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RESEARCH PAPER

Preparation and evaluation of edible fish powder prepared from small sized croaker *Otolithes ruber* landed at southern coast of Gujarat

■ B.G. CHUDASAMA, S.M. ZOFAIR, T.H. DAVE AND D.V. BHOLA

SUMMARY : To find the utilization of the presently wasted by-catch, an attempt has been made in this study to prepare edible fish powder, using small sized croaker and low-cost technology. Small sized of croaker was converted to nutritionally rich edible fish powder by thermal processing technique. These edible fish powder were stored in 200-gauge LDPE bags for six months. Freshly prepared edible fish powder had moisture content 8.10 ± 0.14 per cent, crude protein 57.83 ± 0.28 per cent, crude lipid 4.63 ± 0.23 per cent and ash 7.01 ± 0.24 per cent on dry wt. basis. Monthly analysis indicates that edible fish powder was also rich in protein (57-51%) and mineral like calcium (1319-1214 mg%). During the six-month storage period, TVB-N and PV values increased slowly but steadily, reaching values of 28.66 mg per cent and 22.71 milliequivalent/1000g of fat, respectively. No bad odour was developed during the storage period. There was no discoloration of the product during six months of storage. Chemical analysis and sensory evaluation showed that the product was in prime acceptable form for six months of storage at ambient temperature. The edible fish powder finds use as a fortifying agent to improve the food value and taste of different food items like fish gathiya, fish papad, fish chakri and can also be incorporated in veg. curry to enhance its nutritional value.

Key Words : Edible fish powder, Small size croaker, Thermal processing

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World fish production has peaked more than 128.8 million tons but only just over 60 per cent are used for human consumption and almost 40 per cent are not used for this purpose. The fish that are not utilized for human consumption include 30 million tons of small pelagic fish used for production of fishmeal and some 20 million tons of discarded as by-catch (Chandrapal, 2005). Low value fishes account for more than 40 per cent of the total catch from marine fish landings of our country. In India, exports constitute 8 per cent of the trawl catch, distant domestic markets 12 per cent, local consumption as fresh fish 15 per cent, local consumption as salted and dried fish 15 per cent, and fish meal of three grades 50 per cent (Kungsuwan, 1999). Almost 50 per cent or more fish catch in Gujarat does not fetch value and thus is commonly grouped as trash fish. However, much value of unutilized fish is also equally good in protein and other nutritive contents. These small fishes of low value do not fetch high cost and presently they are utilized for drying, fish meal and fish manure only.

Also small varieties of fishes are not relished because of pin bones (source of minerals) and conveniently, converted into meal for animal feed. Considering the growth of the

MEMBERS OF THE RESEARCH FORUM

Author for Correspondence :
B.G. CHUDASAMA, Department of Fish Harvest and Post Harvest Technology, College of Fisheries, Junagadh Agricultural University, VERAVAL (GUJARAT) INDIA
Email : cbg@yahoo.com

Coopted Authors:
S.M. ZOFAIR AND D.V. BHOLA, Department of Fish Harvest and Post Harvest Technology, College of Fisheries, Junagadh Agricultural University, VERAVAL (GUJARAT) INDIA

T.H. DAVE, Department of Fish Biology, College of Fisheries, Junagadh Agricultural University, VERAVAL (GUJARAT) INDIA
Email : tushar.dave@indiatimes.com

population and to make use of this high quality protein for human consumption it is necessary to convert low value fishes into value added fishery product like edible fish powder. In this study edible fish powder was prepared from small sized croaker with and without bone to find out and to prevent the loss of the importance of minerals like calcium, potassium, iron and sodium. So, the present attempt has been made to study the prepare edible fish powder, using small sized croaker and low-cost technology for better utilization and possible improvements underutilize fish available in Gujarat.

EXPERIMENTAL METHODS

Fish:

Small sized croakers weighing about 150-250 g. were utilized for preparation of edible fish powder. The fishes were purchased from fishing harbour in fresh condition and transported in chilled condition (5° -10° C) to the laboratory for product preparation.

Preparation of edible fish powder:

Edible fish powder was prepared as per the method described by (Chattopadhyay *et al.,* 2004). The fresh raw materials was dressed and made into a small chunk of 1-2 inch without bones in treatment 1 and with bone in treatment 2. Autoclaving was done at 15 psi for 45 min. to soften the bones completely. Pressed the soften meat while hot followed by tray drying at 65° C for 8 – 10 hrs. Dried material was grinded in to fine powder. Powder was packed in 200 g quantities in readily available 200 gauge LDPE sachets and stored at room temperature. The powder was analyzed at monthly interval for the biochemical variation and sensory analysis.

The process is shown as flow chart (Fig. 1):

Raw material
↓
Dressing / Beheading
↓
Cut into chunks (1-2 inch) with bones
↓
Autoclaving at 15psi for 45 minutes
(to soften the bones completely and remove fat partially)
↓
Pressing the softened meat while hot
↓
Tray drying
(65 °C for 8-10 hrs)
↓
Fine grinding
↓
Packaging of edible fish powder in 200 gauge LDPE sachets
↓
Store at room temperature

Fig. 1 : Flow chart for the preparation of edible fish powder from small sized croaker

Nutritive and organoleptic evaluation:

Proximate compositions like moisture, protein, lipid and ash were determined as per standard method methods (AOAC, 2006). Minerals and other parameters like peroxide value (PV) were also determined as per standard methods described in AOAC (2006). Total volatile based nitrogen (TVBN) was determined by the Conway micro diffusion method (Conway, 1947). The microbiological characteristic of edible fish powder was carried out according to standard method of TPC recommended by AOAC (2006). Organolptic evolution was carried out by 9 point Hedonic scale method (Joseph, 2003). Where below 5 was unacceptable score.

Statistical analysis:

Data were statistically analysed as per standard statistical method. Analysis of variance (ANOVA) was used to find out significant difference in samples between the treatments as per the methods described by Snedecor and Cochran (1967).

EXPERIMENTAL FINDINGS AND ANALYSIS

Edible fish powder was developed from sciaenid fish tiger tooth croaker (*Otolithus ruber*), using simple thermal processing technique (Chattopadhyay *et al.,* 2004). The proximate compositions of fresh fish croaker were moisture 76.72±0.49 per cent, crude protein 17.49±0.28 per cent, crude lipid 1.79±0.22 per cent and ash 2.74±0.06 per cent, where as minerals content were found around calcium 237.66±8.50 mg per cent, iron 1.15±0.04 mg per cent, potassium 280.33±2.51 mg per cent and sodium 87.66±0.26 mg per cent on wet basis given in Table 1.

Table 1: Raw material characteristic of fresh fish meat of croaker

Parameters	Value
Moisture, %	76.72 ± 0.49
Protein, %	17.49 ± 0.28
Lipid, %	1.79 ± 0.22
Ash, %	2.74 ± 0.06
Calcium, mg%	237.66 ± 8.50
Iron, mg%	1.15 ± 0.04
Potassium, mg%	280.33 ± 2.51
Sodium, mg%	87.66 ± 1.04
TVBN, mg%	8.83 ± 0.26
PV, meq of O_2/ kg of fat	4.48 ± 0.07
TPC, cfu/g	1.49 x 10^5 ± 0.06
Overall acceptability	9.0 ± 0.05

* mean ± SD
* Values were on wet basis

To determine the optimum importance of minerals content in the edible fish powder in order to get most acceptable dried product as far as minerals are concerned, two different treatments

Table 2 : Nutritional composition of edible fish powder prepared from small size croaker

Parameters	Value
Moisture, %	8.10 ± 0.14
Protein, %	57.83 ± 0.28
Lipid, %	4.63 ± 0.23
Ash, %	7.01 ± 0.24
Calcium, mg%	1319.66 ± 12.66
Iron, mg%	4.27 ± 0.09
Potassium, mg%	650.66 ± 2.51
Sodium, mg%	331.66 ± 6.65
TVBN, mg%	18.32 ± 0.15
PV, meq of O_2 / kg of fat	11.18 ± 0.20
TPC, cfu/g	1.26 x 10^3 ± 0.08
Overall acceptability	8.6 ± 0.15

* mean ± SD
* Values were on dry basis

were used *i.e.* T_1 (edible fish powder without bones), T_2 (edible fish powder with bones).

The proximate composition of freshly prepared edible fish powder of small sized croaker (Table 2) shows that it was rich in protein (57.83 ± 0.28%) and calcium (1320 ± 12.66 mg%) content. All chemical and microbiological analysis were found within acceptable limits (Connell, 1975).

The dried edible fish powders were then packed in 200 gauge LDPE bags and sealed. The sealed bags were stored at room temperature and samples were drawn for chemical, microbiological and organoleptic analysis at monthly intervals are presented in Table 3 and 4. During the six-month storage period, no signification change was found in moisture content in both the treatments where as protein content was found within the range of 57.83 -50.96 per cent. Edible fish powder was also rich in calcium (1320-1214 mg %) content. During storage the total volatile bases nitrogen (TVB-N) values

Table 3: Storage studies of edible fish powder without bone (T_1)

	Storage period in months						
Parameters	0	1	2	3	4	5	6
Moisture, %	7.77 ±0.30	7.82 ±0.37	8.42±0.11	9.27±0.15	10.04±0.17	11.14±0.11	11.50±0.17
Protein, %	59.00±0.27	58.31±0.07	57.81±0.07	56.75±0.31	55.02±0.75	53.13±0.05	53.00±0.47
Lipid, %	4.67±0.13	4.88 ± 0.09	5.18 ± 0.03	5.44 ± 0.18	5.56 ± 0.05	6.02 ± 0.07	6.10 ± 0.03
Ash, %	6.28±0.16	6.17 ± 0.05	5.83 ± 0.09	5.73 ± 0.07	5.23 ± 0.05	5.16 ± 0.06	5.22 ± 0.10
Calcium, mg%	1053.33±12.74	994.00 ± 2.64	980.66 ± 5.13	964.33 ± 4.04	961.00 ± 3.60	955.66 ± 2.08	945.20 ± 3.50
Iron, mg%	3.86±0.23	3.82 ± 0.15	3.51 ± 0.05	3.51 ± 0.12	3.22 ± 0.01	3.17 ± 0.05	3.15 ± 0.09
Potassium, mg%	527.00 ± 5.29	524.66 ± 3.51	520.33 ± 4.72	510.33 ± 5.03	484.33 ± 6.02	479.00 ± 5.29	477.12 ± 3.22
Sodium, mg%	309.33 ± 6.65	298.00 ± 4.00	284.33 ± 4.16	281.00 ± 4.58	256.00 ± 3.60	252.00 ± 5.29	251.00 ± 3.44
TVBN, mg%	18.640.42	19.21±0.02	20.06±0.40	22.11±0.76	23.46±0.10	24.92±0.06	28.66±0.23
PV, meq of O_2 / kg of fat	12.45±0.29	12.30±0.04	13.56±0.10	16.07±0.18	17.25±0.06	17.95±0.12	22.71±0.26
TPC, cfu/g	1.39 x 0^3± 0.03	1.51x10^3 ± 0.03	2.03x 10^3±0.06	2.35x 10^3±0.12	2.92x 10^3±0.06	3.10x10^3 ± 0.10	3.15x10^3 ± 0.14
Overall acceptability	9.2 ± 0.15	8.7 ± 0.11	8.4 ± 0.26	7.9 ± 0.15	7.5 ± 0.15	7.0 ± 0.05	6.8 ± 0.05

* mean ± SD
* Values were on dry basis

Table 4: Storage studies of edible fish powder with bones (T_2)

	Storage period in months						
Parameters	0	1	2	3	4	5	6
Moisture, %	8.10 ± 0.14	8.24 ± 0.01	8.32 ± 0.08	9.31 ± 0.16	10.19±0.04	10.64±0.04	11.33±0.08
Protein, %	57.83±0.28	57.54±0.04	56.82±0.06	56.13±0.26	55.52±0.09	54.69±0.16	52.24±0.05
Lipid, %	4.63 ± 0.23	5.00 ± 0.11	6.03 ± 0.12	6.43 ± 0.10	6.64 ± 0.08	6.90 ± 0.04	6.95 ± 0.16
Ash, %	7.01 ± 0.24	6.69 ± 0.13	6.64 ± 0.08	6.30 ± 0.07	6.22 ± 0.18	5.94 ± 0.06	5.90 ± 0.07
Calcium, mg%	1319.66± 12.66	1296.66 ± 7.63	1259.66 ± 8.50	1251 ± 3.60	1240.33 ± 7.50	1218.33 ± 2.88	1215.21 ± 2.23
Iron, mg%	4.27 ± 0.09	4.20 ± 0.08	4.02 ± 0.07	3.93 ± 0.11	3.60 ± 0.01	3.34 ± 0.05	3.33 ± 0.08
Potassium, mg%	650.66 ± 2.51	643.66 ± 4.16	641.66 ± 3.21	638.00 ± 3.00	622.33 ± 2.51	614.00 ± 1.73	611.00 ± 1.30
Sodium, mg%	331.66 ± 6.65	325.33 ± 3.05	314.66 ± 5.03	312.00 ± 5.29	300.12 ± 4.50	282.66 ± 3.05	271.87 ± 2.48
TVBN, mg%	18.32±0.15	19.22±0.21	20.98±0.50	22.53±0.12	24.21±0.11	25.31±0.20	27.19±0.12
PV, meq of O_2 / kg of fat	11.18±0.20	11.25±0.02	12.14±0.16	13.49±0.07	14.54±0.10	17.14±0.13	18.36±0.08
TPC, cfu/g	1.26x10^3 ± 0.08	1.78x10^3 ± 0.15	1.91x10^3 ± 0.04	2.20x10^3 ± 0.05	2.63x10^3 ± 0.11	3.05x10^3 ± 0.13	3.09x10^3 ± 0.11
Overall acceptability	8.6 ± 0.15	8.5 ± 0.05	8.1 ± 0.15	7.9 ± 0.11	7.5 ± 0.05	7.3 ± 0.05	7.1 ± 0.05

* mean ± SD
* Values were on dry basis

increased slowly but steadily, reaching a values from 18.32 mg per cent to 28.66 mg per cent which were well within the limits compared to the recommended value of 100-200 mg per cent for salted and dried fish (Gopakumar, 2002). No bad odour was developed during the period of storage. Peroxide value was also increased slowly with storage period, reaching values of 11.18 to 22.71 milliequivalent/1000g of fat. The total bacterial count increased very slowly with storage period. Organoleptic analysis showed that the product was in prime acceptable form for six months of storage at ambient temperature.

Conclusion:

A new product in the form of edible fish powder was prepared from small sized croaker *Otolithus ruber*. Six months of study indicated that edible fish powder was nutritionally rich in protein and calcium. Qualitative and Sensory analysis indicates it is acceptable for human consumption up to 6 months. This edible fish powder can be utilized in the formulation of value added fishery by-products like fish gathiya, fish papad fish chakri etc. and can also be incorporated in veg. curry to enhance its nutritional value.

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