

Characteristics of Gel from the Meat of Twelve Species of Fish from Visakhapatnam Coast

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Proximate composition and gel formation capacity of the meat from twelve low priced fish of Visakhapatnam coast were studied. It was found that the mince from these fish, on steaming formed gel having satisfactory strength. Gel strength of meat samples from fresh fish varied from 450 to ~500 gcm. The colour of the steamed cake from jew fish, bull's eye, barracuda and lizard fish was white and it varied from light grey or yellow to grey in the case of goat fish, sardine, rainbow sardine, thread fin trevelly, horse mackerel, cat fish and scad. The fish mince from all the twelve species can be used for preparation of various products.

Key words: Gel formation, proximate composition, by-catch, Visakhapatnam coast

With the fast growing demand for surimi and its products such as crab and shrimp analogs, attempts are being made throughout the world to find out suitable raw materials for surimi. The suitability and feasibility of using the less utilized species for production of surimi are being investigated all over the world (Suzuki, 1981; Spencer *et al.*, 1992; Torley & Lanier, 1992). Attempts are being made to improve the yield of surimi and to minimize the demand for fresh water for the washing steps. Loss of suspended solids in wash and press water can be upto 35 percent of the total solids (Suzuki, 1981; Lee, 1984). Hasting (1989) showed that strong gel could be made from unwashed mince from fresh cod fillets and the properties of gel could be modified further by adding starch and additives.

The present study was undertaken to determine proximate composition of low priced fish such as lizard fish, jew fish, horse mackerel, bull's eye, threadfin trevelly, rainbow sardine, goat fish, sardine and barracuda available at Visakhapatnam coast and the properties of gel prepared from the meat of these fish.

Materials and Methods

Megalaspis cordyla, *Otolithes ruber*, *Nebia maculata*, *Arius dussumieri*, *Decapterus* sp.,

Saurida tumbil, *Atule mate*, *Dussumiena acuta*, *Upeneus vittatis*, *Sardinella dobsi*, *Sphyræna jello* and *Priacanthus hamrur*, were collected from local landing centers and brought under ice to the laboratory without delay. Each variety with acceptable degree of freshness was divided into two lots. One lot was taken immediately to conduct studies on fresh fish and the other lot was stored in deep freezer at $-18\pm2^{\circ}\text{C}$ for conducting studies on frozen fish.

Moisture, protein, fat, ash, potassium, calcium and iron contents in fresh fish meat were determined by standard methods (AOAC, 1975). Phosphorus content was determined by the method of Fiske & Row (1925). Water soluble protein was extracted from fish meat by thorough mixing of meat with measured volume of water followed by collection of clear solution after decantation (Winton & Winton, 1958). The process was repeated two times and the collected extracts were filtered using Whatman No.1 filter paper. The filtrate was taken for estimation of protein content by micro-Kjeldhal method (AOAC, 1975).

Manually picked white meat from fish fillets of fresh or thawed fish was mixed with 4% sodium chloride to get a smooth paste. The paste was filled in heat stable 2 mm

thick plastic casing (3.0 cm length x 2.5 cm diameter), heated in open steam for 40 min and then cooled to ambient temperature. The steamed cakes were taken out from plastic casing and then cut into 1 cm and 0.5 cm thick test pieces with 2.5 cm diameter. The break point of test pieces were recorded on standard paper chart using a gel strength meter based on the principle of Okada gelometer (Okada, 1959).

Results and Discussion

Table 1 shows the composition of twelve varieties of low cost fish available at Visakhapatnam coast. Crude protein and water soluble protein contents in the fish meat were 16.5-22.0% and 4.0-7.0% respectively. The difference between crude protein content and water soluble protein content represents the apparent myofibrillar protein content which is mainly responsible for gel formation (Suzuki, 1981; Lee, 1992). The proportion of myofibrillar protein (Table 2) showed variations in these species. Similar range of myofibrillar protein was reported in many fish species with good gel forming ability (Suzuki, 1981).

The proportion of white meat varied from 80-94% and the proportion of red meat in rainbow sardine, horse mackerel and cat fish was high (Table 2). The colour and flavour of the steamed cake varied with the species, depending on the relative proportions of red and white meat. The colour of the gel from jew fish, bull's eye, barracuda and lizard fish was white and it varied from light grey or yellow to grey in the gel from remaining fish species. Good gel strength (450 to 500 gcm and above) was noticed in all fresh fish samples, when tested using 1 cm thick test pieces. On frozen storage of fish, the gel strength of meat decreased

(Table 2). This method of preparation of gel from fish meat does not involve loss of nutritional elements from the meat and is advantageous in many ways.

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Table 1. Composition* of fish meat from 12 species of fish from Visakhapatnam coast

Fish	Body Weight g	Moisture %	Crude protein %	Water soluble protein %	Fat %	Ash %	Calcium mg %	Potassium mg %	Iron mg %	Phosphorus mg %
<i>Megalaspis cordyla</i>	100 - 150	75.1	20.1	5.8	1.9	1.4	46.5	159.6	1.5	231.5
<i>Otolithes ruber</i>	100 - 200	77.1	19.5	4.7	1.3	1.1	66.2	240.4	1.2	157.9
<i>Nebia maculata</i>	80 - 100	77.6	18.6	4.6	1.5	1.3	62.5	302.1	2.2	351.1
<i>Arius dussumieri</i>	130 - 150	77.5	18.5	6.6	1.2	1.1	63.2	129.1	1.7	167.7
<i>Prichanthus hamrur</i>	100 - 150	79.1	18.1	4.9	1.0	1.1	66.0	237.0	2.1	237.2
<i>Decapterus sp</i>	40 - 50	75.1	19.3	5.0	2.9	1.4	95.8	410.8	1.5	284.5
<i>Saurida tumbil</i>	125 - 150	77.6	19.6	4.8	0.7	1.4	89.8	359.5	1.7	378.7
<i>Atule mate</i>	60 - 80	76.9	18.7	4.0	1.4	1.3	61.2	289.2	3.5	202.1
<i>Dussumiena acuta</i>	30 - 40	76.7	19.6	7.0	0.8	1.7	98.6	443.4	1.8	530.7
<i>Upeneus vittatis</i>	30 - 35	76.6	19.2	6.2	2.78	1.1	95.6	236.1	2.0	281.2
<i>Sardinella dobsi</i>	20 - 30	76.3	19.4	6.4	1.3	1.4	94.5	323.1	3.1	212.0
<i>Sphyræna jello</i>	200 - 500	78.4	20.1	5.6	0.7	1.3	68.2	250.4	3.35	205.8

*on wet weight basis; = all values average of 4 trials.

Table 2. Properties of mince and gel from twelve species of fish from Visakhapatnam coast

Fish	White Meat %	Myofibrillar Protein %	Gel strength** gcm		Colour
			Fresh fish	Frozen fish*	
<i>Megalaspis cordyla</i>	80	14.3	500	407 - 440 (14 days)	Light grey
<i>Otolithes ruber</i>	87	14.8	500	285 - 299 (14 days)	White
<i>Nebia maculata</i>	90	14.0	500	333 - 354	LY
<i>Arius dussumieri</i>	83	11.9	480 - 500	350 - 400 (15 days)	Light grey
<i>Prichanthus hamrur</i>	93	13.2	500	480 - 500 (3 days)	White
<i>Decapterus sp</i>	86	14.3	480 - 500	350 - 380 (7 days)	Grey
<i>Saurida tumbil</i>	94	14.8	460 - 490	390 - 435	White
<i>Atule mat</i>	85	14.7	500	340 - 386 (18 days)	Light grey
<i>Dussumiena acuta</i>	81	12.6	500	480 - 490 (3 days)	Light grey
<i>Upeneus vittatis</i>	90	13.0	430 - 450	246 - 253 (14 days)	Light grey
<i>Sardinella dobsi</i>	92	13.0	460 - 500	420 - 490 (3 days)	White
<i>Sphyræna jello</i>	91	14.5	469 - 500	480 - 490 (3 days)	White

* Frozen storage time in brackets

** White meat used