

Effects of Different Oil Cakes on the Growth and Survival of *Liza parsia* (Hamilton-Buchanan, 1822)

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Fry of mullet *Liza parsia* were fed with whole poultry egg based flakes diet supplemented with various oil cakes viz. Mustard Oil Cake, Groundnut Oil Cake and Soya Cake. The experiment was conducted with five replicates for 90 d. The maximum length gain, weight gain, specific growth rate and survival recorded was 429.20%, 2140.38%, 3.45% and 86.00% respectively in diet with mustard oil cake. Based on these results, Mustard Oil Cake can be used in feed for better growth and survival for fry of *L. parsia*.

Keywords: Oil cakes, *Liza parsia*, growth, survival, specific growth rate

Mullets form one of the major components of brackish water farming all over the world. Among the mullet available in India, *Mugil cephalus*, *L. tade*, *L. troshelli*, *L. macrolepis* and *L. parsia* are the important cultivable species. *L. parsia* forms an important cultivable species in brackish water fish farming along Ratnagiri coast. Successful and sustainable culture of mullet is dependent on use of nutritionally balanced low cost ecofriendly feeds.

Protein is the most expensive component of artificial feed and hence its inclusion should follow a careful assessment of the nutritive quality from various sources. The rapid expansion of livestock industry in many parts of the world is absorbing almost all of the feedstuffs produced, thus increasing the cost of certain feedstuffs used in aquaculture feeds (FAO, 1983). The price of fishmeal, which is the main conventional protein source, has increased sharply. It is therefore imperative that other unconventional protein sources be used in fish feeds for increasing the fish production.

Oil cakes are available on a large scale as by-product of oil industry, such as linseed, karanja, coconut, sesame, neem, groundnut, soyabean, mustard, sunflower, cottonseed

and rapeseed oil cakes. These have traditionally been used as feed ingredients for fish culture.

Soyabean meal, groundnut oil cake (GOC) and mustard oil cake (MOC) are used as a main source in the diets due to their low cost and ready availability in the market. However, there is a paucity of information on the use of GOC, MOC and Soyabean Oil Cake as potential feed ingredients for fry of *L. parsia*. Barve (1987) showed that a minimum of 30% protein in the diet was necessary to obtain good growth of fry *L. parsia*. GOC was used in the supplementary feeding of fry *L. parsia*, but no attempt was made to use other oil cakes in feed to study growth and survival of fry of *L. parsia*. Therefore, the present study was undertaken to evaluate the effect of different oil cakes, such as GOC, MOC and Soya Cake on growth and survival of fry of the *L. parsia*.

Materials and Methods

Fry of mullet were collected during low tide with the help of dragnet from the Kalbadevi creek of Ratnagiri (16° 59' 10" N and 73° 16' 25" E). Collected seed were stocked at the rate of 10-no./ 1 in 20 l capacity plastic container and transported to the laboratory. Fry of *L. parsia* were

segregated from the collected seed using the taxonomic key (Barve, 1987). Prior to experiment the segregated seed were acclimatized to laboratory conditions for a period of two weeks in a plastic pool (500 l capacity) and were fed with control diet (T_0) at the rate of 8% of the wet body weight.

Control diet

The ingredient proportion and proximate composition of T_0 is given in Table 1. The diet formulation was similar to Barve (1987). Required quantities of finely pulverized ingredients were mixed with 150 ml water and cooked for 15 min; cooked paste was spread on plastic sheet with the help of soft brush for forming the flakes. The flakes were dried in sunlight for one day and stored in airtight plastic bottle.

Test diet

Control diet was used as a base for preparation of test diets. Three test diets were formulated by incorporating three locally available oil cakes *viz.*; MOC diet (T_1), GOC diet (T_2) and Soya Cake diet (T_3). Flakes

preparation process was similar as the control diet. The ingredient proportion and proximate composition of the test diets is given in Table 1.

The proximate analyses of the control and test diets were performed according to AOAC (1984) methods.

Experimental design

At the start of experiment fry of *L. parsia* with an average length (1.4 ± 0.026 cm) and average weight (0.053 ± 0.002 g) were randomly stocked in 54 l aquarium. Each aquarium was filled with 40 l of 15 ppt seawater. Ten fishes were randomly assigned to each aquarium. There were five replications per diet. The fishes were fed twice daily (at 09 00 hrs and 17 00 hrs) at the rate of 8% of wet body weight for the period of 90 d. Every day siphoning was carried out to remove leftover feed and faecal matter and to clean the tanks. About two third of the water was replaced every alternate day from each aquarium. Feed ration was adjusted after every 15 d based on sampling weight. Water parameters such as temperature,

Table 1. Ingredient proportion and proximate composition of the diets

Ingredients	Diets			
	T_0	T_1	T_2	T_3
Wheat flour (g)	25.41	12.18	23.42	25.00
Rice bran (g)	25.41	12.18	23.42	25.00
Whole poultry egg (g)	49.18	37.82	26.58	24.96
Mustard Oil Cake (g)	-	37.82	-	-
Groundnut Oil Cake (g)	-	-	26.58	-
Soya cake (g)	-	-	-	24.96
Proximate composition				
Crude protein(%)	30.15	30.55	30.78	32.07
Crude fat(%)	04.54	08.91	09.56	08.61
Carbohydrate(%)*	51.30	45.79	44.03	45.07
Ash(%)	08.20	07.59	08.81	06.80
Moisture(%)	05.81	07.16	06.82	07.45
Gross energy (kcal/g)**	423.585	444.538	444.772	447.35

*Carbohydrate % = $(100\%) - [(\% \text{ Protein}) + (\% \text{ Fat}) + (\% \text{ Moisture}) + (\% \text{ Ash})]$
Woods & Aurand (1977)

** Gross energy = $(\text{crude protein} \times 5.65) + (\text{crude fat} \times 9.5) + (\text{Carbohydrate} \times 4.1)$
El-Sayed (1994)

dissolved oxygen, carbon dioxide, pH, alkalinity were determined every week by using standard method (APHA, 1998).

At the beginning of experiment a total of 100 fishes were weighed collectively by using top pan electronic precision (0.01g accuracy) balance. At the interval of 15 d five fishes were randomly collected from each tank and weighed collectively. The length of 20 fishes was measured at the beginning of experiment. At the interval of 15 d five fishes were randomly collected from each aquarium for measuring length. The length of fishes was measured by using measuring scale (0.5 mm fraction). After 90 d of experiment the biomass of each aquarium was estimated and fishes were counted to determine survival.

A completely randomized block design with five replicates per diet was used in experiment. All data on growth and survival was analyzed by one way ANOVA followed by Newman-Keul multiple range test. Differences were considered significant at $p < 0.05$ according to standard methods of Zar (1974).

Results and Discussion

The percentage length gain, percentage weight gain, specific growth rate and

survival of *L. parsia* are shown in Table 2. The maximum percentage length gain, percentage weight gain, specific growth rate and survival recorded was 429.20%, 2140.38%, 3.45% and 86.00% respectively in diet T_1 (MOC) after 90 d. There was significant difference for percentage length gain, percentage weight gain, specific growth rate and survival between control and test diets ($p < 0.05$). The comparison of means with Newman-Keul multiple range test revealed the significant difference for the mean percentage length gain, percentage weight gain, specific growth rate and survival of fry fed with T_1 (MOC) diet as compared to means recorded for fry fed with other test diets.

During the experimental period, water temperature ranged between 18.5 to 26°C, the pH was between 7 to 7.98, dissolved oxygen fluctuated between 6.5 to 10 mg/l, carbon dioxide fluctuated between 6.4 to 13 mg/l and total alkalinity was between 48 to 75 mg/l. Water quality was within the permissible limit and did not show any remarkable variation.

Maximum percentage length gain (429.20%) was recorded in diet T_1 supplemented with MOC for fry of *L. parsia* in 90 d. Roy

Table 2. The average length gain, weight gain, specific growth rate and survival of *L. parsia* fed with control and test diets for 90 days

Parameters	Diets			
	T_0	T_1	T_2	T_3
Average initial length (cm)	1.37	1.40	1.41	1.38
Average final length (cm)	4.52	5.30	5.11	4.97
Average percentage length gain	241.60	429.20	262.41	260.14
Average initial weight (g)	0.0530	0.0530	0.0529	0.0258
Average final weight (g)	0.673	1.187	0.943	0.860
Average percentage weight gain	1170.57	2140.38	1679.25	1521.89
Specific growth rate (%)	2.82	3.45	3.20	3.10
Survival (%)	62.00	86.00	70.00	56.00

(1984) and Roy & Chakraborti (1984) have also reported the maximum length gain for *L. tade* fed with diet supplemented with MOC.

During present study, the maximum percentage weight gain (2140.38%) was observed in diet T₁ (MOC) for 90 d. Roy & Chakraborti (1984) reported appreciable weight gain in *L. tade* fed with MOC supplemented diet. Dhawan & Singh (1993) found highest weight gain in *C. carpio* fed with diet supplemented with Soyabean meal and Mustard meal. Good weight gain in polyculture of *Catla catla*, *Labeo rohita*, *Cirrihinus mrigala*, *Cyprinus carpio* and *Puntius gonionotus* fed with Mustard Oil Cake has been reported by Mazid *et al.* (1997).

Highest specific growth rate (3.45%) was found in diet T₁ (Mustard Oil Cake) for fry of *L. parsia* in 90 d. Dhawan & Singh (1993) reported similar results in *C. carpio* fed with Soybean and MOC. The maximum survival (86.00 %) was observed for fry of *L. parsia* fed with diet T₁ (Mustard oil Cake).

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