



RESEARCH ARTICLE

Effect of Feed Supplementation in Growth Response of Carps under the Influence of Ammonium Nitrate

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ARTICLE INFO

Received: August 26, 2012
Revised: August 28, 2012
Accepted: September 05, 2012

Key words:

Growth performance
Maize gluten
Organic fertilizer
Rice polish

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ABSTRACT

The experiment was planned to observe the growth response of carps towards rice polish and maize gluten supplementation in ammonium nitrate fertilized ponds. Two earthen ponds were selected and each pond was stocked with 15 Silver carp (*Hypophthalmichthys molitrix*), 25 Rohu (*Labeo rohita*) and 15 Mori (*Cirrhinus mrigala*) with a total number of 55 fishes. Pond 1 was treated with ammonium nitrate and rice polish while pond 2 was treated with ammonium nitrate and maize gluten. Total net fish production of pond 1 and pond 2 was remained 1104.3 and 1374.2 kg/ha/year, respectively. Gross fish production/ha/year of *Hypophthalmichthys molitrix*, *Labeo rohita*, *Cirrhinus mrigala* was 1163.9 kg and 1424.0 kg in pond1 and pond 2. The physico-chemical parameters were measured on weekly basis. Temperature, pH, light penetration and planktonic biomass showed non-significant relationship. Pond 2 which was treated with ammonium nitrate and maize gluten showed 2.69 times greater fish growth than pond 1 which was treated with ammonium nitrate and rice polish.

Cite This Article as: Nazish N, M Noureen, A Mateen and S Abdullah, 2012. Effect of feed supplementation in growth response of carps under the influence of Ammonium nitrate. *Inter J Vet Sci*, 1(1): 17-20. www.ijvets.com

INTRODUCTION

Pakistan being located on the tropics falls under arid and semi-arid climatic regions with scarce and irregular rainfall. Much of the land and ground water of the country is affected with high level of salinity. Such areas can be used for pond fish culture. The establishment of fish pond not only provides fish meat but also act as a tool for rehabilitation of soil of areas through flushing (Payne *et al.*, 1988). More than 90 % of freshwater aquaculture production is represented by three Indian major carps, *Labeo rohita*, *Catla catla* and *Cirrhinus mrigala* accounts for (Veerina *et al.*, 1999), yet the most preferred fish for culture is rohu. Extensive or Semi-Intensive farming is predominantly modified farming practices for rohu.

Rapid increase in world population needs food for its growth. Shortage of food especially protein is very serious problem for human population. Fish is a good source of protein and also has essential amino acids with minerals like zinc, magnesium, sodium etc. (Kaleeswaran, 2011). Fish farming and aquaculture industry play significant role in contributing fish protein to large Asian population. Fish production can be increased with accurate application of fertilizers and supplementary feeds in carp in semi

intensive culture system. The main purpose of pond fertilization is to augment the production of plankton which serves as natural food of the fishes; because fertilization stimulates both the autotrophic and heterotrophic levels which increase fish production (Sayeed *et al.*, 2007).

Freshwater fish have an optimum growing temperature in the range of 25-30 °C at which they grow quickly. Silver carp is a freshwater species living in temperate conditions (6-28 °C) and its natural distribution is in Asia. Rohu (*Labeo rohita*) is the most important among the three Indian major carp species used in carp polyculture systems. Rohu is a eurythermal species and does not thrive at temperatures below 14 °C. It is a fast growing species and attains about 35-45 cm total length and 700-800 g in one year under normal culture conditions. Mrigala is eurythermal, appearing to tolerate a minimum temperature of 14 °C. It is a bottom feeder fish; utilize all the organic material and acts as a good environmental friend with the carps.

Supplementary feeding plays an important role in intensive and semi-intensive fish culture system. The use of supplementary feed in carp culture has become inevitable for the success of fish culture. The total

managerial expenditure of the feed costs varies between 40 to 60 % in fresh water fish culture system. Supplementary feed comprising maize gluten and rice bran are provided to the pond by placing in the four corners of the pond or provided in the tray mooring in a bamboo pole placed in the pond, to minimize wastage of feed which covers around 50 % of the recurring cost per annum. The feed is provided one time daily in the morning at the rate of 1 % of their body weight (Shahzadi *et al.*, 2006). Fertilization of organic manure and provision of supplementary feed with additives such as mineral and vitamin premix had a positive influence on the growth of major carps that contributed to high fish production (Nazish and Mateen, 2011).

The present work therefore has been planned to study the Effect of feed supplementation in growth response of carps under the influence of ammonium nitrate.

MATERIALS AND METHODS

For studying the growth performance of Silver carp (*Hypophthalmichthys molitrix*), Rohu (*Labeo rohita*) and Mori (*Cirrhinus mrigala*) under different treatments with two replications, two earthen ponds, each with dimensions 25 x 8.5 x 1.5m (length x width x depth) located at Fisheries Research Farms, University of Agriculture, Faisalabad, were selected.

To disinfect the ponds and to stabilize pH of water, liming was done with calcium oxide. All the ponds watered up to a level of 1.5 m this level was maintained throughout the experimental periods. Each pond was stocked with 15 *Hypophthalmichthys molitrix*, 25 *Labeo rohita* and 15 *Cirrhinus mrigala*. Pond 1 was treated with ammonium nitrate and rice polish and pond 2 with ammonium nitrate and maize gluten at the rate of 0.3 gN/100gm of fish body weight daily. Fish growth parameter viz; body weight was measured on weekly basis. The most important water quality parameters viz: temperature, light penetration, pH and planktonic biomass were studied weekly.

Growth parameters and statistical analysis

After every week, 10 cultured fish species was captured randomly by using drag net from each experimental treatment and released back into their respective ponds after recording the data for body weight. The data was analyzed statistical analysis using Micro Computer. The comparisons of weekly based average values for various parameters were analyzed by using

Analysis of Variance (ANOVA) and comparison of means by Duncan's Multiple Range Test with repeated sampling. Correlation analysis was also performed to find out the relationship among various physico-chemical characteristics.

RESULTS

A 15 week experiment was conducted in field conditions using 2 earthen ponds to investigate the effect of feed supplementation in growth response of carps under the influence of ammonium nitrate. The studied growth parameters were the increase in body weight. There was a total body weight gain of 289.6±8± 58.84, 154.5± 22.88 and 137.1 ± 24.55 g in the pond-1 and 411.97 ± 84.32, 172.9 ± 20.01 and 158.6 ± 27.46g in the pond-2 for *Hypophthalmichthys molitrix*, *Labeo rohita* and *Cirrhinus mrigala*, respectively (Table 1). There was highly significant difference among weekly gain weight in fish species and ponds for the gain in body weight ($P<0.01$). *Hypophthalmichthys molitrix* showed the best growth in overall weight gain. Growth in terms of weight gain related to the month in pond treated with maize gluten had good performance than with rice polish. The physico-chemical parameters such as Water temperature (°C), Light penetration (cm), pH and Planktonic biomass (mg/L) were non significant in pond 1 and pond 2 (Table 2).

DISCUSSION

As for as the individual growth of three cultured carp species is concerned there is found significant difference among these in both pond 1 and 2 with respect to gain in body weight of three said fish species. Silver carp (*Hypophthalmichthys molitrix*) showed the maximum gain in weight (289.68 g) and (411.97 g) in both the ponds, showing that it has greater adaptability to low temperature as compared to *Labeo rohita* (154.5 g) in P₁ and (172.9 g) in P₂ and *Cirrhinus mrigala* (137.1 g) and (158.6) in pond 1 and 2. Similar results were also reported by Qadoos *et al* (2000). They observed that the effect of rice polish (12.8% protein) and maize oil cake (22.4% protein) on the growth performance of major carps in pond one and pond two. In one pond, the average body weight gained were observed as 239.6, 319.6, and 1092g for per *Labeo rohita*, *Cirrhinus mrigala* and *Hypophthalmichthys molitrix*, respectively, while pond treated with maize gluten oil cake has average gain in

Table 1: Growth performance, Gross and Net fish production and total gross and net fish production of Silver carp, Rohu and Mori in ammonium nitrate fertilized ponds

Treatment	Species	Initial weight	Final weight	Total gain weight (g)	Gross fish production/ha/year (Kg)	Net fish production/ha/year (kg)	Total gross fish production/ha/year (Kg)	Total net fish production/h a/year (Kg)
Ammonium nitrate +	<i>H. molitrix</i>	10.1	300.0	289.68±58.84a	489.4	476.9	1163.9	1104.3
Rice polish	<i>L. rohita</i>	6.2	160.8	154.5±22.88b	436.1	392.2		
	<i>C. mrigala</i>	5.8	145.9	137.1±24.55b	238.1	235.2		
Ammonium nitrate +	<i>H. molitrix</i>	20.4	432.3	411.97±84.32a	699.6	671.4	1424.0	1374.2
maize	<i>L. rohita</i>	7.2	170.1	172.9±20.01b	454.9	442.4		
gluten	<i>C. mrigala</i>	6.5	165.4	158.6±27.46b	269.5	260.4		

Amount bearing different superscripts in a column in each parameter differ significantly ($P<0.01$).

Table 2: Water quality parameters of experimental ponds (mean±SE)

Parameters	Treatments	
	P1: Ammonium nitrate + Rice polish	P2: Ammonium nitrate + Maize gluten
Water temperature (°C)	34.30±1.37	35.03±1.37
Light penetration (cm)	14.75±0.47	14.60±0.51
pH	8.07±0.07	8.13±0.08
Planktonic biomass (mg/L)	190.80±9.84	171.33±11.2

body weight of 330, 388.2 and 246g for *Labeo rohita*, respectively. Major carps showed least production in both ponds. These results were in accordance with the results of Afzal *et al.* (2007), who reported that *Hypophthalmichthys molitrix* gained higher body weight (852.85 g) was greater than Rohu (774.62 g) and Mori (757.94 g) in the pond which is treated with inorganic fertilizers in polyculture carp system.

Hypophthalmichthys molitrix showed the best growth in overall weight gain. These results were in accordance with the values reported by Nazish and Mateen (2011). They observed the total body weight gain of 86.2±27.8, 28.8±9.39 and 21.3±7.68g in the pond-1 and 124.3±38.4, 34.4±9.2 and 27.5±9.2g in the pond-2 for *Hypophthalmichthys molitrix*, *Labeo rohita* and *Cirrhinus mrigala*, respectively. There was highly significant difference among weekly gain weight in fish species and ponds for the gain in body weight ($P < 0.01$).

Supplementary feeding is known to increase the carrying capacity of culture system and can enhance fish production by several folds. This experiment showed that the pond treated with the supplementary feed (maize gluten) along with the fertilizer had 2.69 times greater fish production than with rice polish and fertilizer. Kabir *et al.* (2009) also reported that net fish production of treatment with supplementary feed was 7.7 times greater than the ponds without feed in conducting the experiment in polyculture system.

Temperature has very significant effect on growth performance of carps as it was evident from this experiment. In the present experiment, the body weight of fishes increase with the increase in temperature. Results obtained from present study showed that maximum growth of fishes was observed during the month of May and June. The lower values of monthly weight gain were recorded in December and January, which might be due to decreased food intake by fish at low temperature. This result was in according with the findings of Kolar *et al.* (2005) that the lower weight gains. Overall range of temperature was recorded between 23.4-36.8 °C. This finding was similar to Jha *et al.* (2007) work who reported that water temperature of about 29.7 °C gave maximum growth of carps while lowest was observed at 18.6 °C.

The value of pH remained in the range of 8.05-8.18 which was considered best for all fish species (Afzal *et al.*, 2008). Such type of result was also obtained by Rehman and Hussain (2008), who reported the range of pH value, was 9.07 to 8.72 by using the zooplankton as a food for major carps from the ponds of Rajshahi, University. The variation in transparency had occurred from 12.9 to 18.5cm during conducting the experiment. Such type of variation

was also reported by Rahman (1992), that the average values of transparency showed fortnightly, these variations; such variations may be caused by a number of factors, e.g. viewer, time of the day, season and weather during the month of September to February.

The value of planktonic biomass was slightly higher in the ponds treated with fertilizer than the pond with supplementary feed due to favorable condition and availability of nutrients. As the planktonic biomass was increased, the penetration of light decreased. The value of planktonic biomass was slightly higher in the ponds treated with fertilizer than the pond with supplementary feed due to favorable condition and availability of nutrients. As the planktonic biomass was increased, the penetration of light decreased.

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