Texturised Meat from Low Cost Fish

A. VASANTH SHENOY, R. THANKAMMA, A. LEKSHMY NAIR and K. GOPAKUMAR

Central Institute of Fisheries Technology, Cochin - 682 029

A comparative study of the suitability of five species of fish, namely, threadfin bream *(Nemipterous japonicus)*, cat fish *(Tachysurus jella)*, ribbon fish *(Trichiurus* spp.*)*, barracuda *(Sphyraena jello)* and jew fish *(Pseudosciaena* spp.*)* for the production of texturised meat has indicated that all these species are good source for the purpose. Protein content of the final product from all the species was higher than that precribed for FPC type A. The product had excellent rehydration capacity and firm and elastic texture. No significant difference was observed in the rehydration capacity of the texturised meat from all the species studied. Salt concentration was found to influence the texture and salt content of 1.5 to 2% was found to result in the desirable firm and elastic texture. Rehydration capacity was not influenced to any significant extent by the salt content.

Fisheries make an important contribution to the world population by providing animal protein which is of great nutritional significance. The by-catch of shrimp trawlers which is assuming great significance due to enormous quantityof landing, could be turned into palatable human food by applying new processing methods. The problem of utilization of this low cost miscellaneous fish has been tackled to a small extent by converting them into useful consumer products like fish wafers, fish soup powder, fish fingers etc. (Gopakumar *et al.,* 1975). However only a small percentage of the landings is being converted into these type of products. Conversion of the fish into fish protein concentrate (FPC) is perhaps the most efficient means of utilization of the protein for human consumption. Various methods have been worked out for the production of FPC from Indian fish (Bhatia *et al.,* 1959; Pillai, 1956, 1957; Moorjani *et al.,* 1962; Ismail, *et al.,* 1968 and Shenoy *et al.,* 1976). FPC though highly nutritious wholesome protein food is lacking in such functional properties as solubility, water binding and holding characteristics besides being gritty in its texture. Lack of rehydration ability makes it difficult to process the FPC with other foods.

In order to overcome these disadvantages, FPCs with better functional properties have been developed (Bligh, *et al.,* 1973 and Gopakumar & Shenoy, 1977). A process has been developed to prepare FPC retaining to a significant degree the desirable functional properties so as to provide fish protein supplement more acceptable to consumers. The product has been named marinbeef (Taneko Suzuki, 1981).

It is the purpose of this paper to present laboratory data on some factors which relate to the production of texturised meat from five species of low cost fish abundantly available at the Kerala coast.

Materials and Methods

The fish utilized for the study were threadfin bream *(Nemipterous japonicus)*, cat fish *(Tachysurus jella)*, ribbon fish *(Trichiurus* spp). barracuda *(Sphyraena jello)* and jew fish *(Pseudosciaena* spp.*)*. All the species were collected from the fisheries harbour, Cochin. Moisture, fat and protein were estimated by the AOAC (1975) method.

Marinbeef was produced by the method of Taneko Suzuki (1981). Fish on arrival at the laboratory was washed well and meat separated using a meat-bone separator. The separated meat was again washed well with

water and the excess water removed by pressing. For fatty fishes like cat fish the washing was carried out more thoroughly with dilute sodium bicarbonate solution. The meat was then treated with 1–2% sodium chloride by weight of the meat and the pH of the meat adjusted to 7.4–7.8. The pH adjusted meat was kneaded till it became a viscous paste. This paste was then extruded into cold ethanol (5°C), three times the volume of the paste and stirred for 15 min. The excess ethanol was removed by pressing. The ethanol treatment was repeated two more times. The pressed material was dried in an artificial dryer for 4–5 h at 40–50°C.

Rehydration capacity of the meat was measured as follows:

Five gram of the product was immersed in cold water (5°C) five times its weight for 2 h and centrifuged for 15 min. The residue was weighed and the weight was divided by the initial weight of the test material and expressed as rehydration capacity.

Results and Discussion

The most important steps in the processing of the texturised meat are (1) adjustment of pH at 7.4 to 7.8 to improve the rehydration properties (2) addition of sodium chloride and kneading to form actomyosin solution for modifying the texture and (3) ethanol treatment to remove moisture, fat and odour bearing compounds as also to denature and coagulate the protein in the fish meat. In order to minimise the protein denaturation, the ethanol treatment is carried out at temperatures below 10°C.

In order to study the influence of salt concentration on the texture and rehydration properties of the texturised meat products with different salt concentrations were prepared from threadfin bream and organoleptic evaluation was carried out. Table 1 depicts the effect of salt concentration on the texture and rehydration properties of texturised meat from threadfin bream. It can be seen that the texture was soft at salt concentration of 0.5 to 1% and hard above concentration of 2%. The firm and elastic texture at salt concentrations of 1.5 and 2% was adjudged the best on organoleptic examination. Taneko Suzuki (1981) observed that the texture at salt concentration from 1–2% came closest to the texture of animal meat. Determination of rehydration capacity of the material with varying contents of salt indicated that the salt concentration did not influence the rehydration properties to any significant extent.

Table 1. *Effect of salt concentration on rehydration capacity and texture of texturised meat from threadfin bream.*

Salt concentration %	Rehydration capacity	Texture
0.5	2.85	Soft and elastic
1.0	2.65	,,
1.5	2.60	Firm and elastic
2.0	2.92	,,
2.5	2.59	Hard and elastic
3.0	2.72	,,

Texturised meat was produced from five species of low cost fish. The pH of the meat was adjusted to 7.4–7.8 by addition of sodium bicarbonate and salt concentration maintained at 2% in all cases. Ethanol temperature was kept at 5°C. The physical properties of the texturised meat from all the species were almost alike. The dried material was off white in colour and had only very faint odour and flavour of fish and ethanol. On soaking in cold water for one hour the meat was found to swell about 4–5 times its original weight. The product after soaking in water neither had the odour and flavour of fish nor that of ethanol. The texture of the product was firm and elastic. Table 2 presents the general composition and rehydration capacity of the texturised meat from the five species of fish. Protein content of the final product obtained from all the species was higher than that prescribed for FPC type A. The protein content ranged from 86.64% for cat fish to 88.45% for barracuda. Rehydration capacity of the product from all species was good and there was not much variation in the degree of rehydration among the different samples.

Table 2. *Composition of texturised meat from different species of fish*

Fish species	Moisture %	Crude protein N x 6.25 %	Crude fat %	Ash %	Rehydration capacity
Threadfin bream	9.98	87.91	1.07	3.35	2.85
Cat fish	11.10	86.64	3.81	1.56	2.77
Ribbon fish	9.13	86.58	2.73	1.64	2.81
Barracuda	10.74	88.45	0.23	2.27	2.69
Jew fish	8.36	87.47	1.73	2.09	2.75

Threadfin bream, cat fish, ribbon fish, barracuda and jew fish constitute potential source for the production of texturised meat with excellent functional properties. Absence of fish odour, taste or shape together with high nutritional value with the special elastic texture can open new avenues for this product to be used as a protein supplement in a wide variety of foods.

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