

CERTAIN BIOCHEMICAL CHARACTERISTICS OF FISH SAUCES*

P. VELAYUTHAM AND G. JEGATHEESAN

Fisheries College, Tamilnadu Veterinary and Animal Sciences University,
Tuticorin-628 008

ABSTRACT

Finfishes such as *Leiognathus equulus*, *Sardinella albella* and *Selaroides leptolepis* were treated with salt in the ratios of 2 : 1, 3 : 1 and 4 : 1 to prepare good quality fish sauces. The chemical characteristics of fish sauce such as pH, salt, solids, protein, amino-nitrogen, trimethylamine (TMA), total volatile nitrogen (TVN) and total volatile acids (TVA) and organoleptic properties were studied at an interval of 3 and 6 months. The values of protein and amino-nitrogen content of the fish sauces produced from *L. equulus*, *S. albella* and *S. leptolepis* after 6 months, in the fish-salt ratio of 4 : 1 were found to be 7.76, 8.6 and 9.68 g (protein) and 401.00, 550.00 and 635.00 mgN (amino-nitrogen) per 100 ml of fish sauce respectively. The pH of the fish sauces of the above species were more or less similar to that of sauces produced elsewhere from quality fish. The values of TMA and TVN of *L. equulus*, *S. albella* and *S. leptolepis* fish sauces were also found to be within acceptable level. Among the different fish : salt ratios, 4 : 1 ratio was found to be better with regard to the quality of sauce. The quality of fish sauces based on their protein and amino-nitrogen level was in the order of *S. Lepto-lepis*, *S. albella* and *L. equulus*.

INTRODUCTION

AT PRESENT, much of the trashfishes are either utilized for the production of low cost fish meal or as manure. Many countries have now devised ways and means to use the trash fish resources for the preparation of fish sauce for human consumption. The present study deals with the production of fish sauces from the locally available cheap fishes along with their chemical and organoleptic properties.

MATERIALS AND METHODS

Samples of finfish *Leiognathus equulus*, *Sardinella albella* and *Selaroides leptolepis* were collected from the landings of the Old

Fishing Harbour area of Tuticorin. Fishes not packed in ice and landed after six hours were selected for the present study. The fermentation of fish samples was carried out in plastic containers of 5 litre capacity under different fish-salt ratios viz. 2 : 1, 3 : 1 and 4 : 1 following the method of Baens-Arcega (1970). Cotton was used to filter the clear liquid from the fermented samples. The fish sauce samples were collected at the end of the 3rd and 6th month and their organoleptic and chemical characteristics such as pH, salt, protein, amino-nitrogen, trimethylamine (TMA), total volatile nitrogen (TVN) and total volatile acids (TVA) were studied following the methods listed below. The protein content of the sauce was assessed by estimating the total nitrogen by microkjeldahl method (Oser, 1971) followed by multiplying the total nitrogen content by the factor 6.25. The trimethylamine and

* Presented at the 'Symposium on Tropical Marine Living Resources' held by the Marine Biological Association of India at Cochin from January 12 to 16, 1988.

TABLE 1. *Chemical and organoleptic characteristics of fish sauces produced from Leiognathus equulus under different fish-salt ratios (Each value is the mean of three replicates)*

Ratio	Fermentation period (month)	pH	Salt (g/100 ml)	Total Protein (g/100 ml)	Amino N (mgN/100 ml)	TMA (mgN/100 ml)	TVN (mgN/100 ml)	TVA (ml of N/100 NaOH/100 ml)	Organoleptic characteristics		
									Colour	Odour	Taste
2:1	3	5.8	34.5	2.56	210.0	9.0	34.5	17.5	Turbid white	Fishy	Good and more salty
3:1	3	5.8	33.0	3.60	280.0	9.2	37.0	29.0	Turbid pale yellow	Fishy	Good and salty
4:1	3	5.9	32.5	4.28	300.0	9.6	43.5	32.0	Pale yellow	Cheesy	Good and less salty
2:1	6	5.9	32.5	4.80	330.0	11.0	79.5	48.0	Yellow	Acetic acid	Good and more salty
3:1	6	6.0	30.0	6.70	360.0	11.8	80.0	73.0	Clear yellow	Butyric acid	Good and salty
4:1	6	5.9	31.0	7.76	401.0	11.5	81.5	70.5	Clear yellow	Acetic acid	Good and less salty

TABLE 2. *Chemical and organoleptic characteristics of fish sauces produced from Sardinella albella under different fish-salt ratios (Each value is the mean of three replicates)*

Ratio	Fermentation Period (month)	pH	Salt (g/100 ml)	Total Protein (g/100 ml)	Amino N (mgN/100 ml)	TMA (mgN/100 ml)	TVN (mgN/100 ml)	TVA (ml of N/100 NaOH/100 ml)	Organoleptic characteristics		
									Colour	Odour	Taste
2:1	3	5.9	35.5	3.35	185.5	8.8	32.5	20.5	Yellow	Aromatic	Good and more salty
3:1	3	5.8	34.5	3.95	215.0	9.6	40.5	31.5	Dark yellow	Cheesy	Good and salty
4:1	3	5.9	33.0	4.15	285.5	9.0	42.0	33.0	Yellowish brown	Cheesy	Good and salty
2:1	6	6.0	31.5	7.25	420.5	10.7	78.5	45.0	Yellow	Butyric acid	Good and salty
3:1	6	6.1	29.0	7.85	445.5	10.9	81.5	71.0	Dark yellow	Acetic acid	Good and salty
4:1	6	6.0	30.5	8.60	550.0	11.4	80.0	71.0	Brownish yellow	Butyric acid	Good and less salty

TABLE 3. Chemical and organoleptic characteristics of fish sauces produced from *Selaroides leptolepis* under different fish:salt ratios (Each value is the mean of three replicates)

Ratio	Fermen- tation period (month)	pH	Salt (g/100 ml)	Solids (g/100 ml)	Total Protein (g/ml)	Amino N (mgN/100 ml)	TMA (mgN/100 ml)	TVN (mgN/100 ml)	TVA (ml of N/ 100 NaOH/ 100 ml)	Organoleptic characteristics		
										Colour	Odour	Taste
2:1	3	5.8	34.7	—	3.50	220.6	8.7	33.5	31.5	Yellow	Fishy	Good and more salty
3:1	3	5.9	33.5	—	4.25	260.0	9.2	38.0	34.0	Dark yellow	Cheesy	Good and salty
4:1	3	5.9	32.5	—	4.56	330.8	9.5	37.0	36.5	Dark yellow	Cheesy	Good and less salty
2:1	6	6.0	32.0	—	8.00	520.0	10.6	74.5	70.0	Yellowish brown	Butyric acid	Good and more salty
3:1	6	6.1	30.5	—	8.20	580.0	11.2	72.5	76.6	Reddish brown	Butyric acid	Good and salty
4:1	6	6.0	30.0	—	9.68	635.0	11.0	77.6	72.5	Reddish brown	Acetic acid	Good and less salty

total volatile nitrogen were determined by Conway's micro-diffusion technique (Beatty and Gibbons, 1937). The sodium chloride content of fish sauce was estimated through Volhard's titration method (Pearson, 1977) and the total volatile acid by the steam distillation method of Chandrasekhar and Manisseri (1976). The amino nitrogen content of fish sauces was determined adopting the procedure of Pope and Stevens (1939).

RESULTS AND DISCUSSION

The salt content of fish sauces obtained from *L. equulus*, *S. albella* and *S. leptolepis* showed a decreasing trend in all the fish : salt ratios at the end of the 6th month. On the other hand, the protein, amino-nitrogen, TMA, TVN and TVA were found increasing from the smaller to higher ratios. The results pertaining to chemical and organoleptic properties of the different fish sauces obtained are given in Tables 1, 2 and 3. Howard and Dougan (1975) and Nonaka *et al.* (1975) observed a pH range of 5.6-6.1 for various fish sauces. Fujii and Sakai (1984 a) reported a maximum pH value of 6.2 for quality fish sauce. The present study also revealed that the values of pH of the different fish sauces produced were well within the prescribed range of quality fish sauces. Further, the range of values of salt content (29.0-35.5 g/100 ml), TMA (8.7-11.8 mgN/100ml) and TVN (32.5-81.5 mgN/100 ml) of the presently prepared fish sauces were also agreeing with that of Fujii and Sakai (1984 b). Among the different fish : salt ratios studied, the 4 : 1 ratio was found to be more suitable for the production of sauces from trash fish with reference to their protein and amino nitrogen contents. Compared to *S. albella* and *L. equulus*, the fish sauce extracted from *S. leptolepis* however showed invariably high values of protein (9.68%), amino-nitrogen (635.0 mgN/100 ml) and TVA (72.5 ml of N/100 NaOH/100 ml).

REFERENCES

- BAENS-ARCEGA, L. 1970. Sauce Manufacture. *Process Bio-chemistry*, 5 : 50-51.
- BEATTY, S. A. AND N. E. GIBBONS 1937. The measurement of spoilage in fish. *J. Biol. Bd. Canada*, 3 (i) : 77.
- CHANDRASEKHAR, T. C. AND H. K. MANISSERI 1976. *A practical manual for processing technology of fishery products (Revised)* (mimeo). College of Fisheries, University of Agricultural Sciences, Mangalore, p. 99-100.
- FUJII, T. AND H. SAKAI 1984 a. Chemical composition and microflora of fish sauce 'Shotturu'. *Bull. Japan Soc. Sci. Fish.*, 50 : 1061-1066.
- AND ————— 1984 b. Chemical and microbiological analysis of putrid fish sauce 'Shotturu' *ibid.*, 50 : 1067-1070.
- HOWARD, G. E. AND J. DOUGAN 1975. Analytical indications of a more rational approach to accelerated fish sauce production. In: R. Kreuzer (Ed.) *Fishery Products*. FAO, England, pp. 176-177.
- NONAKA, J., L. T. M. DIRU AND C. KOIZUMI 1975. Studies on volatile constituents of fish sauces Nuocmam and Shotturu. *J. Tokyo Uni. Fish.*, 62 : 1-10.
- OSER, B. L. 1971. *Physiological Chemistry*. Tata McGraw-Hill Publishing Co. Ltd., New Delhi, 1219 pp.
- PEARSON, D. 1977. *The Chemical analysis of foods*. Chemical Publishing Co., INC., New York, 7th Edn. 519 pp.
- POPE, C. G. AND M. F. STEVENS 1939. The determination of amino-nitrogen using a copper method. *J. Biochem.*, 33 : 1070-1077.