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Impact of chapila (*Gudusia chapra* Ham.) on growth of carps in polyculture

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Abstract

The impact of chapila (*Gudusia chapra*) on the growth of carps was determined through introducing the fish in polyculture. A net average production with and without chapila were obtained at 467.11 and 889.54 kg/ha respectively ($P<0.05$) without affecting the survival of carps ($P>0.05$). The highest level of dietary overlap occurred between chapila and catla followed by chapila and rohu ($P<0.05$). The present study revealed that chapila reduces the net production at 47.49% in carps polyculture.

Key words : Carps polyculture

Introduction

Polyculture management techniques are based on the relationships between organisms at different levels of the food chain and the environment (Halver 1984, Hepher *et al.* 1989). Food and feeding habits of fishes are the prerequisites to the understanding the interspecific relationships for proper management of an ideal fishery system. For a better utilization of the food available in different strata and zones of an aquatic environment and maximizing production depends on the selection of appropriate fish species (Jhingran 1975). A knowledge of food and feeding habits would thus help in the selection of species for polyculture by ensuring maximum production through utilization of all available potential food in the waterbodies with minimum competition. To achieve adequate knowledge of the food and feeding behaviours and the extent of food competition between coinhabiting fish species, evaluation of dietary overlap are of great importance (Wahab and Ahmed 1992).

Therefore, considering the above facts, the present study was undertaken to observe the growth and determine the feasibility of culturing chapila in polyculture system by evaluating the production and dietary overlap among selected species (chapila, rohu, catla and mrigal).

Materials and methods

The experiment was conducted for a period of five months July to November, 1995 in six ponds of 800 m^2 with an average depth of 1.5m. The ponds were fertilized with urea and triple super phosphate (TSP) @ 25kg/ha respectively, after three days of liming @ 250 kg/ha. Three ponds were stocked with Indian major carps viz., rohu, catla and mrigal at the ratio of 4:3:3 at a stocking density of 6000/ha and the rest three ponds were stocked with the same manner plus 25% (1500/ha) of the total number with chapila under the treatment I and II, respectively.

Twenty fish of each species were randomly sampled fortnightly to know the growth and for adjustment the feeding on the basis of standing crop. All the ponds were fertilized fortnightly with Urea and TSP @ 25 kg/ha. The fishes were fed with supplementary feed with rice bran and mustard oil cake (2:1) daily at 3% of the total body weight. Routine sampling for water quality parameters such as DO, p^H, transparency and temperature were monitored weekly between 8.0-9.0 AM.

Five fishes were sacrificed and plankton sample collected through plankton net from each of the three ponds of the treatment II fortnightly. The preserved samples of plankton from ponds water and stomach content were investigated through a binocular microscope (X10) using a Sedgewick-Rafter Cell (Model S50, Fisons) following a standard method (APHA 1985) for counting plankton and identified upto genus level according to Prescott (1962) and Bellinger (1992). The dietary overlap among *G. chapra, L. rohita C. catla* and *C. migrala* were determined using Schoener's Index equation given by Schoener (1970).

Results and discussion

The overall mean values of each water quality parameters between the two treatments showed insignificant differences (P>0.05) except Secchi readings (P<0.05). The summarized data of growth of fish in the two Treatments are presented in Table 1. The results showed that the overall mean values for length and weight of carps under the two Treatments were found to be much higher in Treatment I over Treatment II owing to the absence of chapila. The weight basis data varied significantly (P<0.05) in rohu between the treatments i.e. with and without chapila and the other two for catla and mrigal were found to be almost higher which is also due to absence of chapila. Comparatively higher values of coefficient of correlation and regression were found in length-weight relationships for carps in Treatment I than that of treatments II. Thus the results indicates higher growth, healthy and relative robustness of carps cultured without chapila than that of with chapila. The reflection of these results can also be seen in the data given in Table 2 where net production was 90% higher ($P<0.01$) in the polyculture of carps without chapila (Treatment I) over that of with chapila (Treatment II). It also be noted that chapila reduces the net production of carps to 47% in polyculture compared to that of without chapila. No significant differences ($P>0.05$) was found in survival rates of carps between the two treatments.

Table 1. Length-weight relationships and t-tests between mean values for rohu, catla and mrigal under the two treatments

Species	Treat-ment	Mean		t-statistic	Correlation between length and weight		
		Length (cm)	Weight (g)		Correlation coefficient	Regression coefficient	Intercept
Rohu	T_1	14.364 ± 4.899	89.754 ± 59.573	2.745^{*}	0.97691	11.87884	-80.86872
	T_2	10.233 ± 3.004	31.426 ± 22.694		0.97936	7.39718	-44.27228
Catla	T_1	14.932 ± 5.359	116.594 ± 73.256	1.932^{NS}	0.97579	13.33853	-82.57959
	T_2	11.893 ± 4.027	61.683 ± 43.554		0.92677	9.25999	-51.53552
Mrigal	T_1	15.623 ± 6.072	111.640 ± 86.286	1.442^{NS}	0.96762	13.74926	-103.16920
	T_2	13.292 ± 5.253	62.957 ± 53.029		0.96660	9.75750	-66.74218

NS = Non significant at 0.05 level (P>0.05)
* *= Significant at 0.05 level (P<0.05)*
Where, $t_{0.05}(16) = 2.120$ *and* $t_{0.01}(16) = 2.921$

Table 2. Species wise survival rate, yield and production of two treatments during the period of experiment

Treatment	Species	Survival rate (%)	Yield (kg/ha)	Production (kg/ha)	
				Gross	Net
T_1	*L. rohita*	60.50	255.60	926.34	889.54
	C. catla	80.22	312.66		
	C. mrigala	80.00	358.08		
T_2	*L. rohita*	67.33	71.01	512.93	467.11
	C. catla	72.22	132.72		
	C. mrigala	80.00	234.07		
	G. chapra	Not estimated	75.13		

Estimates of dietary overlap based on calculation of schoener's index were summarized in Table 3. The highest level of dietary overlap occurred between chapila and catla followed by chapila and rohu and the lowest level occurred between chapila and mrigal (P<0.05).

Table 3. Dietary overlap between chapila and Indian major carps, catla, rohu and mrigal in different fortnight

Group	Schoener Index		
	chapila/catla	chapila/rohu	chapila/mrigal
Bacillarioplyceae	0.79	0.58	0.60
Chlorophyceae	0.70	0.41	0.43
Cyanophyceae	0.60	0.71	0.47
Euglanophyceae	0.53	0.63	0.52
Zooplankton	0.24	0.33	0.25
Phytoplankton	0.66	0.58	0.51
Zooplankton	0.24	0.33	0.25

The branchial mesh size of chapila is nearly related to silver carp (Alam 1995, Rahmatullah 1992). Dewan *et al.* (1991) stated that the greatest dietary overlap were observed for catla-silver carp. There is a remarkable significant effect on the growth of catla and rohu by silver carp (Matin. 1995). Hence, due to smaller branchial mesh size of chapila it appears to dominant for food competition and greatest dietary overlap occurred for chapila-catla and chapila-rohu.

Conclusions

Therefore, there is a clear indication in this study that the chapila does not suite in polyculture with Indian major carps because the fish is a strong filter feeder and heavily compete for food with catla and rohu.

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