage and Analysis of Samples

The 'kilishi' products were packed in brown envelopes similar to was used by Ibrahim *et al.* (2013) and stored in room temperature for a period of six weeks. Each week, samples were withdrawn for organoleptic, proximate, TVB-N and microbial analysis to assess the quality of the products.

Proximate analysis was carried out according to AOAC (1995) before, after processing the fish and during storage for a period of six weeks. These samples used for proximate analysis were also used to analyse the total volative bases Nitrogen TVB-N.

Table 1 The proportion of ingredients used as slurry formation

S/No	Ingredients	Hausa Name	Weight
1	Groundnut dough	Labu/Tunkuza	1989
2	Tigernut	Dakkuwa	1980
3	Curry powder	Kori	30
4	Dried (hot) pepper	Barkonu	90
5	Eugenia caryphyllata	Kanunfari	60
6	Fagara zanthoxyloids	Fasakwaun	60
7	Zingiber officinale	Ginger /Chitta	180
8	Knor cube	Knor	60
9	Onion	Albasa	420
10	Pepper guinensis	masoro	90
11	Salt	Gishiri	30

Organoleptic Assessment

At weekly intervals, samples of the three 'kilishi' products were withdrawn for organoleptic assessment. The samples were presented to a ten-member panel of judges in specially designed containers equipped with organoleptic materials (water for rinsing mouth, score sheets and indices to be scored). The parameters that were assessed included texture, flavor, taste and odour. A seven point hedonic scale as suggested by Clucas and Ward (1996) was adopted to score the quality of the products, which ranged between 1 – 7 that is; like extremely = y, like very well = d6, like slightly = 5 undecided = 4, dislike slightly= 3, dislike very well= 2, dislike extremely = 1.

Bacteriological Assessment

Bacterial count was carried out using standard plate count. 1g of the kilishi samples was diluted into 9mls of distilled water (1g:9mls) in sterilized universal tubes for each of the treatments. From this dilution, further serial dilutions were made up by 1ml transfer from tube 1 through tube 5. Plates already prepared were allowed to set before incubating for 24hours and colony counts were carried out on plates.

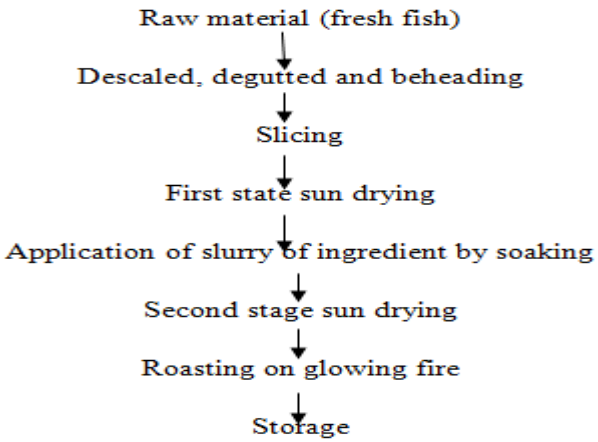

Fig. I: Conventional stages of fish kilishi processing source (Magawata and Oyelese, 1999).

Statistical Analysis

Data collected were analysed using descriptive statistics and analysis of variance (ANOVA) with SPSS Package means with significant differences were separated using the LSD procedure.

RESULTS AND DISCUSSION

Proximate Composition

The proximate compositions of the three different slurries are given in Table 2. The result showed that there were significant difference (P<0.05) in the percentage moisture, crude protein and lipid from the three different slurries.

The percentage moisture content (78.00±1.00) was higher in fresh samples and this result conforms with the findings of Peason, (1981) and that of Clucas and Ward (1996). Crude protein level (16.93±0.47%) indicates that the species could be a ready source of concentrated protein, the result of which is similar to those reported by Abdullahi *et. al*., (2000), Magawata and Oyelese (2000) and Eyo, (2001).

The three 'kilishi' products immediately after roasting were found to have lower moisture content (11.67, 12.33 and 10.17) meaning that a lot have been lost in the process of applying heat during sun drying and roasting. The crude protein increased from 16.93% (while in fresh state) to 29.46, 30.49 and 26.31 respectively for the three 'kilishi' products. This was due to concentration of the protein as a result of removal of moisture as reported by Magawata and Oyelese (1999), Magawata and Oyelese (2000) on fish 'kilishi' Ogunsola and Omojola (2007) for dehydrated shredded beef meat and Magawata and Obafemi (2010) on shredded fish muscles.

ORGANOLEPTIC PROPERTIES

Table 4 shows the summary of the taste panel scores of the three 'kilishi products. There were significant difference (P<0.05) in texture, taste, flavor and colour of the three products during the six weeks storage period.

Kilishi product has been characterized by its quality and pleasant flavor and highly relished by the consumers (panels) shown that the 'kilishi' prepared with groundnut dough has high significant score (P<0.05) for texture at week 6 and lowest in 'kilishi' prepared with Tigernut dough at week 5 and 6 (3.23±1.22, 2.97±1.45% respectively. While 'kilishi' prepared with groundnut dough is significantly high (P<0.05) in taste at week 5 and lower (P>0.05) in kilishi prepared with tigernut dough with value (2.80±1.39%) a week 6 while 'kilishi' prepared dough combination is highly significant (P<0.05) in flavor (5.70±1.02%) at week 6.

TOTAL VOLATILE BASES-NITROGEN (TVB-N)

Table 5 shows the result of the volatile bases-Nitrogen (TVB-N). TVB-N was lower in 'kilishi' prepared with groundnut dough with the value 8.4mg/100g after 1st, 2nd and 3rd weeks of storage period. In 'kilishi' prepared with tigernut dough, the TVB-N was higher at week 5 and 6 of storage duration with the value (19.6%) and thus made 'kilishi' prepared with groundnut dough to be more acceptable than 'kilishi' prepared with tigernut dough and 'kilishi' dough combination. This is not unconnected with the fact that extraction of oil was done on groundnut dough which was not the case with tigernut dough. This is evident taking into account the results of the proximate composition of the ingredients (Table 1). Although the concentration of oil was not significant in the two doughs, that of tigernut was higher and this might have facilitated the development of rancidity which manifested in the results of TVB-N.

MICROBIAL COUNT

Throughout the course of the work, Table 6 showed that there was higher microbial load in 'kilishi' prepared with tigernut ($5.9x10^6$) at week 6, lower in 'kilishi' prepared with dough combination ($8x10^5$) at week 3 and least in 'kilishi' prepared with groundnut dough ($4x10^5$) at week 6 respectively.

Similar result was obtained by Frazier and Westhoff (1991) who observed that microbes have an absolute requirement for water in order to survive. Although all the products contained acceptable limit of bacterial load, *Kilishi* prepared with groundnut dough showed more promising result with the least bacterial counts.

CONCLUSION

The result of this investigation showed that people were interested in all the products developed, therefore, fish with less market value should be used for further production and thus preparation of 'kilishi' should be explored as a means of preserving fish catches to arrest spoilage and ensure sustainable fish supply even during times of scarcity.

REFERENCES

Abdullahi, S. A., Abolude, D.S and Ega, M.A. (2000). Nutrient Quality of Four Oven Dried Fresh Water Catfish

Species. *Northern Journal of Tropical Bioscience*, 1(1): 70:76,.

Adeneji, J.P (1987). Fish composition in Nigeria: Implication of fish development policies. *Journal of West African Fisheries* 3(2): 151-101.

A.O. A.C. (1995). *Official Methods of Analysis*, 15th edition.Association of Official Analytical Chemists

Clucas, I. J. and A. R. Ward (1996). *Post Harvest Fisheries Development: A Guide to Handling, Preservation, Processing and Quality*. Chatham Maritime, Kent ME4 4TB, United Kingdom.

Eyo A.A. (2001) *Fish processing, technology in the tropics*. National institute for fresh water fisheries, New Bussa, Nigeria. 403p.

Frazier W.C, and Westhoff D.C. (1991) *Food microbiology* (3rd Edition) Tata McGraw – Hill publishing Co. Ltd. New Delhi. 540p.

Ibrahim Shehu Jega, Ibrahim Magawata, Joseph Kayode Ipinjolu and Muawiyah Jibir (2013). Quality Evaluation Of *kilishi* Processed Bony Tongue (*Heterotis niloticus,* Cuvier) Under Different Storage Media. *International Journal of Agriculture and Food Science Technology, ISSN 2240-3050. 4 (1). 83-93*

Ipinjolu, J.K., Olapade, J.O. Shehu, R.A and Hassan, W.A (2004). Assessment of Consumer acceptance of kilishi of African Carp (*Labeo coubie,* Ruepplell) and Elephant Snout. (*Hyperopisus bebe occedentalis,* Gunther). In: Proceedings of the Nigerian Society for Animal Production Annual Conference held at Usmanu Danfodiyo University, Sokoto, 21st – 25th March, 2004. pp 131 – 134.

Igene, J.O. Faruok, M.M. and Akanbi, C.I. (1989). Preliminary Studies on the Traditional Processing of kilishi. *Journal of the Science of Food and Agriculture*. 60(1)89-98.

Ketiku, A.O. (1975). *The Chemical Composition of Nigerian Onions (Allium cepacinn) food chem.. (1)* Applied Science Publishers Ltd, England.

Magawata, I. and Oyelese, O.A (1999). Fish kilishi: An alaternative means of reducing postharvest losses and improving the quality of processed fish. *Book of proceedings*. Nigerian Association of Aquatic Sciences.

Magawata, I. and Oyelese, O.A (2000). Quality Changes and Shelf Life of processed *Clarias gariepinus* and *Bagrus bayad Journal of Agriculture and Environment*. 1(1), 101-110.

Magawata, I. and Obafemi, T. (2010). Preliminary Investigation on the Nutritive value of Dehydrated Shredded fish muscles of *Clarias gariepinus* (Burchell, 1822) *Biological and Environmental Journal of the Tropics,* 7(4) 62- 66.

Pearson, D. (1981) *The chemical Analysis of Foods*. Churchill, Livingstone, Edinburg, UK. 530p.

Table 2: Mean proximate composition of the three different slurries of Ingredients

Slurries	Moisture	C/protein	Lipid	Ash	NFE
G/nut dough	40.50±1.00[a]	13.26±0.33[a]	5.83±0.76[a]	8.67±0.76[b]	13.26±0.33[a]
T/nut dough	20.00±8.67[c]	9.89±0.57[c]	6.00±0.50[a]	12.17±2.3[a]	9.89±0.57[c]
Combined dough	35.17±2.02[b]	10.40±2.23[b]	2.00±1.00[b]	12.83±0.53[a]	10.40±2.23[b]

Table 3: Proximate composition of fresh and 'kilishi' products from *Lates niloticus* fish/products

Fish/products	Parameters (%)				
	Moisture	C/protein	Lipid	Ash	NFE
Fresh *Lates niloticus*	78.00	16.93	1.50	1.0	16.93
After Processing (%DM)					
"Kilishi" G/nut dough	12.33±0.29^{a}	30.49±0.17^{a}	1.33±0.29^{ns}	4.17±0.29^{ns}	30.495±0.17^{a}
"Kilishi" T/nut dough	10.17±0.29^{c}	26.49±0.22^{c}	1.33±0.29^{ns}	5.00±0.50^{ns}	26.31±0.17^{a}
"Kilishi" combined dough	11.67±0.29^{b}	29.46±0.14^{b}	1.33±0.29^{ns}	5.67±0.58^{ns}	26.31±0.17 ^{a}
During Storage					
Weeks	Sample	Moisture	C/protein	Lipid	Ash	NFE
1	"Kilishi" G/nut dough	11.33±0.58^{a}	56.13±1.42^{cdef}	2.67±1.26^{abc}	7.33	1.67±1.75^{abc}
	"Kilishi" T/nut dough	12.33±0.29^{a}	30.49±0.17^{i}	1.33±0.29^{ns}	5.17±0.29^{ns}	1.83±0.76^{ab}
	"Kilishi" combined dough	11.67±0.29^{b}	29.46±0.14^{j}	1.33±0.29^{ns}	5.67±0.58b^{ns}	1.67±0.76 ^{abc}
2	"Kilishi" G/nut dough	7.33±0.29^{e}	48.77±0.31^{g}	2.83±0.29^{abo}	8.00±0.29^{a}	0.67±2.29^{c}
	"Kilishi" T/nut dough	7.16±0.29^{cde}	56.03±3.23^{def}	2.17±0.29^{c}	7.83±0.29^{a}	0.83±0.29^{bc}
	"Kilishi" combined dough	8.83±0.29^{d}	58.17±0.42^{bcd}	2.17±0.29^{c}	7.33±0.29b^{a}	0.67±2.29^{c}
3	"Kilishi" G/nut dough	8.50±0.50^{cd}	52.57±1.11^{g}	2.17±0.58^{c}	7.17±0.76^{ab}	1.0±0.50^{bc}
	"Kilishi" T/nut dough	7.67±0.29^{de}	43.93±1.21^{h}	2.00±0.50^{c}	7.17±0.29^{bcd}	1.67±0.76^{abc}
	"Kilishi" combined dough	8.00±0.00^{e}	62.23±1.26^{a}	2.00±0.50^{c}	7.50±0.50^{a}	0.83±0.29^{bc}
4	"Kilishi" G/nut dough	7.17±0.76^{ef}	54.77±0.85^{efg}	2.33±0.58^{bc}	7.17±0.29^{bcd}	2.17±0.76^{a}
	"Kilishi" T/nut dough	6.67±0.58^{e}	48.67±1.06^{h}	2.50±0.05^{bc}	7.83±0.76^{cd}	1.0±0.50^{bc}
	"Kilishi" combined dough	7.67±0.58^{de}	58.67±1.55^{bc}	2.00±0.50^{c}	8.50±0.50^{bcd}	1.0±0.50^{bc}
5	"Kilishi" G/nut dough	6.83±0.29^{fg}	54.37±1.47^{fg}	2.50±0.00^{bc}	7.00±0.50^{bcd}	0.67±0.29^{c}
	"Kilishi" T/nut dough	6.0±0.50^{h}	52.50±0.36^{g}	2.67±0.29^{abc}	7.50±0.29^{bcd}	0.67±0.29^{c}
	"Kilishi" combined dough	7.0±0.50^{ef}	58.43±0.50^{bcd}	2.50±0.50^{bc}	6.00±0.50^{bcd}	1.67±0.76^{abc}
6	"Kilishi" G/nut dough	6.83±0.29^{fg}	56.37±1.36^{cdef}	3.67±0.29^{a}	6.67±0.29^{bc}	0.67±0.29^{c}
	"Kilishi" T/nut dough	6.17±0.29^{e}	53.10±1.39^{g}	3.38±0.29^{ab}	6.67±050^{bc}	0.67±0.29^{c}
	"Kilishi" combined dough	6.17±0.29^{e}	59.27±0.68^{b}	3.67±0.29^{a}	7.17±0.29^{bcd}	0.67±0.76^{c}

Means with the same letters are not significantly different (P<0.05).

Table 4: Taste panel scores of the three "kilishi' products

Weeks	Sample	Texture	Taste
1	"Kilishi" G/nut dough	4.93±1.20^{bcd}	4.87±1.53^{abc}
	"Kilishi" T/nut dough	5.97±1.36^{de}	4.87±1.53^{abc}
	"Kilishi" combined dough	5.17±0.95^{cd}	4.90±1.97^{abc}
2	"Kilishi" G/nut dough	4.80±0.92^{de}	4.90±0.99^{abc}
	"Kilishi" T/nut dough	4.80±1.52^{de}	4.43±1.43^{bc}
	"Kilishi" combined dough	5.67±1.09^{abc}	5.37±1.03^{ab}
3	"Kilishi" G/nut dough	5.07±0.98^{cd}	4.73±1.34^{bc}
	"Kilishi" T/nut dough	4.97±1.61^{cd}	4.87±1.59^{abc}
	"Kilishi" combined dough	5.17±0.79^{bcd}	5.50±0.82^{ab}
4	"Kilishi" G/nut dough	4.63±1.56^{de}	4.50±1.89^{c}
	"Kilishi" T/nut dough	4.23±1.25^{ef}	4.80±1.06^{bc}
	"Kilishi" combined dough	4.97±1.53^{cd}	5.03±1.07^{abc}
5	"Kilishi" G/nut dough	3.97±1.93^{f}	5.63±0.99^{a}
	"Kilishi" T/nut dough	3.23±1.22^{g}	2.97±1.29^{d}
	"Kilishi" combined dough	5.83±0.91^{ab}	4.23±1.30^{e}
6	"Kilishi" G/nut dough	6.10±1.24^{a}	3.37±1.22^{d}
	"Kilishi" T/nut dough	2.97±1.45^{g}	2.80±1.39^{d}
	"Kilishi" combined dough	3.93±1.14^{f}	5.53±1.41^{ab}

Means with the same letters are not significantly different (P<0.05).

Table 5: Mean total volatile bases (MgN/100g) of the kilishi products during storage

Product	Storage period (weeks)					
	1	2	3	4	5	6
"Kilishi" G/nut dough	8.4	8.4	8.4	12.0	12.0	14.0
"Kilishi" T/nut dough	11.2	14.0	16	16.8	19.6	19.6
"Kilishi" combined dough	11.2	11.2	11.2	14	16.8	16.8

Table 6: Viable count of bacteria in 10^5 dilution from kilishi samples period IT

Week1		
"Kilishi" G/nut dough	8.67	9×10^5
"Kilishi" T/nut dough	10	1.0×10^6
"Kilishi" combined dough	9	9×10^5
Week 2		
"Kilishi" G/nut dough	10	1.0×10^6
"Kilishi" T/nut dough	13	1.3×10^6
"Kilishi" combined dough	10	1.0×10^6
Week 3		
"Kilishi" G/nut dough	11	1.1×10^6
"Kilishi" T/nut dough	25	2.4×10^6
"Kilishi" combined dough	8	8×10^5
Week 4		
"Kilishi" G/nut dough	8	8×10^5
"Kilishi" T/nut dough	40	4.0×10^6
"Kilishi" combined dough	12.33	1.2×10^6
Week 5		
"Kilishi" G/nut dough	6	6×10^5
"Kilishi" T/nut dough	42	4.2×10^6
"Kilishi" combined dough	12.33	1.2×10^6
Week 6		
"Kilishi" G/nut dough	4	4×10^5
"Kilishi" T/nut dough	59	5.9×10^6
"Kilishi" combined dough	11.33	1.1×10^6

Means with the same letters are not significantly different ($P<0.05$)