

## DEVELOPMENT OF FISH PRODUCTS FROM LOW PRICED FISH

K. GOPAKUMAR AND M. RAJENDRANATHAN NAIR

*Central Institute of Fisheries Technology, Cochin-682 029*

### ABSTRACT

A variety of useful protein rich products such as fish protein concentrate, edible fish powder, fish hydrolysate, fish soup powder, fish fingers, fish flakes and pet food for domestic animals can be prepared from economically low priced fish. Their methods of preparation, analytical composition and viability to commercial production are discussed in this chapter.

### INTRODUCTION

A MAJOR portion of the country's marine landing is composed of low priced fish. This includes a very large number of species of fish, some of them are either consumed fresh or in dried form. But many of these species fetch only very low market values. Research conducted on them, for their effective utilization at the Central Institute of Fisheries Technology (CIFT), Cochin has shown that a variety of useful products, having high commercial value can be prepared. Some of these are described below.

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### FISH PROTEIN CONCENTRATE

Fish Protein Concentrate (FPC) has been a subject of investigation in several laboratories. Investigations carried out in CIFT have shown

that an acceptable product can be prepared from low priced fish.

### *Method of preparation*

The comminuted fish meat is cooked in 0.5% acetic acid containing water in the ratio 1:1 (w/v) for one hour. The water containing fat is removed. Further, the cooked meat is pressed in canvas bags to remove water. The pressed meat is extracted first with ethanol. Alcohol also removes any water remaining with the meat. The extracted fish meat is again extracted with an azeotropic solvent mixture of hexane and alcohol (33.2 mole per cent alcohol, B.P. 58.69) following the method of Ismail *et al.* (1968). After the solvent extractions the meat is pressed free of solvents and vacuum dried. The last traces of solvents remained in the dried mass is steam stripped off and the defatted fish meat is vacuum dried again. Yield—10% of the whole fish. Cost Rs. 12 per kg.

The finished product is a colourless, odourless and tasteless product. It has got a shelf

life over 2 years at room temperature. Analytical and nutritional characteristics of FPC samples prepared from some cheap fish are given in Table 1 as determined by the methods of AOAC (1960).

*Analytical characteristics of fish powder from Threadfin bream*

Protein	80.6 %	Fat	5 %
Ash	1.7 %	Total platecount	50 g
Moisture	7.5 %	Coliforms	Nil

TABLE 1. *Analytical and nutritional quality of FPC (as % of FPC)*

Fish	Moisture	Protein	Pepsin digestibility	Available lysine	Total lipids	Calcium	Phosphorus	Ash	Per	NPR
Threadfin bream ..	8.1	67.7	98	7.9	0.4	5.4	3.9	24.1	2.34	3.5
Catfish ..	8.4	73.2	97.3	7.2	0.5	3.6	1.8	12.9	2.0	3.2
Jewfish ..	7.8	75.9	96	6.6	0.5	1.5	0.9	15.6	2.6	3.7

PER — Protein Efficiency Ratio

NPR — Net Protein Retention.

#### EDIBLE FISH POWDER

This is one of the cheapest ways of preparation of protein concentrate from fish. Low priced fish, lean fish, is perhaps the best material for this purpose.

##### *Method of preparation*

The whole fish has to be washed thoroughly until it is free of adhering slime and dirt. Minced meat is then prepared out of this material using a mechanical flesh separator. The minced fish meat is then cooked with equal quantity of water containing 0.5 per cent acetic acid. After cooking the material is allowed to cool. Decant the supernatant water containing fat. The meat is then pressed in a screw press until it is free of water. The press cakes are dried in a tunnel dryer maintained about 60°C. The dried material is pulverised in a mill and sieved to fine mesh. The fine fish powder must be tightly packed in air tight containers. It has a shelf life over 9 months at ambient temperature.

Yield—12 to 15% of the whole fish.

Cost—Rs. 8 per kg.

#### FISH HYDROLYSATES

Protein hydrolysate is an industrially important product. It has got several commercial applications like incorporation in fortified foods, medicines and beverages. Miscellaneous fish forms one of the cheapest raw material for this purpose. It can be prepared by enzymatically hydrolysing the comminuted fish meat.

##### *Method of preparation*

Comminuted fish meat is cooked in water 1:1 (w/v). The pH is adjusted to 6.5 with mineral acids. It is then hydrolysed with enzyme papain, in the ratio 1:30 (enzyme nitrogen to substrate nitrogen) for 30 minutes. After which the contents are boiled to deactivate the enzyme and stop the reaction. The solubilized proteins are filtered and concentrated. The concentrated hydrolysate is converted to fine powder by drying the product under vacuum.

The product is hygroscopic and easily soluble in water and can be used in any food products as a protein supplement.

The major disadvantage of the protein hydrolysate is its bitterness. It has to be masked by mixing with other flavouring and sweetening agents. The yield of protein hydrolysates from some low priced fishes are given below.

Yield—7 to 8 g/100 g fish meat

Cost of production—Rs. 50.

*Yield of protein hydrolysates from low priced fish species*

Name of fish	Yield* of hydrolysate
Lizardfish ( <i>Saurida tumbil</i> ) ..	13.3
Ribbonfish ( <i>Trichiurus</i> sp.) ..	9.9
Jewfish ( <i>Johnius</i> sp.) ..	9.9
Threadfin bream ( <i>Nemipterus japonicus</i> ) ..	12.0
Catfish ( <i>Tachysurus</i> sp.)	10.9
Anchovies ( <i>Thrissoles</i> sp.) ..	9.7

\* g per 100g wet fish.

**FISH SOUP POWDER**

Investigations carried out at CIFT, Cochin has shown that a economically cheap soup powder can be prepared from the minced fish meat of low priced fishes.

Its composition (in gm) and method of preparation is given below :

Cooked picked fish meat	750
Salt	170
Fat	125
Onions	750
Corriander powder	12
Tapioca starch	250
Milk powder	100
Pepper powder	15
Vitamin C	1.5
Carboxy methyl cellulose	3
Monosodium glutamate	5

*Method of Preparation*

Fry the onions in fat until it is pale brown. Pour into it all the ingredients except milk powder. The whole material is then ground to a fine paste. The paste is then dried under vacuum to a moisture level of 6-7%. The dried mass is then powdered well in a pulveriser, mixed intimately with the milk powder and packed in air-tight glass bottles. Cost of production Rs. 15 per kg.

25 gm of this powder will be sufficient for 3 cups (450 ml) of soup.

The finished soup powder will have the following composition.

Protein	..	21%
Fat	..	14.6%
Ash	..	19.4%
Moisture	..	5%
Carbohydrates	..	20%

**FISH FINGERS**

It is perhaps one of the best product having a high consumer acceptability prepared and marketed successfully from minced fish meat.

*Method of preparation*

Fish meat is prepared, free of bones, skins and adipose fat, from cheap fish. The meat is then mixed with sufficient water containing sodium tripolyphosphate (6g/1000 g of fish meat) to a hard thick paste. The paste is then packed as slabs of suitable sizes and deep frozen at  $-40^{\circ}\text{C}$  in a contact plate freezer. After two hours, when it is well frozen, it is taken out and cut into small fingers. The size of the fingers usually varied depending on the manufactures. Generally a finger will have a size of 8 cm (length)  $\times$  2.5 cm (width)  $\times$  0.75 cm (thick). The fingers are then battered, breaded, fried in edible oil (this frying results only surface frying) and packed in paper cartons. The fingers are kept at  $-20^{\circ}\text{C}$  and sold in frozen condition.

The consumers will have to fry the material again prior to consumption.

The study conducted on various types of fingers from cheap fish at CIFT, Cochin has shown that this product is highly acceptable to consumers. However, it is seen that the best way to sell the product in this country is as frozen fingers without breading and battering. In this condition it resembles more to frozen fish. However, each finger has to be wrapped separately in polythene paper.

Consumers can apply any suitable batter according to the varying tastes of different regions. Consumer preference studies and cost of production worked out at CIFT has shown that this product has a high prospects in this country for manufacturing and marketing.

#### FISH FLAKES

It is a product prepared out of fish meat, starch and salt. Minced fish meat is the best material suited for this purpose.

#### Recipe

Cooked pressed fish meat	..	2 kg.
Tapioca starch	..	2 kg.
Corn starch	..	1 kg.
Refined sodium chloride	..	50 gm.
Water	..	3.5 litres

#### Method of preparation

Fish meat, starches and salt are thoroughly homeogenised with above quantity of water in a mechanical grinder to a fine paste. The fine liquid slurry is then spread in an aluminium tray in thickness of 1 to 2 mm. The trays are then cooked in steam until the layers became transparent. The layers are cut into suitable sizes. The trays are dried either in sun or in a drier maintained between 50-60°C. The dried fish flakes have a moisture content below 6 per cent.

The flakes are fried in any edible vegetable oil and served hot. The protein content of the product is about 15 per cent.

Cost of production—Rs. 10 per kg.

#### PET FOOD

When quality products are prepared from cheap fish usually a lot of materials will be left over as wastes. This includes, head, bones, skins, etc. However, these materials contain plenty of protein, fat and minerals. Economic way of utilization of these low priced fish essentially demands conversion of these wastes into useful products. One of the product developed from these wastes at CIFT is the pet food.

#### Method of preparation

The whole wastes are to be cooked thoroughly in an autoclave for one hour at 15 lbs pressure.

The cooked material is then mixed with the following materials in the weights given below.

#### Ingredients

Cooked fish wastes	600 g,
Wheat flour, rice powder (Low grade)	100 g
Carrots (low priced)	200 g
Tapioca starch	100 g
Shark liver oil	1 to 3 cc/kg of whole mass
Water	30% of whole solid mass
Vitamins and minerals mix	Vitamins B and C, Calcium, Sodium, Potas- sium, Magne- sium, Iron, Cobalt, Copper, Zinc

[(Must contain 0.5 to 1 mg (100 g)]

The whole mass is then converted to a very fine paste by grinding in a mechanical meat mincer or wet food grinder. The fine paste is packed in cans of size 301 × 206. Each can contains about 220 g of material. The can are exhausted and seamed.

The sealed cans are sterilized at 15 lbs per sq. inch of pressure for 70 minutes to get a sterile product.

*Analytical characteristics of pet food*

Protein	..	10%
Moisture	..	67%
Ash	..	3.5%
Fat	..	1.2%
Pathogens	..	Nil

The canned pet food is an excellent food for cats and dogs.

REFERENCES

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