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FEED CONVERSION RATIO OF MAJOR CARP, *CIRRHINUS MRIGALA* FINGERLINGS FED ON SOYBEAN MEAL, MAIZE AND MAIZE GLUTEN

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ABSTRACT

A six week experiment was conducted in aquaria to evaluate the feed conversion ratio (FCR) of major carp *Cirrhinus mrigala* fingerlings fed on soybean meal (43.50% protein), maize (9.00% protein) and maize gluten (54.72% protein). The ingredients were supplied at the rate of 4% of wet body weight of fish twice a day. The fish gained the highest average body weight (0.900 ± 0.05g) on soybean meal, followed by maize gluten (0.543 ± 0.02g) and maize (0.421 ± 0.02g). FCR calculated for three treatments was the highest for maize (3.36), while for soybean meal it was the lowest (1.70). The correlation between average body weight and FCR was significantly positive in case of soybean meal (r=0.801) and maize gluten, whereas in case of maize, the correlation was non-significantly negative (r = -0.518).

Key words: Major carp, soybean meal, maize, maize gluten, FCR

INTRODUCTION

The feed conversion ratio (FCR) is an appropriate way to judge the acceptability and suitability of artificial feed for fish. The information of FCR on locally available ingredients will provide the basis to develop acceptable fish feed. The FCR has also been termed as food quotient or food coefficient. The FCR values of various fish feed ingredients for *Cirrhinus mrigala* under controlled conditions have been estimated by many workers (Seema *et al.,* 2002; Shabir *et al.,* 2003; Jabeen *et al.,* 2004). Jhingran (1991) stated that value of feed conversion rate, besides depending upon the nutrient contents of feed, varies with method of presentation of food to the fish, environmental factors (such as temperature, dissolved oxygen) and size of fish. He further reported that no reliable data had been obtained on the rate of conversion of supplementary feed into fish flesh.

Keeping in view the importance of FCR in formulation of fish diet, the present study was carried out to evaluate the feed conversion ratio (FCR) for major carp *Cirrhinus mrigala* fingerlings by feeding on three locally available feed ingredients, i.e. soybean meal, maize and maize gluten.

MATERIALS AND METHODS

The experiment was performed to evaluate the FCR of major carp *Cirrhinus mrigala* fingerlings fed on soybean meal (43.50% protein), maize (9.00% protein) and maize gluten 60% (54.72% protein). The experiment lasted for 6 weeks. Fingerlings of *Cirrhinus mrigala* were collected from Government Fish Seed Hatchery, Faisalabad. These fingerlings were kept in cemented tank for acclimatization during which fingerlings were fed with rice polishing.

The experiment was run in six glass aquaria, each having working dimension of 60 x 44 x 44 cm. Each aquarium was filled with water up to 25 cm and the level was maintained throughout the study period.

After acclimatization, 15 fingerlings weighing 0.31 ± 0.05g on the average were randomly stocked in each aquarium. Two replicates were followed for each treatment. The feed was supplied twice a day at the rate of 4% of wet body weight of fingerlings. Dissolved oxygen and pH of water was maintained by changing water daily and by using air pump. The water temperature during the study period ranged between 24 and 26°C.

Fingerlings were taken from each replicate on weekly basis for recording body weight and total body length. The mean weight of fingerlings in each aquarium was calculated to workout the feeding rate for the next week. The FCR was worked out.

The data on body weight, body length and feed conversion ratio were subjected to statistical analysis by using statistical packages Minitab, MSTAT, SPSS. The comparison of mean values of various parameters were made by Duncan's multiple range test according to procedures described by Steel and Torrie (1992).

RESULTS

The body weight and body length of fingerlings in all three groups increased as the study advanced. At the end of the study, *Cirrhinus mrigala* fingerlings showed the highest body weight (0.90 ± 0.05g) on soybean meal and this was followed by maize gluten (0.74 ± 0.02g) and maize (0.52 ± 0.02g). Trend of mean body weight of three dietary ingredients was the same during different weeks. Similarly, the total length was maximum (2.95 ± 0.05 cm) on soybean meal. The next higher body length attained by fish was on maize gluten (2.80 ± 0.05 cm) and maize (2.45 ± 0.05 cm). The mean of total body length indicated the same trend during different weeks (Tables 1 and 2). The difference in body weight and body length attained by *Cirrhinus mrigala* fingerlings on three ingredients was significant ($P< 0.05$).

The regression lines (Fig. 1 and 2) indicate the trend of body weight gain and increase in total length by *Cirrhinus mrigala* fingerlings on three ingredients. On soybean meal, regression equations for body weight and body length were 0.03354 + 0.939 X and 1.2161 + 0.3018 X, respectively. Although growth rate remained different in different weeks but overall increase was linear (R^2 = 99.71% and R^2 = 98.87%, respectively) in both parameters. Similarly, the linear (R^2 = 97.84% and R^2 = 99.25%) increases under maize followed 0.2846+0.0461 X and 1.25 + 0.1929 X equations for body weight and total body length, respectively. Fish on maize gluten 60% also showed a linear increase (R2 = 98.64% and R2 = 98.50%) with regression equation 0.3429 + 0.0671 X and 1.2643 + 0.27X for body weight and body length, respectively.

Fig. 3 represents the trend followed by FCR values of *Cirrhinus mrigala* fed on three ingredients. The overall average FCR at 6th week was highest for maize (3.36), followed by maize gluten (2.23) and soybean meal (1.70). FCR values of three ingredients during six weeks were statistically different. The correlation coefficient between average body weight and feed conversion ratio of three ingredients was positively significant in case of soybean meal (0.801) and maize gluten 60% (0.718). However, in case of maize (-0.15), the correlation was negative but non-significant.

DISCUSSION

In the present study, the overall growth of *Cirrhinus mrigala* fingerlings remained higher for soybean meal and maize gluten, while the lowest for maize throughout the study period. The higher growth response shown by the fish appears to be due to higher protein contents of soybean meal (43.50% crude protein) and maize gluten (54.72% crude protein). The present results substantiate the findings of Rajbanshi *et al*. (1989), who reported that 45 days old rohu (*Labeo rohita*) fingerlings gave the highest growth rate on diets containing 39.18% protein than diets containing 25.4% protein. Similarly, Salim and Sheri (1999) observed

Table 1: Weekly variations in body weight (g) of *Cirrhinus mrigala* fed on three ingredients

Weeks	Soybean meal	Maize	Maize gluten 60%
-	0.32 ± 0.05o	0.30 ± 0.05p	0.31 ± 0.05op
1	0.44 ± 0.05l	0.31 ± 0.05op	0.41 ± 0.00m
2	0.51 ± 0.05ij	0.36 ± 0.00n	0.50 ± 0.05j
3	0.60 ± 0.05f	0.40 ± 0.05m	0.55 ± 0.05h
4	0.70 ± 0.00d	0.47 ± 0.05k	0.60 ± 0.05f
5	0.81 ± 0.01b	0.52 ± 0.00i	0.67 ± 0.00e
6	0.90 ± 0.00aA	0.57 ± 0.00gB	0.74 ± 0.00cC

Values with different lower case letters within a column and upper case letters within a row differ significantly ($p<0.05$).

Table 2: Weekly variations in body length (cm) of *Cirrhinus mrigala* fed on three ingredients

Weeks	Soybean meal	Maize	Maize gluten 60%
-	1.25 ± 0.050k	1.30 ± 0.00jk	1.25 ± 0.05k
1	1.50 ± 0.00hi	1.40 ± 0.00ij	1.55 ± 0.05gh
2	1.80 ± 0.00f	1.65 ± 0.05g	1.80 ± 0.00f
3	2.05 ± 0.05f	1.80 ± 0.050f	2.00 ± 0.00e
4	2.45 ± 0.05c	2.00 ± 0.00e	2.45 ± 0.05c
5	2.85 ± 0.05a	2.20 ± 0.00d	2.70 ± 0.00b
6	2.95 ± 0.05aA	2.45 ± 0.05cB	2.80 ± 0.05cC

Values with different lower case letters within a column and upper case letters within a row differ significantly ($p<0.05$).

significant effects of high protein diet (50%) on growth performance of *Cirrhinus mrigala* fingerlings, followed by medium (45%) and low protein diets (40%).

As far as the overall FCR is concerned, it was the highest for maize (3.36), followed by maize gluten (2.23) and the lowest for soybean meal (1.70). This means that a greater quantity of maize was required for a unit weight gain of fish, whereas soybean meal was required in lowest quantity. This shows that soybean meal is a more acceptable ingredient for fish as compare to other ingredients. These results are in accordance with those of Das and Ray (1991), who observed that feed conversion ratio increased with decreased dietary protein upto 35%.

The trend of correlation between FCR and average body weight recorded in the present study matches with the results given by Faturoti (1989), who reported that feed intake, protein intake and FCR were positively correlated with average weight gain. Contradictory results were observed by Shabir *et al*. (2003). They observed that the correlation between average body weight and FCR values was significant and negative in case of wheat bran, whereas in case of sunflower meal and maize gluten the correlation was non significant and negative. Similar results were also observed by Seema *et al*. (2002), who observed that the correlation between average body weight and FCR values was non-significant and negative in case of three ingredients viz. rice polish, maize oil cake and rice broken.

Finally, the results of this study lead to the conclusion that soybean meal is more suitable and acceptable ingredient than maize gluten and maize for the better growth of fingerlings of *Cirrhinus mrigala* and this ingredient can be included in the diet of the fish.

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