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RESEARCH ARTICLE

Winter Growth of Carps under Different Semi-Intensive Culture Conditions

Nadia Nazish* and Abdul Mateen

Department of Zoology and Fisheries, University of Agriculture, Faisalabad
*Corresponding author: nadianazish@ymail.com

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ABSTRACT

The experiment was planned to observe the influence of different semi intensive culture conditions i.e. organic and inorganic fertilizer with rice polish on the growth of carps during winter season. Two earthen ponds were selected and each pond was stocked with Silver carp (*Hypophthalmichthys molitrix*), Rohu (*Labeo rohita*) and Mori (*Cirrhinus mrigala*) at the ratio of 1:2:1 respectively with a total number of 44 fishes. Pond 1 was treated with poultry dropping and urea while pond 2 was treated with poultry dropping, urea and rice polish. The ponds were treated with at the rate of 0.2 g N/100g of wet body weight of fish. Fertilizers were added on weekly basis while rice polish was added daily. Total net fish production of pond 1 and pond 2 was remained 797.3 and 1033.0 kg/ha/year. The pond treated with fertilizer and artificial feed (rice polish) showed 3.6% more fish production than the pond treated only with fertilizer. The physico-chemical parameters were measured on weekly basis. Temperature, light penetration, pH and planktonic biomass showed non-significant difference in both ponds. Pond 2 which was treated with poultry dropping, urea and rice polish showed 1.26 times greater fish growth than pond 1 which was treated with poultry dropping and urea.

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INTRODUCTION

Fish is an important dietary animal protein source in human nutrition (Abbas *et al*., 2010). Asia, consider the candle of aquaculture, accounts for over 80% of the world's production. 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 (Grag and Bhatnagar, 2000). Fish production can be increased up to 5,000kg/ha by feeding and fertilization. Optimum fertilization rate is amount of organic matter that can be cost effectively and utilized in a pond ecosystem without having harmful effect on water quality as well as on fish growth (Bhakta, 2003). Supplementary feeding plays an important role in intensive and semi-intensive fish culture system. It also offers best means of fish production within shortest possible time in ponds. The use of supplementary feed in carp culture has become inevitable for the success of fish culture (Shahzadi *et al*., 2006).

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 700-800g in one year under normal culture conditions. Mrigala is eurythermal, appearing to tolerate a minimum temperature of 14ºC. It is a bottom feeder fish; utilize all the organic material and acts as a good environmental friend with the carps.

The production of fish pond depends on the vegetation, which is dependent on the nutrients in the ponds. It is not possible to increase the production of cultivated fish by giving them the greater quantities of natural food directly. Organic manures and chemical fertilizers can be used to increase the planktonic biomass, on which fish mainly feeds. It stimulates the growth of natural food by providing essential deficient elements, which are utilized by the phyto-and zooplanktons. The

fertilization in fish farming is to improve water quality and to increase the variety and quantity of phytoplankton and zooplankton, which eventually leads to high fish yield and economic returns.

Supplementary feed is required when the natural feed becomes scare, energy becomes limiting not protein. 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 than fertilization alone (Diana *et al.*, 1994). Supplemental diets do not contain a full complement of vitamins or minerals, but are used to help fortify the naturally available diet with extra protein, carbohydrate and/or lipid. Keeping in view on the fertilization and supplementary feeding, the present study was conducted to access the growth performance of carps in integrated semi-intensive ponds supplemented with rice polish by the affect of temperature during winter.

MATERIALS AND METHODS

Experimental Plan

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 ponds and to stabilize pH of water, liming was done with calcium oxide. The inlets of the ponds were properly screened with gauze of fine mesh to avoid the entry of intruder into or exit of fish from the ponds. Tube well was used as source of water. All the ponds watered up to a level of 1.5 m and this water level was maintained throughout the experimental period. The total number of fish in each pond was 44. Each pond was stocked with 11 Silver carps, 22 Rohu and 11 Mori with the ratio of 1:2:1 respectively.

Pond 1 was treated with organic fertilizer (poultry dropping) and inorganic fertilizer (urea) and pond 2 was treated with inorganic fertilizer (urea), organic fertilizer (poultry manure) and supplementary feed (rice polish). The ponds were treated with at the rate of 0.2g N/100gm of wet body weight of fish. Fertilizers were added on weekly basis while rice polish was added daily.

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 most important water quality parameters viz: temperature, light penetration, pH and planktonic biomass were studied weekly.

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

There was a 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 (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 is pond treated with supplementary feed had good performance than without supplementary feed. The physic-chemical parameters such as Water temperature (ºC), Light penetration (cm), pH and Plankonic biomass (mg/L) were non significant in pond 1 and pond 2 (Table 2).

DISCUSSION

Among three fish species, silver carp showed maximum gain in weight followed by Rohu and Mori with the treatment of poultry dropping, urea and rice polish. Highest growth performance of silver carp was due to its higher growth potential and ability to wide tolerance towards the low temperature than the other two species reared in semi-intensive culture system. This result was in accordance with the findings of Afzal *et al*. (2007) who reported that mean values of the weight gain of Silver carp (852.85g) was greater than Rohu (774.62g) and Mori (757.94g) in the treatment of fertilizer in polyculture system of carps.

Supplementary feeding is known to increase the carrying the capacity of culture system and can enhance fish production by several folds. This experiment showed that the pond treated with the supplementary feed (rice polish) along with the fertilizer had 1.26 times greater fish production than with fertilizer only. Abbas *et al*. (2001) reported 1.46 times greater increase in fish production for pond treated with artificial feed than the pond without feed in culture of major carps in semi-intensive culture system. 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.

The variation in the temperature ranged from 16.60 to 35.68°C in this experiment. The temperature as observed in this study appeared to be suitable for fish culture which agreed with the findings of Hossain *et al*. (1997) and Wahab *et al*. (2001). Ehsan *et al*. (1996) found the highest water temperature (31.70ºC) in the month of June and the lowest (25.20ºC) in January in Chanda beel which is similar to this study. 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 results was in according with the findings of Kolar *et al*. (2005) that the lower weight gain was observed in the month of January and February. The pH values of both ponds water showed alkaline in nature.

Table 1: Growth performance, Gross and Net fish production and total gross and net fish production of Silver carp, Rohu and Mori under different treatments in semi-intensive culture system

Treatments	Species	Initial Weight (g)	Final Weight (g)	Total gain Weight (g)	Gross fish Production kg/ha/pond	Net fish production kg/ha/pond	Total gross fish production/ ha/ year (kg)	Total net fish production/ ha/year(kg)
Poultry Dropping	Silver carp	50.0	394.8	86.2±27.8a	440	400		
+ urea	Rohu	14.3	130.3	28.8±9.39b	300	300	850	797.3
	Mori	12.0	97.2	21.30±7.68b	110	97.3		
Poultry Dropping	Silver carp	33.1	530.1	124.3±38.4a	600	600		
+ urea + Rice polish	Rohu	11.0	148.5	34.4±9.2b	330	310	1070	1033
	Mori	12.0	122.1	27.5±9.2b	140	123		

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

Table 2: Water quality parameters of experimental ponds (Mean ± SE and ranges)

Parameters	Treatment	
	Pond 1	Pond 2
Water temperature (°C)	26.84±1.70	26.87±1.76
Light penetration (cm)	16.44±0.57	16.17±0.57
pH	8.19±0.050	8.23±0.047
Plankonic biomass (mg/L)	144.63±15.58	122.19±0.57

The value of pH remained in the range of 7.0-8.5 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 19.9cm 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 biomasss was increased, the penetration of light decreased.

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