

# ON FISH MEAL AND OUR FISH MEAL INDUSTRY

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Fish meal is a valuable animal feed, rich in easily digestible protein and minerals, made from mixed varieties of cheap fishes, which can be incorporated in suitable proportions in animal feeds to enhance their nutritive value. When available in sufficient quantities, it is always preferable to use a single variety of fish so that variations in the composition of the finished product (fat content etc.) can be minimised. Scientifically made high quality fish meal usually has the following composition. Protein 70-75%. Fat 5-8%. Water 8-10%. Salt 1-2%. Ash 8-10%. Compared to groundnut meal or soyabean meal, in which cases the average protein content is around 50%, high quality fish meal is a definitely superior component for incorporation in live stock and poultry feeds. More than the amount of protein, its quality is what makes fish meal a better feed than other feeding stuffs. The proteins of fish meal are easily digestible and are rich in essential amino acids like lysine, methionine etc, which are often lacking in other vegetable proteins. It is rich in minerals and vitamins also, Some unidentified growth factors, which promotes growth of chicken fed on it beyond

the expected level, are also reported to be present in fish meal. The Net Protein Utilization of fish meal proteins is also high, resulting in maximum returns in the form of consumable protein from animals and chicken fed on it. All these factors make fish meal an ideal animal and poultry feed and demand for fish meal is increasing. In modern fish meal plants, fish oil is also a valuable by product, which can be put to various industrial uses. Indian Standards Institution has already laid down the standards for Fish meal as Live stock feed. According to this, Superior grade fish meal should have protein content of not less than 60%, Moisture should not exceed 10%, Fat can go up to a maximum of 10%, Acid insoluble ash should not exceed 3%. In B grade fish meal, protein should be at least 50% and acid insoluble ash may go upto 5%, other values are the same. The fish meal in either case should be free from Salmonella. It should be a powder of characteristic colour and smell and should be free from off odour, insects, mites etc. Govt. of India is shortly going to introduce compulsory preshipment quality control inspection for fish meal. Export of this valuable source of pro-

tein is now discouraged to increase its domestic consumption. Accordingly, a quota system for each major port is introduced to restrict the export of fish meal from the country.

The main countries producing fish meal are Japan, Peru, USSR, U.S.A., Norway, Denmark, South and South West Africa, Chile, Iceland and the U. K. India, in spite of our long coast line and vast marine resources, is yet to emerge as a major producer of fish meal. There is tremendous scope for this industry in India, as demand for fish meal is increasing both in the internal as well as international markets.

There are basically two different methods for making fish meal. The first one, which is an out-dated and unacceptable method, is however, still in use in under-developed countries. It consists in simply sun drying miscellaneous varieties of fish as well as trimmings and wastes from fish processing plants, (often on the sandy beach itself) and then pulverising them to a powder. This type of product also goes under the name "fish meal", though it should be more aptly called "fish manure". It usually has a high content of sand and other foreign matters and is very often contaminated with harmful bacteria. When protein content is very low, this type of product can be used only as a manure. The composition of such products also shows wide fluctuations, making it difficult for the farmer using it, to formulate a feed of desired composition. But as it involves very little expenses by way of machinery or equipment, this continues to be a major method of fish meal production in India still.

The sophisticated method of producing high quality fish meal makes

use of fresh fish as such, as the raw material. The essential parts of such a plant can be described as follows. Washed and cleaned fish are fed through a hopper (after chopping the bigger fishes in a hasher) to a cooker. Well cooked coagulated material is strained in a vibrating screen and then charged into a press, where it is pressed well. The press cake is then disintegrated in a tearing machine. The press liquor is decanted to remove the sludge and from the clear liquor oil is separated by centrifuges. The oil is then purified by removing water and fine suspensions and the "polished" oil is stored in tanks. The sludge is added to the press cake. The stick water is then concentrated in evaporators. This also is then added to the press cake and the combined material charged into driers, where it is dried to a moisture level below 10%. After drying, the meal passes over a vibrating screen provided with a powerful magnet to remove metallic particles if any. This dried meal is then fed into the hammer mill where it is powdered well. The powdered meal is then sieved, cooled and packed in moisture proof polythene lined bags and sealed. The bagged meal is then stored in a dry rodent and insect proof store. This type of fish meal utilizing the soluble protein from the stick water also, is usually referred to, as "whole meal". If very lean fish is the raw material, oil recovery may not be economical. If the stick water is not evaporated to recover the protein, it may result in losing upto 20% of the protein. So if the oil is not recovered the whole material after cooking can be fed directly to the driers without pressing. Fish meal produced in sophisticated plants will have a more or less uniform composition with a high protein content.

Such plants are very few in India at present. But there is very good scope for such plants and in the near future, a number of plants are likely to come up especially along the Saurashtra coast, where cheap raw material is available in plenty. Low quality sun dried product goes mostly as manure and rarely as poultry feed in the interior rural market. The machine made high quality meal is mostly exported.

Chemical composition of the meal depends on the raw material used. If fish of high fat is used and oil is not recovered, fat content will go above the desirable limits. If fish wastes are used, calcium content of the meal will be more, due to the presence of higher amounts of bones etc. Even in the case of the same species of fish, the size of fish has a bearing on the quality of meal as smaller size generally will have a lower fat and protein content. Spoilage of raw material will result in higher amounts of volatile bases in the product giving it some off odours. The sun dried product will generally have a higher moisture and sand content. It has a lesser protein digestibility also, when compared to the machine made product.

Good quality fish meal can be incorporated upto 30% in chicken feeds, upto 10-15% in pig feeds and 5-10% in cattle feeds for optimum results.

Along the South West coast of India, oil sardine is the ideal raw material. During seasons of heavy landing the price of the fish goes very low and it can be economically used for fish meal production. In this case, due to the fatty nature of the fish, oil recovery will be economical and more or less essential to bring down the fat content of fish meal to acceptable

levels. Sardine oil has been found to be useful for a variety of industrial purposes. Several sophisticated plants are in operation along this area now. Along the Saurashtra Coast, Scianeids, locally known as Dhoma, is the main raw material. In recent years landings of Scianeids have shown a phenomenal increase and with the World Bank aided intensive development scheme already started at Veraval, landings of scianeids as well as other cheap fishes like ray, ribbon fish, horse mackerel etc. are expected to go up sharply still. Till recently these species were all sold at a throwaway prices of 15-20 ps/kg in this region. But with the tremendous increase in fish meal production in this region, prices of these fishes have also shot up. In spite of that, prices are still sufficiently low as to make these ideal raw materials for fish meal production. Moreover prices of fish meal also has gone up both in the internal as well as international markets.

However it should be emphasised that before venturing into setting up a fish meal plant in any area, a realistic and correct assessment of the raw material availability should be made. Over-optimistic estimates in this regard can lead to raw material starvation and consequent unhealthy competition for raw material. This may result in rise in prices, affecting the economical functioning of the plant. So while preparing the project report for a fish meal plant, the species of fishes suitable for fish meal production available in the area, its availability and fluctuation in prices round the year, the places of landing and cost of transportation to the site if necessary etc. should be given due consideration. Toxic fishes should be avoided. In

designing the plant also, the nature of raw material available in the area should be kept in mind, Fatty fishes may make oil recovery essential whereas lean fish with less than 2% fat will make oil recovery uneconomical.

The freshness of the raw material is important in that it avoids loss of protein and fat due to leaching. Spoilage may lead to other problems like obnoxious odour and production of toxic gases like Hydrogen sulphide. There is a general belief that fresher the material better the quality of fish meal. But this has not been fully substantiated. However it is always advisable to get the raw material in the freshest condition possible, as it avoids objectionable off odours in the finished product.

For short term preservation of fish prior to reduction as fish meal, various methods of preservations have been tried. But by far, chilling in crushed ice is found to be the cheapest, safest and best method. Sodium nitrite gives satisfactory preservation. But since there is a chance of production of toxic substances nitrite is not advisable. Sodium Sulphite, Benzoate, ascorbic acid etc. are also effective to an extent but may not be economical for preservation of substantial quantities of fish. Formaldehyde at 0.05% (on the wt. of raw fish) has been reported as good by many, but prolonged use of this is supposed to accelerate corrosion of the plant.

In the hot humid tropical climate, storage of fish meal also poses problems. The meal, especially whole meal, is somewhat hygroscopic and absorbs moisture unless it is stored in sealed moisture proof polythene lined bags in dry godowns. Rise in moisture will lead to bacteria and mould growth in

the fish meal. Insect infestation and rodent nuisance is another major problems. Godowns storing fish meal should be properly designed to minimise this nuisance. Occasional fumigation of the godowns to destroy rodents and insects is also advisable. Stocking and storing of fish meal should be done scientifically to minimise development of heat in the meal. This, when it happens, accelerates oxidation of the free fatty acids in the meal.

In India, Fish meal production has not received the attention it deserves. Considerable quantities of low quality sun dried and pulverised material is produced which also goes under the name fish meal. But this is actually a misnomer. In international markets such products, contaminated with all bacteria as well as sand and other foreign matter, will not be acceptable. Considering the rising demand for fish meal in international markets, production of high quality fish meal should be given more encouragement. In the internal market also use of fish meal as an animal and poultry feed should be popularised more to utilise our vast marine protein resources in a better way. Government of India is at present discouraging export of fish meal to increase its domestic consumption. The quota system for each port introduced by Government of India is thus creating some difficulties to exporters, as the prices in the domestic market is much lower than in markets abroad.

Gujarat has substantial landings of Scianoids, Rays, Ribbon fishes, and other miscellaneous varieties. Till recently fisheries had not received due attention in the States's development programmes But now the situation has changed and fish landings, especially

along the Saurashtra Coast, has registered an unprecedented and phenomenal increase. A World Bank aided multimillion development programme is underway at Veraval and Mangrol. As a result of all these, landings from this rich ground is sure to increase tremendously in the near future. Considerable quantities of this increased landings will be miscellaneous varieties unsuitable for direct consumption. Obviously these will have to be reduced to fish meal. The production of fish meal, including the sun dried pulverised fish, in the Veraval region during the last few years is given below:-

1973-74	554 M. tonnes
1974-75	929 "
1975-76	1014 "
1976-77	2276 "
1977-78	2798 "

Already there are some sophisticated fish meal plants in this region, producing high quality fish meal. But only a beginning has been made so far. In the near future Gujarat is sure to take a lead in the production of international grade fish meal, opening a new chapter in our marine products industry. ●

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