

Nutritional requirement of cultivable fish and shell fish (Proteins, amino acids, lipids)

- There are about 40 essential dietary nutrients required by fish and prawn. Hence care must be taken to ensure the presence all essential nutrients in the formulated feed for optimum growth

Protein and Amino acids

- Proteins are major nutrient in fish tissue constituting about 65-75% of the total on the dry weight basis
- Protein are also required for synthesis of new tissues and hence growth.

Cont....

- The dietary protein requirement has a linear relationship with the specific growth rate
- The gross protein requirement decreases with increase in age and size of fish. However, generally 25-30% protein is optimum for practical diets for herbivorous and omnivorous fishes for pond feedings.
- Protein requirements usually are lower for herbivorous fish and omnivorous fish than carnivorous fish.
- Protein requirements are generally higher for smaller fish. As fish grow larger, their protein requirement usually decrease.

Cont....

- Protein is used for fish growth if adequate levels of fats and carbohydrates are present in the diet. If not, protein may be used for energy and life support rather than growth.
- The gross protein requirement for carp fry and fingerlings vary from 36-45%. The protein requirement is higher in catla fry (45-47%) than fingerlings (40%). The protein requirement in silver carp fry ranges from 37-42% and for common carp it is 31%.

Dietary protein requirements of some finfish and shellfish species for their optimum growth

Species	Protein source	Protein requirement (% dry weight basis)
<i>Cyprinus carpio</i> fingerlings	Fish meal	54
<i>Labeo rohita</i> fry	Fish meal and groundnut oil cake	40
<i>Labeo rohita</i> fingerlings	Casein and groundnut oil cake	30
<i>Catla catla</i> fry	Casein gelatin	47

Cont....

Species	Protein source	Protein requirement (% dry weight basis)
<i>C. Catla</i> fingerling	Casein gelatin	40
<i>Macrobrachium rosenbergii</i>	Fish meal and groundnut oil cake, soybean meal	35
<i>Clarias batrachus</i> fingerling	Casein gelatin	40

- Gross protein requirement of a fish is the requirement of essential amino acids and some non-essential amino acids to maintain metabolic activities.
- With hydrolysis of protein, about 20 different amino acids are released, out of which 10 are essential – arginine, histidine, isoleucine, leucine, lysine, methionine+cystine, phenylalanine+tyrosine, threonine, tryptophan and valine, which are not biosynthesized and hence required by fish

Essential amino acid requirements (% dietary protein) of some fish and prawn species

Amino acids	RoHu	Catla	Mrigal	Common carp	Tilapia	Rainbow trout	Prawn	Milk fish
Arginine	5.75	4.80	5.25	4.3	4.2	5.0	3.70	5.2
Histidine	2.25	2.45	2.13	2.1	1.7	1.8	0.70	2.0
Isoleucine	3.00	2.35	2.75	2.5	3.1	2.0	0.60	4.0
Leucine	4.63	3.70	4.25	3.3	3.4	3.5	1.00	5.1
Lysine	5.58	6.23	5.88	5.7	5.1	4.5	3.20	4.0
Methionine	2.88	3.55	3.18	3.1	2.7	3.5	1.20	2.5
Phnylalanine	4.00	3.70	4.00	6.5	5.5	4.5	1.70	4.2
Threonine	4.28	4.95	4.13	3.9	3.8	2.0	1.60	4.5
Tryptophan	1.13	0.95	1.08	0.8	1.0	0.5	0.50	0.6
Valine	3.75	3.55	3.50	3.6	2.8	3.2	2.06	3.6

Lipids

- Lipids are important source of energy, essential fatty acids and phospholipids which provide a vehicle for absorbance of fat-soluble sterols and vitamins.
- These also play a vital role in the structure of cell and cellular membrane and serve as the precursors of several hormones, in addition to their function for prostaglandin synthesis.
- Dietary lipids influence flavour and texture of prepared feeds and also flesh quality of fish.
- Marine fish typically requires n-3 HUFA for optimal growth and health, usually in quantities ranging from 0.5-2.0 per cent of dry diet.
- Freshwater fish require linolenic acid (18:3, n-3), in quantities ranging from 0.5 to 1.5 % of dry diet.

Essential fatty acid requirement of some fish and prawn species

Shrimp	
Linoleic acid	0.4 %
Linolenic	0.3 %
EPA	0.4 %
DHA	0.4 %
Common carp	0.5-1 %
Eel	0.5 %
Tilapia	1 %
Milk fish, mullets, sea bass, grouper and sea bream	1.2%

Dietary Lipid requirements of fish and shell fishes

Common carp	8-18 %
Indian and Chinese carps	5-8 %
Tilapia	6-10 %
Channel cat fish	8-12 %
Milk fish and Mulletts	6%
Seabass	12-13%
Grouper	14%
Eel	12-15%
Rainbow trout fry	15%
Rainbow trout fingerling	12%
Rainbow trout adult	9%
Shrimp-general	5-10%
<i>Penaeus indicus</i>	6-10 %

HUFA - Highly Unsaturated Fatty Acid

- Marine fish have dietary requirement of eicosapentaenoic acid (EPA) 20:5 n-3 and or docosahexaenoic acid (DHA) 22:6 n-3. dietary phospholipids have beneficial effects on growth and survival of fish and prawn larvae.
- Cholesterol is synthesized in the body, but some crustaceans like prawns require cholesterol in the diet. Feeding sterol and cholesterol at 0.25% and 0.5% levels yielded beneficial effects in prawns.
- Larvae of Indian major carps and marine shrimp require phospholipids to the tune of 4% and 1-2%, for enhancing growth and survival rates.

- Supplementation of n-3 and n-6 PUFA is also required for broodstock diet which is generally done by providing fish oil of marine source and vegetable oil respectively. This greatly influences gonadal maturation, breeding efficiency and spawn recovery of Indian major carp.