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Nutritional and Feeding Reuirement of Milk Fish (*Chanos chanos*)

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ABSTRACT

Aquaculture is the fastest growing food sector in the world. World aquaculture production of fish accounted for 44.1 percent of total production. It's predicted that in future aquaculture production immensely contribute to the food security. World's population is predicted to increase to 10.9 billion people by 2050, whereas, India's contribution is 1.6 billion (i.e 14.67% of world). To feed such a huge population is one of the major challenging task before the world. Within the available limited resources (land, water etc.) the use of unutilized water bodies, fallow lands (unfit for agriculture), huge marine water and coastal areas for food production can be a new hope for nutritional & food security for such huge population. But, high stocking densities, use of chemical inputs and diseases outbreaks are the major issues used by several farmers. Therefore sustainable aquaculture is the hour's need where minimal use of chemical, zero water exchange culture, diversification of species and resources and many more are required to incorporate. Species diversification not only provide year round culture and profit to the farmers but also, ensure reduction in disease outbreak which leads to serious loss of economy due to continuous culture of same species. In India several which can be suitable for species diversification. Chanos chanos (milk fish) is one of the euryhaline species which can be most suitable for culture in Indian conditions. This article contains the information of the milk fish as candidate species and its nutritional requirements.

Key words: *Chanos Chanos, Milkfish, Nutritional requirements, Aquaculture, Aquafeed, Alternative candidate spp.*

INTRODUCTION

Milkfish (*Chanos chanos*), family (Chanidae) is found in the Indo-Pacific regions used as food fish (Chen, 1976). Fingerlings of milkfish are used as lure for the tuna fishing. It's best suited for culture in the tropics country because of fast growth, efficient use of natural foods, herbivorous food habit, and readiness to consume a variety of supplemental feeds, disease resistance and tolerance to a wide range of environmental conditions. Milkfish are euryhaline. It can survive in 0 to 150 ppt a salinity of waters[8]. This fish is cultured on a huge scale in the Indonesia, Taiwan, and Philippines. Small-scale production is being practiced in Thailand, Malaysia, Vietnam and Sri Lanka, and in Hawaii, Guam and Kiribati Asian countries.

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Milkfish farming is begun in Indonesia some 700 years ago[18] follow by the Philippines and Taiwan more than 300 years ago[14]. In 1990, Indonesia occupied the largest pond area for milkfish production but the average yield was 0.6 tonnes per ha. The difference between the yield in these countries is mainly attributed to differences in culture technology, skill, and management inputs, such as stocking rate, size, pest and predator control, fertilization, feed and feeding and water management. Not much information is available about artificial formulated diet being used for milk fish in Indian conditions Therefore, in this section it is tried to provide information on nutrient requirements of milkfish and feeding practices.

NUTRIENT REQUIREMENTS

PROTEIN AND AMINO ACIDS

Milkfish is requiring a balanced mixture of essential and non-essential amino acids. The minimum amount of dietary protein required for the optimum growth and feed efficiency and survival of 40 mg milkfish fry has been reported to be about 40%[13]. However, it has been reported that the protein requirements of fish vary with species, size or age, protein quality, dietary level of energy, water quality, presence of natural food and feeding and culture management[16,17]. Milkfish require 10 essential amino acids (arginine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan and valine) as other species[3].

The juvenile of milkfish is requirement of Essential amino acid[3].

Amino acid Requirement	(% of dietary protein)
Arginine	2.0
Histidine	4.0
Isoleucine	5.1
Leucine	4.0
Lysine	2.5
Methionine	4.2 or 2.8
Phenylalanine	4.5
Threonine	0.6
Tryptophan	3.6
Valine	5.2

The limiting amino acids arginine, leucine and lysine are high concentrations[7] than tryptophan and valine were lower in the whole body of milkfish juveniles but those were similar values for the tissue proteins[3]. The non-essential amino acids can be synthesized by fish but which is available in the feed diets has a sparing effect. Two special examples of sparing action are the conversion of phenylalanine to tyrosine and methionine to cystine.

These non-essential amino acids can only be synthesized from the essential amino acid precursor[16,17]. Milkfish actually have a requirement for aromatic amino acids (5.22% of dietary protein), which can be met by either phenylalanine alone or a proper mixture of phenylalanine and tyrosine. Most fish of practical diets contain adequate levels of phenylalanine and tyrosine, the sum of these two amino acids normally needs in the diet[16,17]. A similar relationship between sulphur-containing amino acids (methionine and cystine).The presence of cystine will reduce some requirement of methionine in the diet[16,17]. Milkfish appear to have the ability to utilize crystalline amino acids. Supplementation of 0.5% L-tryptophan to a vitamin-free casein diet provided better growth of young milkfish than a diet containing a combination of casein and gelatin[9,6] reported that supplementation of 2.8% lysine hydrochloride to a maize-gluten meal-based diet significantly improved the growth and feed efficiency of milkfish fry. Milkfish use proteins of animal origin better than plant proteins. Among animal proteins, fish meal and meat and bone-meal have higher nutritive value than shrimp-head meal. Plant proteins, soybean meal was superior to copra and *Leucena leucocephala* leaf meals among all[19].

Energy

Lim *et al.*[13] obtained maximum growth of milkfish fry (40 mg) with a 40% protein diet having 2740 kcal of digestible energy kg−1 diet. Sumagaysay *et al.*[22] reported that a diet containing 27.4% protein and 4236 kcal of gross energy kg−1 observed in a maximum increase in profit. In the lack of information on energy requirement, data available for tilapia and common carp are suggested.

Carbohydrates

Milkfish do not have a specific requirement for carbohydrates like other finfish. However, carbohydrates are always needed in fish diets because they are the least expensive source of energy, function as a pellet binder and serve as precursors for the formation of various metabolic intermediates essential for growth. Carbohydrates have also been shown to have a sparing effect on the utilization of dietary protein in several aquaculture species. Milkfish can utilize carbohydrates as an energy source very efficiently, as do tilapia and common carp. Purified diets containing up to 35% dextrin have been used successfully in various nutritional studies. Practical diets in Taiwan currently used for pond feeding contain 45% or more of total carbohydrate.

Vitamins and minerals

The importance of vitamins and minerals has been recognized as these nutrients have normally been included in milkfish experimental or production diets. Except for the study of Minoso *et al.*[15], which demonstrated the dietary essentiality of phosphorus and iron, lack of information is available on milkfish vitamin and mineral requirements. However, milkfish could be requiring the same vitamins and minerals as do other aquaculture species. Various vitamin and mineral mixes designed for cold-water and warm-water fishes have been used by different workers in milkfish nutrition research with satisfactory results. Thus, in the absence of information on these subjects, vitamin and mineral allowances established for other tropical species, such as tilapia and common carp, are recommend

Practical diets

Newly hatched fry of milkfish utilized their yolk as initial a source of nutrients. After the yolk-sac is absorbed, they begin to swim upper surface and search for food. An initial stage up to 14 day used rotifers (*Brachionus* sp.) as a live food. Newly hatched brine shrimp (*Artemia*) nauplii are commonly used onward 15 day up to harvest 21 day. However, wild-caught milkfish fry or 15-day-old hatchery-produced milkfish larvae have been reared successfully to adult stages with artificial diets. Before the development of compounded diets, during 1- to 2-week holding periods, wild-caught milkfish fry were fed mashed boiled egg-yolks, good-quality rice bran or wheat flour. Such agricultural products as rice bran, leaf meal, breadcrumbs or soybean meal are occasionally used for fish grown in nursery phase or grow-out phase. When there is depletion of natural foods or poor growth.

Practical diets of milk fish have been develop by using available information on milkfish nutrient requirements and information derived from other species. Micro bound larval diets were developed by using carrageenan as a binder. These diets have been used for larvae in combination with rotifers from 2 to 14 day and after 15 to 21 day *Artemia* as a substitute[4]. Diets for fry have been formulated and used for fish grown in fresh water[20,21] and sea water[1].

Practical diet formula for milkfish fry (40% protein) is given below in Table.

(Modified after Lim, 1991)

Ingredient	Percent in diet
Fish-meal	30.0
Soybean meal	20.0
Squid meal or shrimp meal	15.0
Wheat flour	25.45
Marine fish-oil	8.0
Vitamin mix	1.0
Trace mineral mix	0.5
Antioxidant	0.05

In grow-out phase, milkfish is herbivore feeding behaviour. In the absence of information on milkfish brood-stock nutrient requirements, the diets for brood-stock should contain a high level of good-quality protein (PUFA), vitamins and trace minerals. Milkfish accept a variety of diets, in meal form and in moist, sinking or floating pellets. Milkfish can use meal-form diets effectively but compounded diets are sinking pellets. Pelleted diets must have desirable physical characteristics, especially water stability for to minimize nutrient loss and diet wastage and pellet size. Hard and durable pellets are necessary when diets are to be crumbled for feeding smaller fish. Diets in meal or crumbled forms of different smaller particle sizes are used for fry and fingerlings compared to marketable size (400 to 500 g) is approximately 4–5 mm in diameter and 6–8 mm long.

Practical diet formula for milkfish brood stock diet (36% protein) is given below in Table.

(Modified after Lim, 1991)

Ingredient	Percent in diet
Fish-meal anchovy or menhaden	25.0
Soybean meal	34.0
Wheat flour	15.0
Rice bran	20.9
Pellet binder	3.0
Fish-oil	2.5
Dicalcium phosphate	1.0
Vitamin mix	1.0
Trace mineral mix	0.5

Feeding Practices

Milkfish feeding rates are affected by size of fish, water quality (such as temperature, salinity and dissolved oxygen), feeding frequency, and nutrient density of the diets, especially energy content. As with other fish, the feed consumption rate of milkfish is inversely related to fish size. For example, with a diet containing 40% protein and 3450 kcal of metabolizable energy (ME) kg−1, a daily feeding rate of 20% of the biomass is optimum for 7.7 mg milkfish fry reared in lab conditions[11]. For fish averaging 0.60 g, feeding at 9% of the body weight resulted in a 130% increase in weight gain over the 5% feeding rate[6]. In pond environments where natural food is present, milkfish grown to marketable size are fed with commercial pellets containing 23–27% protein at a daily rate of 3–4% of body weight[2]. Milkfish is benefit from multiple daily feedings like most of other species. The growth and feed efficiency of 0.6 g fingerlings fed at 5% or 9% of body weight Increased by about 20% when the feeding frequency was increased from four to eight times daily[6]. Milkfish are normally fed two to three times daily in pond[10]. Diets are offered to fish by hand or by automatic feeders. The latter are commonly used in Taiwan and in intensive culture in the Philippines. The pond bottom of the feeding area is checked 1 h after feeding for the Purpose of adjusting diet allowances.

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