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GROSS CONVERSION EFFECIENCY (GCE) OF *LABEO ROHITA* FED ON FORMULATED FEED

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ABSTRACT
The primary objective of fish production is to produce a marketable product for maximum profit. This involves a continuous effort to reduce feed cost, while trying to maintain fish health, feed efficiency and growth. In current aquaculture, commercial feeds are often formulated to contain a slightly higher level of nutrient than required by the species for maximum growth. The extra nutrients are added to feeds to insure that the requirement for maximum growth is fulfilled. The present investigation is carried out to evaluate nutritional efficiency in terms of Gross Conversion Efficiency (GCE) in freshwater fish *Labeo rohita* fed on different combinations of formulated feed. Earthworm species and deoiled groundnut cake was used to formulate the feed in various combinations that is from 100% earthworm formulated feed to 100% conventional feed that is deoiled groundnut cake feed. The faecal matter was collected, dried on Filtron filter paper 201 (12.5 cm) and weighted.Simulteneously the body weights are also recorded for selected time intervals. The fishes fed on formulated feed were having highest SGR and GCE values than conventional feed.

INTRODUCTION

The cost of feeding fish takes about 60% or two third of the total operational cost in fish farming (Lovell, 1981; NRC, 1983; Niamat and Jafri, 1984; Akiyama, 1988).This has been a major factor affecting the development and expansion of aquaculture enterprise in India. The success of fish farming depends invariably on provision of suitable and economical fish feed. A survey of fish farms shows 86% of fish farms do not practice standard supplementary feed due to high cost of production (Eyo, 1995). The quest to reduce the quantity of fish meal while maintaining the protein quality in fish feed has been the focus of fish nutritionists. Several studies on replacing fish meal with plant protein (Lim and Dominy, 1990; Shiau *et al.,* 1990) and other animal sources have also been attempted such as mussels (Guerrero, 1982), crabs and frogs (Smith *et al.,* 1988), lizard (Faleye 1992; Fagbenro, 1993), periwinkle (Akegbejo, 1999) and blended poultry meat meal (Sadiku and Jauncey, 1995).

Gross conversion efficiency (GCE) is often used as an indicator of the bioenergetic physiology of fish under different experimental conditions. This parameter measures the growth rate relative to feed intake of the fish. Both growth rate and feed intake are related to body size. Modeling biomass flow in aquatic ecosystem indicates knowledge of conversion efficiency from one tropical level to another. Small fishes have higher relative feeding rate than large fishes and therefore have greater potential impact on the ecosystem in terms of food consumed or biomass produced per unit biomass of feed.

MATERIALS AND METHODS

Choice of ingredients to be used in feed formulation should be based on qualities such as protein content, energy level, types of amino acids etc. Since fish feeds contain high protein levels, protein sources are key ingredients. Protein is the main constituent of the fish body and animal sources are always higher in proteins than plant; hence earthworm species *Eisenia foetida* are selected as raw material in feed formulation. The other ingredients such as milk powder, corn flour, eggs, cod liver oil, vitamin mixture containing vitamin B Complex and E, agar powder, garlic paste, pepper powder and cumin powder are incorporated for their nutritional properties.

Formulation of fish feed

Earthworms of about 80 g were collected from vermiculture centre, brought to laboratory, washed and cleaned using blotting paper. They were sacrificed by introducing them in boiling water and squashed using mortar and pastel. Ingredients such as milk powder (60g), corn flour (20g), and eggs (70g) were added and mixed well. Agar powders (4g) were added as binding agent; turmeric, pepper and cumin powder (each of 0.5g) and garlic paste (1g) were added as antibiotics. Cod liver oil (3.5 mL) and vitamin mixture of B and E (each of 1g) were added. Ingredients in semisolid form were kept under refrigeration for 12 hr. Then they were squeezed over polythene sheet and dried at room temperature for 48 hr. The dried nodules were crushed into small pellets. Pellets were sun dried to avoid fungal infection and stored in the bottles, used as and when required. Based on above procedure, all feeds are formulated in the percentage composition of 25% (earthworms 25% and groundnut oil cake 75%), 50% (half the earthworm and half the groundnut oil cake), 75% (earthworm 75% and groundnut oil cake 25%) and 100% formulated (totally of earthworms). Control set was maintained by feeding fishes with 100 % conventional feed *i.e.* of deoiled groundnut oil cake.

Experimental set up

The fingerlings of freshwater fish *Labeo rohita* were brought to laboratory from government fish seed rearing centre and acclimatized for one week in glass aquaria. During acclimatization adequate aeration and temperature was maintained. The fingerlings were randomly distributed at the rate of 25 fishes per aquaria. The fishes from each tank were weighted and recorded as initial weight before setting the experiment. Thus the average initial weights in each tank were recorded. The experiment was conducted by feeding the fingerlings at the rate of 5% of body weight. The feeding was carried out once in a day. After every twenty four hour, the faecal matter of the fish was siphoned out. The collected faecal matter was filtered by using Filtron filter paper 201 (12.5 cm), air dried and weighed. The body weights of fishes were recorded at selected time intervals from each aquarium. The SGR, RFI and GCE values were obtained by taking into account weights and faecal matter of experimental fishes.

GCE (K) is often used as an indicator of the bioenergetic physiology of fish under different experimental conditions instead of determining complete energy budget. This parameter measures growth rate relative to feed intake of the fish. Both growth rate and feed intake are related to body size. GCE is described by the equation:

$$GCE = \frac{SGR}{RFI} \times 100$$

Where,

SGR is Specific Growth Rate which is calculated by:

$$SGR = \frac{\log (Wt_2) - \log (Wt_1)}{t_2 - t_1} \times 100$$

RFI is Relative Feed Intake which is calculated by

$$RFI = \frac{F}{0.5 \times (W t_2 - W t_1)(t_2 - t_1)} \times 100$$

Where, log Wt_1 _ natural log of the weight of the animal at initial time

Wt_2 _ natural log of the weight of the animal at final time

Statistical analysis: Differences between the mean test groups were established by analysis of variance (By One Way ANOVA).

Table 1: The values of Specific Growth Rates (SGR) of experimental fishes fed on different combinations of feeds were as follows

Number of days	100%Conventional fish feed	100%Formulated fish feed	75%Formulated Fish feed	50%Formulated fish feed	25%Formulated fish feed
30	0.1200	0.2183	0.1276	0.1650	0.2860
45	0.1691	0.1713	0.1435	0.1700	0.2784
60	0.1925	0.2333	0.1411	0.2163	0.2346
75	0.2076	0.2198	0.1434	0.2232	0.2332
90	0.2304	0.2317	0.1500	0.2306	0.1995

Table 2: The values of Relative Feed Intake (RFI) of experimental fishes fed on different combinations of feeds were as follows

Number of days	100%Conventional fish feed	100%Formulated fish feed	75%Formulated fish feed	50%Formulated Fish feed	25%Formulated fish feed
30	1190.83	630.53	920.95	649.83	530.77
45	544.41	331.90	530.39	411.44	426.44
60	342.51	270.73	394.82	227.76	277.19
75	241.36	223.34	303.18	213.43	211.94
90	171.20	166.43	174.35	157.28	202.748

Table 3: The values of Gross Conversion Efficiency (GCE) of experimental fishes fed on different combinations of feeds were as follows

Number of days	100%Conventional fish feed	100%Formulated fish feed	75%Formulated fish feed	50%Formulated Fish feed	25%Formulated fish feed
30	0.0001	0.0003	0.0001	0.0002	0.0005
45	0.0003	0.0003	0.0002	0.0004	0.0006
60	0.0005	0.0008	0.0003	0.0009	0.0008
75	0.0008	0.0009	0.0004	0.0010	0.0009
90	0.0013	0.0014	0.0006	0.0013	0.0011

Table 4: Statistical values of Mean and SD of GCE

Type of formulated feed	30days	45days	60days	75days	90days
Conventional feed 100%	0.0003 ± 0.000158	0.00034 ± 0.000114	0.00054 ± 0.000114	0.0006 ± 0.000158	0.00118 ± 0.00013
100% formulated	0.00042 ± 0.00013	0.00044 ± 0.000152	0.00068 ± 0.00013	0.00078 ± 0.00013	0.00124 ± 0.000089
75% formulated	0.00022 ± 0.00013	0.00034 ± 0.000114	0.0005 ± 0.000155	0.00054 ± 0.000114	0.0006 ± 0.000071
50% *Formulated*	0.00032 ± 0.00013	0.00044 ± 0.000114	0.00078 ± 0.00013	0.00112 ± 0.000113	0.00136 ± 0.000114
25% *Formulated*	0.00054 ± 0.000114	0.00044 ± 0.000114	0.00068 ± 0.00013	0.00078 ± 0.00013	0.00126 ± 0.00013

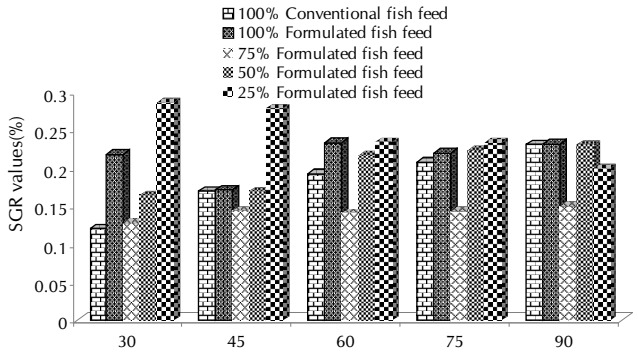

Figure 1: Graphical presentation of the SGR values of experimental fishes

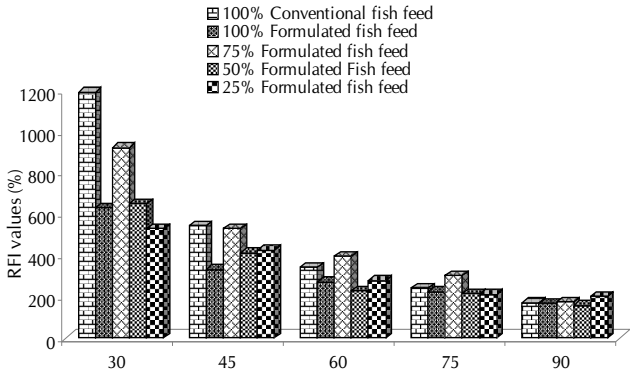

Figure 2: Graphical presentation of the RFI values of experimental fishes

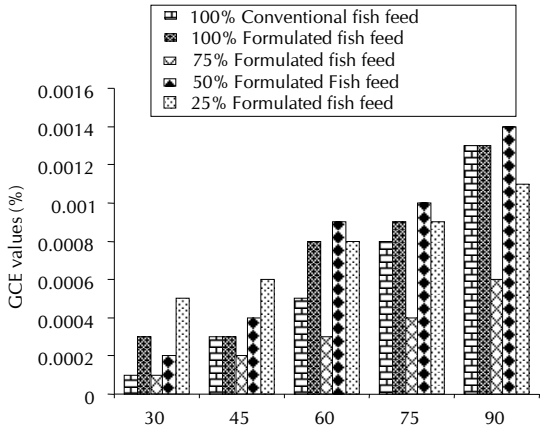

Figure 3: Graphical presentation of the GCE values of experimental fishes

RESULTS AND DISCUSSION

Feed is considered as an important ecological factor influencing the population dynamics in fishes. One of the essential prerequisite for the successful management of fish culture programme is a comprehensive understanding of feeding (Halve, 1972).The increase in cost and demand of feed protein from conventional resources necessitates fish culturists of the developing countries to incorporate cheap and locally available ingredients in fish feeds. Nutritionists have studied growth and nutritional parameters in order to enhance better understanding of production process both in nature and in culture practices (Brett, 1979).

Present study reveals that the experimental fishes fed on formulated feeds were having high SGR *i.e.*0.2860% and GCE, 0.0014g values as compared to conventional feed *i.e.* SGR is 0.2304% and GCE is 0.0013g. The values of GCE of experimental fishes are statistically highly significant (pd"0.0001) for all the feeds.

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