

FISH NUTRITION

Nutrient requirements of fish:

Fish as other animals require balanced diets contain certain amounts of CP, CHO, EE, minerals and vits.

(1) Protein requirements:

CP serves a three-fold role in the nutrition of fish: a- To provide energy.

b- To supply AAs.

c-To meet the reqs. for functional proteins, enzymes and hormones.

On DMB, fish contain 60-93% CP. From this, it is easy to understand why fish foods are higher in CP than the diets of birds and mammals.

Protein provides a major source of energy for fish
CHO & fat are metabolized easily as energy sources,
but if they do not meet energy reqs. of fish ,protein is
utilized.

Fish is efficient utilizer of protein to energy with
efficiency of 84% when protein is metabolized for
energy, nitrogen end product is excreted through gills
and in the feces and urine.

Both the quantity and quality of the dietary protein
must be correct in relation to the req. of fish species .

Success of fish culture depend on availability of 10 EAAs (arg., hist.,isoleu,leucine,lysine,meth.,thr.,,phenylalanine,tryptophan and valine) in proper ratio.

As fish can not synthesize these AAs ,these are to be obtained chiefly from the diet & absence of even one of them may affect growth of fish.

Fish do not have ability to utilize NPN source.

Factors such as species ,age ,stocking denisity ,water temp. and production stage should govern the protein level in the diet. Levels (%) of CP in fish diets

Item	Start	Grower	Production
Cold water fish	40–50	35–40	30–40
Warm water fish	35–50	25–50	28-32

Def. of lysine may result in dorsal and/or caudal fin erosion and increased mortality. Def. of methionine result in cataract. Def. of tryptophan may result in scoliosis, renal calcinosis ,cataract, caudal fin erosion and decreased carcass lipid content.

Sources of protein

- 1-Animal products as fish meal, meat meal, poultry by-products
- 2 Agricultural by-products as algae, oil seed meals, cereals, legumes and single cell proteins.
- 3 Industrial waste products.

(2) Energy requirements

a- Carbohydrates

Fish have the ability to digest simple sugar efficiently but as the sugar molecule become larger and more complex ,digestibility decreases rapidly.

In most species of fish, the efficiency of CHO is about 39% compared with 96% in mammals.

CHO can be used to spare protein since less protein will be used for energy. But if there is an excess of dietary CHO, glycogen will accumulate in the liver and fat deposit will form in the liver and kidneys.

CF as cellulose and hemicellulose, while of low nutritive value, probably have role in controlling the passage of food through the gut.

Manufactured feeds have a fibre content between 2-5% and may reach 8%. A level of 10% cause reduction in nutrient intake and reduce digestibility.

b- Fats

Fat provide energy, act as cushions for vital organs, energy reserves, insulators, lubricants, essential lipids (hormones) and transporters of fat soluble materials as vitamins.

Fish can utilize energy of fat by about 84% efficiency.

Animal fats that are highly saturated are of little value in fish diets as their digestibility is low. On the other hand, highly unsaturated fats in fish ration may result in feed spoilage.

Best suppl. of fats are fish oils, Soya and corn oils.
EFAs must be suppl. and fish oils is the best source.
Fish diets should contain at least 5% fish oil to meet the 1% dietary req. for EFA.

EFA def. cause

- reduced growth

- poor feed conversion efficiency

- increased mortality

- elevated muscle water content

- increased susceptibility to caudal fin erosion

- Fatty infiltration in the liver

- lower spawning efficiency

(c) Energy metabolism in fish

Fish not spend much energy towards maintain body temp. because they are cold blooded creatures. By not having to regulate body temp., more energy is available to fish for growth, activity and production.

Energy utilization capacity of fish is affected by:

1Species: MRs vary according to the characteristic behavioral pattern of species.

2Size: smaller fish have higher MR than larger fish.

3-Light exposure: Darkness decreases the energy requirement in some fishes. fish grown in constant light do not grow well as those of the same species having a "rest period" of darkness.

4-Composition of diet: high CP or mineral, increased MR. Since, the diet for carnivores is composed primarily of protein material, they have a higher MR than herbivores.

5Physiological activity: All species have high MR during the spawning season.

6 Age: MR of fish generally decreases with age.

7Temperature of water: As the temperature of water increases, its ability to carry oxygen decreases resulting in increased respiration rate of fish a matter which resulting higher MR. Additionally, there is a 5% decrease in MR for each degree °F decrease from SET.

8Other environmental factors: Such as water flow rates, water composition and pollution put certain stress on fish and result in changes in their MR.

(3) Vitamin requirements

As digestive system of fish is simple in structure and function, there is definite need for suppl. of vits in fish diets. In general, vit. Req. of fish as poultry, with a few exceptions. Fish shown to have req. for vit.C. There is not enough bacterial activity in the gut to satisfy either B-complex or vit.K reqs. Since fish feeds usually contain high levels of oils, oxidation may result in inactivating. For this reason, amounts in excess of the NRC req. should be added to feed to ensure that fish receive adequate levels.

(4) Mineral requirements

Fish have the ability to absorb a number of minerals directly from the water, thereby reducing the mineral req. in the diet.

Fish require all of the macro-and micro-elements req. by other animals for enzymes and cofactors. Since ,fish absorb some mineral from water, the mineral content of the water is of considerable importance.

Fish in soft water (low mineral content) require additional suppl. in the diet .

Fish farming

1 Fish farming with agriculture:

Fish culture is integrated with agricultural crops such as rice, banana. Rice fish culture is an age old practice but it is not given fully owing to the use of insecticides.

This type of fish culture has several advantages as economical, little extra-labour.

2 Fish farming with Livestock:

In this practice, excretion of ducks, chicks, pigs and cattle are either recycled for use by fish or serve as direct food for fish.

Duck-fish culture

It is highly profitable as it enhances animal protein production (fish & duck/unit area). The duck dropping contain 25% inorganic substance with a number of elements such as C, P, K, N, Caetc.

Beside manure, ducks eradicate the unwanted insect, snails and their larvae. Further, ducks also help in releasing nutrient from the soil of ponds particularly when agitate the shore area of the pond.

Feeding methods

1-Hand feeding

This method has the important advantage that the operator can note the feeding behaviour and demands of the fish and thus gauge the quantity of food required accordingly in addition the operator can ensure that the food is dispersed over a wide area and is thus available to all of the fish in the tank/pond.

Major disadvantage is usually high labour cost, especially on a large fish farm, also there will be increased handling of the food.

2-Automatic feeding

The use of automatic feeds has the main advantage of reducing labour costs, after the initial outlay on equipment, and ensuring that a known quantity of food is dispersed to the fish on a regular basis.

The main disadvantage is that, there will generally be less observation of the fish, while feeding and thus problems can not be discovered and investigated as quickly as when fish are fed by hand. Furthermore, confined area of a tank, can be over-come by using pellet blowers.

3-Demand feeders

Using this systems, fish can obtain food on demand generally by depressing a trigger.

The advantage of this method is that fish can obtain as much food as require as often as they require it, but the major drawback that fish must be trained to operate the system, also some fish may be "trigger happy" which leads to food wastage and water pollution.