Evaluation of different stocking densities of two small indigenous fish, pabda (*Ompok pabda*) and gulsha (*Mystus cavasius*) with Indian major carps in polyculture system

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Abstract

An experiment on the polyculture of carps with high valued small indigenous fish species (SIS) pabda (*Ompok pabda*) and gulsha (*Mystus cavasius*) was carried out in six months culture period to evaluate the production performance of carp with small indigenous fish pabda (*Ompok pabda*) and gulsha (*Mystus cavasius*) in the on-farm condition. Three stocking densities of pabda and gulsha were tested, keeping the carp species combination and stocking density similar. Each stocking density of pabda and gulsha was considered as treatment and replicated thrice. Fingerlings of pabda and gulsha were stocked at the rate of 5,000 (1:1), 7,500 (1:1) and 10,000 (1:1)/ha in treatments 1, 2 and 3, respectively. In all the treatments, carps (*Catla catla*, *Labeo rohita*, and *Cirrhinus mrigala*) were stocked at the rate of 5,000/ha. The production obtained were 2,986±78, 2,580±88 and 2,393±71kg/ha from treatments 1, 2 and 3, respectively, at harvesting. The production levels showed significant difference ($P<0.05$) among treatments. The contribution of pabda and gulsha to total production was 5.22% in treatment 1, while in treatments 2 and 3 were 7.86 and 9.40%, respectively. It was concluded that pabda and gulsha could be cultured in low input carp polyculture management.

Keywords: Carp, Pabda, Gulsha, Polyculture

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Introduction

In recent years, increasing the 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 and a few such as pabda (*Ompok pabda*) and gulsha (*Mystus cavasius*) are on the verge of extinction (Akhteruzzaman *et al*. 1991, 1993). These are popular among consumers because of their taste. Mass propagation coupled with judicious culture in controlled environments is often considered as the logistic approach for conservation ventures. Also, to increase their production through aquaculture, the Bangladesh Fisheries Research Institute under its Fresh-water Station, Mymensingh (Akhteruzzaman *et al*. 1991, 1993) has developed seed production technology through artificial propagation. However, these two species have been reported quite favourable under standard conditions of carp farming (Kohinoor *et al*. 1997; Hossain *et al*., 1998), their culture technique with carps in polyculture system is still under development. This trial was designed to evaluate the production performance of pabda and gulsha in carp polyculture management.

Materials and methods

Nine farmers pond at Boilor, under Trishal Upazila, Mymensingh, Bangladesh were used in this experiment for a six month period. The range of pond area was 0.06-0.10ha. Prior to running the experiment, piscicide, rotenone (12.50kg /ha) was applied to eradicate predators and small fish. Then ponds were treated with lime at the rate of 250kg/ha. After 5 days of liming, ponds were fertilized with cow manure at the rate of 2,000kg/ha.

Three stocking densities of pabda (*Ompok pabda*) and gulsha (*Mystus cavasius*) fingerlings were tested as treatments in triplicates, keeping the carp species combination and stocking densities similar. The stocking densities were 5,000 (1:1), 7,500 (1:1) and 10,000 (1:1)/ha in treatments 1, 2 and 3, respectively. In all treatments, catla (*Catla catla*), rohu (*Labeo rohita*), and mrigal (*Cirrhinus mrigala*) were stocked at the rate of 5,000/ha in the ratio of 1:1:1.

After stocking, the fishes were fed with rice bran (80%) and mustard oil cake (20%) at the rate of 3% of estimated body weight. Besides feeding, all the ponds water was fertilized with organic fertilizer (cow dung) at the rate of 1,000kg/ha/15 days interval.

Twenty fish of each species from each pond were caught at each monthly sampling day using a seine net. The weight (g) of each species was measured using a portable balance (TANITA model 140). Fishes were returned into the ponds after sampling.

After six months of culture period, fish were harvested by repeated seine netting. After seine netting, the pond water was pumped out and all fishes were harvested. Total bulk weight and number of fish from each pond was recorded. Survival and gross production of fish of each treatment was estimated. Specific growth rate (SGR) was estimated as:

$$SGR (\% day) = \frac{\log_e W_2 - \log_e W_1}{T_2 - T_1} X 100;$$

Where,

W1= Initial live body weight (g) at time T_1 (day)

W2= Initial live body weight (g) at time T_2 (day)

Data were analysed using the statistical package, Statgraphics version 7 and Microstat. ANOVA was performed on all the dependent variables to find out whether treatments had any significant difference on growth. Duncan's New Multiple Range Test (DNMRT) was performed to identify any significant difference among treatment means.

Results

Details of stocking, growth and production performances in different treatments are presented in Table 2. It was observed that among the carp species under three treatments, the highest weight was attained by catla in treatment 1. Catla reached an average harvesting weight of 820±54g in treatment 1, 690±48g in treatment 2 and 610±38 in treatment 3, respectively. The harvesting weight of catla was significantly higher (P<0.05) in treatment 1 compared to treatment 2 and treatment 3.

The average weight attained by rohu was 590±22, 505±31 and 496±41g in treatments 1, 2 and 3, respectively at the end of the experimental period. However, it was observed that treatment 1 was significantly better (P<0.05) than treatments 2 and 3. At harvest, the weights of mrigal were 560±46, 506±30 and 466±29g, in treatments 1, 2 and 3, respectively. The weight of mrigal in treatment 1 was significantly higher (P<0.05) than treatments 2 and 3.

The average final weights of pabda were 32±3.83, 27±3.88 and 23±3.0g, in treatment 1, treatment 2 and treatment 3, respectively. The poor harvesting weight was observed in treatment 3 where as, comparatively higher harvesting mean weight was observed in treatment 1. The weight of pabda showed significant difference (P<0.05) among the treatments. In case of gulsha, the harvesting mean weight was higher than pabda in all the treatments. However, it was 48±4.22, 42±2.99 and 38±3.81 in treatments 1, 2 and 3, respectively.

The specific growth rate (SGR) of catla, rohu, mrigal, pabda and gulsha varied from 2.41 to 2.28, 2.31 to 2.17, 2.25 to 2.18, 1.07 to 0.87 and 1.38 to 1.22, respectively. Among the treatments, the highest SGR values were observed in treatment 1. The specific growth rate of catla, rohu, mrigal, pabda and gulsha in treatment 1 were 2.41, 2.31, 2.25, 1.07 and 1.38, respectively.

After six months rearing, the total fish production obtained were 2,986±112, 2,580±94 and 2,393±102kg/ha in treatments 1, 2 and 3, respectively (Table 1). The highest production was obtained from treatment 1, where carp were stocked with pabda and gulsha at the stocking density 5,000/ha. The lowest production was obtained in treatment 3 where pabda and gulsha were stocked at 10,000/ha. The production levels showed significant differences ($P<0.05$) among the treatments. The contribution of pabda and gulsha to the total production was 5.22% in treatment 1, while in treatment 2 and treatment 3 were 7.86 and 9.40%, respectively. The relative contributions of small indigenous fish, pabda and gulsha, in different treatments are shown in Fig. 1.

Table 1: Growth and productions of fish under three treatments during March to September 2003

Treatment	Fish	At stocking		Individual weight (g) at harvesting	Survival (%)	Total production (kg/ha)	SGR (%)
		Initial weight (g)	Stocking density/ha				
T-1	Catla	10.6±0.94	5,000	820±58[a]	87	2,986±112[a]	2.41
	Rohu	9.20±1.31	5,000	590±35[a]	89	"	2.31
	Mrigal	9.7±1.00	5,000	560±44[a]	82	"	2.25
T-2	Pabda	4.6±0.77	5,000	32±3.43[a]	72	2,580±94[b]	1.07
	Gulsha	4.0±0.80	5,000	48±4.22[a]	82	"	1.38
	Catla	10.21±1.45	5,000	690±49[b]	85	"	2.34
	Rohu	9.49±0.89	5,000	505±41[b]	86	"	2.20
	Mrigal	8.70±1.11	5,000	506±38[b]	80	"	2.25
	Pabda	4.40±0.70	7,500	27±3.05 [b]	70	"	1.00
	Gulsha	4.10±0.78	7,500	42±2.99 [b]	84	"	1.29
	Catla	10.05±1.20	7,500	610±40[c]	83	"	2.28
T-3	Rohu	9.88±1.21	5,000	496±46[b]	85	2,393±102[bc]	2.17
	Mrigal	9.20±1.40	5,000	466±28[c]	80	"	2.18
	Pabda	4.80±0.70	10,000	23±2. 22[bc]	65	"	0.87
	Gulsha	4.20±0.66	10,000	38±3.8 [bc]	79	"	1.22

Figures in the same column having the same superscripts for each species are not significantly different ($P>0.05$).

Figure 1: Relative contribution of different species in different treatments

Discussions

Perhaps one reason for the maximum weight gained by the Indian major carps in treatment 1, where pabda and gulsha were stocked at lowest density, could be the lack of competition for space and food with Indian major carps. On the other hand, the lowest weight gain was observed in treatment 3 where pabda and gulsha were stocked in highest density. The growth of Indian major carps was affected by the inclusion of pabda and gulsha. This might be due to the fact that pabda and gulsha competed for food and space with carps. Pabda is reportedly an omnivorous, feeding on small fish, protozoa, algae, crustaceans, insects and debris (Bhuiyan & Islam, 1991) while gulsha is a carnivorous fish in nature and feeds on crustaceans, protozoans, insect larvae, small fish and debris (Akhteruzzaman *et al*., 1991).

The small indigenous fish pabda and gulsha in treatment 1 (5,000/ha) showed the highest growth, while the lowest was in treatment 3 (10,000/ha). This result clearly indicated that maximum growth in weight was attained at the lowest stocking density and growth gradually decreased with increase in density, which agreed with the findings of Kohinoor *et al*. (1994).

Survival rates of various species of carps and small indigenous fish pabda and gulsha among the treatments were fairly high, which was ranged from 65% to 89%. The high percentage of survival obtained in different treatments suggests that such factors as healthy fish, predator free pond and favourable ecological condition can be important in influencing survival. Lakshmanan *et al.* (1971) and Choudhuri *et al.* (1978) stressed the importance of these factors in governing the survival.

The overall highest fish production of 2,986±112 was obtained in treatment 1 followed by 2,580±94 and 2,393±102 in treatments 2 and 3, respectively. These production levels were comparable to those obtained in other polyculture systems in the South Asian region. Kohinoor *et al*. (1997)

recorded an average production from semi-intensive culture of pabda (*O*mpok *pabda*) with rajpunti (*Puntius gonionotus*) and mirror carp (*Cypinus carpio*) in six months culture period as 2,932kg/ha where the contribution of pabda was only 15.27%, while Hossain *et al*. (1998) got a production of 3,125kg/ha from polyculture of gulsha (*Mystus cavasius*) with rajpunti (*Puntius gonionotus*) and silver carp (*Hypophthalmichthys molitrix*) in earthen ponds. Shahabuddin *et al*. (1994) obtained yields of 2,000 to 3,400kg/ha/yr and Mazid *et al*. (1997) recorded a gross production of 3,600kg/ha/yr from a composite culture of the Indian major and Chinese carps.

The production obtained in the present study was not very encouraging, but the endangered small fish like as pabda (*O. pabda*) and gulsha (*M. cavasius*) culture with carp would add social benefit in that the fish farmer may get a chance to consume them readily than sale them in to the market. It was also revealed that the small and shallow water bodies may be used for small indigenous fish species (SIS) culture, indicating the feasibility of attaining a good production of it along with carp.

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