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## Feed formulation and their composition of selected fresh water ornamental fishes (*C. auratus* and *T. trichopterus*)

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**Abstract-** The ornamental fish trade earns foreign exchange and has a significant role in the economy of Country and state level. Culture and breeding of ornamental fishes can be promising alternative for many people and unemployed youths especially in rural population. The study on nutrient requirement and feed development for ornamental fish is more important than food fish as the former is reared in a very limited water environment where the chances of water quality deterioration is faster. The feed must be nutritionally adequate and cost-effective feed. A proper statistical analysis estimation has been done which supports fish feed must be of good quality to assure high growth rate. The present knowledge on the nutritional requirement of ornamental fishes, cost effective feed, utilization of live feed, formulated feed and specially prepared feed along with the proper maintenance of aquatic environment and also maintenance of good quality and quantity of protein in fish diet have received lesser attention.

**Key words:** Formulated feed, aquatic environment, ornamental, nutritionally adequate and cost-effective

### INTRODUCTION

India is the third largest producer of ornament fish in the world and fishery sector is a major foreign exchange earner. Ornamental fish breeding is an emerging sector and can be world scale opportunity area for fish farmer in India. The ornamental fish trade earns foreign exchange besides serving as a source of employment to rural population. It has the significant role of economy of country and state level. It requires little space and less initial investment than most other farms of aquaculture. The study on nutrient requirement and feed development for ornamental fish is more important than the food fish as the former is reared in a very limited water environment where the chances of water quality deterioration is faster

due to nitrogen and organic loads derived from deteriorating unused feed and excreta.

Ornamental fishes are often known as living jewels because of their color, shape and behavior. They are peaceful, generally tiny, attractive colored and could be accommodated in a confined space.<sup>1</sup>

Ornamental fish keeping is emerging as one of the most popular hobbies across the world next to photography.<sup>2</sup> Watching these beautiful fishes swimming gracefully in the aquarium is a pure sense of joy and mental pleasure to many enthusiastic.

Aquarium keeping in household adds to the aesthetic beauty of a house in many parts of the world. Ornamental fish has become an important part in International trade too. The annual global trade has increased from 4.5 billion dollars (1995) to about 9 billion

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dollars (2002) which comprises 85% of fresh water species and the rest are marine species.<sup>3</sup>

Singapore is the top exporting country of ornamental fishes in the world followed by HongKong, Malaysia, Thailand, Taiwan, Indonesia and India. USA ranked first as the importer of ornamental fish followed by Europe and Japan. The ornamental fish trade earns foreign exchange besides serving as a source of employment to rural population. It has significant role in the economy of developed and developing country.

Feed management plays a critical role in the success of fish culture. Formulated feeds are expensive as most of the ingredients are imported and prices are rising continuously. Thus, it is necessary to seek cost effective replacement of dietary protein from locally available inexpensive materials in order to avoid high costs.<sup>4</sup>

The present knowledge on the nutritional requirement of ornamental fishes are limited. Hence the present study was carried out with the prime objective of low cost feed formulation which influences the growth and reproduction in selected ornamental fishes, *Carassius auratus* and *Trichopodus trichopterus*.

Generally, the proximate composition of fish feed includes five basic constituents such as Protein, Carbohydrate, Lipid, ash and water. The proximate composition varied widely depending on factors like species, size, sex, maturity of fishes, season and feeding regimes. In fish farming nutrition is critical because feed represent 40-50% of production costs.<sup>5</sup> Prolonged use of live feed alone to rear fish is often impractical and costly, so conversion to formulated feed is necessary.

## LITERATURE REVIEW

Ornamental fishes are assuming importance in recent days as stress remover. Hardy developed methods for fish feed formulation in aquaculture with balanced nutrition. Another approach has been developed by Singh and Srivastava to formulate low cost diet with appropriate feeding management strategies, The general problem of high speed cost in fish culture has been minimized by using cheaper ingredients as protein source was assessed by De Silva (1985)<sup>4</sup> effect of artificial diets with different protein levels on growth and feed efficiency of C was at high fish (*Clarias batrachus*) was observed by Mollah and Hossain. Tacon (1990)<sup>6</sup> reported the fish feed formulation and its effect on trout's. Das *et al.* (1993)<sup>7</sup>

examined the efficacy of formulate feeds for juvenile green-black grey mullet, *Liza Subviridis*. Sitasit studied about the raw materials used to produce fish feed and its quality control in aquaculture.<sup>8,9</sup>

## MATERIALS & METHODS

### Fish Feed Preparation:

To estimate the growth, survival and reproduction, five different types of food were formulated for two different species of ornamental of fishes, *C. auratus* and *T. trichopterus* given below:

1. Control Feed- C (Feed 1)
2. Dried Earth worm Feed - DEF (Feed 2)
3. Dried Chironomid Feed - DCE (Feed 3)
4. Dried Spirulina Feed - DSF (Feed 4)
5. Specially Prepared Feed - SPF (Feed 5).

#### 1. Control Feed - C (Feed 1)

Control Feed (C) was prepared with 35% protein in the diet as given below:

**Table 1- Ingredient profile of Control feed (C)**

S. No	Feed ingredients	Percentage of ingredients (%)
1	Fish meal	47.1
2	Groundnut oil cake	25.62
3	Soya meal	10.34
4	Rice bran	8.21
5	Tapioca flour	3.24
6	Wheat flour	4.6
7	Vitamins	0.54
8	Minerals	0.25
9	Vegetable oil	0.1
	Total	100

#### Control feed



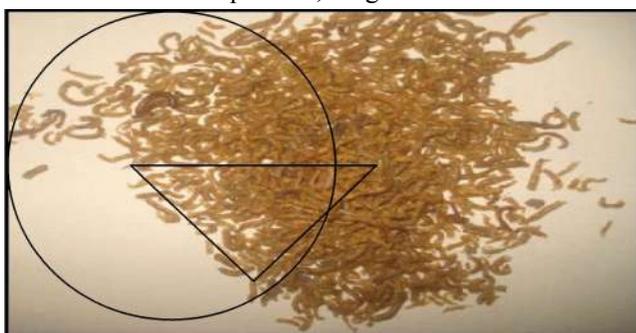
#### 2. Dried Earthworm Feed - DEF (Feed 2)

Earth worms (*Eisenia foetida*) were segregated from vermicompost pit and released into water for complete evacuation of food consumed by them. Then these worms were chopped and dried under sunlight.



**3. Dried Chironomous Feed - DCF (Feed 3)**

Dried Chironomous Feed was purchased from Karthick fishland aquarium, Nagercoil.



**4. Dried Spirulina Feed - DSF (Feed 4)**

Feed 4 was prepared with appropriate proportions of Spirulina with 35% protein diet, by Square method (Hardy, 1980) as given below.

Diet 1: The formulated feed with 10% dried Spirulina powder (S1)

Diet 2: The formulated feed with 20% dried Spirulina powder (S2)

Diet 3: The formulated feed with 30% dried Spirulina powder (S3).

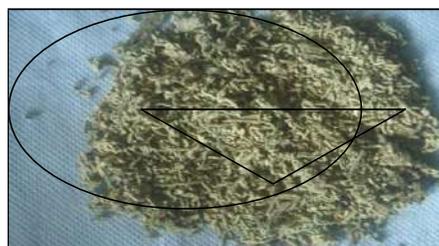
Dried Spirulina Feed (DSF) was formulated with different levels of Spirulina

**Table 2- Ingredient profile of Spirulina diets**

S.No	Feed ingredients	Diets (g/100g)		
		S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>
1	Spirulina	10	20	30
2	Fish meal	37.2	37.22	32
3	Groundnut oil cake	24.63	26.14	20.24
4	Soya meal	9.82	7.42	6.14
5	Rice bran	8.82	4.24	6.01
6	Tapioca flour	3.8	2.28	2.23
7	Wheat flour	4.85	2.15	2.28
8	Vitamins	0.53	0.25	0.5
9	Minerals	0.25	0.2	0.5
10	Vegetable oil	0.1	0.1	0.1
	<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>

The Spirulina was purchased from Biotein Naturals Spirulina, Chennai. And rest of the ingredients were purchased from the market at Nager Coil

**Spirulina Diets**



**S<sub>1</sub> Diet**



**S<sub>2</sub> Diet**



**S<sub>3</sub> Diet**

**5. Specially Prepared Feed (SPF)**

A special feed (SPF) was prepared by mixing dried earthworm, dried chironomid larvae, Spirulina, ground nut oil cake, fish meal, soyameal, rice bran, tapioca powder, wheat flour, vitamins and minerals.

**Table 3- Ingredient profile of specially prepared feed (SPF)**

Sl. No	Feed ingredients	Percentage of ingredients (%)
1	Dried Earthworm	25
2	Dried Chironomid	25
3	Spirulina	25
4	Fish meal	9
5	Soyameal	10
6	Tapioca powder	1.5
7	Wheat flour	1.5
8	Vegetable oil	0.5
9	Rice bran	2
10	Vitamins	0.25
11	Minerals	0.25
	<b>Total</b>	<b>100</b>

**Chemical Analysis of diet**

Protein, lipid and ash content were estimated in the experimental diets following standard procedures. Nitrogen Free Extract (NFE) was calculated by subtracting the protein, lipid, and ash contents from the dry weight of the feed samples. Two-way ANOVA without replication was applied using MS Excel.

**RESULTS**

Throughout the experiment, water quality parameters as temperature, PH, dissolved oxygen, hardness, ammonia and nitrate in all experimental tanks were maintained. (Temp.-27-30°C), (PH-6.5-8.5), (Dissolved oxygen-4.5-5.5 mg/l), (Hardness-120-140 mg/l), (Ammonia-0.04-0.08 mg/l) and Nitrite- 0.05-0.09 mg/l).

In *C. auratus*, the growth rate ranged from 14.21+0.85 for fishes with control diet and with Spirulina diets as 23.45+1.54(S<sub>1</sub>), 32.84+2.54(S<sub>2</sub>) and 44.37+1.99 (S<sub>3</sub>) diet. In *T. trichopterus* where the highest growth rate (46.30+3.11) was observed in fishes with S<sub>3</sub> diet and lowest (11.36+0.93) in fishes with control diet. All the five different feeds were readily accepted from the beginning of feeding in *C. auratus* and *T. trichopterus*. The larval survival was found to be high (97.32 +/- 2.95%). In *C. auratus* fed with SPF where the larva fed with control diet exhibited a low survival rate (40.52+/- 1.35%). In *T. trichopterus*, maximum survival rate with SPF diet (98.37+/-3.46%) followed by DSF (88.91 +/-2.98%), DCF (86.34 +/-3.56%), DEF(85.76 +/-2.87%). *C. auratus* fed with SPF exhibited a higher weight gain (7.09 +1.55 g) than that of fishes fed with other feeds such as DSF (5.93+1.92 g), DEF (5.88 +2.68 g) and DCF (5.74 +1.97g). The maximum weight gain was observed in *T. trichopterus* fed with SPF (6.24 + 2.64g) followed by DSF (5.27+1.67 g), DEF (5.14 +0.93g) and DCF (4.96+0.68g). The weight gain fed with experimental feeds were statistically significant (P<0.005).

**CONCLUSION**

Fish feed must be of good quality to assure high utilization, high growth rate, good health and at the same time to protect the aquatic environment.

Protein is the vital and expensive nutrient of formulate fish feeds quality and quantity of protein in fish feeds is of supreme importance in promoting fish growth for achieving marketable size of fish at early phase. The

increasing demand, unstable supply and high price of the fishmeal with the expansion of aquaculture made it necessary to search for alternative protein source. Hence there is need to compensate this ingredient with some other suitable ingredients to reduce production cost. The highest share of total cost in the intensive aquaculture is invested for the fish feed. So the feed quality and feeding strategies are of great importance in fish nutrition.

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