Effect of different animal diets on energy budget of fresh water fingerlings *Catla catla* and *Cirrhinus mrigala*

Merlin Dayana L., Delphine Rose M.R., Sr. Nirmala T. and Jemima Florence Borgia

Jayaraj Annapackiam College for women (Autonomous), Periyakulam-625601, Theni District

*Email:* merlindayana.dayana@gmail.com

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**Abstract:** Experiment was designed to investigate the effect of animal food utilization and energy budget of fresh water fingerlings *Catla catla* and *Cirrhinus mrigala*. Experiment was conducted to know the influence of animal diet viz., earthworms, frog thigh muscle, goat liver, egg white on *C.catla* and *C.mrigala*. Among the different animal diet earthworm recorded significantly highest growth rate whereas goat liver, frog thigh muscle, egg white diet were showed least influence on growth rate. Further, the study also revealed that animal diet earthworm approached to be more effective in increasing the growth of both fishes. The maximum growth rate was seen in *C.catla* than *C.mrigala* in all the animal diet. These results enable us to find out which one is more economical for culturing in large scale.

**Key words:** Energy budget, *Catla catla*, *Cirrhinus mrigala* and Animal diets

**Introduction**

Aquaculture is an instrument of livelihood, ensures national food security powerful income and employment generator for growth of subsidiary industries. From the very ancient times, fisheries played a significant role in the national economy and a sizeable proportion of the population in the country has been traditionally involved in making their livelihood from fisheries (Sree Latha, 2007).

Aquatic resources are of vital importance for human welfare as they are important sources of fish used as food. Due to increase in population all over the world, it is necessary to use all the natural resources judiciously for sustainable development and maximizing the food production. With increasing demand, fish scientists are paying more attention on proper development of ponds, high survival rate and nutrient rich diets for fishes. Food is considered as the most potent factor affecting metabolism (Smith, 1935, Beamish and Dickie, 1967). Fish feed play very important role in achieving faster growth and high survival of fish. Therefore, fish feed should be nutrient rich and cost effective too. Fish are capable of using a high protein diet (Craig, 2002).

Jena et al., (1997) reared Indian carp fry with exotic carp fry and reported that Indian major carps showed improved growth, biomass production and feed conversion rate. Among the Indian major carps *L.rohita* is most preferred species and constitutes about 25% of the Indian major carp's production (FAO, 2000 and Singh et al., 2006). The growth of the carps depend upon the local environment, culture methods, stocking density, quality and quantity of feed supply (Rod and Jeya D Bista, 2001). Early researchers on fish biology and fish culture relied fresh animal meat and fishery by products for feeding fish (Ganesh and Joseph., 1997). When fishes were allowed to feed on animal food it resulted in a better conversion of food into body substance (Arunachalam et al., 1985). Animal foods provide a good source of protein of higher biological value (high content of methionine and lysine). The most economic sources of protein are from natural food stuffs of plant and animal origin, particularly animal wastes and non conventional feed sources (Singh et al., 2006). Ray and Saha, (1978) incorporated poultry litter and goat blood meal as dietary sources for *L.rohita*. The body fat content is closely related to weight gained and inversely related to body moisture content (Soltan et al., 2008). The two Indian major carps viz., *C.catla* and *C.mrigala* were selected for the present study as their growth rates and size are greater than other carp species (Aravinddakshan and Jana, 1995). The animal chosen were the earth worm, goat liver, frog thigh muscle and egg white. Considering the above discussion the present study was designed to find effectiveness of animal foods on feed utilization and energy budget of the fresh water carp *catla* and *mrigala*.

**Materials and Methods**

Healthy juvenile experimental fishes namely *catla* and *mrigala* used for the experiment were collected from "Poondi fish farm" and were transported live in plastic containers. Fish were maintained in glass stock tanks (60x30x30cm) where the temperature was maintained at 25±10ºC. They were acclimatized in the laboratory for a minimum period of 30days prior to the initiation of experimental treatment. Fishes were fed with rava ad libitum. The water in the aquaria was renewed daily.

Feeding of the fishes was stopped prior to the commencement of the experiment in view of making the gut-empty. The experiments were carried out in duplicate four pairs of troughs with *C.catla* and another four pairs with *C.mrigala* being assigned for every diet viz., frog thigh muscle, goat liver, egg white and earth worms. Each trough was supplied with 2g of food per day during the experimental period of 30 days. The unconsumed feed and
faeces was collected the next day immediately before next feeding and were dried and weighed daily to estimate the amount of food consumed. Ten of the fishes were selected at random, dried and weighed to estimate the initial dry weight of the test fishes. The sacrifice method of Maynard and Loosli (1962) was followed to estimate the fish growth. The bioenergetic parameters of the fish were calculated following IBP formula (Petruceswicz and Macfadyen, 1970).

Results and Discussion

Carps are the mainstay of Indian freshwater aquaculture. Effects of food quality and quantity on the overall energy budget of C. catla and C. mrigala were computed in Table 1 & 2 and Fig. 1 to 4.

In the present investigation variation in energy budget of catla and mrigala were noticed as a function of quality of food. Both in catla and mrigala fingerlings the maximum animal feed preference was noticed with earth worm (0.54±0.076 g dry wt.) and (0.058±0.027 g dry wt.) and in minimum preference towards frog thigh muscle (0.22±0.032 g dry wt.) and 0.21±0.003 g dry wt.) respectively. Hangray et al., (2003) observed that maximum feed preference on goat liver (7.65±0.009 g dry wt.) in Cyprinus carpio and least feed preference of the same fish was noted on egg albumin (6.3±0.15 g dry wt.).

Among the various animal food the maximum feeding rate of Catla catla fingerlings was observed with earth worm (0.0115±0.0006 mg dry wt/g live fish/day). Feeding rate of Catla reported in the present investigation was lower in comparison with the reports of previous authors. Different feed consumption or feeding success between the individuals appears to be a common phenomenon in fish either in the wild or in captivity (Ferit and RAD, 2009). Among the animal food given to C. mrigala fingerlings the maximum conversion rate (0.0035±0.0071 mg dry wt/g live fish/day) was noted in the fish fed with earth worm and minimum conversion rate (0.0013±0.0074 mg dry wt/g live fish/day) on goat liver. According to Purey and Masten (2007) reported Cyprinus carpio fed on animal matter (chicken viscera) showed low conversion rate (1.30). Food conversion rate increased with increasing weight of fish (Mohamed H Ahmad, 2000). Mehrej ud Din et al., (2009) showed the better specific conversion rate (4.96±0.01) and (5.41±0.03) was obtained for the fish fed with zooplankton and chicken intestine in case of fry and fingerlings respectively and the poorest growth rate value was obtained for the fish fed on fish waste. Increasing types of food was correlated with differential cumulative performance in weight gain of Cyprinum carpio (Verma et al., 2005).

When fish grow up to fingerling and growing stages and their protein requirements get lower as a result of age or size they can tolerate replacement of fishmeal to a greater extent. Several studies have been conducted in carnivorous fishes by many authors (Albriksen et al., 2003., Kim et al., 2000., Gunasekara et al., 2002., Davis et al., 2002., Cho et al., 2001, Grisdale Helland
Fish consume feed to satisfy their energy needs (Koushik and Loquet, 1990) and if the diets are not balanced with an adequate supply of non-protein energy the dietary protein may be catabolized for energy. Among all the animal food provided to *C. catla* and *C. mirgala* the range of net conversion efficiency denoted between 43.13 to 65.2% and 17.56 to 33.02% respectively. Among the all animal matter (chicken viscera) provided to *Cyprinus carpio* the range of conversion efficiency denoted (1.86%) by Purey and Masten (2007). The present investigation stressed the research strategies that would enable the fish farmers to gain access and information needed for them to adopt better nutrition and enhance the result in profit maximizations.

References


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### Table - 1: Overall energy budget of *C. catla* and *C. mirgala* fed on four different types of animal food for a period of 30 days. All values are expressed as mg dry wt/gm live fish/day

<table>
<thead>
<tr>
<th>Experimental fishes</th>
<th>Food given</th>
<th>Consumption rate</th>
<th>Absorption rate</th>
<th>Conversion rate</th>
<th>Metabolic rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>mg dry wt./g live fish/day</td>
<td>mg dry wt./g live fish/day</td>
<td>mg dry wt./g live fish/day</td>
<td>mg dry wt./g live fish/day</td>
</tr>
<tr>
<td><em>C. catla</em></td>
<td>Frog thigh muscle</td>
<td>0.0051 ± 0.0007</td>
<td>0.0022 ± 0.0006</td>
<td>0.0013 ± 0.0031</td>
<td>0.0021 ± 0.025</td>
</tr>
<tr>
<td></td>
<td>Goat liver</td>
<td>0.0071 ± 0.0006</td>
<td>0.0036 ± 0.0003</td>
<td>0.0018 ± 0.0050</td>
<td>0.0038 ± 0.017</td>
</tr>
<tr>
<td></td>
<td>Egg white</td>
<td>0.0071 ± 0.0001</td>
<td>0.0036 ± 0.0003</td>
<td>0.0026 ± 0.0068</td>
<td>0.0040 ± 0.022</td>
</tr>
<tr>
<td></td>
<td>Earthworm</td>
<td>0.0115 ± 0.0006</td>
<td>0.0075 ± 0.0005</td>
<td>0.0030 ± 0.0098</td>
<td>0.0082 ± 0.025</td>
</tr>
<tr>
<td><em>C. mirgala</em></td>
<td>Frog thigh muscle</td>
<td>0.0059 ± 0.0008</td>
<td>0.0029 ± 0.0001</td>
<td>0.0019 ± 0.0030</td>
<td>0.0025 ± 0.035</td>
</tr>
<tr>
<td></td>
<td>Goat liver</td>
<td>0.0074 ± 0.0005</td>
<td>0.0023 ± 0.0003</td>
<td>0.0013 ± 0.0074</td>
<td>0.0029 ± 0.045</td>
</tr>
<tr>
<td></td>
<td>Egg white</td>
<td>0.0109 ± 0.0001</td>
<td>0.0059 ± 0.0003</td>
<td>0.0036 ± 0.0070</td>
<td>0.0068 ± 0.005</td>
</tr>
<tr>
<td></td>
<td>Earthworm</td>
<td>0.0120 ± 0.0006</td>
<td>0.0079 ± 0.0003</td>
<td>0.0035 ± 0.0071</td>
<td>0.0010 ± 0.007</td>
</tr>
</tbody>
</table>

### Table - 2: Absorption and net conversion efficiency of *C. catla* and *C. mirgala* fed on animal food. All the values are expressed in %

<table>
<thead>
<tr>
<th>Food given</th>
<th>Absorption efficiency (%)</th>
<th>Net conversion efficiency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental fishes</td>
<td><em>C. catla</em></td>
<td><em>C. mirgala</em></td>
</tr>
<tr>
<td>Frog thigh muscle</td>
<td>43.13</td>
<td>49.15</td>
</tr>
<tr>
<td>Goat liver</td>
<td>47.88</td>
<td>31.08</td>
</tr>
<tr>
<td>Egg white</td>
<td>50.70</td>
<td>54.12</td>
</tr>
<tr>
<td>Earthworm</td>
<td>65.2</td>
<td>65.83</td>
</tr>
</tbody>
</table>


