QUALITY OF FISHMEAL PROCESSED FROM SUN-DRIED FISH IN A COMMERCIAL FISHMEAL DRYER

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The physical and chemical compositions of the raw materials received and the composition and nutritive values of the finished products in a commercial size fish meal plant employing the dry rendering process were studied and reported in this paper.

INTRODUCTION

In India fishmeal has been produced in recent years from sun-dried fish by simple grinding process. With the initiation of the poultry and animal husbandry developmental programmes the demand for fishmeal has increased enormously. Considering the present landings of fish in India, it is difficult to obtain fresh fish at a sufficiently low price for conversion into meal on a commercial scale. However, smaller lots of fish are sun-dried in different fishing villages and brought to a centralised place for marketing. The material in such cases is generally contaminated with extraneous matter such as sand, dust and pathogenic organisms such as *salmonella* and shows high moisture content. In the present study, heat treatment has been given to the sun-dried material in order to lower the moisture below 10% and to free the meal from *salmonella*. The nutritive values of the heat-treated meals have been assessed by chemical methods and the results of the investigation have been reported in this paper.

MATERIALS AND METHODS

The raw material used was received from the Sewree market, one of the largest dry fish marketing centres of India, and processed in a dry rendering fishmeal plant. The drying unit consisted of a stationary steam jacketed drum with rotating paddles inside to turn over the material. The material could be dried in vacuum so that the temperature of the product could be kept low. In each batch 500 kg of the meterial was fed and dried at 80° to 90°C in 2 to 3 hrs. The dried material was pulverized in a hammer mill and seived through 40 mesh seive.

Proximate chemical compositions of the raw material and meals were determined according to the A O A C (1960) methods. Available lysine was determined by Carpenter's method (1960). Methionine

was estimated by Mc Carthy and Sullivan's method (1944) as modified by Csonka and Denton (1946). The fractionation of the proteins and the protein quality index were determined by the method of Almquist et al (1935). The detection of *salmonella* was done by the enrichment technique using the media given in the Difco Manual (1953).

Results And Discussion

As the quality of the fishmeal is dependent on the raw material, a detailed study of the composition of the raw material was made and the details are given in table 1. The protein content is mainly dependent on the composition of fish, crustacean etc. Analysis is done for different batches and shown in table 1. It is seen from the table that the composition of the material varies widely in the different batches and a judicious selection of raw material is necessary for the production of good quality fishmeal with a high % of protein in a commercial venture.

In table 2 the chemical compositions of the different dried fish and crustaceans which normally constitute the bulk of the raw material are given. In general, the moisture varied from 15 to 26% in the different samples. The protein contents in the different dried fish varied from 45 - 55% while in the crustaceans they are of a lower order. The sand content is less than 3% except in the case of broken where the sand accounts for 12.5%. It is therefore absolutely necessary to choose the raw material with less amount of broken pieces.

The chemical compositions of the meals prepared in a commercial dryer from the dried fish are given in table 3. Fish meals prepared from different lots were well within the specifications prescribed by ISI(1967)for livestock feeds. Bacteriological analysis of the different fish meal samples showed complete destruction of *salmonella* during heat treatment; however, the sun-dried raw materials do show contamination with salmonella organisms.

Table 4 deals with the fractionation of the proteins along with other factors which determine the nutritive value of the meal. The copper precipitable nitrogen which represents the intact proteins with little of peptides and amino acids varied from 89.41 to 78.16. The pepsin insoluble nitrogen varied from 4.169 to 10.42, while hot water soluble nitrogen was of higher order from 13.39 to 30 10. The protein quality index which is a measure of digestibility showed a lower range of values from 62.33 to 75.52, compared with the meals prepared from fresh fish by wet reduction process (unpublished results.).

TABLE I COMPOSITION OF THE RAW MATERIAL

Sample no	Fish %	Crustaceans %	Broken %
1.	41.5 to 81.6	14.5 to 50.0	2.7 to 8.5
2.	27.0 to 45.0	50.0 to 64.0	5.0 to 12.5
3.	26.7 to 44.4	47.3 to 56.6	8.3 to 16.0
4.	38.4 to 50.0	40.0 to 53.1	6.3 to 12.5
5.	30.0 to 48 8	44.5 to 57.9	2.4 to 20.1
6.	33.3 to 82.3	11.7 to 53.8	0.0 to 28.6
7.	62.5 to 77.7	16.6 to 25.0	5.6 to 12.5
8.	46.2 to 66.6	33.4 to 46.2	0.0 to 7.6
9.	13.4 to 41.7	50.7 to 79.9	5.3 to 28.8
10.	45.0 to 75.0	25.0 to 50.0	0.0 to 5.0

TABLE II CHEMICAL COMPOSITION OF THE INGREDIENTS OF THE RAW MATERIAL

Common name	Moisture %	Protein %	Ash %	Fat %	Sand %	Calcium as Ca0 %	Phospho-rus as $P_2 0_5$ %
Crabs (small)	17.78	29.17	34.97	3.29	3.07	2.05	3.08
Jawla	18.24	37.93	24.43	4.22	2.73	13.57	3.01
Squilla	26.40	34.87	26.63	1.69	2.96	5.99	2.87
Cuttle fish	21.09	47.24	18.91	3.78	2.05	7.17	3.36
Kardhi	15.76	55.35	22.50	4.98	1.05	7.90	4.61
Ribbon fish	18.94	55.32	17.69	4.90	0.87	6 44	4.44
Bombay duck	22.42	52 02	20.54	4.59	1.84	3 88	2.97
Dhoma	15 20	46.86	30.98	4.13	2.06	14.49	10.82
Broken	24.25	51 99	16 04	4.79	1.16	2.36	2.68
,,	19.46	35.30	35.26	3.58	12.54	6.04	2.30

TABLE III CHEMICAL COMPOSITION OF FISHMEALS

Sample no. %	Moisture %	Protein %	Fat %	Ash %	Sand %	Calcium as Ca0 %	Phosphorus as $P_2 0_5$ %
1.	5.92	64.98	5.14	22.62	0.31	8.94	7.24
2.	5.19	51.56	5.75	26.47	3.41	6.63	2.76
3.	8.89	54.49	3.57	23.12	1.76	7.05	2.62
4.	6.56	53.38	2.90	26.14	4.10	6.29	2.18
5.	7.92	41.59	3.86	29.71	5.41	8.57	3.05
6.	6.12	52.30	3.23	28.86	4.27	8.53	3.24
7.	9.29	41.04	3.56	30.79	6.59	7.63	2.76
8.	4.09	48.62	2.72	32.89	5.87	7.85	4.25
9.	4.89	51.63	3.00	30.01	5.39	6.78	3.53
10.	8.42	40.35	3.32	34.79	7.02	7.15	1.14

TABLE IV NUTRITIVE VALUE OF FISHMEALS BY FRACTIONATION OF PROTEINS

Sample no.	Copper precipitable N %	Pepsin insoluble N %	Hotwater soluble N %	Phospho-tungstic acid precipitable N %	Protein qnality index (PQI)	Available lysine g/16g of N	Methionine g/16 g of N
1.	81.30	6.292	27.51	9.566	62.33	5.24	1.38
2.	85.23	5.974	30 10	9.860	65.20	5.46	1.45
3.	81.62	5.930	27.23	9.443	63.13	5.27	1.52
4.	87.04	7.839	21.47	7.889	69.46	5.12	10.9
5.	87.12	9.642	23.92	23.75	72.63	5.04	1.12
6.	83.35	9.792	23.70	22 39	68.24	5.24	1.01
7.	89.41	9.333	22.49	22.36	75.52	5.20	1.24
8.	78.45	9.774	13.39	15.52	66.85	5.46	1.68
9.	78.16	10.42	15.35	17.27	65.43	5.51	1.66
10.	80.58	8 662	20.81	13.75	64.83	5.16	1.28

SUMMARY

As in India fishmeals are produced largely from sundried fish, the compositions and the nutritive values of the meals prepared on a commercial scale, were studied and the results presented in this paper. The protein quality index varied from 62.33 to 75.52. The available lysine was also of lower order as the fish has already been subjected to sun-drying prior to its processing io meal.

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