

Effect of Replacement of Maize Gluten with Rice Bran (5:0 and 1:4) Feed Supplement on Fish Growth in a Composite Culture

Seyyeda Umme Farwa Naqvi¹, Ghulam Abbas^{2,*}, Nasir Ahmd¹, Iftikhar Ahmad¹,
Muhammad Khurram Shahzad³, Sajid Hussain Qamar²

¹Department of Zoology and Fishries University of Agriculture Faisalabad, Pakistan

²Department of Poultry Science, University of Agriculture Faisalabad, Pakistan

³Department of Chemistry and Biochemistry, University of Agriculture Faisalabad, Pakistan

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Abstract This experiment was conducted to evaluate comparative effect of replacement of maize gluten with rice bran feed supplement on fish growth in composite culture. Two earthen ponds, each measuring 30m x 16m x 1.5m (length x width x depth) were stocked with 100 *Labeo rohita*, 50 *Cirrhina mrigla* and 25 *Ctenopharyngon idella*. Pond P1 was provided maize gluten and rice bran with a ratio 5:0 whilst pond P2 was provided maize gluten and rice bran with a ratio 1:4. Average body weight gain, fork length and total length were affected significantly by replacing maize gluten with rice bran. Results indicated that it is better to supplement maize gluten (30% CP): rice bran 1:4 for more yield as compared to maize gluten (30% CP) alone.

Keywords Fork Length, Rice Bran, Maize Gluten, *Cirrhina Mrigla*, *Ctenopharyngon Idella*, *Labeo Rohita*

1. Introduction

Rapid growth in human population forecasting several problems including food shortages, malnutrition and protein deficiency challenges especially that of animal origin. Fish meat is an important dietary animal protein source of high biological value and can significantly contribute and help in alleviating food shortages globally. It is an important source of nutrients as it contains all essential amino acids, essential fatty acids particularly omega-3 polyunsaturated fatty acids, vitamins and minerals especially iodine, phosphorus, potassium, iron, copper in desirable concentrations whilst carbohydrates in a very low level [22,20]. Basic fertility of the water body and supply of supplementary feeds largely affect the fish growth and natural productivity of fishes may be improved provided with supplementary feeds [5].

Species interactions among fishes also important and

suitable selection of fish in composite culture can boost nutrient level [18,21]. Sustainable and successful freshwater fish culture on scientific basis principally depends upon the use of adequate, economically viable and environment friendly artificial feeds. Since the feed costs vary between 40 to 60% of the total managerial expenditure in fresh water fish culture system, provision of artificial feed increases the fish growth and production in the fertilized ponds and results in higher growth rates and yields. It is noted that fish supplemented with more crude protein in feeds showed significantly better growth as compared to that supplemented with low crude protein feeds [1].

Pakistan is enriched with marine and island fisheries resource of a great potential which can participate significantly in human food supply chain [8]. Composite Fish Culture (production of two or more fish species within a particular aquaculture environment) technology is the most sustainable system of fish production in Asian region [3]. Supplemental feeds are used to fortify the natural available diet with extra protein, carbohydrates or lipids. Supplementary feeds are less expensive agricultural or animal by-products used to increase productivity of ponds. Maize bran and rice bran have been used in ponds as feed supplement in many studies (Kadongola 1991; Fitzmmons *et al.* 1999; Veverica *et al.*, 2000) but a little research work has been done to evaluate effects of different supplementary feeding on growth performance of fish in composite culture system. Therefore the present study was designed to envisage the effect of replacement of maize gluten with rice bran (5:0 and 1:4) feed supplement on fish growth in a composite culture.

2. Materials and Methods

Experimental facilities

The experiment was carried out in two earthen ponds, each measuring 30m x 16m x 1.5m (length x width x depth) located at Fisheries Research Farm, University of Agriculture, Faisalabad. To disinfect these ponds and to stabilize pH of water, liming was done with calcium oxide. The inlets of ponds were properly screened with gauze of fine mesh to avoid the entry of any intruder in to or exit of fish from ponds. All the ponds were watered up to a level of 1.5m and this water level maintained throughout the experimental period.

Experimental Fish species

Both ponds were stocked with 100 *Labeo rohita*, 50 *Cirrhina mrigla* and 25 *Ctenopharyngon idella*.

Feeds and feeding

Fishes in treated ponds were supplied with maize gluten (30% CP) and rice bran at a rate of 5:0 and 1:4 daily from May 31, 2007 to November 02, 2007.

Data Recording

At the time of stocking the morphometric characteristics of fish e.g. body weight and total length, recorded and then fishes were released in to their respective ponds samples containing 1/5 fishes of each species were randomly captured after 15 days from these ponds by nylon drag net. Their body weight and total length were recorded and these fishes were then released back in to their respective ponds after morphometric analysis. The growth rate of the cultured species was taken as increase in body weight and total length.

Statistical analysis

The collected data were subjected to analysis of variance (ANOVA) using a Micro Computer IM-PC and means were compared using Duncan's multiple range tests [23]

3. Results

Analysis of variance showed significant differences in body weight gain among fish species in each fortnight

(fourteen days interval) and supplement treatment (Table 1). In pond 1 *Ctenopharyngon idella* gained maximum weight of 76.9g in 11th fortnight, *Labeo rohita* gained maximum body weight of 53.2g during 5th fortnight whilst *Cirrhinus mrigla* gained maximum body weight of 39.5g during 7th fortnight. In pond 2 *Ctenopharyngon idella* gained maximum weight of 72.6g at 9th fortnight, *Labeo rohita* gained maximum body weight of 55.9g during 5th fortnight whilst *Cirrhinus mrigla* gained maximum body weight of 37.3g during 8th fortnight. As regard the increase in average fork length varied significantly (Table 2) from a minimum increase of 2 cm at day 19/10/2007 to maximum increase of 2.9 cm at day 08/09/2007 for *Labeo rohita*, a minimum of 1.2 cm at 11/07/2007 to a maximum of 2.8 cm at 14/06/2007 for *Cirrhinus mrigla* whilst maximum and minimum increase in fork length in *Ctenopharyngon idella* were 1.7 cm at 28/06/2007 and 4.4 cm at day 05/10/2007 respectively in pond1. As well as increase in average fork length in pond 2 is concerned, its minimum and maximum increase for *Labeo rohita* were 1.6 cm at day 22/09/07 and 2.9 cm at date 19/10/2007 respectively. Minimum and maximum increase in average fork length of *Cirrhinus mrigla* was 1.8 cm (05/10/2007) and 2.9 cm (25/07/2007) respectively whilst these values for *Ctenopharyngon idella* were recorded as 1.9 cm (08/08/2007) and 4.5 cm (02/11/2007).

Feed supplements showed a significant effect on average total length of fish species in composite culture (Table 3). Increase in average total length of *Labeo rohita*, *Cirrhina mrigla* and *Ctenopharyngon idella* in experimental pond 1 were a minimum of 1.8 cm (25/07/2007), 1.6 cm (11/07/2007), 1.9 cm(11/07/2007) and maximum 3.2 cm (02/11/2007), 3.6 cm (02/11/2007), and 5.4 cm (19/10/2007) for these species respectively. Increase in average total length of *Labeo rohita*, *Cirrhina mrigla* and *Ctenopharyngon idella* in experimental pond 2 remained a minimum of 1.8 cm (25/07/2007), 1.8 cm (08/09/2007) and 1.8 cm (11/07/2007) and maximum 3.9 cm (02/11/2007), 2.8cm (25/07/2007) and 3.6 cm (02/11/2007) for three fish species respectively.

Table 1. Fortnight increase in weight gain of carps in pond 1 and 2

Fortnight	Wight gain (g)						
	P1			P2			Means
	<i>Labeo rohita</i>	<i>Cirrhinus mrigla</i>	<i>Ctenopharyngodon idella</i>	<i>Labeo rohita</i>	<i>Cirrhinus mrigla</i>	<i>Ctenopharyngodon idella</i>	
14-6-2007	34.2	20.2	55	39.2	30.5	58.5	39.6C
28-6-2007	46.8	26.4	66.5	48.3	32.3	65.6	47.65AB
11-7-2007	39.9	30.8	71.4	43.7	34.2	68.3	48.05AB
25-7-2007	53.2	24.7	75.6	55.9	32.4	69.4	51.87A
8-8-2007	51.9	33.6	70.8	40.1	35.5	60.7	48.77AB
22-8-2007	47.3	39.5	60.4	48.9	32.5	61.3	48.32AB
8-9--2007	40.9	36.3	63.3	51.2	37.3	69.3	49.72AB
22-9-2007	39.2	28.4	50.5	44.2	33.5	72.6	44.73BC
5-10-2007	36.9	26.8	54.4	49.8	32.4	59.9	43.37BC
19-10-007	47.2	34.6	76.9	48.6	36.3	70.6	52.37A
2-11-2007	37.9	37.4	66.7	54.2	29.3	69.5	49.17AB

Table 2. Fortnight increase in Fork length gain of carps in pond 1 and 2

Fork length gain(g)							
P1				P2			
Fortnight	<i>Labeo rohita</i>	<i>Cirrhinus mrigla</i>	<i>Ctenopharygodon idella</i>	<i>Labeo rohita</i>	<i>Cirrhinus mrigla</i>	<i>Ctenopharygodon idella</i>	Means
14-6-2007	2.4	2.8	1.9	1.8	2.6	2.1	2.3BC
28-6-2007	2.9	2.2	1.7	1.7	2.4	2.2	2.183C
11-7-2007	2.4	1.2	2.0	2.1	1.9	2.2	1.967D
25-7-2007	2.8	2.4	2.2	2.4	2.9	2.4	2.52ABC
8-8-2007	2.7	1.9	1.8	1.9	2.4	1.9	2.1CD
22-8-2007	2.2	1.8	2.9	2.2	2.2	2.3	2.267BC
8-9--2007	2.9	2.1	3.4	1.8	1.9	2.1	2.367BC
22-9-2007	2.2	2.2	3.9	1.6	2.5	2.2	2.43BB
5-10-2007	2.7	2.3	4.4	1.9	1.8	2.8	2.65AB
19-10-007	2.0	1.8	3.8	2.9	1.9	2.9	2.55ABC
2-11-2007	2.4	2.1	3.2	2.6	2.9	4.5	2.95A

Table 3. Fortnight increase in Total length gain of carps in pond 1 and 2

Total length gain (g)							
P1				P2			
Fortnight	<i>Labeo rohita</i>	<i>Cirrhinus mrigla</i>	<i>Ctenopharygodon idella</i>	<i>Labeo rohita</i>	<i>Cirrhinus mrigla</i>	<i>Ctenopharygodon idella</i>	Means
14-6-2007	1.9	1.9	2.2	2.4	2.1	2.2	2.12C
28-6-2007	2.2	2.5	2.1	2.2	1.9	2.4	2.22BC
11-7-2007	2.3	1.6	1.9	2.1	2.4	1.8	2.02C
25-7-2007	1.8	2.2	2.2	1.8	2.8	2.3	2.183C
8-8-2007	2.6	2.1	2.4	2.4	1.9	2.2	2.267BC
22-8-2007	2.4	3.2	2.9	1.9	2.6	1.9	2.48BC
8-9--2007	2.0	2.4	2.6	2.1	1.8	2.4	2.22BC
22-9-2007	1.8	1.9	3.4	2.0	2.4	3.2	2.45BC
5-10-2007	3.0	2.4	3.8	3.4	1.8	2.9	2.88AB
19-10-007	3.2	2.0	5.4	3.2	2.2	3.2	3.2A
2-11-2007	3.2	3.6	4.0	3.9	2.4	3.6	3.45A

4. Discussion

All the organisms are influenced by their surroundings. The surroundings consist of several physiochemical and biological components. The most important influencing factor in aquatic ecosystem on growth of organisms is feeding. Supplementary feeding nourishes fish with the additional proteins and good carbohydrates, which results in better weight gain [11]. The growth rate is a good tool to check the acceptability of supplementary feed in fish feeding experiments [2,10]. Supplementary feeding may enhance carrying capacity of culture systems by several folds [12,16,17]. In the present study, the average maximum fortnightly weight gain was highest of *Ctenophayrmon idella* (76.9g) in Pond 2 which was provided with maize gluten and rice bran in 1:4 ratio, at 11th fortnight e.g. 19-10-2007. Results are in accordance with the findings of Diana *et al.* [6] and Khan *et al.* [15] who reported more weight gained response in fish provided rice bran as compared to other feed supplements. The maximum weight

gain of *Labeo rohita* was recorded in the month of July during 4th fortnight (53.2g). Maximum weight gain of *Cirrhinus mrigala* was recorded in the month of August during 6th fortnight (39.5g), whilst maximum weight gain of *Ctenopharyngodon idella* was recorded in the month of October during 11th fortnight (76.9g). These findings are in accordance with the findings of Hussain *et al.* [9] who investigated that duration had significant impact on growth performance of fish in terms of weight, fork length and total length increments.

During June to August the pond water temperature ranged between 26°C and 33°C might be suitable for the growth of *Labeo rohita* and *Cirrhinus mrigala*. At these temperatures fish fed extensively on natural and supplementary feeds [4]. Similar results are also reported by Rashid (1985) that fish activities including growth and development greatly depends on temperature. Growth potential of *Ctenopharyngodon idella* is higher than indigenous species i. e. *Labeo rohita* and *Cirrhinus mrigala*. Kanak [14] reported that in polyculture of exotic carps, silver carp performed the highest mean

length and weight gain (30.7 cm and 513.0g). Indigenous species have approximately similar growth potential. The results of the present investigation also revealed that fortnights exerted significant effect on weight gain, fork length gain and total length gain of fishes. During the comparative study of ponds maximum gain obtained in P2 which was provided with maize gluten and rice bran in 1:4 ratio.

Supplementary feed: maize gluten and rice bran in 1:4 ratio, showed significant effect on average weight, average fork length and average total length of fish species in composite culture. Hossain et al. [6] investigated significant highest production of fish from rice bran + mustard oil cake supplemented feed [7]. Better performance of fish species fed on supplementary feeds with higher crude protein was also reported by Joshi *et al.* [13] and Sunder *et al.* [24]. The results of the present study revealed that it is better to supplement maize gluten (30%) and rice bran 1:4 in order to maximize the production of composite fish culture. These results have significant practical importance in encouraging and maximizing the production of composite fish culture with the use of supplementary feeding to enhance the production potential. These findings can support fish farmers and in terms can improve the economics of the fish farming sector.

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