

FISH NUTRITION AND FEED PRODUCTION

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Man began to think of fish culture when he realised that the oceans and other waterbodies could not provide sufficient fish to meet the demand of increasing population. This led to the beginning of studies on the reproduction and nutritional requirements of different species of fish.

Fish that grow in natural waters get their food from their environment. They move in the sea, lake or river in search of food and favourable conditions for growth and reproduction. When fish are stocked in ponds and farms they have to get additional supply of nutrients from external sources.

Availability of good quality water and facility for water exchange are the basic requirements in fish culture. Nutritionally rich and balanced safe food is the other factor which determines the success of aquaculture. Feed which can be stored at ambient temperature for a reasonable period and remains in water for at least three to four hours is needed to ensure satisfactory growth and survival. The cost of feed forms about 50% of the total input cost and hence serious attention is required in selecting feeding materials. Nutritional requirements of fish vary from species to species, at different stages of growth and also with different feeding habits. While formulating and processing feeds all these factors have to be taken into account.

When fish are fed on artificial feeds the residual feed and metabolic wastes cause environmental pollution which causes stress to the fish. In the beginning of this decade the aquaculture giants of South East Asian Countries suffered severe set-back due to faulty use of feed and subsequent pollution. Shrimp farmers of Andhra Pradesh and Tamil Nadu also had the same experience.

Let us see what are the nutrients required by fish. Almost all the nutrients required by man are required by

fish. Besides protein, carbohydrates and fat, almost all vitamins and minerals are necessary for healthy growth and survival of all species of fish and shellfish. In culture farm where the fish depends entirely on supplied feed, deficiency of any one of the essential nutrients will adversely affect the growth of the fish. In addition to macro nutrients, vitamins and minerals, binders and attractants are also required in the formulated feeds.

The amino acids in the protein are mainly responsible for the growth. The essential amino acids of commonly cultured species are arginine, histidine, isoleucine, leucine, lysine, methionine, phenyl alanine, tryptophan, valine and tyrosine. The amino acid composition of fish varies from species to species. When the fish depends entirely on the feed supplied, the feed should contain all the essential amino acids in the required proportion. Therefore the essential amino acid profile of the raw materials used for feed formulation should be similar to that of the cultured species. The protein requirement is also different for different species and in different stages of growth. Normally the requirement of protein content is between 25 and 50%. For tiger prawns the requirement is between 35 and 40%. In vegetable proteins the essential amino acids lysine and methionine are not found in the required proportion for fish and shellfish. Addition of fish meal along with vegetable proteins can produce feeds having the amino acid profile similar to fish. Fat-extracted soya flour and edible oil cakes are very good sources of protein for feed formulation. In addition to protein these provide the dietary fatty acids, fat soluble vitamins and phospholipids. Easily digestible starch is also required for feed formulation. Corn flour, tapioca starch, wheat flour, defatted soya flour etc. are very good sources of carbohydrate for fish feed. About 1-1.8% unsaturated fat, containing polyunsaturated fatty acids is required for healthy growth of fish. Linoleic, linolenic, arachidonic, eicosapentaenoic and docosahexaenoic acids are the important essential fatty acids for fish. These fatty acids are present in fish oils and in some vegetable oils. Vitamins such as A, B, B₁, B₁₂, C, D, E, biotin, folic acid, niacine and pyridoxine are also needed by the fish. Micro nutrients such as Mg, Zn, Cu, Fe, I₂, Mn, Se, B, S, Cl₂, Na and K are also required in feed formulation. In intensive culture absence of any one of these will adversely affect the productivity. Therefore all these nutrients have to be incorporated in the feed in the required proportion during

feed formulation. In extensive culture as some of these are naturally available, absence of any one of these nutrients will not apparently affect the growth and overall production in the farm.

Using the available agricultural and animal products and by-products in our country we will be able to produce the feeds required for culture practices. Rice bran, wheat bran, corn flour, soya flour, rape seed oil cake, fish meal, fish oil, rape seed oil, soya oil etc. are suitable for feed formulation. When feeds are made in the form of pellets care should be taken to make them sufficiently water stable so that they do not disintegrate easily resulting in their loss or water pollution. Depending upon the feeding behaviour of the fish, floating or sinking pellets can be made by manipulating the processing conditions. By using feeds having all the required nutrients and properties fish culture can be done profitably.