Ultra Scientist Vol. 25(1)B, 187-191 (2013).

To study the performance of soybean and squilla meal incorporated diet on the fingerlings of *Labeo rohita*

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(Acceptance Date 29th April, 2013)

Abstract

Supplementary feeding plays an important role in achieving higher fish production. Animal by-products constitute the most important ingredients of aquaculture feeds. The most suitable animal product for incorporation into fish diets is fish meal. The processed soybean (as a protein source) and aquatic macrophytes have been known to have potential food value. Squilla (as a another protein source) is valuable animal protein for fishes. In deficiency of natural feed, the supplementary feed is best option to increase economical value of fishes.

Introduction

Animal by-products constitute the most important ingredients of aquaculture feeds. The most suitable animal product for incorporation into fish diets is fish meal. Supplementary feeds, provided in most of aquaculture systems, are still confined to traditional bran–oil cake mixture (Ayyappan and Jena[2]). The processed soybean (as a protein source) and aquatic macrophytes have been known to have potential food value (Edwards[3]). Squilla (as a another protein source) is animal protein for fishes. Two experiments were conducted by Jana *et al*.[5] to investigated that in order to obtain a high yield in milkfish culture system the fish should be fed supplementary diets containing appropriate (40%) protein levels, especially when the stocking rates are high. The Labeo rohita has good food value and economically very important but their culture is ignored by local and government organisations in Varanasi city. There is no sufficient work has been done on comparative effect of variety of supplementary feeds on growth and nutritional value of fishes. Keeping all this in mind the present study has been carried out to ascertain the effect of soybean and Squilla meal incorporated diets on the growth, nutritive value, PER and FCR of the fingerlings of Labeo rohita.

Materials and Methods

Soybean, squilla meal and azolla and alternanthera were used as the feed ingredients with rice bran and groundnut oil cake and wheat flour as binder. The proximate composition of these ingredients were analysed by AOAC[1].

Preparation of experimental diet using different supplementary feeds (Soybean and Squilla meal) with ground nut oil cake and rice bran (Jayaram and Shetty[6]). The materials were then weighted and mixed in three different combinations (test diet I, II, & III) according to square method. Rice bran and ground nut oil cake (1:1) was used as the conventional feed for control.

Fingerlings of Labeo rohita (3.22+0.12g) were acclimatized to laboratory conditions for 10 days by feeding them on the pelleted control feed. Before transferring fingerlings into the aquaria water analysis will be done by the standard methods of APHA. 25 fishes each were stocked in aquarium at three test diets- I, II, III and control diet. The fishes were allowed to starve for 12 hrs. and weighted before the start of the experiments. They were then fed on the respective diets, at the rate of 10% of body weight, in the morning for 45 days.

After 45 days the fish were again allowed to starve for 12 hrs. and weighed. Then the growth, nutritive value and proximate composition of muscles in respect of protein, carbohydrate and lipid were calculated.

Result and Discussion

The proximate compositions of the feed ingredients are analyzed. Groundnut oil cake, the source of protein in the conventional fish feed, contained 44.50% protein. Soybean, squilla meal, azolla and alternanthera also showed high percentage of protein (52.0, 51.7, 28.5 &25.4% respectively) and therefore can be considered fairly nutritive. The ingredients proportion and proximate composition in all the test diets are shown in Table 1. Observations on the growth performance in terms of average weight, growth, specific growth rate, survival, FCR, PER & FCE and nutritive value of Labeo rohita fingerlings, fed with Test Diets are presented in Table 2. Survival rate was more than 90% in all the groups. The average final weight (gm), average live weight gain (%), and specific growth rate (%day $^{-1}$) were better in the fish fed with soybean and squilla meal incorporated diets when compared to control.

Significant differences for weight gain among the control diet and test diet I were observed, but there were no significant difference observed for FCR and PER among the three test diets. Average live weight gain (%), SGR and nutritive value were significantly different between control and test diets I & II. Test diet I has significantly high muscle protein concentration than that of control and test diet II & III. Test diet II has also significantly high nutritive value than control diet but less in comparison to test diet I & II (Table 2). Test diet II has also showed better performance of fingerlings in reference to

Table 1. Ingredient Proportion & Proximate Composition of Test Diets (%)

Ingredients	Control Diet	Test Diet I	Test Diet II	Test Diet III
INGREDIENT PROPOTION (%)				
Rice Bran	46.5	30.0	30.0	30.0
Ground Nut Oil Cake	46.5	30.0	30.0	30.0
Soybean	-	33.0	-	-
Squilla Meal	-	-	33.0	-
Azolla	-	-	-	-
Alternanthera	-	-	-	-
Wheat Flour(As Binder)	5.0	5.0	5.0	5.0
Agrimin	2.0	2.0	2.0	2.0
Proximate Composition of Feeds (%)				
Moisture	7.5	7.2	6.5	7.0
Protein	25.6	30.1	28.6	26.3
Carbohydrate	50.0	40.5	42.1	44.0
Lipid	5.3	5.6	6.8	5.7
Ash	11.6	16.6	16.0	17.0

growth and nutritive value. In all three test diets the growth performance and nutritive value of fish was better on test diet I and II than control. Test diet III has also showed significant changes in terms of growth performance and nutritive value (Table 2). From the observations it is evident that the test diet I is superior in every respect to the other test diet and control diet. Accordingly, the growth of fishes in terms of weight showed correlation with the superiority of feed.

The average weight gain, live weight gain (%) and nutritive values were higher in fish fed with test diets, than in those fed with control diet. Two experiments were conducted by Jana *et al.*[5] studied that in order to obtain a high yield in milkfish culture system the fish should be fed supplementary diets containing appropriate (40%) protein levels, especially when the stocking rates are high. Supplementary feeds, provided in most of aquaculture systems, are still confined to traditional bran-oil cake mixture (Ayyappan and Jena[2]).

Kalla *et al.*[7] have also reported that fish meal can be replaced by soy protein without

Table 2. Growth Parameters & Nutritive Value of Labeo rohita Fingerlings fed with test diets

Parameters	Control Diet	Test Diet I	Test Diet II	Test Diet III
Average Weight (gm) Initial	3.22 ± 0.12	3.22 ± 0.12	3.22±0.14	3.22±0.08
Final	6.40±.028	9.44±0.02	7.32±0.38	7.0±0.16
Gain	3.18±0.16[a]	6.22±0.39[b]	4.10± 0.15[b]	3.78±0.21[c]
Avg. Live Weight gain (%)	98.76 ± 1.5	193.17± 4.6	127.33±3.8	117.39±6.6
Growth (%)	49.69	65.89	56.01	54.0
Specific Growth Rate(% day^{-1})	0.53 ± 0.01[a]	0.87±0.04[a]	0.65 ± 0.02[a]	0.58 ± 0.02[b]
Survival (%)	92	97	96	94
Nutritive Value				
F C R	4.6[a]	3.1[a]	3.6[a]	3.8[a]
P E R	0.86	1.11[a]	1.07[b]	1.06[b]
Proximate Composition of Muscle (%)				
Protein	9.0 ± 0.10	15.52±0.28[a]	13.6±0.20[b]	12.0 ± 0.16[b]
Carbohydrate	12.5± 0.12	18.20± 0.18[a]	17.0±0.15[b]	17.1±0.21[c]
Lipid	2.8± 0.05	8.61± 0.29[a]	8.03±0.11[a]	7.38±0.20[a]

Values of the parameters in each row with different superscripts (a,b,c) differs significantly ($P < 0.05$)

compromising weight gain or feed efficiency in the fry of Mugil cephalus. Rao and Kumar[8] have studied on performance of squilla meal incorporated diet on the juveniles of Labeo rohita.

Sethuramalingam and Haniffa[9] also reported that the fish meal diet rich in protein showed highest specific growth rate in L. rohita fry compared to other plant protein ingredient feeds. Garg *et al.*[4] have also obtained better growth performance in C. mrigala fingerlings fed on autoclaved soybean.

In the present study indicates that incorporation of soybean and squilla meal at high dietary protein level in the traditional rice bran an oil cake diets, would perform well and further studies at higher level of incorporation may reveal the optimum dietery requirement levels of this protein source.

Acknowledgment

The authors are grateful to the DST,

New Delhi for the financial support provided to undertake this study.

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