Bangladesh J. Fish. Res.,8(2), 2004: 95-100

Culture potentials of gulsha (*Mystus cavasius*) in monoculture management under different stocking densities

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Abstract
Semi-intensive grow-out trials on monoculture of gulsha (*Mystus cavasius*) were conducted to assess the production potentials for the period of six months from March through August 2002. Three stocking densities such as 40,000 (T-1), 50,000 (T-2) and 60,000/ha (T-3) were tested in three replications. The production of gulsha was 1,474±52, 1,535±71 and 1,370±60 in treatment-1, 2 and 3, respectively and they were significantly different ($p<0.05$) from one to another. A higher net benefit was obtained Tk. 42,291 from treatment-1 (T-1) where the stocking density was 40,000/ha.

Introduction

In recent years, increasing anthropogenic pressure on the inland water resources has led to drastic degradation of the rich ichthyofauna of Bangladesh. Many commercially important indigenous fish are greatly threatened. Gulsha (*Mystus cavasius*) is one of them, which is on the verge of extinction. This fish is great favorite to consumers because of its delicious taste and therefore have a great demand fetching high price in the market.

Mass propagation coupled with judicious culture in controlled environments is often considered as the logistic approach for conservation ventures. With this in mind and also to increase its production through aquaculture, the Bangladesh Fisheries Research Institute under its Freshwater Station, Mymensingh has developed seed production technology through artificial propagation (Akhteruzzaman *et al.* 1991). Though this species have been reported quite favorable under standard conditions of carp farming (Hossain *et al.* 1998), their monoculture culture has not yet been developed and established. The present study has, therefore, been proposed to evaluate their production potentials of gulsha in monoculture management

Materials and methods

Experimental design and pond preparation

This trial was under taken in three earthen ponds each with three chambered ($90m^3$ each) over a period of six months during March to August'02 at Freshwater Station,

Bangladesh Fisheries Research Institute, Mymensingh. The experiment had three treatments and three replicates of each. Three stocking density of gulsha fingerling (*M. cavasius*) such as 40,000, 50,000 and 60,000/ha were tested, which considered as treatment-1 (T-1), treatment-2 (T-2) and treatment-3 (T-3), respectively. Before starting the experiment, ponds were drained to eradicate all fishes, embankments were repaired. Pond bottoms were treated with lime (CaO) at the rate of 250 kg ha^{-1} and left for 3 days. Then ponds were filled with groundwater and fertilized with cow manure 2,000 kg ha^{-1} and left for three days.

Stocking of fingerling

Fingerlings of gulsha were stocked at the rate of 40,000 (T-1), 50,000 (T-2) and 60,000/ha (T-3) in three ponds with 9 chambers. Gulsha fingerlings were stocked in 1st March in all the treatments. The initial weight range of fingerling was 3.94 to 4.06g.

Feeding and fertilization

After stocking, fingerlings were fed with supplementary feed (25% crude protein) at the rate of 4-6% of estimated biomass. Organic fertilizer (Cattle manure) was also applied at the rate of 1,000 kg/ha in fortnightly interval.

Fish sampling

The ponds were sampled fortnightly by using a seine net (mesh size 5 mm) to determine growth rate as well as feed adjustment.

Analysis of water quality parameters

Water quality parameters such as water temperature (°C), DO (mg/L), p^H, alkalinity (mg/L), were monitored at weekly interval (APHA 1992).

Statistical analysis

Analysis of variance accompanied by DMRT was employed to see if treatment had any significant effect or not. The statistical analyses were carried out using statistical software, Statgraphics 7.0.

Results and discussion

The overall mean values of water quality parameter of ponds in different months are presented in Table 1. The mean values of water quality parameters in different months were: temperature 25.62±0.28 to 31.31±1.57°C, dissolved oxygen 4.57±0.91 to 8.25±1.83 mg/l and alkalinity 161.25±38.38 to 211±5.48 mg/l.

Water temperature is one of the most important factors, which influence the physico-chemical and biological events of a water body. The ranges of mean value of water temperature in different months in the present study were 25.62-31.31°C. The

values of water temperature are more or less similar to that reported by Paul (1998) and M.M. Rahman (1999) and Kohinoor (2000). The pH in all pond water was alkaline throughout the experimental period. Different authors have reported a wide variation in pH from 6.7 to 7.2 (Ahmed, 1993); 6.7 to 8.3 (Hossain *et al.* 1997), 7.18 to 7.24 (Kohinoor *et al.* 1998) and 6.5 to 8.8 (Rahman 2000) in fertilized fish ponds and found the ranges productive. The ranges and mean values of pH recorded in present study are alkaline, which indicating the productive nature of the fertilized ponds.

Table 1. Mean value (±SD) of water quality parameters in different months

Month	Water temperature (°C)	pH	Dissolved oxygen (mg/l)	Total Alkalinity (mg/l)
March	25.62±0.28	7.82-8.62	8.10±2.55	211±5.48
April	28.88±0.96	7.94-8.37	8.25±1.83	161.25±8.38
May	30.38±2.60	7.67-8.65	5.93±3.2	166±10.75
June	27.55±0.13	7.37-7.69	4.57±0.91	174±9.52
July	31.31±1.57	7.37-7.69	4.86±0.42	198±16.25
August	30.46±1.06	7.5-8.11	5.47±1.73	176.25±12.92

Dissolve oxygen is the most important factor for all aquatic organisms except anaerobic bacteria. The value of dissolve oxygen concentrations was found to vary from 4.57±0.91 to 8.25±1.83 mg/L. Dissolve oxygen concentrations more than 3.5 mg/L in pond waters reported by several researchers (Ali *et al.* 198, Martyshew 1983, Rahman 2000 and Kohinoor 2000) which was similar to the present study.

Total alkalinity more than 100 mg/L should be present in high productive water bodies (Alikunhi 1957). Paul (1998), Kohinoor (2000) and Grag and Bhatnagar (2000) found the average total alkalinity values above 100 mg/L in their experiments. The total alkalinity values found in the present study were within the suitable range. The water quality parameters of the experimental ponds were found to be within the acceptable ranges for aquaculture and there was no abrupt change in any parameter of the experimental pond water.

Growth and production

Details of stocking, harvesting, growth and production of gulsha (*Mystus cavasius*) in different treatments during the study period are presented in Table 2. On the basis of final growth attained under treatments-1, 2 and 3 were 41.42±6.20, 36.11±3.85 and 28.99±4.52g, respectively. The highest growth was obtained in treattment-1 and lowest in treatment-3. The harvesting weight showed significant difference ($p<0.05$) in T-1 followed by T-2 and T-3 when ANOVA was performed. The monthly sampling weight of gulsha under different stocking densities are shown in figure 1. Fig. 1 indicates that the growth rate was always higher in treatment-1 then followed by treatment-2 and 3. The results showed that higher growth rate was observed at lower stocking densities. The percentage increase in weight (g) was found to be 920.19%, 807.28% and 635.71% in

treatment-1, 2 and 3, respectively. The SGR (%) values were more or less same in all the treatments and which showed in significant difference among the treatments.

Table 2. Growth, survival and production of gulsha (*Mystus cavasius*) under different stocking densities

Treatments	Initial weight (g)	Harvesting weight (g)	Increase of growth (%)	Survival (%)	Production (kg/ha)	SGR (%)
Treatment-1	4.06±1.11	41.42±6.20	920.19	89	1,474±52[b]	1.23[a]
Treatment-2	3.98±0.96	36.11±3.85	807.28	85	1,535±71[a]	1.16[a]
Treatment-3	3.94±1.0	28.99±4.52	635.79	79	1,370±60[c]	1.03[a]

* Figures in the same column with different superscripts are significantly different (P>0.05)

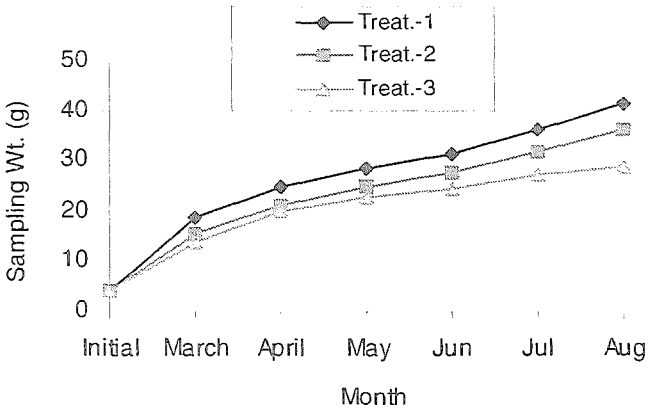

Fig. 1. Growth rate of gulsha (*M. cavasius*) under different stocking densities during the experimental period

The survival rate of gulsha was found to vary with the stocking densities. The highest survival (89%) was obtained in treatment-1, where the stocking density was 40,000/ha. and the lowest (79%) was obtained in treatment-3, where the density was 60,000/ha (Table 1). The survival rate did not show any significant difference (p>0.05) among the treatments. The results reveal that higher survival rate was found at lower stocking density.

Production data of fish per hectare was extrapolated from the data of 90m^3 water area over a 180-day culture period. The productions of gulsha were 1,474±52, 1,535±71 and 1,370±60 kg/ha, respectively in treatments-1, 2 and 3. These data showed significant differences among treatments when compared using ANOVA.

Culture of small indigenous fish such as gulsha, pabda, sharpunti, koi, mola, chela punti has not yet been attempted on large scale in this country. Consequently, published informations on production of small indigenous fish species in freshwater ponds are rather little. Akhteruzzaman (1988) reported that the production of koi (*Anabas*

testudineus) was 450 kg/ha/5 months where the stocking density was 16,000/ha by applying supplementary feed, (rice bran, mustard oil cake and fish meal). In another study, Akhteruzzaman *et al.* (1990) observed that in monoculture condition the production of (*P. sarana*) was 1,200 kg/ha/6 months. Kamal (1996) obtained a net production of 461 kg/ha/5 months from *P. sophore* in monoculture condition by applying fertilization. Rahmatullah *et al.* (1998) reported to obtain a net yield of chapila (*Gudusia chapra*) to be 92.13 kg/ha in 3 months culture period.

Cost and benefit

A simple cost-benefit analysis was performed to estimate the amount of profit that has been generated from these types culture. The results of the analysis are shown in Table 3. The cost of production were Tk. 77,469, Tk. 84,515 and Tk. 92,841 in treatments-1, 2 and 3, respectively. The cost of production was higher in treatment-3 and lower in treatment-1. The higher net profit of Tk. 42,291 was obtained from T-1 where gulsha was stocked in 40,000/ha. Hussain *et al.* (1989) analyzed the cost and benefit of Nile tilapia (*Oreochromis niloticus*) in monoculture condition and got the net benefit of Tk. 72,827/ha/6 months where fish were fed with rice bran and mustard oil cake. The net benefit of rajpunti (*Puntius gonionutus*), Kohinoor *et al.* (1993) found that Tk. 68,135 to 75,028/ha/6 months could be achieved by applying supplementary feed and fertilization. Whereas, Kohinoor (2000) got the net profit of Tk. 32,910/ha/6 months in monoculture of small indigenous fish punti (*Puntius sophore*).

In view of above, it may be concluded that the production and economic return of gulsha in monoculture condition was not very encouraging but culture of endangered species could ensure the availability as well as conservation of this species in inland waters.

Table 3. Cost and return analyses of fish production in different densities in one hectare area

Inputs	T-1		T-2		T-3	
	Quantity (Kg)	Cost (Tk.)	Quantity (Kg)	Cost (Tk.)	Quantity (Kg)	Cost (Tk.)
Lease value	-	25,000	-	25,000	-	25,000
Pond preparation		4,875		4,875		4,875
Feed	2,533	45,594	2,980	53,640	33,87	60,966
Cowdung	2,000	500	2,000	500	2,000	500
Harvesting cost		1,500		1,500		1,500
Total cost		77,469		84,515		92,841
Benefits						
Sell price of pabda (Tk.120/kg)	998	1,19,760	1,022	1,22,640	1,048	1,25,760
Net benefit/ha	42,291		38,125		32,919	

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(Manuscript received 23 August 2003)