Preliminary Production Of Sauce From Clupeids

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ABSTRACT: Sauce a salty; flavoured brown liquid was produced from Clupeids with the use of plastic bucket. Sample A (clupeid with salt) and B, which is the control (clupeids only without salt). The bucket was tightly covered with the help of paper tape, which was used to bind the edges of the bucket so as to prevent the entrance of air. This was buried in the ground to mimic fermentation tanks for a period of three months. The temperatures of the environment were measured and the sauces sampled monthly to quantify sauce and paste production (7% and 70% respectively) with proximate composition. At the end of the last month the sauces were examined for pH, which ranges between 6.8-8.6 specific gravity, 1.09 and 1.06 for samples A and B respectively. The Total Nitrogen was found to be between 20.15-30.5, salt content15g/l for A, iodine values, 3.05 for A and 2.30 for B and peroxide values114 and 81 respectively. The Proximate analysis showed that crude protein and fat increased from 1st month to the 2nd month and dropped at the last month. The crude fibre for B decreases but that of A increased from first month to the last month. The amino acid profile of the sauces A and B differed in concentrations both essential and non-essential amino acids although it conforms to F.A.O/W.H.O standard.
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Key words; Sauce, Amino acids profile, proximate composition, Specific Gravity and pH.

INTRODUCTION.

Fish is an important source of protein in daily diet across the continents as in South East Asia so also in Nigeria; fresh fish are cherished every where, but fresh fish spoils quickly because of the high temperature thus it must be boiled, chilled, smoked, salted or fermented to preserve the nutrients composition of the fish. Among other things high temperature favour the use of fermentation as a method of preservation of fish. It is inexpensive and in many instances whole fish are used. The demands on technology are slight and here is no requirement for chilling, storage or complex transport and distribution facilities.

Fish sauce is the water or juice in the flesh of fish that is extracted during the process of prolonged salting and fermentation, which are called names in different continents, e.g.budu in Malaysia, patis in Philippines, nampla in Thailand, pissala in France, yeesui in Hong Kong, nuoc-nam' in South Asia.e.t.c. (Lopetchara *et al*., 2001). The high salt content prevents growth of pathogenic and putrefactive bacteria and so the shelf life is enhanced (Eyo, 2001). It is usually made from small fish that would otherwise have little value for consumption (Kasma Loha-unchit,1998). It is used like salt in western cooking and most important flavouring in Thai cooking since it imparts a distinct aroma and flavor on its own.

Towards sustainable fisheries development in Post harvest technology one major area is to maximize the utilization of our depleting fisheries resources and minimize the waste of such precious resources. This can be done by identification of resources that are underutilized or currently utilized for animal feed and looking into the possibility of converting the precious resources into food for human consumption, in line with these global principles clupeid was identify as one of such underutilize. Fermented fish product like fish sauces, which are extremely used as a food source or as condiments in south East Asia can become a means of utilization of these underutilize fish in a simple and inexpensive manner. Also converting fish into sauce can also be a better technique of preservation than drying in climates of high humility.

In the suburb of Kainji lake Basin where over night fish catch are often of poor quality and unsuitable for smoking this technique can also be employed. Villages around kanji lake basin e.g. Monai where fishermen are plenty, there are often large catch with low demand or none at all especially after a heavy down pour and instead of being explored by the middle man who buy this fish at a lower price thereby causing lost at the time of gain this method of preservation could be employed to minimize wastage.

This study was therefore carried out to produce sauce from clupeid, a value added fish product for human consumption, and to encourage farmers to utilize this method.

Materials and Method

Fish samples and pre fermentation treatment

Sample of fresh clupeids (*Pellonula afzeliusi*) were bought from Monai village in Kainji lake basin and transported to the fish processing laboratory very quickly, after the dirt were picked from the fish, it was washed thoroughly with clean water, and weighed (1500g) this was divided into two (2) and one portion (A) was mixed thoroughly with (20% salt, and the other (B) which is the control was mixed without salt). The fish were further pounded for even distribution of the salt, each were further divided into two (duplicate) and the mixture kept in an air tight container packed in plastic bucket and buried in an already dug hole of 3 feet having temperature of 28°C (± 4.5°c) t for a period of three months. The treatments were as follows.

Treatment A 750g of fish + 150g of salt. (A1, A2)

Treatment B 750g of fish Control (B1, B2)

SAMPLE COLLECTION

The samples were examined monthly to measure the rate of conversion of fish to sauce and at the end of the third month; the samples were harvested, kept in the freezer before taken to Jos for analysis for pH, specific gravity, salt concentration, iodine value, and peroxide values, proximate analyses viz: - crude protein, crude lipid, ash, crude fibre and moisture content of all the treatments and the amino acid analysis of the sauce in the Department of Zoology, University of Jos, Jos using the methods of A.O.A.C. (2000).

Data Analysis.

All data collected at the end of the experiment were analyzed statistically.

Results and Discussion.

Fish sauce is a liquid of high salt content in which proteinaceous material of the fish has been degraded into free amino acids and nitrogenous bases since fermentation takes place as a result of the action of proteolytic enzymes and microorganisms in the present of high concentration of salt. The nature of final product depends largely on the extent to which fermentation is allowed to precede, the Temperature and pH. In this preliminary experiment the extent of fermentation as indicated by the proximate composition, free amino acid composition, total nitrogen, iodine values, peroxide values, quantity of sauce and paste are shown in the tables 1, 2, 3 and 4.

Proximate composition

The proximate analysis of the sauces produced monthly shows a trend of steady decrease or increase in the nutrient concentration. For example moisture content and ash steadily increased while crude protein and crude ash steadily decreased till the last month of the experiment. The increase in the moisture content could be adduced to the fact that fermentation has taken place, but the rate of fermentation was fastest in sample B where there is no salt hence rate of multiplication of organism and enzymatic action are unchecked compared to sample A where only microorganism tolerant to salt are allowed for fermentation. These actually explained the major difference between the two results. Protein content ranges from 13.86- 5.53 this is low when compared with the work of Wilaipan, (1990) who documented the ranges of their sauces to be 15.2 for clupeids 18.00 for *Stolephorus spp* and 20.00 for Mackerel. The differences could be attributed to differences in origin of fish, condition of fermentation such as temperature, pH and salt concentration. As fermentation proceeds there is conversion of n.f.e to fat so also proteolysis of protein to free amino acids this is the evidence of fermentation (Hiremath *et.al.*, 2005).

Chemical characteristics

Table 4 shows the chemical characteristics of the sauces produced. The pH was found to be between 7.15- 8.14,salt content 15g/L, iodine value 2.1-3.1 and peroxide values, 76-120. These chemical characteristics are influenced by fish species, type of salt, the ratio of fish and salt, minor ingredients and fermentation conditions (Cho and Choi 1999). The pH of the sauce A falls between the ranges of those sauces produced from China and Myanmar while the pH of the sauce B fall out of the range. The reason could be due to the uncontrolled activity of microorganism without salt. The high pH may result from toxins a by-product of bacteria reacting with some other materials during fermentation (Fujii *et al*., 1992; Abe *et al*., 1999). Salt content was found to be 15.10g/mL this is low compared with other sauces from South East Asian but similar to those of soy sauce (Mizutani *et al*.1992). Lower salt contents may have been used in these products for health reasons and this may be a trend for future sauce production. Qualities of sauce are affected by different parameters such as the type of microbiological flora during the fermentation the chemical composition of salt as well as the concentration of the salt. The total nitrogen content was found to be 31.05g/L in sauce A and 26.15g/L in sauce B while the percentage protein in A is 1.96 and for

sauce B is 1.63%. This falls between the standard parameters for fish sauce in Thailand and Korea (Virulhakul, 1999;Inspection Guildlines, 1997). The free amino acids, peptides, pyroglutamate, nucleosides and bases may be responsible to make up for the low record of nitrogen containing compounds.

Amino acids.

Different enzymes involved during fermentation affect the amino acid composition in fish sauce. Glutamic acid plays an important role in fish sauce flavor and the changing enzyme system in fermentation changes the flavor of the product. The amino acids profiles of the two sauces are shown on Table 5 with the highest total amino acids content found in the sauce A. Comparing sauce A to that of sauce B, glutamate was the highest in both sauces followed by Asparagine, leucine, Lysine, alanine, arginine and lastly glycine this is in agreement with the findings of Park et al., (2001) on the different sauces produced from Vietnam, Japanese and Thai countries, but sauce B contain lower concentration of amino acid. Kim et al. (2003) found that the major constituent amino acids of salt fermented shrimp at 3 months were aspartic acid, glutamic acid, alanine, leucine and lysine. In this study glutamate, Leucine, aspartate, lysine, glycine, valine and alanine and histidine are the most prevalent amino acids. This may be as a result of fresh water fish used which is not the type of fish used in south East Asian (salted water) and the non-inclusion of salt to the sauce B which is the control. Amino acids composition in fish sauce is affected by different enzyme produced during fermentation. The major factors influencing the quality of fish sauces are the type of fish used and where the fish are sourced i.e. fresh water or salted water. The percentage of sauce increases as fermentation progresses.

Conclusion.

The fish sauce was produce in kanji Lake basin by pounding clupeids fish with salt and fermenting it for 12 weeks. The chemical characteristics are similar to sauces prepared from Malaysia i.e. Budu and aekjeot the Korean fish sauce. The pH increases but all are in the ranges of the standard sauce produced from Asia. i.e. between 6.8-7.6.

Recommendation.

More research is welcome in this area to upgrade the standard of preparation and packaging of the sauce to standard as well as to reestablish the chemical composition of the sauce produced with that of developed countries.

Table 1. Proximate composition of sauce from Clupeid (*P. afzeluisis*) at the end of 4 Weeks.

Samples	Crude protein	Crude fat	Moisture	Ash	Crude fibre	N.F.E.
A	13.86	5.60	58.15	3.60	0.60	17.19
B	10.10	5.80	60.35	3.15	1.00	11.40

Table 2. Proximate composition of sauce from Clupeid (*P. afzeluisis*) at the end of 8 Weeks.

Samples	Crude protein	Crude fat	Moisture	Ash	Crude fibre	N.F.E.
A	10.35	6.54	62.93	9.25	0.90	9.12
B	8.56	10.93	65.41	8.60	0.50	9.12

Table 3. Proximate composition of sauce from Clupeid (*P. afzeluisis*) at the end of 12 Weeks.

Sample	Crude protein	Crude fat	Moisture	Ash	Crude fibre	N.F.E
A	09.54	3.85	62.98	23.45	0.95	5.41
B	5.53	11.75	68.00	21.30	0.72	5.70

Table 4.

Parameters	A1	A2	B1	B2
Total nitrogen g/l	31g/L	31.1g/L	20.3g/L	20.0g/L
%Protein	1.96%	1.94%	1.63%	1.63%
Peroxide value	120	114	86	76
Iodine value	3.00	3.10	2.50	2.10
PH	7.17	7.15	8.14	8.09

Tables 5; sauce/paste production
Amount of sauce produced by the end of three months.

SAMPLES	MONTH 1	MONTH 2	MONTH 3
A	15	20	32
B	10	25	All slurry

Amount of paste produced by the end of the three months

SAMPLES	MONTH 1	MONTH 2	MONTH 3
A	410	395	300
B	400	264	All slurry

Production of sauce.

20% salt	1st week	1nd month	2rd month	3th month
Content	10	15	20	32
Colour	Milky	Amber	Brown	Golden brown

Table 6
Amino acid profile of the sauces A&B and unfermented clupeids.

Amino acid	Unfermented fish. Clupeid	Sauce from clupeid A	Sauce from clupeid B
Lysine	8.49	3.12	0.80
Histidine	3.48	1.00	0.15
Arg	6.47	2.97	0.06
Asp	10.01	5.16	0.50
Thre	4.77	1.12	0.00
Ser	4.18	1.02	0.00
Glu	15.20	8.11	5.00
Pro	4.89	1.20	0.60
Gly	7.61	2.31	0.55
Ala	6.49	3.11	0.68
Cys	1.06	0.45	0.55
Val	5.00	3.21	0.15
Met	2.89	0.55	0.05
Ile	4.24	1.30	0.15
Leu	8.04	5.22	1.05
Tyr	3.54	1.05	0.00
Phe	4.99	1.34	0.00

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