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Assessment of processing, production and export of fish meal in Pakistan

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Abstract

As aquaculture sector is developing day by day in Pakistan, so the feed industry has a vast prospect to flourish. One of the feed ingredients being studied is fish meal, considered as protein rich animal source commonly used for preparation of poultry and aqua feed. In the recent years, fish meal has been tried to be replaced by protein rich plant sources due to its higher cost and less availability. In Pakistan, fish meal is produced locally using low-value fish catch but there are many processing units manufacturing fish meal of export quality to other countries. The local production of processed fish meal in Pakistan has been continuously increasing causing fish meal import to decline up to 03 MT in 2017. Fish meal export from Pakistan, fit for human consumption has also elevated whereas fish meal unfit for human consumption has been decreasing over last decade.

Keywords: Protein, considered as protein, production of processed

Introduction

Aquaculture in Pakistan

Aquaculture has become an important sector in terms of its potential for increasing domestic supply of quality protein in Pakistan, despite its small contribution to the national economy. Fisheries sector provide direct employment to about 400,000 fishermen and 600,000 people in ancillary industries. Estimated annual fisheries production is about 0.6MMT (Million metric tons) including 63% marine and 37% inland. Pakistan has about 193 freshwater fish species, and 800 marine species.

Fish Feed

In the recent past there was no concept of artificial fish feed in Pakistan. The culture of carp was dominant with a very low stocking density with low inputs in terms of feed. The normal practice of farmers was just to feed rice bran in mash form. In Pakistan the concept of artificial manufactured feed is very new and it was introduced with all-male tilapia culture technology in the country. The production of tilapia has reached 15,000 tonnes in the current year and it is becoming more popular day by day and encouraging the adoption of intensive farming as well as the use of artificial fish feed ^[1]. There are only two fish feed manufacturing factories operating in Pakistan on a very small scale, manufacturing feed for carps, tilapia, catfish and shrimp. The major feed ingredients are very similar to those used for poultry feed e.g. fish meal, soybean meal, canola meal, sunflower meal and gluten. Feed contributes 60% to 80% of the total cost and fish meal is known as its main constituent. More cost and limited availability of fish meal has affected the overall feeding and production costs in aquaculture industry.

Fish meal and its Alternative

Fish meal is considered as protein rich animal source commonly used for preparation of poultry and aqua feed. Fish meal is a costly component of fish feed and has been tried to be replaced by protein rich plants. Alternative protein sources are needed due to the exponential growth of aquaculture without a corresponding increase in sources of fish meal, which is primarily made from small pelagic fish (Food and Agriculture Organization of the United Nations ^[2]). Thus, there needs to be other suitable and cost-effective protein sources to replace dietary fish meal. Soybean products are one of the leading alternatives to fish meal in aquaculture diets ^[3]. Soybeans are highly palatable ^[4, 5], high in protein, and have a balanced

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amino acid profile [6, 7]. Soybean proteins have been recognized as one of the most appropriate alternative protein sources for fish meal in aquafeed because of their consistent nutritional composition, comparatively balanced amino acid profile, availability, and reasonable price. In Pakistan per Kg cost of soybean meal is around to 80-90 PKR while cost of 400g fish meal is 350 PKR.

Significance of fish meal

Fish meal is an excellent source of protein. It is considered to be one of the best ingredients for aqua feed as it enhances the feed consumption and feed efficiency and improves the egg production and feed conversion efficiency. Fish meal provides a balanced amount of all essential nutrients including amino acids, phospholipids, and mineral content, for optimum development, growth, and reproduction and the quality of fish meal improves the fecundity and feed conversion ratio [8].

Nutrient composition of fish meal

The nutrient composition of fish meal can vary depending on the type and species of fish, the freshness of the fish before processing and the processing methods. According to NRC (2000), protein content of fish meal varies from 60.00 to 72.30% due to type of fish and method of preparation. Fish meal also contains 5% to 12% fats and 10% to 20% ash; high amount of fatty acids among them the most common is omega-3 fatty acid (DHA or docosahexaenoic acid and EPA or eicosapentaenoic acid). Moreover, it contains all the essential amino acids, especially lysine and methionine, in adequate quantities required for fish.

Production of fish meal

Fish meal is produced locally using low-value fish catch and there are many factories manufacturing fish meal of export quality to other countries. In Asian countries, fish meal is prepared from mixture of trash fish and byproducts of the canning industry, resulting in a product of very variable composition. In Pakistan, annually 40,000- 45,000 tons of fish meal is produced. Overfishing and lack of fisheries management also influences the production of fish meal [9]. Globally, many types of species are used for the preparation of fish meal. Among them, the oily and pelagic species are important to utilize in fish meal. In Pakistan, 23 finfish species (Table 1) were recorded for fish meal preparation [10].

Quality of fish meal in Pakistan

The quality of fish meal is often questioned due to adulteration with cheap diluents such as sand, stone, soil, fine sawdust, horns and hooves, blood meal, animal oil, prawn, poultry byproducts and wastes of tannery [10, 11]. It is mostly formed from wild fish having abundant bone which are not used for direct human consumption [12]. Use of pelagic fish in fish meal was estimated as 75% in 2009, and 25% comes

from trimmings [13].

In South Asia, fish meal is usually prepared from low quality trash fish that contains low nutritive value and high ash contents. All this is due to the use of the low-quality fishes and processing techniques in the preparation of fish meal [12]. Most of the fish meal plants (Sindh and Balochistan) are 25 to 30 years old with no oil extracting provisions as a result losing huge sum of money [14]. The net yield during this process ranges from 20% to 22% whereas the protein content and gross energy are between 50% to 61% and 4115- 4558 cal/g, respectively, which is satisfactory (Table 2).

Fish meal processing

Two techniques are used for the processing of fish meal in 18 processing units of Sindh and Balochistan, Pakistan. In traditional technique, the wet raw material (fish) are brought into a conveyor and then cooked in cooker by steam, then dried in sunlight and cooled before grinding. After grinding, fish meal powder is stored in bags. In second technique, raw material (fish) is mechanically processed. This process is performed by an automatic machine. The raw material is brought in conveyor, cooked in machine and then dried inside automatic machine by dryer and powdered by cutter. All processing units of Sindh and Baluchistan use traditional sun dry method,

In majority of fish meal processing plants in Pakistan, the traditional sun dry method is utilized to manufacture fish meal in the coastal region of Sindh and Balochistan except Mateen fish meal plant, Shameem fish meal plant and New fish meal plant, that mechanically process the fish meal (Table 3). Traditional methods have many bad aspects i.e. the bacterial contamination during drying raw fish on ground, secondly the manual hooked apparatus is used which damages fish meat and thus protein contents are reduced in product. On the other hand, in mechanized method the chances of protein loss are least due to drying in machine and bacterial contamination is low as well. Evidence to support this is available as higher protein contents found in fish meal produced by Mateen processing plant using mechanized method [10].

Fish meal export from Pakistan

Pakistan has also been exporting fish meal since a few decades. Fish meal (fit for human consumption) export from Pakistan has increased since 1987 and was highest (12888 MT) in 2017, whereas the export of fish meal including fish viscera (thus unfit for human consumption) has been decreasing during the past decade, found lowest (404 MT) in 2017. And fish meal import in Pakistan has also significantly declined over the past decade (3 MT in 2017) because the local processed production of fish meal has been continuously increasing in Pakistan with the values of 54635 MT, 55635 MT, 56891 MT and 57645 MT in 2014, 2015, 2016 and 2017, respectively (Table 3).

Table 1: Import, export and production of fish meal from Pakistan over the period of 1987-2017 (FAO, 2018). (MT: Metric Tonnes)

Year	Fish meal import (MT)	Fish meal export (MT)		Fish meal processed production (MT)
		Fish meal including fish viscera	Fit for human consumption	
1981-1990	326	12482	1816	318070
1991-2000	295	18095	20021	380637
2001-2010	77416	57755	30643	427709
2011	34	8371	378	50143
2012	100	980	8312	51230
2013	100	8272	6350	52634
2014	457	6479	4437	54635

2015	10	2254	4130	55635
2016	04	1844	6887	56891
2017	03	404	12888	57645

Table 2: Chemical composition of fish meal samples collected from different processing units of Sindh and Balochistan, Pakistan (Source: Rahim *et al.*, 2017).

Sr. No.	Name of the processing unit	Dry matter (%)	Protein (%)	Fat (%)	Gross energy (cal/g)	Ash (%)	Fiber (%)	Phosphorus (%)
1	Hassan angara fish meal plant	91.25	57.51	16.15	4356	17.56	8.42	0.54
2	Liaquat fish meal plant	92.11	60.10	15.51	4213	16.56	7.52	1.51
3	Ahmed fish meal plant	87.56	55.31b	17.51	4403	15.32	11.71	0.90
4	Al-hamad fish meal plant	90.13	52.51	19.35	4412	17.41	10.34	0.52
5	Hameed fish meal unit	90.41	53.51	17.33	4406	18.32	11.35	0.81
6	New sonmiani fish meal plant	88.57	59.51	16.41	4290	14.32	10.14	0.81
7	Ghulam hussain fish meal plant	90.29	55.43	19.55	4272	14.61	10.53	0.21
8	Kampalini fish meal plant	88.32	57.31	18.53	4312	15.32	9.12	0.50
9	Yaqeen fish meal plant	90.02	59.15	17.31	4056	14.41	8.95	0.82
10	Abdul rahid unit	87.96	56.52	18.13	4115	14.12	11.41	0.83
11	Maaz fish meal plant	90.26	60.32	17.21	4218	12.32	10.15	0.31
12	Abdul baqi fish meal plant	87.43	58.13	18.15	4042	13.18	10.31	0.21
13	Kampa industry unit 1	90.01	52.41	20.15	4558	15.02	12.31	0.51
14	Kampa industry unit 2	92.19	50.51	20.13	4496	15.19	13.12	1.8
15	Kohing fish meal plant	90.17	60.23	17.13	4239	13.28	8.12	0.31
16	Mateen fish meal plant	88.03	61.26	26.23	4425	16.26	12.27	0.89
17	New fish meal plant	91.55	53.48	19.15	4119	14.12	12.15	1.2
18	Shameem fish meal plant	93.13	51.71	15.29	4346	27.26	5.15	0.7

Conclusion

Research is necessary to develop quality feeds with judicious price, trade and marketing, and to provide job opportunities for unemployed youth and farmers. The quality of fish meal in Pakistan is just satisfactory. The protein and energy contents in fish meal manufactured by various fish meal processing plants match with the standard value of feed formulation. Production of fish meal is also in reasonable condition but production of fish meal may decrease in long term, the price of small fish will increase due to high price of edible fish. People will consume small fishes directly and as a result of this supply of raw material (fish) will be declined. The method of preparation is still traditional and it should be mechanized for further improvement of fish meal quality. Fishmeal industry is in the decline stage of product life cycle as local industry is not able to compete with international fishmeal producers. All local fish meal producers could be wiped out by Chinese product which is better in quality and is still cheaper than the local product.

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