A SURVEY ON THE QUALITY OF INDIAN FISH MEAL OF COMMERCE

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Data on proximate composition, total volatile bases, total non-protein nitrogen and bacterial quality of commercial samples of Indian fish meal are presented in this communication. The samples vary very much in quality depending on the type of raw material used and method of processing followed. The data are discussed in relation to the Indian Standard Specifications for fish meal as livestock feed.

INTRODUCTION

Commercial production of fish meal employing scientific methods and reasonably modern equipments started in India only recently. The total installed capacity is over 175 tonnes of raw fish per day, the plants being located in Kerala, Tamil-Nadu, Mysore, Maharashtra and Gujarat States. The fish used in these plants are sardines, silver belly, dhoma, Bombay duck, other miscellaneous fishes and wastes from prawn processing factories. Small quantities of meal are exported and the rest is used in the country as livestock feed. Fish meal is valued for its protein content which in turn depends on the type of fish used and the method of processing followed. In some of the plants, especially those in Gujarat and Maharashtra, dried fish is the starting material. The processing is limited to pulverization and heat treatment to destroy salmonella organisms and to reduce moisture level. The recent increase in the international prices of fish meal resulted in increased export of this item from India. 650 tonnes of fish meal worth Rs. 9 lakhs were exported in 1972-'73.

Reports on the quality characteristics of Indian fish meal are limited. Rao and Kamasastri (1971) presented data on the fish meal processed from dried fish. However, more reports are there on the nutritive value of experimental fish meal samples (Kamasastri and Rao, 1962; Rao, Kamasastri and Bose, 1965). A survey was undertaken on the quality of Indian fish meal of commerce and the results are presented in this communication.

MATERIALS AND METHODS

Samples of fish meal (250-500g.) were collected from the various fish meal plants. A total of fifty one samples were collected from seven sources. They were kept in screwcap glass bottles till

TABLE I

PROXIMATE COMPOSITION OF INDIAN FISH MEAL

Type of Meal	Nos. examined	Moisture %	Fat%	Ash%	Protein%	Acid insoluble ash%
1. Oil sardine meal (Press cake - factory product)	7	6.84±1.51	7.21±1.44	24.27±2.05	57.33±3.30	2.24±0.61
2 Oil sardine meal (Press cake meal - sundried)	10	6.1 ± 0.97	7.65±1.64	28.92±3.84	50.36±3.14	9.16±2.48
3 Silver bellies (Factory product)	5	8.98±1.39	6.12±0.97	30.50±2 44	48 30±0.54	3.10±1.00
4 Dried fish (Pulverised)	9	7.93±1.91	6.22±2.11	26.57±5.56	52.42±4.64	2.64±2.07
5. Prawn shell waste	4	5 08±3.30	4.4 ± 3 94	32.0 ± 3.27	39.27±9.44	7.67±3.65
6. Oil sardine meal & prawn shell waste	10	6.05±0.51	4.75±0.58	29.77±1.17	43.82±2.37	7.16±1.06

Note:- Fat, Ash, Protein & Acid insoluble ash are on moisture free basis (MFB).

analysed. Wherever the sample appeared heterogenous, it was ground to a fine powder in a coffee grinder. The factors analysed were: moisture, fat, crude protein, ash, acid insoluble ash, sodium chloride, total volatile bases, total non-protein nitrogen and bacterial quality. Total bacterial count and numbers of *Escherichia coli.*, faecal streptococci and coagulase positive staphylococci were determined according to the methods reported earlier (Cyriac Mathen, 1973). Salmonella was tested after pre-enrichment for 24 hours in lactose broth. Moisture, fat, crude protein and acid insoluble ash were determined by I. S. I. methods (IS:4307 - 1967). Total non-protein nitrogen was determined by Kjeldahl method, whereas total volatile bases was estimated by distillation of the trichloracetic acid extract with saturated sodium borate followed by absorption in boric acid. Sodium chloride was estimated by Volhard's method.

Results and Discussion

The results on 45 samples are presented in Tables I and II. The remaining six samples were from different production centres and from other fishes not mentioned in the tables. Their results are not presented.

The results on moisture, fat, protein and acid insoluble ash show that 66.7% of the samples are substandard as per the relevant specifications (IS:4307-1967). The prescribed limits for the above values are: moisture, max. 10%; fat, max. 10%; acid insoluble ash, max. 5% moisture free basis (MFB) and crude protein, min. 50% (MFB). Of the 51 samples, majority had moisture and fat below 10% (1.95 and 3.9%, respectively, had higher fat and moisture). However, 53% had lower protein and 51% had higher sand contents. The results also tend to indicate that 35.3% more of the samples could have recorded protein content above 50% had the acid insoluble ash been very low. Samples with protein content above 60% are rare. Sodium chloride was above 3% in 13.7% of the samples. Sodium chloride was highest in meal produced from dried fish (7 to 10%) followed by silver-belly meal (1 to 2%) and lowest in press-cake meal (< 1%). Ash was above 30% in 43.1% of the samples.

Total volatile bases (TVB) and total non-protein nitrogen (TNPN) were highest in meal manufactured from dried fish (TVB upto 250 mg% and TNPN above 3,000 mg%). TVB values were above 100 mg% in 29.4% of the samples. TNPN values were lowest in press cake meal. Of the 51 samples, one contained Salmonella. This sample was supplied by a poultry farm owner. The total bacterial count varied within wide ranges - few hundreds to more than 10 million. Counts below 1,00,000/g. were noted in 72.5% of the samples. *E. coli.* was present only in one of the fifty one samples, whereas faecal streptococci was present in 27.5%. These were present in low numbers. Some of the samples, especially those manufactured by sun-drying only, developed mite and insect infestation on storage.

Analysis of the data has shown that if the products are grouped in relation to the nature of the raw material and the method of processing, the meal produced from sardines (press cake meal) could be adjusted the best (with protein content above 55%) followed by meal from dried fish and sun-dried sardine press cake meal (protein >50%), silver belly meal (protein *Ca.*48%)and prawn shell meal (protein *Ca.* 40%) in that order. Fish meal

TABLE II

SOME OF THE QUALITY INDICES OF INDIAN FISH MEAL

Type of meal	Nos. tested	Sod. chloride % (MFB)	*TNPN mg. %	**TVN mg. %	***SPC x 10^4
1) Oil sardine meal (Presscake - factory product)	7	0.76 ± 0.06	812 ± 237.4	87.3 ± 63.5	278 ± 649
2) Oil sardine meal (Presscake meal - sundried)	10	0.46 ± 0.06	1254 ± 320	57.3 ± 28	1.48 ± 1.44
3) Silver bellies (Factory product)	5	1.62 ± 0.19	1148 ± 546	59 ± 97	50.62 ± 130
4) Dried fish	9	5.98 ± 2.37	2512 ± 404	157 ± 38	4.52 ± 5.79
5) Prawn shell waste	4	1.37 ± 1.49	1281 ± 513	25.7 ± 17.5	8.80 ± 8.1
6) Oil sardine meal & prawn shell waste	10	1.07 ± 0.13	1086 ± 137	40.2 ± 17.26	6.63 ± 3.39

*Total Non Protein Nitrogen **Total Volatile Nitrogen ***Standard Plate Count/g.

with protein content between 40-55% is obtained by mixing sardine meal with prawn shell waste meal.

Conclusion

These studies reveal that the fish meal produced in India vary very much in quality depending on the raw material and the method of processing. The protein content varies from 40 to 60%. Lower protein levels are attributable to high admixture with sand. The yield of 17% for oil sardine meal can be improved by concentrating the press liquor and converting it also to meal. The silver belly meal may not improve either in quality or yield as these are peculiar problems inherent with the fish. There is more scope in improving the quality of meal from fish by preliminary removal of sand. Heat treatment of the meal is essential to destroy Salmonella and to prevent insect and mite infestation. The Indian Standard Specification for fish meal as livestock feed need rivision in the light of these data. Provision may be made to include maximum limits for sodium chloride and ash contents - 3.0% and 30.0% are the respective maximum limits suggested. The maximum limit for acid insoluble ash is to be raised to 7% in the case of Grade II meal. Provision may also be made to include fish meal with 40 to 50% protein and upto 35% ash as a third category of meal.

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