Quality Assessment Of Smoked Dried Fish Packed In Sealed Transparent Polythene Nylon

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Abstract: The quality assessment of smoked dried fish packed in sealed transparent polythene bag was carried out for six (6) weeks. The effect of alligator pepper in the processed smoked dried fish was also compared with the brined smoked dried fish. The fresh fish were prepared by gutting, washing and rinsed thoroughly, sample A brined (20% salt) and sample B (20% ground alligator pepper) which were smoked separately (A1, A2, A3) and (B1, B2, B3) They were then analyzed fortnightly for microbial load, proximate analysis, chemical analysis and sensory evaluation. (Colour, taste, appearance and flavour) were determined also with two (2) weeks interval. The moisture content ranged between 10.55± 0.26, 8.99± 0.75 and 8.27± 0.48 as means while sample A was found to be higher in moisture content than smoked dried sample B preserved with ground alligator pepper. The microbial load ranged between 7.8×10^{-5}, 7.5×10^{-5} and 7.0×10^{-5} which is higher than the microbial load in brined smoked dried fish. The chemical parameter TVB ranges between 24.12±0.53 and 14.42±0.48. There were significant difference between preserved fish by brine and the preserved fish with alligator pepper; this shows that, the shelf life of brined smoked fish is longer than the shelf life of ground alligator peppered smoked dried fish for the six weeks studied. Smoked dried fish preserved with ground alligator pepper was preferable owing to the high crude protein content despite the high microbial load. In all, both samples A's and B's kept and remained preserved for the six weeks of the experiment without any visible sign of change.
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Introduction

Fish are major living aquatic resources which contain high quality of protein, vitamins and minerals for human consumption (FAO, 1981). Poor handling, storage and distribution are responsible for 100% by weight loss of fish that are caught and stored; fish are often prone to spoilage because of its low value, which supports the growth of pathogen (Oyeleye, 2003) postulated further that improved handling and storage could improve quality of smoked fish in Africa. The importance of fish in the developing world cannot be over emphasized as it is a source of food and income to many people. About 35 million of the people in Nigeria depend on artisanal fisheries for their livelihood. Fish production has been at increase in Nigeria as a result of expansion in freshwater aqua cultural activities by various development program of government to make fish protein available for the teaming populace furthermore; various traditional methods have been employed to preserve the processed fish for consumption and storage. These include smoking, drying, salting, frying, fermentation and combination of these but on the contrary, fish smoking is the mostly practiced method. Practically all species of fish available can be smoked and it has been estimated that 70-80% of domestic marine and freshwater catch are consumed as smoked fish (Akande, 1997).

Fish can be preserved traditionally by modern techniques which retard spoilage and extend the shell life of the fish, (Akande, 1997) advocated the adoption of catfish smoking as a preservation method to protect fish against pathogenic microorganisms and insect deterioration. Smoking is the process through which volatiles from thermal combustion of wood penetrate fish flesh (Simko,1991). Curing by salting and smoking permits lengthy- preservation by removing moisture, which is essential for bacteriological and enzymatic spoilage (Antonia da Silva, 2002), various food preservation techniques have been utilized to improve the microbial safety and extend the shelf life of fishing generally including freezing, chemical preservation, salting and smoking (Nickelson *et al*., 2001).

The quality of smoked product is dependent on several factors including the quality of the fish at the time of smoking, the nature of wood and the type of smoking procedure employed (Antonia da Silva, 2002). To satisfy the consumer demand, it is necessary to produce good quality and safe smoked products. The most important environmental factors governing the storage or shell life of fish are ambient temperature and humidity. These factors dictate the rate at which

chemical changes take place for these reason smoking is one of the traditional fish processing methods aimed at preventing or reducing post-harvest losses.

Traditional methods of smoking is rampant and it is inexpensive method of preservation of fish, this study will enlighten farmers on the benefit of smoking fish with alligator pepper (having some medicinal importance according to Stuart, 2013) which is relatively available and its shelf life when kept in transparent polythene bag. The study apart from enumerating the benefit of peppered smoked dried fish will also show its overall acceptability in terms of taste, appearance and as alternative to brined smoke dried fish which may not be generally acceptable to a diabetic patient. (Eyo, 2001) stated that the main problem of salted fish is in its taste which make consumers take little at a time excerpt when stewed or in soup. Therefore the end product of this study will constitute one of the varieties of smoke dried fish thereby adding to the consumer choice of eating smoke dried fish. The African mud fish *Clarias gariepinus* (Burchell 1822) is the most popular widely cultivated and mostly smoked fish in Nigeria (Awa and Alegbeleye, 1991; Aderolu and Akpabio, 2009). *Clarias gariepinus* will be used in the study since there is no religious sentiment attached to it and is most widely farmed fish in the world, making it readily available. The obvious food economic and health implication of infected smoked fish has called for several attempts to control it. The short shelf life of dead fish is due to changes in the chemical constituents of fish after death smoking enhance flavour and increase utilization of the fish. It reduces waste at times of bumper catches and permit storage from the lean season making fish easier to package, transport and market. Ashamo and Ajayi, 2003 recommended the use of paper cartons and aluminum foils through which a flow of air can pass would nullify its effectiveness, as insect could move in and be sustaining on the stored fish. This awareness has created worldwide interest in the development of alternative strategies including examination of spices which are more readily biodegradable, less toxic to man, easy and readily available to farmers. (Fasakin and Aberejo, 2002). This research is to study the quality of peppered and brined smoked dried fish packed in sealed transparent polythene bag by examining its shelf life.

Materials And Methods

Fish: Fresh hybrid clarias (2kg) were purchased from Monai fishing village settlement in Lake Kanji basin New Bussa, Niger state; the fish were transported to the fish processing laboratory of the department of Fisheries Technology of Federal College of Freshwater Fisheries Technology (F.C.F.F.T) New Bussa, Niger state where they were kept in different bowls filled with clean water. The proximate analyses were done in the chemistry laboratory of National Institute of Freshwater Fisheries Research New Bussa, Niger state (NIFFR).

Materials; The materials used for the study includes fish (hybrid clarias), ground alligator pepper and salt, knife, chopping board, tray, tissue paper, disposable mouth and hand gloves, masking tape, sample bottles, bowls, salt, buckets, fire-wood, advance drum smoking kiln, detergent and transparent polythene bag. The alligator pepper, detergent, bowls, sachet salt and transparent polythene bag were bought from Monday market, New Bussa Niger State, the alligator pepper were taken to the college mills, dried and milled into powder using electric blender. Some of the laboratory equipment used such as sensitive weighing balance, thermometer, spatula, were obtained from the central laboratory of the College. While other materials like masking tape, disposable mouth and hand gloves, tissue paper, were bought from the pharmaceutical store, and the sample bottles were bought from General hospital laboratory all in New Bussa.

Sample preparation; The fish were gutted, washed and brined for sample A (20% salt) while for sample B (20% ground alligator pepper) 150g of ground alligator pepper was rubbed on 600g of fish) the two fish samples were triplicated (A1, A2, A3), (B1, B2, B3) and smoked differently. The thoroughly washed crucibles were dried and then sterilized in the oven (series thermal electric thermostatic drying oven) for six (6) hours at 100^0C for the analysis. The advance drum smoking kilns were cleaned and kept sterile by burning wood in it for 1 hour. In the laboratory, all equipment used were kept clean and sterilized, cotton wool was used to clean the working surface (Table) and made aseptic before the materials to be used were arranged on it. The brine solution was made to be saturated by adding 1:5 Salts to water and it was allowed to dissolve until no more residues in the clean water. Fresh fish cleaned 600g were inserted into the brine solution for 1 hour before smoking and it was smoked till constant weight of 100g was gotten. The fish were designated samples A (brined) and B (with 20% ground alligator pepper (GAP) was also smoked to a constant final weight of 125g at the same time. A small bit of the triplicated samples A & B were collected into the sample bottles for analysis in the laboratory first and then fortnightly. The samples were sealed in the transparent nylon and kept in a carton in room temperature. During the study period, the microbial analysis, the proximate analysis, the chemical test (TVB), water activity test αw, $P^{h.}$ value, peroxide value and the Organoleptic test which was based on the color, texture, flavour, appearance and

overall acceptability were determined fortnightly (2 weeks interval) The proximate composition of the processed smoked dried fish and water activity test αw were determined using the procedures of A.O.A.C (1990).

Results

Table: 1 shows the sensory evaluation on smoked dried fish Samples A and B

Period	Treatment	Taste	Texture	Flavour	Appearance	Overall acceptability
Week 0	A_0	1.35+0.42^{a}	1.90+0.21^{a}	1.65+0.63^{a}	1.80+0.17^{b}	1.50+0.56^{abc}
	B_0	1.40+0.56^{a}	1.93+0.34^{a}	1.75+0.50^{a}	1.90+0.10^{b}	1.60+0.58^{abc}
Week 2	A_2	1.30+0.48^{a}	1.80+0.63^{a}	1.60+0.70^{a}	1.50+0.53^{bc}	1.10+ 0.32^{d}
	B_2	1.10+0.32^{a}	2.00+0.82^{a}	1.70+0.67^{a}	3.00+0.47^{a}	1.70+0.82^{abc}
Week4	A_4	1.60+0.70^{a}	1.70+0.48^{a}	1.40+0.70^{a}	1.60+0.84^{bc}	1.90+0.88^{a}
	B_4	1.50+0.71^{a}	1.80+0.63^{a}	1.60+0.52^{a}	2.10+0.88^{b}	1.80+0.42^{ab}
Week 6	A_6	1.10+0.32^{a}	1.60+0.70^{a}	1.70+0.67^{a}	1.10+0.32^{c}	1.30+0.48^{bcd}
	B_6	1.40+0.52^{a}	1.80+0.92^{a}	1.60+0.70^{a}	2.00+0.82^{b}	1.20+ 0.42^{cd}

Means of three replicates ± SEM values in the same column per weeks with different superscripts are significantly different (P< 0.05).

Table 2: Shows the Proximate Analysis on smoked dried fish Sample A and B

Period	Treatment	Moisture (%)	Ash (%)	Fiber	Protein	Fat	NFE
Week 0	A_0						
	B_0						
Week 2	A_2	8.27+0.48 ^{cd}	11.31+0.33^{c}	0.97+0.06^{b}	59.40+1.22^{a}	16.88+1.02^{c}	3.17+ 0.92^{a}
	B_2	7.66+1.23^{d}	14.34+0.66^{a}	1.13+0.13^{a}	59.85+0.75^{a}	13.82+1.07^{d}	3.19+0.98^{a}
Week4	A_4	8.99+0.75^{bc}	10.38+0.45^{d}	0.92+0.08^{bc}	57.62+1.05^{b}	20.26+0.70^{b}	2.50+0.92^{a}
	B_4	8.87+0.20^{bc}	12.72+035^{b}	1.15+0.09^{a}	60.06+0.71^{a}	14.77+1.21^{d}	2.44+2.00^{a}
Week 6	A_6	10.55+0.26^{a}	9.05+018^{f}	0.80+0.05^{c}	54.43+1.76^{c}	23.17+1.14^{a}	2.01+0.36^{a}
	B_6	9.51+0.16^{ab}	10.19+0.41^{e}	0.90+0.05^{bc}	59.99+0.74^{a}	17.98+0.46	1.43+0.07^{a}

Mean ± standard Deviation with different superscript letters in a column differ significantly (P<0.05).

Table 3: Shows the Chemical parameters and Microbial load on Smoked dried fish sample A and B

Period	Sample	Total Volatile Base	Peroxide value	P^H	Total Microbial load (cu/ml)
Week 0	A_0				
	B_0				
Week 2	A_2	15.61+0.32^{e}	5.33+0.29^{c}	6.86+0.02^{d}	6.5 x 10^{-5c}
	B_2	14.42+0.48^{f}	6.26+0.23^{b}	7.36+0.04^{a}	7.0 x 10^{-5d}
Week4	A_4	18.45+1.00^{d}	5.40+0.17^{c}	6.62+0.02^{e}	6.8 x 10^{-5e}
	B_4	20.03+0.17^{c}	6.26+0.23^{b}	7.24+0.01^{b}	7.5 x 10^{-5b}
Week 6	A_6	24.12+0.53^{a}	5.73+0.28^{bc}	6.60+0.01^{e}	7.3 x 10^{-5c}
	B_6	21.61+0.56^{b}	8.73+0.57^{a}	7.15+0.01^{c}	7.8 x 10^{-5a}

Mean± standard deviation with different superscript letters in a column differ significantly (P< 0.050).

Statistical Analysis: Results presented are means values of each determination ±standard error of mean (SEM). Analysis of variance was performed by one –way ANOVA statistical software program for social sciences (SPSS 17.0 for windows). Differences between mean values of treatments were done using Duncan's Multiple Range Test for significant differences and differences were accepted as significant at P< 0.05.

Discussions

The smoked dried samples above shows difference in rate of absorption of water during the period of smoked drying of fish preserved with salt and with alligator pepper respectively, this indicate that alligator pepper possess ability to retain water and as well to impact its general acceptability. The results in table 1 show the sensory scores of smoked dried fish *(Clarias garipenus)*. There were no significant difference in the taste, texture and flavour among the samples throughout the period of storage but for the colour/appearance and overall acceptability of the spiced smoked dried sample during the second weeks of storage were scored highest by the panelists there were Significant differences in the samples. Fasakin and Aberejo, 2002 reported that when plant (leaf, bark

or seed) was mixed with smoked dried fish it reduces fish damage rate. Alligator pepper has great influenced on the colour and overall acceptability of spiced sample which tend to decreased significantly as the storage time increases from two (2) to six (6) weeks. Differences in ingredients, processing, and flavour profile do exist per culture, area, country and/or region, but generally the process of preparation involve in processing of fish, usually with salt and herbs or spices are optionally. Table 2 above expresses the proximate composition of smoked dried fish *(Clarias garipenus).* There were significant differences in the nutrients: moisture, fat, ash, fibre and protein both in the weeks and between the smoked fish excerpt in N.F.E only that there was no significance difference throughout the duration of the experiment. Brined smoked dried sample whose moisture content was lowest during the first two weeks of storage increased significantly compared to spiced sample as the storage period increased from 2 to 6 weeks. Eyo (1998) reported that fish brined has higher potential to retain moisture content than the spiced smoked fish. Spiced smoked sample generally retained its nutrients more than the brined smoked sample during the studied period of storage. The moisture content of the brined smoked fish range from 8.27± 0.48 to 10.55±0.26 while the moisture content of the spice with pepper range from 7.66±1.23 to 9.51±0.16. This made the crude protein level of the pepper smoked fish in week six (6) to be much higher than the crude protein of the brine smoked fish. Eyo, 2001 reported the higher the moisture content the lower the protein content. The total volatile base increase in range as the week of storage increase, in week 6 the brined smoked fish is higher in range of 24.12±0.53 than the peppered smoked fish of 21.61±0.56 which shows the significance difference between the both samples ($p<0.05$). Peroxide value also is significantly difference; P^h of the peppered smoked sample is significantly higher throughout the storage period. This agreed with findings of (Botta *et al.,* 1984*)* who also reported increased in these parameters during storage of brine smoked dried fish. The microbial load of the peppered sample increases excerpt for first reduction in the first two weeks after which it increases till the sixth week of storage although the microbial load in peppered smoked dried fish is higher than the microbial load in the brined smoked fish, from the result obtained in the experiment, both fish samples are said to be safe for consumption. The effect of the polythene is that the smoked fish kept for there was no physical observation of any interference with insects.

Conclusion

This study shows that the appearance and overall acceptability is significantly different. The smoked dried fish retain the nutritional composition except for a slight decreased in the brined smoked dried fish sample but with peppered smoked dried fish are higher in protein and ash content. The brined smoked dried fish can keep longer even with high moisture content when packaged in sealed transparent polythene bag which is air tight until is ready for consumption. Peppered smoked fish samples have the crude protein stationary while the moisture content continues to reduce. As of the time for termination of this work the fish products are still presentable kept in seal polythene. It is recommended that further studies should be carried out to increase the concentration of alligator pepper used for shelf life of the smoked fish. Shelf-life studies on smoked fish should be extended to the time the fishes will actually spoil so as to ascertain how long it could keep for recommendation to fish farmers. The consumption of pepper in food is advisable since pepper help in slowing aging and serves as protection against heart disease. Therefore the end product of this study apart from constituting varieties of smoke dried fish thereby adding to the consumer choice, it also ascertain that smoked fish brined or spice will keep more than six weeks if kept in sealed transparent polythene bag.

References

1. Aderolu, A.Z. and Akpabio, V.M. (2009) Growth and economic performance of *Clarias gariepinus* juveniles fed diets containing velvet bean. *Mucuna pruriens, seed* meal. *African journal of Aquatic Science,* 34:131-134.
2. Akande, (1997), Fish processing, preservation and storage presented at training workshop on green storage and fish processing technology organized by the crop storage unit (csu) under the programme on post-harvest food loss prevention. 1st -12th September, 222.
3. Antonia da silva, (2002). Food preservation technique Retrieved from www.fao.org/../en. smoked fish.
4. Ashamo, M.O. and Ajayi, O.E. (2003). Effect of processing and storage methods on the shelf life and incidence of insect pests on smoked fish Global *Journal of Pure and Applied Sciences* 9(3): 319 – 324.19, 2003.
5. AOAC, (1990). Official Methods of Analysis of the Association of Official Analytical chemists 15th ed.
6. Awa, I.N. and Alegbeleye, W.O. (1991). Occurrence and treatment of cracked-skull disease affecting Clarias species in homestead

ponds in Nigeria. Journal of Fish Diseases. 1.4: 431-505. DO1-10.1111/j.1365-2761.
7. Botta J, Lauder J, Jewer M (1984). J. Food science www.wikipedia.org/wiki/ food science 49:734
8. Eyo, A.A (1997). Post-harvest losses in the fisheries of Kainji Lake. A consultancy report submitted to Nigerian/German (GTZ) Kainji Lake Fisheries promotion pocket. March, 75pp.
9. Eyo, A.A (1998). Fish fragmentation Retrieved from www.fao.org/../en smoked fish.
10. Eyo, A.A. (2001), Fish Processing Technology in the tropics. National Institute for Freshwater Fisheries Research. New Bussa, Niger State. PP403.
11. FAO (1981). The prevention of losses in cured fish. Technical paper 219; 87.
12. FAO (2001). Processing fish and fish products in: fish processing Retrieved December 28th, 2013 from www.fao.org>FAOHome> Fisheries & Aquaculture.
13. FAO (2005). Handing of fish and fish product Fisheries and aquaculture department, Rome Retrieved December 9th 2013, from www.en-wikipedia. Org/wiki/fish-processing.
14. Fasakin, E.A. and Aberejo, B.A. (2002). Effect of some pulverized plant materials on the developmental stages of fish beetle, Dermestes maculates Degeer in smoked catfish *Clarias gariepinus*) during storage. Bioscience Technology, 85: 173-177.
15. Gran L.J Oundo, J. Bon; (1989). Storage life of fish dependent on storage temperature and initial bacterial load, international journal of food microbiology.
16. Jason and Richard, (1975). Finding new uses for fish instrument Retrieved from www.enwikipedia.org/wiki.fish Torry meter.
17. Lazarides, H. N, Katsinidis, E and Nickolaidis A (1995), Mass transfer kinetics during osmotic pre-concentration aiming at minimal solid uptake. Journal of food. Engineering 25: 151 – 166.
18. Nickelson, G.H. (2001). Nutrition of fish and Crustaceans a Laboratory Manual Mexico City June (c) FAO, 1994, 15-19.
19. Okonkwo. T.M. Obianu Z.A and Okotete I.O, 1991. Effect of ginger on the sensory properties and stability of intermediate moisture smoked fish during storage processing of the 5th FAO expert consultation of Fish tech. in Africa. Accra. Ghana, October 22-25, 1991. FAO Fisheries report No. 467 Supplement 72-75.
20. Olokor J.O, Ihuahi J.A. Omojomo F.S. Falayi B.A and Adelowo E.O (2007). Handbook of Practical Fisheries Technology Division. National Institute of Freshwater Fisheries Research (NIFFR). New Bussa, Niger State. Rem-Thomas Press Pp. 13-42.
21. Oyeleye, O. (2003) Export potential of smoke fish in Nigeria. The Guardian paper, Lagos, Nigeria, .
22. Paine and Paine, (1993) Packaging material of smoked fish Discover magazine in packaging material Retrieved December 28th 2013.
23. Simmko P (1991). Changes of Benzo (a) Pyrene contents in smoked during storage. Food chemistry, 40: 293-300.
24. Stuart, A., (2013). Peppers and your Health: Retrieved December 28th, 2013 from www.webmd.com/food. recipes/ feature three benefit of Alligator pepper.

Appendix

From 0-2 weeks mean pour plating
Samples 10^{-1} 10^{-2} 10^{-3} 10^{-4} 10^{-5} 10^{-6} 10^{-7} 10^{-8} 10^{-9} 10^{-10}
A - - 65 61 53 42 31 22 12 6
B - - 70 66 57 50 43 32 16 9
CFU = A (6.5 x 10^{-5}/ml) CFU = B (7.0 x 10^{-5}/ml)
From 2-4 weeks mean pour plating Samples
A - - - 68 63 54 44 33 22 13 7
B - - - 75 65 58 54 45 33 18 10
CFU = A (6.8 x 10^{-5}/ml) CFU = B (7.5 x 10^{-5}/ml)
From 4-6 weeks mean pour plating Samples
A - - 73 65 57 46 35 23 14 8
B - - 75 70 61 55 47 31 20 13
CFU = A (7.3 x 10^{-5}/ml) CFU = B (7.8 x 10^{-5}/ml)

Key: CFU= colony forming unit of bacteria / ml. A2= brined smoked dried fish analyzed after two weeks of storage. B2= peppered smoked dried fish analyzed after two weeks of storage. A4= brined smoked dried fish analyzed after four weeks of storage. B4= peppered smoked dried fish analyzed after four weeks of storage. A6= brined smoked dried fish analyzed after six weeks of storage. B6=peppered smoked dried fish analyzed after six weeks of storage.

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