

Utilization of sweetwater fish *Catla Catla* for preparation of plain and spiced fish sauce

R.R. ANDHALE, A.C. DAGADKHAIR AND H.M. SYED

The present investigation was undertaken with an objective to utilize the fresh water fish *catla catla* for the preparation of plain and spiced fish sauce. Fish sauce is an ingredient that has been used widely in Southeast Asian and also worldwide for the cooking purpose due to its specific flavour. The addition of spices to the plain fish sauce has showed the little change in sensorial quality of fish sauce. The different physico-chemical, sensorial and microbial parameters were determined. The different chemical results of plain sauce showed that it contains moisture, fat, protein, and ash was 68.40g, 2.10g, 7.3g and 9.01 g/100, respectively. The pH of prepared fish sauce was 5.87. Total soluble solid content and total solids content of plain fish sauce was 30^o Bx and 31.50 per cent, respectively. The viscosity was 17.40 cP. The results indicate that it is good source of protein and minerals. The spiced sauce with the formulation T₂ got the highest score for the overall acceptability (8.5). The microbiological examination of plain fish sauce showed that the TPC of plain fish sauce was 5.6×10^5 cfu/ml, the yeast and mold count was 1.2×10^2 cfu/ml. T. Ultimately it reveals that it's a good source of probiotics *i.e.* Lactic acid bacteria.

Key Words : Fish, Sauce, Plain, Spiced, Microbial

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INTRODUCTION

India is the second-largest producer of farmed fish in the world, and carp contribute most of the country's aquaculture production. Three major species of carp indigenous to the rivers of the Indian subcontinent – *Catla catla* (common name: Catla), *Labeo rohita* (Rohu) and *Cirrhinus mrigala* (Mrigal) – are widely cultivated in India and parts of Southeast Asia. Current annual production of these species is about 2 million metric tons.

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Aquaculture has been the engine driving growth in total fish production as global capture production has leveled off. Production of freshwater fishes has always been dominated by carps (FAO, 2012).

Fish is a rich source of animal protein. Fish and fishery products represent a valuable source of nutrients of fundamental importance for diversified and healthy diets. Fish provides not only high-value protein, but also a wide range of essential micronutrients including various vit-D, vit-A and vit-B, minerals including calcium, iodine, zinc, iron and selenium and polyunsaturated omega-3 fatty acids (docosahexaenoic acid and eicosapentaenoic acid) (FAO, 2012).

The processing method for fish sauce can be different in each country, but the basic principle is quite similar. The main ingredients of fish sauce are fish and salt. Fish sauce is a translucent amber liquid with a unique

aroma and flavour and is rich in amino acids. It is widely used as a condiment and seasoning in most countries of Southeast Asia and is gradually gaining acceptance worldwide (Saisithi, 1994). Naturally occurring compounds in spices such as sulphur compounds, terpenes and terpene derivatives, phenols, esters, aldehydes, alcohols and glycosides have shown antimicrobial functions (Russel and Gould, 1991 and Deis, 1999).

In Southeast Asia, fish sauce is made from various types of fish, from both freshwater and marine fish species, by various methods. Each has its unique taste and characteristic. Fish sauce is known as 'nampla' in Thailand, 'patis' in Philippines, 'kecapikan' in Indonesia, 'budu' in Malaysia, 'nuocnam' in Vietnam and Cambodia and 'nganpyaye' in Myanmar (Ismail, 1977; Putro, 1993; Phithakpol *et al.*, 1995 and Tran, 2002).

Spices and herbs have been used for thousands of centuries by many cultures to enhance the flavour and aroma of foods. Early cultures also recognized the value of using spices and herbs in preserving foods and for their medicinal value (Omer, 2006). It has been extensively reported that the essential oils of spices have shown antimicrobial functions against food borne pathogens. The spices used for study are such as *Cuminum cyminum* (Cumin), *Brassica juncea* (Mustard), *Triticum astivum* (wheat), *Pepper nigrum* (Black pepper), *Coriandrum sativum* (Coriander) and *Foeniculum vulgare* (Fennel) (Reichling *et al.*, 2009).

Due to the biological nature and limited shelf-life, several methods can be used to extend the shelf-life of fish including chilling in ice, freezing, drying, smoking, canning and modified atmosphere packaging. Another method of preserving or improving the quality of fish is through fermentation with endogenous fish or microbial enzymes or added proteolytic enzymes to convert fish to sauces, pastes, soup stocks and protein concentrates (Van Veen, 1965).

Fermentation is one of the oldest techniques in food preservation as it not only extends the shelf-life but also enhances the flavour and nutritional quality of the product (Visessanguan *et al.*, 2004). Hence, the present investigation was undertaken to develop the plain and spiced fish sauce from fresh water catla fish.

METHODOLOGY

Materials :

Raw Materials were procured from the local market.

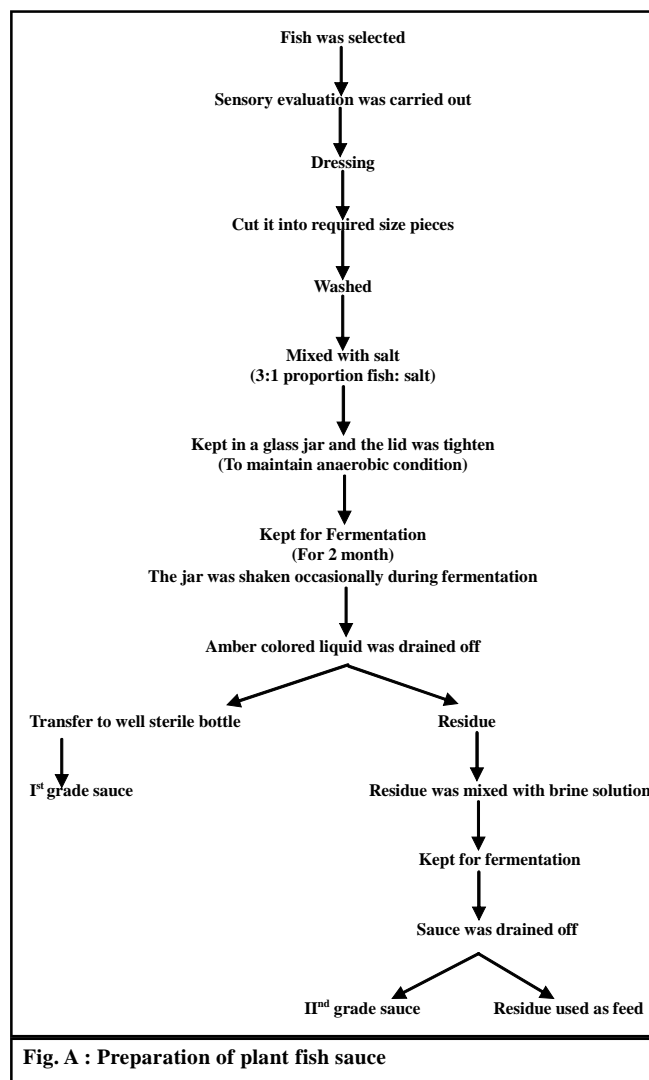
Chemicals of analytical grades were obtained from Department of Food Chemistry and Nutrition, College of Food Technology, Vasantao Naik Marathwada Krishi Vidyapeeth, Parbhani (M.S.) India.

Methods:

Chemical constituents like moisture, fat, protein, carbohydrate, total ash, salt, TSS, TS and total organic content and pH were determined by AOAC (1990) and Ranganna (2007).

Viscosity was determined by using the Brookfield viscometer DV-E at different speed and at constant temperature 25°C with a spindle number S-62 and it were expressed in terms of centipoises (cP).

Preparation of plain fish sauce:



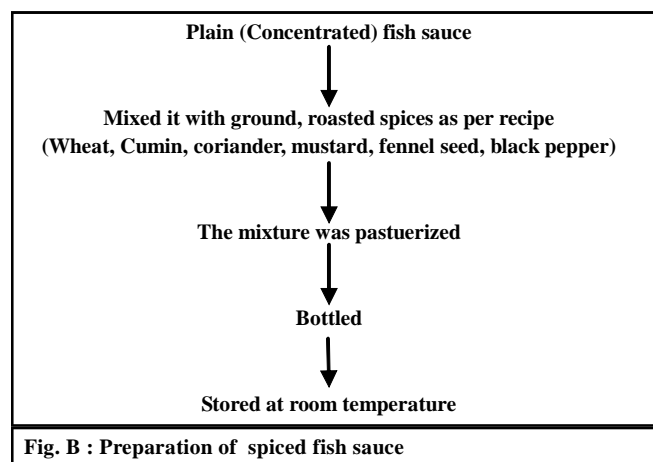
The plain fish sauce generally prepared by using sweet water fish variety *i.e.* Indian major carp (Catla). Firstly, the fishes were wash and eviscerated to remove all internal organs and again rinsed by clean water to remove blood clots and other unwanted parts. The fish cut into small strips of required size and shape then mixed with salt in proportion 3:1. The mixture was poured in glass chamber and lid closed tightly, to avoid air contamination. Mixture was allowed to ferment for 2 months, after fermentation clear amber liquid *i.e.* plain fish sauce was extracted from fermented mass and used for further study (Fig. A).

Standardization of recipe for spiced sauce preparation (for 10 g) by using sensory evaluation of spiced fish sauce :

The standardization of recipe was completed according to sensory evaluation of prepared product, and the selected product recipe was accepted for further study. Recipe for the preparation of the spiced sauce are depicted in the Table A.

The spiced sauces were produced according to above Table A through which information emerges that three recipes were made *i.e.* T₁, T₂ and T₃, and the spice mix was prepared according to standard recipe adopted from (Al Jedah *et al.*, 2000). The recipe was standardized for 10 g of plain fish sauce (Fig. B).

Sr. No.	Spiced mix	Plain sauce	Water
T ₁	30 g	10 g	80 ml
T ₂	40 g	10 g	80 ml
T ₃	50 g	10 g	80 ml



Preparation of spiced fish sauce :

The spiced fish sauce prepared by using following ingredients such as plain fish sauce 1kg, Wheat 1.5 kg, Cumin seeds 500g, coriander 1kg, mustard 1kg, fennel seed 750 g, black pepper 100g and water 8 lit (Al-Jedah *et al.*,2000). All spices were roasted, ground and then mixed thoroughly with plain fish sauce.

OBSERVATIONS AND ASSESSMENT

The results obtained in the present investigation are presented and are discussed under suitable headings.

Chemical composition of freshwater fish *i.e.* Catla:

The different chemical constituents like moisture, fat, protein, carbohydrate, total ash, minerals, salt, TSS, TS and total organic content and pH were determined and the result pertaining the same are summarized in the following Table 1.

Table 1 : Chemical composition of freshwater fish *i.e.* Catla

Sr. No.	Chemical component	Values per 100 g
1.	Moisture	67.82 g
2.	Fat	09.32 g
3.	Protein	74.77 g
4.	Carbohydrate	09.89 g
5.	Total ash	05.64 g
	Calcium	170 mg
	Phosphorus	470 mg
6.	Total organic content	93.98 g

*Each value represents the average of three determinations

The chemical composition of fish from Table 1 revealed that the moisture content of fish was 67.82 g, the further components were analyzed on dry weight basis, the fat content of fish was 9.32 g which indicates that freshwater fishes are good source of fat and also valuable source of Omega-3 fatty acids, the protein content of fish was found 74.77 g which clearly shows that it is a good source of protein and it contains maximum amount of essential amino acids, the carbohydrate content of fish was 9.89 g on dry weight which shows that it is also a good source of carbohydrate on drying, the total ash was 5.64 g which contains Calcium 170 mg and Phosphorus 470 mg and the total organic content was 93.98 g. The similar findings pertaining to chemical composition of fish were observed by Ali *et al.* (2006) and Gopalan *et al.* (2011).

Chemical composition of plain fish sauce:

The different chemical properties of the prepared plain fish sauce are depicted in the following Table 2.

It is observed from the Table 2 that the plain sauce contains moisture 68.40g, fat 2.10g, the protein content of sauce was 7.30g which demonstrates that the fish sauce is a good source of hydrolyzed protein, the total ash content was 9.01g. Salt 23.94g and the pH of fish sauce was 5.87. Further, it was found that the total soluble solids of plain fish sauce was 30⁰Bx, total solids was 31.50g. The viscosity of plain sauce was found to be 17.40 cP. The viscosity of fish sauce was basically due to its high salt content, hydrolysed protein and fat content of fish sauce. These results are conformity with the scientific literature by Bersamin and Napugan (1961); Al-Jedah *et al.* (2000) and Lopetcharat and Park (2001).

Table 2 : Chemical composition of plain fish sauce

Sr. No.	Characteristics	Values per 100 g
1.	Moisture	68.40 g
2.	Fat	02.10 g
3.	Protein	07.30 g
4.	Total Ash	09.01 g
5.	Salt	23.94 g
6.	pH	5.87
7.	Total soluble solid	30 ⁰ Bx
8.	Total solids	31.50 g
9.	Viscosity	17.40 cP

*Each value represents the average of three determinations

Microbial quality of plain fish sauce:

In Plain fish sauce production micro-organisms are associated with the fermentation process however, the microbial examination becoming a important aspect regarding quality of fish sauce while the total plate count, Yeast and Mold, Lactic acid Bacteria's, Coliform and Salmonella were examined throughout the study and the results are depicted in Table 3.

The data expressed in the Table 3 shows that the total plate count of plain fish sauce was 5.6×10^5 cfu/ml,

Table 3 : Microbial quality of plain fish sauce

Sr. No.	Microbial quality	Colony count (cfu/ml)
1.	Total plate count	5.6×10^5
2.	Yeast and mold	1.2×10^2
3.	Lactic acid bacteria (LAB)	3.2×10^4
4.	Coliform	Absent
5.	Salmonella	Absent

*Each value represents the average of three determinations

the total plate count indicates that fish having much concentration of halophilic or salt tolerant micro-organisms, the yeast and mold count was 1.2×10^2 cfu/ml, lactic acid bacteria's count was examined, results showed that dominant micro flora at the final stage of fermentation was lactic acid bacteria's (Saisithi, 1994) whose concentration was 3.2×10^4 cfu/ml.

Sensory evaluation of plain fish sauce:

The sensory evaluation of plain fish sauce was carried to determine the quality at various stages of fermentation. The sensory score of organic evaluation is depicted in Fig 1.

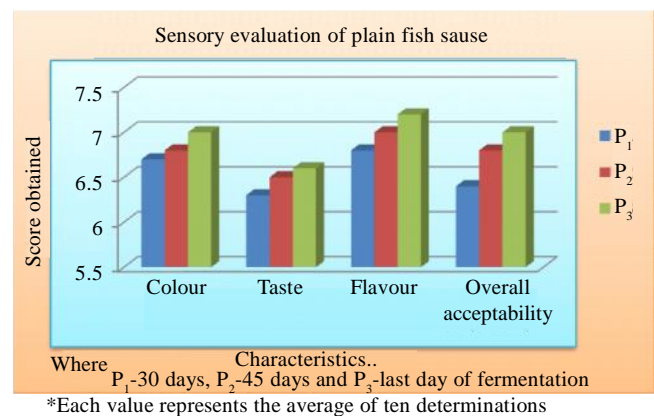


Fig. 1 : Sensory evaluation of plain fish sauce

From the above graph found that the fermentation of sauce exhibited not much difference with regard to colour character of final product ranging from 6.7 to 7.0. The colour of sauce on last day (P₂) was more acceptable (7.0) The best taste was observed in case of P₃ stage (6.6) at par with P₂ stage (6.5) followed by P₁ stage of fermentation (6.3). Further, it was found that the flavour character was more acceptable at P₃ stage (7.2). It is seen from the results that variation do exists in overall acceptability score. The highest score was observed at last stage of fermentation *i.e.* at P₃ for the overall acceptability. It is revealed from the scores of the overall acceptability that the fermentation period more than 60 days is better as per sensory evaluation to the fish sauce to produce a better acceptable product. After organoleptic assessment of plain fish sauce at different stages of fermentation, the sauce at more than 60 days of fermentation having a best sensory acceptability than other stages of fermentation.

Table 4 : Sensorial score card of spiced sauce for standardization of recipe

Sr. No.	Spices mix	Colour	Taste	Flavour	Over all acceptability
1.	T ₁	7.5	7.0	8.0	7.3
2.	T ₂	8.2	8.0	9.0	8.5
3.	T ₃	8.0	7.7	7.5	7.5
4.	Mean	7.90	7.56	8.16	7.76
5.	S.E. ±	0.0577	0.1012	0.0942	0.0816
6.	C.D. (P=0.05)	0.1991	0.3523	0.3262	0.2825

*Each value represents the average of ten determinations

Sensorial score card of spiced sauce for standardization of recipe :

The panel of semi- trained judges was given the spiced fish sauce samples for evaluation of organoleptic characteristics viz., colour, taste, flavour and overall acceptability. It was served to judges on the day of preparation. The average score recorded by judges is presented in Table 4.

From the above Table 4 it could be revealed that spiced mix addition exhibited not much difference with regard to colour character of final product ranging from 7.5 to 8.2. The colour of T₂ sample was more acceptable (8.2) followed by T₃ sample (8.0). The best taste was observed in case of T₂ sample (8.0) at par with T₃. Further, the flavour character was more acceptable for T₂ sample (9.0) as compared with sample T₁ (8.0). Finally, T₂ sample got the highest score for overall acceptability (8.5). The overall acceptability of spiced sauce could be attributed to the different characters of colour, taste and flavour of the final product. It is revealed from the scores of the overall acceptability that the T₂ sample successfully mixed to the fish sauce to produce a better acceptable product.

Conclusion :

From the above investigation it could be concluded that the good quality plain and spiced fish sauce can be prepared having good nutritional and sensorial qualities.

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