Nutritional Quality of Some Food Fish*

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The proximate compositions and amino acid make-up of silver jew fish *(Johnius argentatus)*, Indian halibut *(Psettodes erumei)*, grey mullet *(Mugil cephalus)* and pearl spot *(Etroplus suratensis)* are reported. Calorific values of these fishes have been calculated from their proximate compositions and their amino acid make-up compared with the available data for beef and egg. From the study, pearl spot is adjudged to be the most nutritive among the fishes studied, followed by Indian halibut, grey mullet and silver jew fish.

Fish and meat occupy prominent positions in human food. They are more nutritive and relishing than plant food, though comparatively costlier. In advanced countries part of the agricultural produces are used for rearing animals and fish, which in turn form the preferred item of food for man. The nutritive values of meat of almost all animals which form man's food have already been studied and reported. In the case of fish the work done on these lines is scanty. An understanding of the nutritional quality of fish is important in its use as food and for formulation of balanced food products from plants, cereals and fish.

Richard *et al.* (1962), Sohn *et al.* (1961) and Kuttyayyappan *et al.* (1976) have reported the proximate composition of commercially important fish of New England waters and Indian waters respectively. Thurston & Claude (1958) determined the sodium and potassium contents of some fishes. James (1969) and Rangaswamy *et al.* (1970) have studied the free amino acid composition of Indian shrimp. There are also reports about the study of a single amino acid in fish (Gowri *et al.*, 1972) and in shrimp (Nair & Bose, 1965) as indicators of flavour. The present report consists of a study on the mineral, amino acid and proximate compositions of four species of Indian food fishes. The amino acid composition is compared with the data available for beef and egg (Merlyn *et al.*, 1976) and screened for their adequacy to meet the FAO/WHO recommended pattern of amino acid requirement.

Materials and Methods

Fresh adult fish were collected from the local markets, skinned, muscle excised and minced. The minced muscle was used for all experiments unless otherwise specified.

Moisture, ash and protein were determined according to official methods of AOAC (1975). Lipids were determined by the method of Bligh & Dyer (1959). The ash was dissolved in 1 N hydrochloric acid and the solution was used for the estimation of sodium, potassium and calcium using Systronics flame photometer. The carbohydrate was estimated by the method of Umbriet & Burris (1959). Amino acid composition was determined by standard micro-biological assay methods (Gerald, 1963), using the residue left after the extraction of lipids.

Results and Discussion

Table 1 shows the proximate composition of the fish studied. Pearl spot showed the highest content of protein, carbohydrate and ash. Fat was maximum in grey mullet and minimum in Indian halibut. Silver jew fish showed the lowest levels for protein and carbohydrate. In the case of minerals, Indian halibut showed the maxium levels for sodium and calcium. Potassium was more in pearl spot. However, the total mineral content (sodium + potassium + calcium) was more in Indian halibut.

* Paper presented in the National Colloquium on 'Biochemistry of Fish' jointly sponsored by UGC and Centre for Advanced Studies in Marine Biology, Porto Novo, during 17th—19th September 1977.

Table 1. *Proximate composition of four species of Indian food fish*

Common name	Scientific name	Moisture g/100g	Ash g/100g	Protein g/100g	Fat g/100g	Carbohydrate mg/100g	Sodium mg/100g	Potassium mg/100g	Calcium mg/100g
Pearl spot	*Etroplus suratensis*	75.29	0.9426	22.50	2.378	717.5	126.9	296.7	315.3
Grey mullet	*Mugil cephalus*	74.94	0.5898	20.84	5.060	509.1	136.4	252.8	136.9
Silver jew fish	*Johnius argentatus*	77.80	0.6677	20.46	1.630	429.6	160.2	175.3	116.9
Indian halibut	*Psettodes erumei*	76.12	0.7757	21.60	0.915	430.6	195.5	236.7	370.9

Table 2. *Calorific values of the different constituents of the fish*

Name of fish	Protein k cal/100g	Fat k cal/100g	Carbohydrate k cal/100g	Total k cal/100g
Pearl spot	92.25	22.12	2.939	117.3
Grey mullet	85.44	47.06	2.087	134.8
Silver jew fish	83.89	14.66	1.758	100.8
Indian halibut	88.56	8.51	1.763	98.8

Table 3. *Amino acid composition of beef, egg and the experimental fish* (g amino acid/100 g protein)

Amino acid	Beef	Egg	Pearl spot	Grey mullet	Silver jew fish	Indian halibut
Lysine	8.76	6.96	9.64	10.01	13.64	12.84
Histidine	3.44	—	2.63	4.51	3.32	1.55
Arginine	6.84	—	3.89	4.10	3.28	4.27
Aspartic acid	9.36	—	7.14	7.02	6.28	8.19
Threonine	4.60	5.12	6.46	4.64	2.45	3.25
Serine	4.24	—	5.30	3.70	2.40	3.13
Glutamic acid	17.28	—	12.30	23.16	28.55	21.96
Proline	6.96	—	6.35	4.52	6.89	5.84
Glycine	8.20	—	4.73	0.63	1.39	1.98
Alanine	6.76	—	—	—	—	—
Valine	5.32	6.84	5.58	5.42	2.18	5.21
Cystine	—	2.44	0.95	0.70	0.48	0.90
Methionine	2.68	3.36	4.46	4.00	3.77	5.34
Methionine + cystine	2.68	5.80	5.41	4.70	4.25	6.24
Isoleucine	4.76	6.28	4.20	9.31	8.58	12.17
Leucine	8.20	8.80	9.77	5.10	5.65	5.34
Tyrosine	3.28	—	6.51	3.88	1.46	4.66
Phenyl alanine	4.20	5.72	3.84	6.00	3.84	4.62
Tryptophan	1.16	1.48	1.26	1.62	1.74	0.81

Table 2 shows the calorific values calculated on the basis of fat, protein and carbohydrate at the rates of 9.3 ,4.1 and 4.1 k cal/g respectively. Calorific value is maximum for grey mullet because of its high fat content. Since fat varies with season (Gopakumar, 1973; Solanki *et al.*, 1976), calorific value of grey mullet also will be changing accordingly. In the case of pearl spot, Indian halibut and silver jew fish, calorific values are mainly dependent on their protein content, being non-fatty and remain more or less constant throughout the year.

Table 4. *FAO/WHO recommended pattern of essential amino acid requirements/day* (*g*/100*g protein*)

Amino acid	Infant	Child	Adult
Histidine	14.0	—	—
Isoleucine	3.5	3.7	1.8
Leucine	8.0	5.6	2.5
Lysine	5.2	7.5	2.2
Sulphur amino acids	2.9	3.4	2.4
Aromatic amino acids	6.3	3.4	2.5
Threonine	4.4	4.4	1.3
Valine	4.7	4.1	1.8

Table 3 gives the amino acid compositions of the fishes compared to those of beef and egg. The data indicate that all the fish studied have high content of the essential amino acids especially lysine, methionine and isoleucine. In the case of arginine and proline beef has an edge over fish and egg. Egg on the other hand is rich in valine and sulphur amino acids (cystine + methionine).

Thus these fishes are rich sources of amino acids especially lysine, isoleucine, threonine and methionine which are considered limiting amino acids in plant and cereal foods. (Harden, *et al.*, 1976). Hence these proteins can be used for formulating protein enriched foods from pulses and cereals to give well balanced protein diets.

The recommended pattern of essential amino acid requirement (FAO/WHO, 1973) presented in Table 4, shows that 100 g protein from any of these fishes can provide a balanced protein diet for adults. In the case of children 100 g protein from pearl spot, grey mullet or Indian halibut can provide essential amino acids for normal growth. Similarly for infants 100 g protein from pearl spot can meet all essential amino acid requirements except that of histidine. Though these fishes contain slightly lower amounts of valine, proline and arginine compared to beef and egg, they are better sources of other amino acids. Since they contain sufficient quantities of all essential amino acids they are superior in nutritional quality, especially due to the easy digestibility of fish protein.

The above results show that pearl spot is the best fish from nutritional point of view as it has a comparatively high and steady calorific value and a good combination of all essential amino acids, closely followed by Indian halibut and grey mullet.

The authors are grateful to Shri M. R. Nair, Project Co-ordinator and Shri P. D. Antony, Scientist, C. I. F. T., Cochin for guidance and encouragement in this work and to Shri G. K. Kuriyan, Director for kind permission to publish this paper.

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