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EFFECT OF NUTRIENT RICH FEEDS IN THE INITIAL STAGES OF CATLA FRY REARING IN NURSERY PONDS UNDER PHASED FERTILIZATION CONDITION

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Abstract

Small seasonal nursery ponds were used to determine the effect of nutrient rich feeds for rearing of initial stages Catla fry under phased fertilization condition at KVK fish farm. Raw cowdung and mustard oil cake were used as organic manure. Single Super Phosphate was used as inorganic manure. Ponds were stocked *Catla catla* spawn @ 10 million / ha. Egg yolk and soybean milk were used as supplementary feeds in the initial stages (first 5 days) of fry rearing. After five days, the fry was fed twice a day with a mixture of finely ground mustard oil cake and rice bran in the ratio of 1:1. The highest growth (27 mm and 232 mg) and survival rate (80.5%) were observed in treatment $\mathbf{T_1}$ (Egg yolk). Physico-chemical and biological parameters were found within the productive range for all the treatments.

Key words: Supplementary feeds, phased fertilization, nursery ponds, catla fry.

Introduction

The spawn is delicate and very small in size. It starts feeding voraciously soon after the absorption of yolk sac. At this stage, spawn measures 5.0 to 6.0 mm in length with a small mouth and requires a congenial environment for growth and survival. Thus, it is essential to produce large quantities of plankton of desirable size at a short period. Phased fertilization technique may be good to produce zooplankton in a very short duration. Under this technique, natural food chain in the aquatic ecosystem comprising of phytoplankton and zooplankton are replaced and continuous production of plankton is achieved. In this manner, zooplankton *viz.*, rotifers and cladocerans multiply very fast and due to their small size are readily consumed by the early stages of fish spawn. Further, initial stages of fry also require adequate amounts of protein and other nutrients and energy. In intensive culture, nurseries are stocked heavily with spawn and they consume plankton heavily, which may therefore, fall short. Hence, to achieve maximum survival of fry, it is necessary to supply nutrient rich supplementary feed along with production of natural zooplankton. Egg yolk and soybean milk, which are rich in protein, can play an important role in obtaining maximum growth and survival of spawn in their initial stages of rearing.

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Materials and Methods

The present investigation was carried out during *Kharif* 2017-18 at fish farm, Krishi Vigyan Kendra, Raipur. Experiments were conducted in four seasonal earthen nursery ponds varying in between 0.02 and 0.05 ha, with a water depth of 1.25 m. The ponds were prepared by ploughing with a tractor. After ploughing, lime was applied @250 kg ha^{-1}. Water was filled up to 0.50 m depth after six days of timing. Nurseries were manured three days after filling water. Raw cowdung and mustard oil cake were used in the same ratio as organic manures during the entire rearing period. On the first day of manuring 800: 800 kg ha^{-1} of cowdung and mustard oil cake was used which was reduced to 50% of the dose used on the previous day on each subsequent day. Single super phosphate was used @50 kg ha^{-1} every alternate day, except on the day of stocking and harvesting. Single super phosphate along with defined doses of cowdung and mustard oil cake were thoroughly mixed in water and uniformly spread over the water

surface of the ponds. Three days after the application of manure, by which time sufficient plankton had developed; soap-oil emulsion was spread over water surface to kill harmful aquatic insects. Twenty-four hours after spraying the emulsion, the water level of the ponds was raised upto 1 m and three-day old hatchlings of Catla (*Catla catla*) were stocked @10 million ha^{-1} in the early morning hours. From the second day of stocking, spawn were fed nutrient rich feeds like yolk of eggs @ 20 g per lakh of spawn ($\mathbf{T_1}$) and soybean milk @ 200 ml per lakh of spawn ($\mathbf{T_2}$). The method of feed preparation was very simple. First the required numbers of eggs were boiled. Then hard yolk part was mashed and mixed with a little water to make a paste. Then it was diluted to about two litres of water, it was uniformly spread on the water surface of the pond. For soyamilk preparation, the required amount of soybean grain was taken and soaked in water over night. Next morning, water was drained out and soybean was smoothly crushed in a mixer to extract milk. Then, it was diluted with about two liters of water and uniformly spread on the water surface as feed for spawn. In treatment $\mathbf{T_3}$ the egg yolk and soybean milk were employed. In control ($\mathbf{T_4}$), only phased fertilization technique was adopted. After the initial five days of spawn growth, a mixture of finely powder mustard oil cake and rice bran in equal proportions by weight (1:1) was given to the fry as feed. Along with supplementary feed, Cobalt chloride @ 0.1 g day^{-1} $lakh^{-1}$ and Vitamin B complex @ 0.1 g day^{-1} $lakh^{-1}$ spawn were given as growth promoters in all the treatments. Feed was increased by 5 kg per million hatchlings stocked, every five days. Feed was given twice a day at 8 a.m. and 4 p.m. daily. The ponds were sampled on alternate days to check the growth and well being of the fry. Physico-chemical parameters of water *viz*. temperature, pH, dissolved oxygen and transparency were monitored throughout the experimental period. Plankton samples were collected using no. 55 bolting silk plankton net with a mesh size of 100 mm. The collected samples were preserved in 5% formalin in the field and later both qualitative and quantitative estimation were done at the laboratory. At regular intervals length–weight were taken to estimate the relationship between them. At the end of 15 days, fry were harvested by repeated netting and survival rate and growth were recorded.

Results and Discussion

The water temperature in different ponds during the period of study ranged from 23.6 to 28.7^{0}C. The dissolved oxygen content varied from 4.5 to 7.3 mg L^{-1} (table 1) and the maximum and minimum values were recorded in the treatments $\mathbf{T_3}$ and $\mathbf{T_4}$ respectively. The dissolved oxygen content recorded for the treatments $\mathbf{T_1}$, $\mathbf{T_2}$, $\mathbf{T_3}$ and $\mathbf{T_4}$ were all within the acceptable range. The pH values of the ponds ranged between 7.1 and 8.4, which again shows that the soil is, conditioned which helps in the release of nutrients. Transparency varied from 12.0 to 18.0 cm indicating high productivity. Free CO_2 values were in the range of 0.3 – 1.3 mg L^{-1}.

Plankton populations were estimated from all the ponds and identified. Phytoplankton population was found to range from 700 to 2,200 organisms L^{-1} and zooplankton population was 800 to 2,900 organisms L^{-1}. Percentage values are presented in table 2. The plankton productivity varied between 1.2 and 2.6 ml/ 50 L of water sample. It was observed that generally, plankton production in the ponds was comparatively higher during the later part of the culture period. Among the four treatments, $\mathbf{T_1}$ showed best plankton population, followed by $\mathbf{T_3}$ and $\mathbf{T_2}$.

The highest survival rate was found in $\mathbf{T_1}$ (80.50%) where egg yolk was fed in the initial stages, followed by $\mathbf{T_3}$ (72.4 %) and $\mathbf{T_2}$ (61.25 %). Control ($\mathbf{T_4}$) showed very poor survival rate (25.00 %).

Spawn was reared for a fortnight to attain the fry stage. Hatchlings were generally 5-6 mm in length, weighing 1.5 mg each at the time of stocking. After a fortnight, they attained an average size of 22-27 mm length and 175.4 – 232.0 mg weight.

The survival and growth of fry are totally dependent on plankton productivity. Early fey requires very high amount of live feed *i.e*. plankton. In nurseries, phased fertilization is used to produce huge quantities of plankton. In this technique, certain zooplankters such as rotifers and cladocerans multiply very fast and due to their small size are readily consumed by the early stages (1-5 day old spawn) of fish. The average plankton productivity during the rearing period in four treatments was 2.37, 2.14, 2.35 and 1.46ml respectively. In $\mathbf{T_1}$, during the last 5 days the plankton showed a satisfactory level. All other treatments showed moderate level of plankton productivity. On the third day of manuring (also the day of stocking) a bloom of zooplankton was found. Being the early stages the zooplankton is very small in size. So when the spawn is stocked, they devour them heavily. Hence, plankton counts in the pond water were not enough. In thus of survival and growth, $\mathbf{T_1}$ treatment was the best.

Goolish *et al*. (1984) observed that 26.06^{0}C to 31.97^{0}C temperature range was the best during fish seed rearing periods. The temperature range recorded in the present study was 23.6^{0}C - 28.7^{0}C which is more or less

Table 1: Physico-chemical and biological parameters recorded during rearing period in different treatments.

Treatment	Parameter	Day of sampling							
		1	3	5	7	9	11	13	15
T_1	Temperature (°C)	25.5	27.2	24.8	26.2	28.1	26.0	27.0	27.3
	pH	8.0	7.8	7.9	8.0	7.8	8.0	7.9	8.1
	DO (mg l^{-1})	6.2	6.8	5.9	6.5	6.2	6.5	7.0	6.2
	Free CO_2 (mg l^{-1})	0.6	0.3	0.8	0.6	0.5	0.8	0.7	0.3
	Transparency (cm)	12.0	12.0	12.5	12.8	13.0	13.6	14.0	13.8
	Plankton	2.3	2.1	2.2	2.3	2.4	2.5	2.6	2.6
T_2	Temperature (°C)	25.2	26.8	23.6	25.7	26.0	27.5	27.0	28.5
	pH	7.5	7.2	7.6	7.5	7.9	8.1	8.0	7.8
	DO (mg l^{-1})	6.8	6.0	6.2	6.8	6.5	6.0	6.8	7.1
	Free CO_2 (mg l^{-1})	0.9	0.5	0.7	1.1	0.8	1.2	0.8	0.5
	Transparency (cm)	12.5	13.0	14.5	14.0	15.2	15.0	15.4	15.8
	Plankton	2.0	1.9	2.1	2.2	2.0	2.2	2.3	2.4
T_3	Temperature (°C)	26.9	28.1	24.8	26.4	27.5	28.0	26.7	28.0
	pH	7.8	8.0	8.2	8.3	7.8	8.4	8.0	8.0
	DO (mg l^{-1})	5.5	5.9	6.2	6.8	7.0	6.5	6.8	7.3
	Free CO_2 (mg l^{-1})	0.4	0.8	0.4	0.9	1.0	0.8	0.4	0.7
	Transparency (cm)	12.0	12.5	13.0	13.0	12.8	13.5	12.8	13.9
	Plankton	2.0	2.2	2.4	2.4	2.5	2.3	2.4	2.6
T_4	Temperature (°C)	24.5	26.0	27.8	28.2	28.7	25.7	26.5	26.0
	pH	7.5	7.7	8.0	7.8	7.2	7.9	8.0	7.1
	DO (mg l^{-1})	4.5	5.0	5.2	4.9	5.3	5.8	5.5	6.0
	Free CO_2 (mg l^{-1})	1.0	0.8	0.7	0.9	1.3	1.0	0.9	0.7
	Transparency (cm)	16.0	16.3	16.5	16.8	17.0	17.6	18.0	17.5
	Plankton	1.2	1.4	1.3	1.5	1.3	1.4	1.7	1.9

Table 2: Average quantitative composition (%) of plankton in different treatments.

Plankton	Average population (%)			
	T_1	T_2	T_3	T_4
Phytoplankton				
Chlorophyceae	45.80	47.20	45.00	45.00
Cyanophyceae	26.50	18.80	20.00	15.00
Euglenophyceae	10.30	12.00	18.70	10.50
Bacillariophyceae	5.00	9.00	4.50	5.00
Others	12.40	13.00	11.80	24.50
Zooplankton				
Rotifers	60.50	60.00	61.30	48.00
Copepods	15.00	22.90	16.00	28.00
Others	24.50	17.10	22.70	24.00

similar to the ones reported by those workers. During the experimental period, the highest and the lowest value of dissolved oxygen content were recorded in treatments T_3 and T_4 respectively. Alikunhi *et al.* (1955) reported that the range of dissolved oxygen content of a suitable water body for fish culture should be 5.0-8.0 mg L^{-1}. Dissolved oxygen content in the present study was 4.5 to 7.3 mg L^{-1}. The present observations are in agreement with those of Alikunhi *et al.* (1955) and it can be stated that dissolved oxygen content under different treatments were within the desired and productive range. The maximum and minimum values of pH were recorded in treatments T_3 and T_4 during fifth and third sampling respectively. The pH values as recorded in different ponds ranged between 7.1 and 8.4 indicating good productivity of the pond water though slightly alkaline. Free CO_2 and transparency were also within the desired range. The maximum and minimum values of free CO_2 were 1.3 and 0.3 mg L^{-1} respectively. Transparency range was 12 to 18 cm, indicating good productivity.

A wide variation in the quantity and quality of phytoplankton in terms of number and genera was observed among treatments. The major phytoplankton groups identified belonged to Chlorophyceae,

Bacillariophyceae, Cyanophyceae and Euglenophyceae. Mumtazuddin *et al.* (1982) have identified 33 genera of phytoplankton belonging to Chlorophyceae, Xanthophyceae, Chrysophyceae, Bacillariophyceae, Euglenophyceae and Myxophyceae. In an identical study, Dewan *et al.* (1991) identified genera of phytoplankton belonging to Chlorophyceae, Bacillariophyceae, Englenophyceae and Cyanophyceae. In the present study, Chlorophyceae dominated (45.75 %) in all the ponds followed by Cyanophyceae (20.07%) and Euglenophyceae (12.87%). Wahab and Ahmed (1992) also found that Chlorophytes dominated in the ponds, containing Indian major carps.

Similar to phytoplankton wide variation in zooplankton population in terms of quantity and quality were observed. The zooplankton belonged to groups observed are crustacea, hydrozoa and rotifera. Zooplankton genera found were almost similar to those listed in the earlier studies carried out by Alikunhi *et al.* (1955) in fish ponds. In the present study, zooplankton density was higher than that of phytoplankton, ranging between 800 and 2,900 Nos. L^{-1}. Among zooplankton, the most dominant were rotifers (57.45 %).

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