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Comparative study on the growth performance of amur common carp (*Cyprinus carpio*) and catla (*Catla catla*) at polythene-lined farm ponds of Vijayapur district, Karnataka

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Abstract
The present study was conducted to evaluate the growth performance of Amur common and Catla at polythene-lined farm ponds of Vijayapur district, Karnataka. For this study, two Farm pond selected located at two villages *viz.*, Ronihal, Basavanabagewadi taluk and Kakhandaki, Vijayapur taluk of Vijayapur district, Karnataka. Fingerlings of Amur common carp and catla of uniform size were selected and stocked at the rate of 1 No/m^2 and the fishes were fed with floating carps feed @ 5% of fish body weight. In both the farm ponds located at Ronihal and Kakhandaki, Amur common carp had shown the highest growth in terms of gain in weight and length (1208.9g, 29.1 cm and 1208.9g, 29.1 cm respectively) compared to Catla (809g, 28.0cm and 919.05g, 28.3cm respectively). The specific growth rate of Amur common carp was highest both in Ronihal farm pond (2.29%) and Kakhandaki farm pond (2.33%) compared to Catla. The survival rate was also higher in Amur common carp in both the farm ponds of Ronihal (82%) and Kakhandaki (85%) compared to Catla (78 and 80% respectively). Amur common carp exhibited a better growth compared to Catla, which may be due to the omnivorous feeding habit and burrowing nature. It could be inferred from the study that Amur common carp could be incorporated as an alternative species against existing common carp and Mrigal and it can be culture with Catla by following the Stocking ratio 50: 50 would improve fish production.

Keywords: Amur common carp, polythene lined farm pond, floating carps feed, Catla

Introduction
Aquaculture is an important sector of food production and provide nutritional security, livelihood and employment to more than 14 million people in India. The total fish production of India is estimated to be 12.60 MMT during 2017-18, of which inland sector contributed 65% and culture fisheries contributed 50% of the total production. Presently, India ranks second in the world in total fish production with contribute of 6.3%.

The three Indian major carps including *Catla catla*, *Labeo rohita* and *Cirrhinus mrigala* contribute the bulk of aquaculture production of India to the extent of 85% of total fresh water fish production [1] and are the most preferred fishes for aquaculture because of their fast growth and higher acceptability to consumers [2]. In addition, many other medium as well as minor carps have been successfully incorporated into aquaculture and these fishes also have consumer's demand, higher market value and comparable growth potential in different region of the country [3]. Amur common carp (*Cyprinus carpio*) is an improved strain of wild common carp of Hungarian origin [4]. It has greater practical significance in low-input aquaculture systems due to its better growth performance, late maturing, hardy, accepts artificial feed and has similar food habit to that of existing stock [5].

More than 10,000 farmers in Vijayapur district constructed farm ponds of different size which provide them scope to store water during rainy season and use the same for crops during the dry spells and are successful. A pond of size of 33 m x 33 m x 3m (3,267 m^3) can store water that is enough to irrigate up to four short-term crops in a five-acre area in a span of six months. In many areas, a minimum of 1 m water is maintained and this can be efficiently use for growing fish as an additional income generation activity in addition to supply of proteinacious food. There is a need for utilize these water bodies through available technology. Therefore, the present investigation was conducted to study the growth performance of Amur common carp (*Cyprinus carpio*) and Catla (*Catla catla*) at polythene lined farm ponds of Vijayapur

district, Karnataka under SUJALA III project.

Materials and Methods

The present investigation was conducted to study the growth performance of Amur common carp (*Cyprinus carpio*) and Catla (*Catla catla*) at polythene lined farm ponds located at Ronihal and Kakhandaki village of Vijayapur district, Karnataka during August 2018 to May 2019.

All the two selected farm ponds were stocked with Amur common carp and Catla fingerlings. The healthy Amur common seeds and Catla were procured from FRIC (I), Hesaraghatta, Bengaluru and stocked. The details of stocking are presented in Table 1.

Liming at 0.02 to 0.04g/m2 and manuring with cow dung and urea with 4000kg/ ha (0.4g/ m2) and 200kg/ha respectively were followed in the prestocking management. Floating carps feed (28% protein, 4% fat) was used and it was provided @ 10% of their body weight for the first month and which was reduced to 5% till the end of the culture period. After a culture period of ten months, the fishes were captured using drag net and growth parameters and final weight was recorded and reported.

The fish growth (length and weight) data were collected from individual farm pond. The growth gain was studied following standard methods.

(1) The average body weight gain (ABGW) in grams was determined using following equation:

$$WG = W1\text{-}W0$$

Where**:** *WG* = Average weight gain (g), *W1* = Average final weight (g) and *W*= Average initial weight (g)

(2) The body length increment (cm) was determined using following equation:

$$\boldsymbol{L}=L1\text{-}L0$$

Where: *L* = Length increment (cm), *L*1 = Average final length (cm) and *L*0 = Average initial length (cm)

(3) Specific Growth Rate (SGR) was determined using following equation:

$$\textbf{SGR} = (\text{Ln Wt - Ln W0})/t \times 100$$

Where: *Wt* = Final weight (g), *W0* = Initial weight (g) and *t* = duration of experimental days.

Water quality monitoring

To assess the water quality of farm pond in relation to aquaculture, surface water samples were collected and analyzed at an interval of one month. The samples from two farm ponds were collected using a plastic bucket. The water sample was stored in one litter plastic bottles with air tight cap for analysis of certain parameters (Hardness, Ammonia nitrogen, Orthophosphate etc.) in the laboratory. Whereas, water temperature, pH, dissolved oxygen (DO), alkalinity, were analyzed at the sampling sites. All the parameters were analyzed as per the standard methods [6].

Statistical analysis

The data collected during this study were processed for selected statistical parameters (i.e. mean, range and standard error) for drawing specific conclusion.

Results and Discussion

The results pertaining to range and mean values of physico-chemical parameters, are given in Table 2. The data pertaining to growth of Amur common carp and Catla are presented in Table 3 and Fig 1. Among Two species stocked, Amur common carp had shown the highest growth in terms of gain in weight and length in Ronihal farm pond (1178g and 28.7 cm respectively) compared to Catla (809g and 28.0cm respectively). Similarly in Kakhandaki farm pond also Amur common carp had shown the highest growth in terms of gain in weight and length (1208.9g and 29.1 cm respectively) compared to Catla (919.05g and 28.3cm respectively) (Table 2 and Fig. 1). This finding is in conformity to the findings reported by [3], who found that the mean weight gain and specific growth rate of Amur common carp were higher compared to other carps in polyculture system. Similarly, Amur common carp exhibited faster growth rate compared to Indian major carps in seasonal water bodies of Chamrajnagar district, Karnataka under polyculture system [7].

It is evident from the data that the net weight gain, net length gain and SGR were higher in Amur common carp compared to Catla. The higher mean weight gain of Amur common carp might be due to the less inter-species competition for preferred natural food and dominancy of in feed consumption, burrowing behavior which results in the release of nutrients from pond bottom, increase the productivity and it also releases obnoxious gasses from the bottom consequently results the better yield [7]. This finding is in accordance with the results reported by [5] where they showed that growth of Amur common carp was faster over the existing of common carp.

The specific growth rate of Amur common carp was highest both in Ronihal farm pond (2.29%) and Kakhandaki farm pond (2.33%) compared to Catla. The survival rate was also higher in Amur common carp in both the farm ponds of Ronihal (82%) and Kakhandaki (85%) compared to Catla (78 and 80% respectively) (Table 2). Similar results are of Higher SGR were obtained in Amur common carp under polyculture with Indian major [3] and opined that, It might be due to the burrowing nature of Amur common carp, resulting better primary productivity.

The survivability percentage of Amur common carp (82 and 85 in farm ponds of Ronihal and Kakhandaki respectively) was higher compared to Catla (78 and 80 in farm ponds of Ronihal and Kakhandaki respectively). Similar survival percentage was reported in carps under polyculture [8, 9, 10]. The present work demonstrated that Amur common carp could be incorporated as an alternative species against existing common carp and Mrigal and it can be culture with Catla by following the Stocking ratio 50: 50 would improve fish production.

Table 1: Stocking of Amur common carp and Catla in farm ponds of Ronihal and Kakhandaki

S. No.	Particulars	Farm pond	
		Ronihal, Basavanabagewadi taluk	Kakhandaki, Vijayapur taluk
1	Area (m^2)	1200	750
2	Stocking density	1200	750
3	Size of fingerlings (cm)		
A	Amur common carp	4.1±0.05	4.0±0.05
B	Catla	4.2±0.03	4.2±0.03
4	Weight of fingerlings (g)		
A	Amur common carp	1.2±0.09	1.1±0.09
B	Catla	1.0±0.05	0.95±0.05
5	Stocking ratio (Amur common carp : Catla)	50 : 50	50 : 50

Table 2: Range and mean (in parenthesis) values of water quality parameters in selected farm ponds of Vijayapur district

Sl. No	Parameters	Ronihal	Kakhandaki
1	pH	7.5-8.0 (7.75)	6.5-8.0 (7.25)
2	Total Hardness as $CaCo_3$ (mg/L)	105-150 (127.5)	110-140 (125)
3	Total alkalinity (mg/L)	210-240 (225)	240-265 (252.5)
4	Phosphate (ppm)	0.1-0.2 (0.15)	0.2-0.35 (0.27)
5	Ammonia (ppm)	0.15-0.25 (0.20)	0.1 – 0.3 (0.2)
6	Dissolved oxygen (mg/L)	6.4 – 7.5 (6.95)	6.7-7.6 (7.15)

Table 3: Growth summary of carps (Amur common carp and Catla) in selected farm ponds of Vijayapur district (value ± standard error)

Water Body	Species	Weight(g)			Length (cm)			Survival (%)	SGR (%)
		Initial	Final	NWG	Initial	Final	NLG		
Farm pond, Ronihal, Basavanabagewadi taluk	Amur common carp	1.2±0.09	1180±5.30	1178.8	4.1±0.05	32.8±0.08	28.7	82	2.29
	Catla	1.0±0.05	810±10.90	809	4.2±0.03	32.2±0.31	28	78	2.23
Farm pond, Kakhandaki, Vijayapur taluk	Amur common carp	1.1±0.09	1210±8.80	1208.9	4.0±0.05	33.1±0.17	29.1	85	2.33
	Catla	0.95±0.05	920±6.87	919.05	4.2±0.03	32.5±0.36	28.3	80	2.29

NWG – Net weight gain, NLG - Net length gain, SGR – Specific growth rate

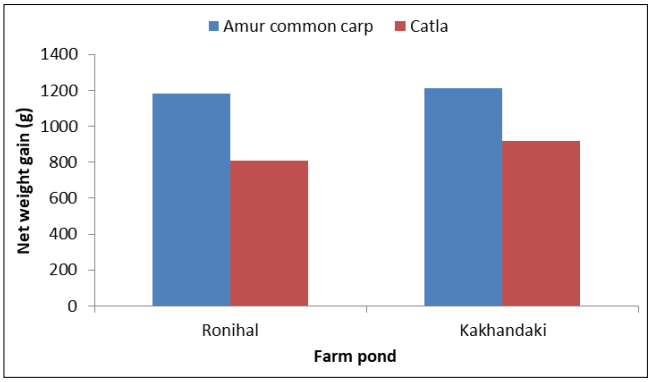

Fig 1: Growth performance of Amur common carp and Catla in selected farm ponds of Vijayapur District

Conclusion

This study indicated that the overall performance in terms of growth, survival, of amur carp is better than Catla and if both are stocked at the ratio of 50% each are more profitable and economically feasible in carp polyculture system.

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