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Polyculture of gulsha (*Mystus cavasius* Ham.) with rajpunti (*Puntius gonionotus* Bleeker) and silver carp (*Hypophthalmichthys molitrix* Val.) in earthen ponds

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Abstract

Culture of gulsha (*Mystus cavasius*) with rajpunti (*Puntius gonionotus*) and silver carp (*Hypophthalmichthys molitrix*) was undertaken to assess the growth and production potential of these species under polyculture system. Fingerlings of gulsha, rajpunti and silver carp were stocked at a density of 18,000, 10,000 and 4,000/ha respectively. Two treatments were tested in this experiment. Treatment-I was conducted with rice bran and mustard oil cake and treatment-II with rice bran and duck weed. All the ponds were fertilized with urea and TSP at fortnightly intervals. After six months' rearing, the gross production was estimated to be 3,582 and 3,125 kg/ha from treatment-I and treatment-II respectively. Total yield showed non-significant differences ($P > 0.05$) between the treatments.

Key words : Polyculture, *M. cavasius, P. gonionotus, H. molitrix*

Introduction

Mystus cavasius locally known as gulsha is an indigenous small fish once available in flood plains, swamps and canals of Bangladesh. It is a great favorite of consumers and, therefore, has a great demand fetching high price in the market. As the catches of the fish have drastically declined from open waters like rivers, beels, haors etc. in recent years due to various ecological changes in the inland water bodies, the fish is now sold at an exorbitant price in the market. Keeping this in mind to increase its production, seed production technology through artificial propagation was developed by the Fisheries Research Institute (Akhteruzzaman *et al.* 1991). Very little information is, however, available on the culture aspect of gulsha. Kohinoor and Hussain (1994) observed that monoculture of gulsha is economically not viable. While polyculture maximizes production, it depends on selection of appropriate fish species for better utilization of the food available in different strata and zones of a given aquatic environment.

Gulsha is carnivorous in nature and feeds on crustaceans, protozoans, insect larvae, small fishes and debris (Akhteruzzaman *et al.* 1991). On the other hand, rajpunti is herbivorous and feeds mainly on soft aquatic plants,

grasses, algae and some invertebrates (Phaohorm 1980, Srisuwantach 1981). Silver carp is principally filter-feeding, planktivore fish (Khan and Siddique 1973, Pillay 1990). Keeping their different feeding habits and niches in mind the present study was undertaken to determine the growth and culture potential of gulsha with rajpunti and silver carp in the polyculture system.

Materials and methods

A six-month experiment was initiated in November'95 to April'96 at the Freshwater Station of the Fisheries Research Institute, Mymensingh. The ponds were prepared by draining and limed at the rate of 250 kg /ha. Three days after liming, ponds were filled with ground water and fertilized with cattle manure at the rate of 1,000 kg/ha. Five days later, inorganic fertilizers, urea and TSP, were applied at the rate of 8 and 17 kg/ha respectively. Three days after the application of inorganic fertilizers, stocking was done with gulsha (2.73 g), rajpunti (5.85 g) and silver carp (3.75 g) at a stocking density of 18,000; 10,000 and 4,000/ha respectively.

Two treatments, each with three replicates were tested. Rice bran (60%) and mustard oil cake (40%) were used at the rate of 5% of body weight in treatment-I. While only rice bran along with duck weed were used each at 3% of body weight in treatment-II. Subsequent to stocking, all the ponds were fertilized regularly at fortnightly intervals with urea and TSP at the rate of 8 and 17 kg/ha/month. The ponds were sampled at fortnightly intervals to assess the growth and condition of fish, and feeding was adjusted on the basis of estimated fish biomass in the ponds.

Physico-chemical parameters such as temperature, transparency, DO, hardness, pH, and ammonia of water were monitored at weekly intervals while biological parameters on productivity at fortnightly intervals.

All the ponds were completely harvested after six months' rearing first by netting and later by draining the ponds.

Results and discussion

The summarized data of water quality parameters between the two treatments showed non-significant differences ($P>0.05$) except pH and are furnished in Table 1. Phytoplankton population mainly comprised four major groups, Chlorophyceae, Cyanophyceae, Bacillariophyceae and Euglenophyceae and zooplankton comprised two groups, Crustacea and Rotifera (Table 2). Both phytoplankton and zooplankton population were high in treatment-I than in treatment-II ($P> 0.05$).

Table 1. Comparison of physico-chemical parameters of pond water of the two treatments

Parameters	Treatment-I	Treatment-II	t- Statistics
Water temperature (^{0}C)	21.38 (±4.18)	22.04 (±3.90)	0.57 NS
Transparency (cm)	27.60 (±6.75)	30.67 (±8.72)	1.37 NS
P^H	8.10 (±0.27)	7.85 (±0.34)	4.58 *
DO (mg/l)	3.91 (±0.84)	3.85 (±0.59)	0.29 NS
Total hardness (mg/l)	150.33 (±21.82)	152.75 (±23.53)	0.26 NS
NH_3 (mg/l)	0.03 (±0.01)	0.04 (±0.03)	1.46 NS

*NS = Non significant at 5 % level * = Significant at 5% level*

Table 2. Mean abundance of plankton (units x 10^3/l) in two treatments

Planktons	Treatment-I	Treatment-II	Significance
Phytoplankton			
Bacillariophyceae	2.25	2.00	NS
Chlorophyceae	8.84	8.70	NS
Cyanophyceae	4.82	4.21	NS
Euglenophyceae	2.37	2.47	NS
Total (A)	18.28	17.38	NS
Zooplankton			
Crustacea	0.65	0.73	NS
Rotifera	2.46	1.15	*
Total (B)	3.11	1.88	*
Grand Total (A+B)	21.39	19.26	NS

*NS = Non significant at 5% level * = Significant at 5% level*

The comprehensive data on the stocking density, production and survival of gulsha, rajpunti and silver carp are given in Table 3. The increase in net weight of gulsha, rajpunti and silver carp was 44.1, 137.4, 433.9g and 33.6, 119.8, 380.1g in treatment-I and II respectively. It was found that the increase in net weight of all the fishes was high in treatment-I than in treatment-II. Species-wise monthly growth pattern of the fishes in treatment-I and II is graphically shown in Figure 1. Growth rate of all species was also high in treatment-I than in treatment-II. However, there was no significant difference in the average survival rate of fishes in treatment-I (85%) and treatment-II (81%).

Table 3. Stocking density, culture period, gross production and survival of gulsha with rajpunti and silver carp

Treat-ments	Species	Stocking density/ha	Culture period	Production (kg/ha)		Survival (%)	
				Species wise	Total	Species wise	Av.
I	*M. cavasius*	18,000	6 months	705.56	3,581.78[a]	84	85
	P. gonionotus	10,000		1,243.33		80	
	H. molitrix	4,000		1,632.89		91	
II	*M. cavasius*	18,000	6 months	579.72	3,124.71[a]	74	81
	P. gonionotus	10,000		1,123.05		89	
	H. molitrix	4,000		1,421.94		81	

Figures in the same column with same superscripts are not significantly different (P>0.05)

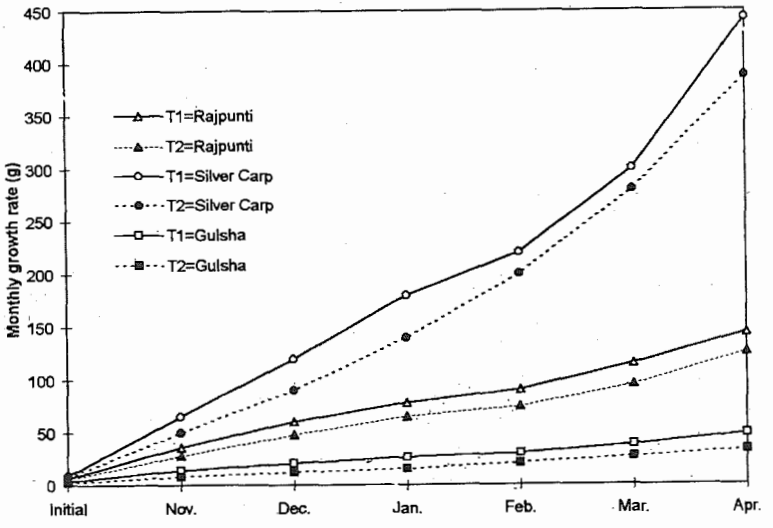

Fig. 1. Showing the monthly growth rate of fishes by average increase in weight.

While gross production did not show significant differences in yield in treatment-I and treatment-II (P> 0.05, F= 5.47), production of gulsha and silver carp was significantly higher (F= 198.30, F= 18.42) in treatment-I over treatment-II which might be due to the application of a nutritionally richer feed in treatment-I. Further, the production of rajpunti did not show any significant differences (F= 6.09) between the two treatments, probably application of duck weed in treatment-II which was utilized by rajpunti alone.

Cost of production and return from this study are presented in Table 4. While, estimating cost of production, variable costs towards lime, feed, fertilizer and fingerlings have been taken into account. As these small ponds are managed by the farmer himself, no labour charges have been taken into consideration. Cost of production in treatment-I and treatment-II was Tk. 79,494 and Tk. 62,788/ha/6 months respectively. While, the net benefit of Tk. 98,846

and 93,892 was obtained from treatment-I and II respectively. Where treatment-I indicating higher profitability in which rice bran and mustard oil cake were used.

Table 4. Cost and return analysis of gulsha with rajpunti and silver carp production per hectare per six months

Item	Treatment-I		Treatment-II	
	Quantity (kg)	Cost (Tk.)	Quantity (kg)	Cost (Tk.)
Pond preparation				
Lime	250	750.00	250	750.00
Cow dung	1,000	250.00	1,000	250.00
Fingerlings				
Rajpunti	10,000 Nos.	3,000.00	10,000 Nos.	3,000.00
Silver carp	4,000 Nos.	800.00	4,000 Nos.	800.00
Gulsha	18,000 Nos.	18,000.00	18,000 Nos.	18,000.00
Feed/Fertilizer				
Rice bran	9,082	18,164.00	17,034	34,068.00
Mustard oil cake	6,055	36,330.00	-	-
Duck weed	-	-	14,880	3,720.00
Inorganic fertilizer	300	2,200.00	300	2,200.00
Total cost		79,494.00		62,788.00
Gross production (kg/ha) and Return (Tk)				
Gulsha	705	70,500.00	579	57,900.00
Rajpunti	1,243	62,150.00	1,123	56,150.00
Silver carp	1,623	45,690.00	1,421	42,630.00
Total Return (Tk.)		178,340.00		156,680.00
Net benefit (Tk.)		98,846.00		93,892.00

The water quality parameters in all the ponds were within the limits of fish production and the fishes were not found in a distress condition during the experimental period. However, DO was relatively low in all ponds throughout the experiment. Ahmed (1993) reported a similar trend of lower DO from the fertilized and fed carp fingerling ponds in Bangladesh. In monoculture of *M. cavasius* using rice bran, mustard oil cake, wheat bran and fish meal, Kohinoor and Hussain (1994) demonstrated a production of 1,135 kg/ha/6 months. In monoculture of *P. gonionotus,* Hussain *et al.* (1989) obtained a production of 1,952 kg/ ha/5 months with only rice bran and 689 kg/ha/5months with only fertilizers. However, Kohinoor *et al.* (1993) got a production of 2,384 kg /ha/6 months using rice bran (60%) and mustard oil cake (40%) in monoculture of *P. gonionotus.* The present study indicates that farming of gulsha with rajpunti and silver carp is more productive and profitable and suitable for Bangladesh conditions.

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