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PRELIMINARY STUDY ON THE PRODUCTION OF COMMON CARP CULTURED IN FRESHWATER RIVER CAGES

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Abstract

A preliminary study was conducted to assess the performance of the common carp, cultured in freshwater river of Brahmaputra cages at different stocking densities during November 2011 to March 2012.The stocking densities tested were 80, 100 and 120 fish/m^3. Fish were fed a 28% protein diet at the rate of 15-5% of body weight. The result of the study showed that fish in the T1 stocked at the rate of 80 fish/m^3 resulted the best individual weight followed by T2 and T3. The productions of fish in T1, T2 and T3 were 22.33±1.20, 19.00±0.58 and 18.00±1.15 kg/m^3, respectively. The results of the present study indicated that the best individual growth and production of common carp was obtained at a density of 80 fish/m^3. The results also showed that the individual mean harvesting weights were negatively correlated with stocking density. Therefore, the stocking density of 80 fish/m^3 is considered optimum for the rearing phase.

Keywords: Production, Common Carp, Cage

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Introduction

Culture of fish in cages is comparatively a new method of aquaculture, which has gained much popularity throughout the world due to a number of advantages over the conventional methods of fish farming. The scope for increasing fish production in inland waters through cage culture is highly expected in Bangladesh and it would be a very profitable industry like Japan, Thailand, Cambodia, Philippines, Malaysia, USA, and UK (Hasan *et al.,* 1982). But, unfortunately cage culture on commercial basis are yet to be popularized in Bangladesh due to many reasons such as, lack of knowledge about proper management, selection of species, determination of appropriate stocking densities, unavailability of cage materials and socio-economic constraints. For cage culture or any other intensive culture system, selection of species is also important since not all species are suitable for all culture system. In Bangladesh, *C. carpio* is an exotic fish, which has been introduced in 1960. Among the various culturable species *C. carpio* are particularly important for their fast growth, lucrative size, good taste, and high market demand in Bangladesh. However, there is published information on cage culture of *C. carpio* in Bangladesh (Haque *et al*., 1994). Stocking density is an important factor for the production of all fishes as well as *C. carpio* in cages. High stocking density decreases the production of fish and low stocking density is not commercially profitable. Using appropriate stocking densities and feeding strategies are two of the keys to success in aquaculture management. Sodikin (1977) stated that the fish culture in cages could be developed by improving stocking density, feeding methods, selection of species and regulating the culture cycle for maximum profitability. Lack of nutritionally adequate and low-cost feed has always been one of the constrains to the successful practice of cage fish culture in many developing countries (Otubusin, 1987). Coche (1979) observed that cost of feeding in intensive cage culture could be account for more than 50% of the production costs.

There are number of literature on the culture of fish in cages with different commercial fish species conducted in different parts of the world. Even in Bangladesh some information's are available on the culture of carps and other catfishes (Ahmed, 1982; Rahman *et al.*, 1992; Hannan *et al.,* 1988; Haque *et al.,* 1984; Haque *et al.,* 1988; Haque *et al.,* 1994) but not much works have been done on the culture of *C. Carpio* in cages. Thus, the present study was carried to optimize the suitable stocking density of common carp (*C. carpio*) in net cages.

Materials and Methods

Experimental site

The trial was conducted in the Brhamaputra River at Khagdohar Ghat, Mymensingh district for five months during November to April 2012.

Construction of net cages

The cages were rectangular shaped, made of iron framework and covered by high-density polyethylene net. The size of each cage was 3m³. The mesh size of the net was 1 cm. Iron rods were welded to construct a rectangular shape frame and nets were attached to the rod with the help of nylon twine. One edge of the side of each cage was kept open which was tied with nylon threads in such a way that it could be opened to deliver feed in the cage.

Installation of the cages

The cages were installed by several bamboo bars. The cage was fixed with bamboo poles inserted into the river bottom. The cages were tied with the frame by nylon ropes at the time of suspension; about 1 feet of the upper portion of the cages were always kept above the water level. For easy management, the cages were numbered as 1 to 9 and were divided into three treatment groups viz. T1, T2 and T3.

Experimental fish

Common carp fingerlings were used in this experiment. Fish fry were collected from hatchery of Bangladesh Fisheries Research Institute (BFRI), Mymensingh. All the fishes were of the same age group having mean weight of 11.92±1.32g. Prior to start of the experiment, the fingerlings were acclimatized to the new environment in floating cages for seven days. Then the fishes were stocked in the cages according to experimental design.

Experimental design

The designs of experiments are as follows:

Table 1. Stocking density of common carp in net cages in three different treatments

Species	Treatment	No of replication	Stocking density (m^3)
	T1	3	80
Common carp	T2	3	100
	T3	3	120

Feeding

Fish in each cage were fed a 28% crude protein (Saudi-Bangla Fish Feed Company Ltd.) ration 2 times/day. Feeding rate was initially 15% of total body weight per day and was subsequently reduced to 13, 11, 9, 7 and 5% on days 30, 60, 90, 120 and 150, respectively. Feed ration was maintained based on monthly samples of fish from each cage. At monthly intervals, 100 fish from each cage were sampled.

Monitoring of water quality parameters

The water quality parameter such as temperature (°C), pH dissolved oxygen (mg/l), transparency (inches) and ammonia (mg/l) were recorded weekly interval throughout the experimental period at 9 am to 10 am by using a water testing kit. The samples were always collected from the sub-surface of with minimum disturbance of water.

Harvesting

After 150 days of culture, all fish from each cage were harvested. Then total number and weight of fishes were recorded and survival, production were also calculated.

Data analysis

A statistical test on the treatment means was done using the procedure for randomized block design. When means were significantly different, the Duncan Multiple Range Test at 5% level was used.

Results

The physico-chemical parameters of Brahmaputra River water viz., temperature, transparency, pH, dissolved oxygen and total ammonia of are presented in Table 2. The values of temperature, transparency, dissolved oxygen, pH and total ammonia were 18.60-29.30°C, 1.20-1.40 cm, 6.72-8.55 mg/l, pH 7.21-8.66 and 1.1-1.80 mg/l, respectively.

Table 2. Water quality parameters of Brahmaputra River during experimental period

Parameters	Value
Water Temperature (°C)	18.6 – 29.30
Transparency (cm)	1.20-1.40
pH	6.72 - 8.55
DO (mg/l)	6.72 – 8.55
Total ammonia (mg/l)	1.10 – 1.80

On the basis of final growth attained, it was observed that the highest average weight was found in treatment-T1. At harvest, the mean weights were 282.37±12.17, 268.55±14.87 and 246±15.62g, in treatments-T1, T2, and T3, respectively. The harvesting weight of treatment-1 was significantly higher ($P<0.05$) than those of other treatments.

The survival rate of carpio varied between 66 to 78%. There were significant difference ($P>0.05$) of survival of Carpio among the treatments. The highest survival was recorded in T1 and lowest in T3.

The mean food conversion Ratio (FCR) values in different treatments varied between 2.4 to 3.5. The highest FCR values (3.5) were recorded in T3 and the lowest (2.4) in T1. The values of FCR in three different treatments were significantly ($P>0.05$) different from each other.

The productions obtained in cages were 22.33±1.20, 19.00±0.58 and 18.00±1.15 kg/m^3 from treatments-T1, T2 and T3, respectively. The highest production was obtained from treatment-T1, which differed significantly ($P<0.05$) from other two treatments, when analyzed statistically. In higher stocking densities, the harvesting weight of Common carp was found linearly. However, the production of fish was not varied significantly from the stocking density of 100 and 120/m^3.

Table 3. Harvesting wt., survival and production of common carp under different treatments

Treatments	Harvesting Wt. (g)	SGR (%)	FCR	Survival (%)	Production/m^3 (kg)
T1 (80/m3)	282±6.11[a]	1.76	2.4±.11[a]	78±2.88[a]	22.33±1.20[a]
T2 (100/m3)	268±5.29[a]	1.73	3.0±.05[b]	74±3.46[ab]	19.00±0.58[ab]
T3 (120/m3)	238±4.61[b]	1.66	3.5±.15[c]	66±3.20[b]	18.00±1.15[b]

*Dissimilar superscript indicates significant difference at 5% level of probability

Correlation matrix among stocking density, harvesting weight, survival and production of fish is shown in Table 4. Stocking density showed an inverse relationship with survival. It means that if stocking density increased, then survival of fish decreased. While, harvesting weight citied positive correlation with production and survival. Whereas, production also showed positive correlation with survival.

Table 4. Correlation matrix among stocking density, harvesting weight, survival, and production of fish

Parameters	Density	Harvesting Wt. (g)	Survival (%)	Production/m3 (kg)
Density	1			
Harvesting Wt. (g)	-0.97741164	1		
Survival (%)	-0.98198051	0.999739528	1	
Production/m3 (kg)	-0.96671061	0.890797029	0.900935671	1

*Significant difference at 5% level of probability

Discussion

The water quality parameters such as temperature, dissolve oxygen, p^H and alkalinity studied during the experimental period were found suitable for fish farming and did not hamper the normal fish growth (Jhingran, 1983).

The results indicated that the growth rate of *C. carpio* varied in different stocking densities. Among the treatments, T_1 (40 fishes/m^3) showed the best result in terms of growth and feed utilization. Ahmed (1982) reported that the stocking rate of *Labeo rohita*, 10 fishes /m^3 in floating cages in ponds gave best result in terms of individual growth followed by 20 and 30 fishes respectively. While, Haque *et al.* (1994) found that in case of *Cyprinus carpio* cultured in floating ponds, the best growth was recorded at lowest density (5 fishes/m^3) and least growth was recorded at highest stocking density (20 fishes/m^3).

While, Dimitrov (1976) observed that low stocking densities 20 fish/m^3 gave the highest production of carps in net cages compare to the high densities of 80 and 150 fishes/m^3.

In another study, Chaitiamvong (1977) found higher production in low stocking densities and lower production in higher stocking densities of carp. Shiremen *et al*. (1977) and Ahmed *et al*. (1983) reported that the growth and production of fish are to a certain extent, dependent on the population density. Whereas, Powell (1972) reported that the harmful effects of higher stocking density on the culture of fish were the reduction of growth rate, increase of food conversion ratio and lowering of survival rate.

The similar type of observation was reported by Azimuddin (1998) who found that in cage culture of pangus, the stocking density of 40 fishes/m^3 gave the best growth in comparison with 50 and 60 fishes/m^3.

The results of the study indicated that the best individual growth and production of carpio was obtained at a density of 80 fishes/m^3.

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