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Research Article

FOOD PREFERENCE IN CATFISH, *HETEROPNEUSTES FOSSILIS*

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ABSTRACT
Food preference in air-breathing catfish, *Heteropneustes fossilis* (Bloch) was examined. For this, two types of food were given to the fishes, one was live food of earthworms and other was formulated food. Our findings indicate that catfish prefer live food i.e. earthworms as compared to formulated food, as increase in body weight was observed in fishes where they were offered live food. The formulated food was supplemented with good ingredients like fish meal, processed soybean; mineral premix etc. still catfish does not show any good preference on feeding that.

Keywords: *Food Preference, Catfish, Earthworms, Formulated Food*

INTRODUCTION
The different species of catfish are widely distributed in Assam, Maharashtra and M.P. Catfish found in different rivers like Chambal River and Brahmaputra. *Heteropneustus fossilis, Clarias batrachus* and *Mystus vittatus* are the species of catfish found all across India. Food plays an important role in determining the abundance of population, rate of growth and condition of fish and it is also the main source of the energy. A study of the food habits of catfish was carried out in the agro climatic condition of the Brahmaputra river system in Assam, Northeastern India between 1981 and 1987.
The most common source of protein for aqua feeds is fish meal. However, cost of the meal is on the rise, because of its competing use as feed ingredients by other animals. A large number of indigenous raw materials mainly poultry by product meals, blood meal, various oil cakes, cereal by products, leaf meals etc. are available in the country. These raw materials can be used in developing supplemental feed for rearing and culture of different fish species. Catfish production is one of the many challenges faced by those interested in promoting industrial production of the emerging marine and fresh water species. In spite of huge efforts to use artificial feeds, the culture of fish larvae during the primary nursing ways still depend heavily on natural feed. There is dearth of information on nutrition in early stage growth of hybrid cat fish. In fish larvae, yolk provides nutrition during embryonic development and early ontogenesis. Larval nutrition and live feed culture like Artemia and rotifers is one of the most important and obligatory matter for successful fish culture.
Fish feed on a wide range of food material and obtain their nourishment from natural food. Live feeds are feeds which consist of living organism that can be active or inactive formulated diets are feeds which are combined together from different nutrients so as to be richer in nutrients. Time of feeding and feeding frequency has been reported to affect feed intake and growth performance in Indian catfish. Workers have also used animal source such as poultry by product, meat and bone meal with favorable result in some cases. The importance of using combined live feed and formulated diets lie mainly in supplying a more suitable and well balanced diets to fish larvae in a digestive form. Not only is reproduction controlled, but the survival of hatchlings in maximized through adequate care and management.
The use of earthworm has also been documented in fish farming. Earthworms are abundant in most parts of India and their nutritional values have been determined. According to Hyatt (1979), the first few months of the life are most critical for the survival of juvenile fish. Presently, most hatcheries are trying to make use of live zooplankton to meet the challenge of feeding fish hatchlings. For the good result of fish production, good quality artificial feed is essential and requires protein level of 35 to 45% in feed (Degani *et al.,* 1989). Feeding with live prey for fish are most essential because during first few days of their life they have no complete develop digestive tract, especially their digestive enzymes. Various ingredients such as lumbricid worms' krill, silk worm pop powder, etc. have been incorporated into fish feeds to act

as feed attractants or feeding stimulants. Stafford and Tacon (1985) showed that replacing fishmeal with earthworm meals at low level of inclusion in the diet for rainbow trout did not have any adverse effect on the growth performance or feed utilization efficiency of the species. Optical feeding frequency may vary depending on species, age, size, environmental factor and husbandry and feed quality. This work investigates the feasibility of using earthworms as feed in diet of catfish, *H. fossilis*.

MATERIALS AND METHODS

Diet Formulation: Diet formulation was done by following the procedure of Jana *et al.,* (2012). Formulated food is prepared through ingredients easily available in Market. A mechanical pelletizer was used and 0.5mm thicker pellets were obtained which then dried in oven (60-62 ˚C) before using in feeding trials. Composition and proximate analysis of experimental diet were reported in Table 1. The dry pellets were stored in freezing at -20˚C until being feed.

Table 1: Formulation of the Experimental Diet

Ingredients	Formulated Diet (g kg^{-1})
Groundnut oil cake	650
Rice bran	26.23
Wheat flour	26.23
Fish meal	200.00
Processed full fat soybean	60.00
Cod liver oil	17.54
Mineral premix with amino acid (MPA)[a]	10.00
Cr2O3	10.00

[a] Each kg containing: copper 312 mg, cobalt 45 mg, magnesium 2.114 g, iron 979 mg, zinc 2.130g, iodine 156 mg, DL-methionine 1.920 g, L-Lysine mono hydrochloride 4.4 g, calcium 30%, phosphorus 8.25%.

Table 2: Proximate Analysis (% Dry Weight Basis) of Experimental Diet

Ingredients	Formulated Diet
Dry matter	91.67±1.2
Crude protein	40.12±0.9
Crude fat	7.19±0.6
Crude fibre	4.68±0.9
Ash	11.67±1.5

All the vales are mean ±S.E of mean.

Experimental Design

Experimental Animals:

Catfish: Experimental catfish *H. Fossilis* were obtained from a Government fish seed farm, Jhajjar Haryana (India). Prior the start of the experiment, they were acclimated to the experimental condition in laboratory for 2 weeks. At the beginning of experiment, fingerlings (Mean body weight 4.25and 4.11) were randomly distributed @ 5 fish in aquarium 1 and in aquarium 2.

All fish were fed daily twice at 0800 h and in afternoon at 4.00 p.m. The feeding rate being 5% BWd-1 for the whole duration of 15 days. Each group of fish were exposed to their respective diet for 4 hour during each ration, thereafter, the uneaten feed was siphoned out, stored and dried separately for the calculation the feed conversion ratio (FCR). At the termination of experiment, the fish from treatments were weighted individually.

Earthworm: Earthworms were obtained from earthworm production farm, Delhi. Earthworms were placed in the laboratory in a tub. At the beginning of experiment, 2 or 3 earthworm give the fish (aquarium 1) according to 5% of body weight of fish. These earthworms which were taken were of

around 10 cm in length and around 0.35 g in weight. The amounts of earthworms offered were measured daily.

Figure 1: Earthworms (Experimental Live Food)

Figure 2: Aquarium 1 (Live Food)

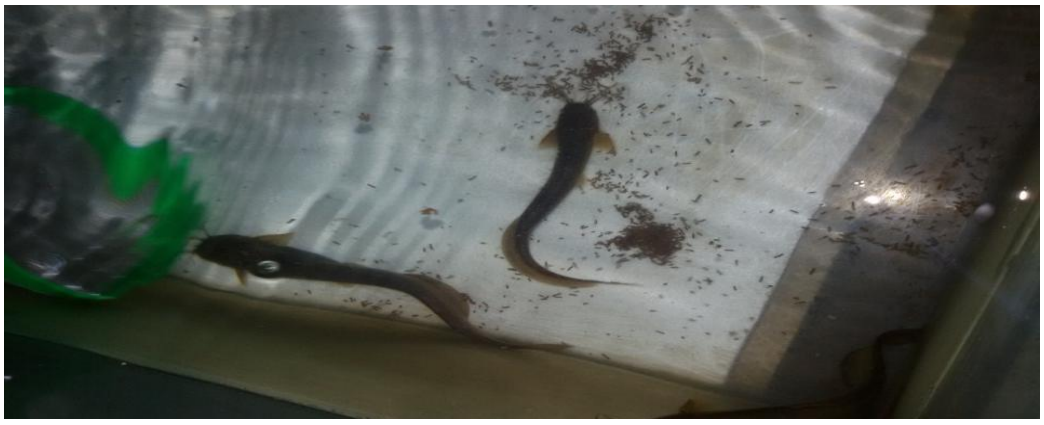

Figure 3: Aquarium 2 (Formulated Food)

Proximate Composition:

Proximate chemical composition of diets and were determined according to AOAC (1995).

Growth Performance:

Growth performances were calculated according to Sevier *et al.*, (2000) by following equation:

Weight gain= Final weight-Initial weight

Final weight – initial weight

$$\text{Growth (\%) gain in Body weight} = \frac{\text{Initial weight}}{\text{Initial weight}} \times 100$$

$$\text{Specific growth rate} = \frac{Ln\ (\text{Final weight}) - Ln\ (\text{Initial weight})}{\text{Experimental periods in days}} \times 100$$

$$\text{Protein efficiency ratio (PER)} = \frac{\text{Fish wet weight gain (g)}}{\text{Protein intake (g)}}$$

Feed Utilization: Feed utilization was determined by feed conversion ratio (Sevier *et al.*, 2000) as the following

$$\text{Food conversion ratio} = \frac{\text{Feed given (dry weight)}}{\text{Body weight gain (wet weight)}}$$

Survival Rate: Survival rate was estimated (Sevier *et al.*, 2000) as the following

$$\text{Survival rate (\%)} = \frac{\text{Number of fish that survived}}{\text{Number of fish stocked}} \times 100$$

ANOVA followed by Turkey HSD test was applied to assess the significance of the differences among treatments.

RESULTS AND DISCUSSION

Earthworm served as an excellent live feed for Fingerlings of Catfish in our experiment. The results of the growth performances, food conversion efficiency of catfish are presented in Table 2. Further 100% survival rate was observed in two groups.

There was increase in weight 5.23g of fish in aquarium where fishes were offered earthworm, as live food. Hence, present finding indicates that live food significantly increased the growth performances of catfish.

Growth (% gain in body weight) of fish in this study was significantly affected by live food. FCR values also differ significantly between the groups, where fish fed on diet containing formulated food and fish feed on diet containing live food. Protein efficiency ratios are noticeably different between treatments and supported the same trend. These results demonstrated that catfish grow fast in presences of live food.

SGR value (2.051±0.02) and PER (0.024±0.03) also recorded to be increased in group where fishes received live food as compare to fish received formulated food respectively.

The FCR value was recorded 0.6±0.02 in fish feed on live food as compare to 0.783±0.05were fed on formulated food Table 3.

Live feeds are feeds which consist of living organism that can be active or inactive. They are palatable to fish and allows for better digestibility (Kolkovski, 2001). Earthworms can be produced by many methods, but especially interesting is the use of organic matter from agricultural activities (Tian *et al.*, 1997; García and Fragoso, 2003), animal waste (Edwards *et al.*, 1978) and kitchen waste (Manh *et al.*, 2009). The survival was significantly higher in larvae fed live food than in larvae fed the three formulated diets. (Stafford and Tacon, 1985) showed that replacing fishmeal with earthworm meals at low level of inclusion in the diet for rainbow trout did not have any adverse effect on the growth performance or feed utilization efficiency of the species.

Studies have shown considerable success in partial or total replacement of FM with SBM in diets for many fish species *Clarias batrachus and Carassius auratus,* (Rani, 2014-15). It was reported that the earthworm contains 60-70% protein and high in essential amino acid compared with meat or fish meal. Earthworm powder-based also contains 6-11% of fat, 5-12% of carbohydrate and 2-3% of minerals and various types of vitamins.

The effect of diet on fish growth depends on several factors including first species, developmental stage, environmental condition and nutrient and energy level in feeds. Good nutrition is a factor for proper growth of fish and is more pronounced with fish in enclosure as they need adequate nutrition (Omoruwou and Edem, 2011).

Many factors are known to influence fingerling prey selection within the restrictions imposed by ontogenetic development. These include prey characteristics such as size, density and motion and also fingerlings characteristics related with trophic level such as sensory capabilities, experience, mouth dimensions, mouth gape and body size and species type (Truemper and Lauer, 2005; Sánchez- Hernández and Cobo, 2012). Most first-feeding fish larvae are dependent upon vision for prey detection, although non-visual senses have also been implicated in prey detection by selective planktivorous fish larvae. Many studies concentrate on the relationship between prey size and mouth size as the primary determinant of prey selection (Dabrowski, 1984; Riley *et al*., 2012).

Table 3: Show Live Weight Gain, Growth % Gain Rate, Specific Growth Rate (SGR), Feed Conversion Rate (FCR), Protein Efficiency Ratio (PER)

Parameters	**Aquarium 1 (Live Food)**	**Aquarium 2 (Formulated Food)**
Initial weight	4.26	4.11
Final weight	5.23	3.94
Live weight gain	0.974	-0.178
Growth % in body weight	22.19±0.01	-4.14±0.02
Specific growth rate (SGR)	2.051±0.02	-0.282±0.03
Feed conversion rate (FCR)	0.6±0.02	0.783±0.05
Protein efficiency ratio(PER)	1.62±0.04	-0.45±0.05
Survival rate	100%	100%

All the values are mean ±S.E of mean.

Conclusion

In present findings catfish prefer live food (earthworms) as compared to formulated food. As catfish *H. fossilis* is carnivore in nature hence accordingly it prefers its food. Hence, the information on food preference of catfish, *H. Fossilis* is essential to bring this species under culture.

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