

## Effects of organic manuring (chicken droppings) on growth of *Labeo rohita* Ham. spawn

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### Abstract

An experiment was conducted in six nursery ponds to determine the effect of different doses of organic fertilizer (chicken droppings) on growth and survival of *Labeo rohita* spawn. Ponds were stocked with four-days old *L. rohita* spawn at a density of 25 g/decimal and reared for 25 days. Three doses of organic fertilizer *viz.* 20kg, 10 kg and 5kg per decimal were tried in treatments T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> respectively with two replication each. Fry were fed twice a day with a mixture of fine mustard oil cake and rice bran at the ratio of 1:1. The highest growth (6.33 cm and 3.33 g) and survival rate (72.30%) were observed for the treatment T<sub>2</sub>. Physico-chemical and biological parameters were found within the productive range for all the treatments.

**Key words:** Chicken manure, Spawn, *L. rohita*

### Introduction

Shortage of major carp seeds has been identified by various agencies as one of the constraints for aquaculture development in Bangladesh. This indicates that mere increase in hatchling production (over 12 billion hatchlings) will not solve the problem of shortage of fry/fingerlings unless efforts are made at the same time to increase their survival rate in nursery ponds. But due to improper nursing practice a considerable portion of those seeds become mortal, which requires to develop suitable techniques for nursing and rearing of larvae to ensure reliable supply of cultural fish fingerlings. In nursery management, proper care and understanding about the biotic and abiotic conditions of particular water body is important, when a undesirable condition may lead to mass mortality of fingerlings (Jhingran and Pullin 1985). Application of organic manure in nursery and rearing ponds can play vital role to ensure the production of planktonic feed for fingerlings. Among the organic manure poultry dropping is the best one for most of the fish species because it contain more nitrogen and phosphorus which play a vital role for primary production (David *et al.* 1969) and promoting fish growth with high profit Rappaport *et al.* (1977). Therefore, the present study was undertaken to understand the effect of different doses of organic fertilizer (chicken droppings) on the growth and survival of Indian major carp, rohu (*L. rohita*).

## Materials and methods

The experiment was undertaken in 6 nursery ponds of the Fisheries Faculty, Bangladesh Agricultural University Campus, Mymensingh. The size of ponds were equal having 1.67 decimal (0.004 ha) each. The average depths of the ponds were 1.25 meter. The experiment was conducted during the month of July 1996. Three doses of fertilizer, like 20 kg, 10 kg and 5 kg chicken droppings/decimal in treatment T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> respectively, each with two replicates were applied.

The ponds were prepared by cleaning them properly and then poisoned by phostoxin (aluminum phosphate) at a rate of 4 tablets/decimal. Three days after the use of phostoxin, lime (CaCO<sub>3</sub>) was applied at a dose of 1 kg per decimal and then after 3 days, the ponds were fertilized properly by chicken droppings using proper dose in the respective three treatment groups. After 5 days of fertilization, the ponds were stocked with carp spawns (*L. rohita*) at a density of 25 g per decimal to the ponds of all the treatments.

From the second day of stocking fry were fed twice daily with a mixture of finely powdered dried mustard oil cake and rice bran at the ratio of 1:1. Supplemental feed was applied on the following days maintaining 3 times of the initial stock of the spawn and was continued up to 5 days. On the consequent 5 days, the amounts of feed were increased 5 times, 7 times and 9 times respectively.

Sampling was done every 5 days interval by dragging a hapa in the pond to check the growth. Survival rate was calculated after the final harvest. Weight and length of 30 fry/pond were recorded randomly during each sampling.

Water quality parameters such as temperature, dissolved oxygen and pH were recorded at an interval of 5 days throughout the experimental period.

Plankton samples were collected by filtering 15 litres of water through No. 55 bolting silk value of plankton net with a mesh size of 100 µm. Collected samples were preserved in 5% formalin. The Sedgwick Rafter (S-R) cell was used to calculate the plankton population. The procedure was repeated 5 times for each sample and the average number of organisms was determined for one litre of water by applying the following formula:

$$N = \frac{A \times 1000 \times C}{V \times L \times F}$$

Where, N = No. of plankton cells or units per litre of original water

A = Total No. of plankton counted C = Vol. of final conc. of the sample in ml.

L = Volume of original water expressed in litre F = No. of field counted.

V = Volume of a field = 1 cu mm.

After 25 days of rearing fry were harvested, first by repeated netting, finally by complete draining of ponds.

## Results

### Water quality

During the period of experiment the water temperature of the ponds were found to varied from 28.30°C to 31.80°C. The average water temperature recorded were 30.30°C, 30.27°C and 30.64°C, for treatment T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> respectively (Table1).

**Table 1.** Average temperature (°C), dissolved oxygen (DO mg/L) content and p<sup>H</sup> value of pond water under different treatments

Treatments	Parameters	Samplings						Average
		1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>	
T <sub>1</sub>	Temperature	31.4	29.4	28.3	31.1	31.2	30.4	30.3
	DO	7.3	5.6	5.9	5.4	5.4	5.8	5.79
	p <sup>H</sup>	8.29	7.27	7.10	7.25	7.15	7.93	7.50
T <sub>2</sub>	Temperature	31.5	29.8	28.7	31.1	31.1	29.5	30.3
	DO	8.2	7.5	5.9	6.5	7.5	5.5	6.6
	p <sup>H</sup>	8.14	7.36	7.82	7.08	7.74	8.03	7.70
T <sub>3</sub>	Temperature	31.8	29.8	29.1	31.5	31.4	30.3	30.6
	DO	6.5	5.8	5.9	5.1	5.9	5.9	5.8
	p <sup>H</sup>	8.49	7.32	7.83	7.18	7.48	8.02	7.70

The dissolved oxygen content ranged from 5.05 to 8.20 mg/L. The maximum and minimum values were recorded for the treatments T<sub>2</sub> and T<sub>3</sub> during 1st and 4th sampling respectively. The average dissolved oxygen content recorded with the treatments T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> were 5.79, 6.55 and 5.81 mg/L, respectively (Table 1).

The pH values of the ponds were found to vary from 7.10 to 8.49 with the treatment T<sub>3</sub> and treatment T<sub>1</sub> at 1st sampling and 3rd sampling respectively. The average value recorded for the treatments T<sub>2</sub>, T<sub>3</sub> and T<sub>1</sub> were 7.50, 7.70 and 7.70 respectively (Table 1).

### Plankton population

Plankton populations were calculated from all the ponds and the results obtained are shown in Table 2. Sample wise average variation in plankton populations were found to range from 35900 to 47200 organisms/litre, 46700 to 59500 organisms/litre and 42700 to 50500 organisms/litre, in treatments T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> respectively.

Sample wise average variations in phytoplankton population were found to range from 15700 to 22700 organisms/litre, 22500 to 28700 organisms/litre and 20200 to 24200 organisms/litre in treatments T<sub>2</sub>, T<sub>3</sub> and T<sub>1</sub> respectively (Table 2). Sample wise average variations in zooplankton population were found to range from 20200 to 24500 organisms/litre, 24200 to 30700 organisms/litre and 22500 to 26200 organisms per litre in the treatments T<sub>2</sub>, T<sub>3</sub> and T<sub>1</sub> respectively (Table 2).

**Table 2.** Average variation in the abundance of phytoplankton and zooplankton and total plankton populations ( $\times 10^3$ ) among the treatments during the study period

Types of plankton	Treatments	Samplings					
		1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>
<b>Phytoplankton</b> (Bacillariophyceae, Chlorophyceae, Cyanophyceae, Euglenophyceae)	T <sub>1</sub>	15.7	18.7	20.5	22.7	21.2	20.5
	T <sub>2</sub>	22.5	24.5	25.9	28.7	25.5	24.2
	T <sub>3</sub>	20.2	22.7	23.9	24.2	22.9	21.7
<b>Zooplankton</b> (Crustacea, Rotifera, Hydrozoa)	T <sub>1</sub>	20.2	22.5	23.2	24.5	22.2	23.2
	T <sub>2</sub>	24.2	27.2	28.9	30.7	28.2	27.7
	T <sub>3</sub>	22.5	23.2	24.7	26.2	27.7	24.9
<b>Total plankton</b>	T <sub>1</sub>	25.9	41.2	43.7	47.2	44.5	43.7
	T <sub>2</sub>	46.7	51.7	54.9	59.5	53.7	52.0
	T <sub>3</sub>	47.7	46.0	48.7	50.5	48.7	46.7

### *Growth of fish*

The growth rate of fishes under different treatments were found to vary from 0.014 to 3.33 g in weight. In case of average gain weight significant variation was observed among different treatments and within the sampling. Significantly higher growth was found in treatment T<sub>2</sub> when compared with other treatments. However, no significant variation was observed between treatments T<sub>2</sub> and T<sub>3</sub> in the 6th samplings. The average maximum (3.33 g) and minimum (1.45 g) growth were observed in treatments T<sub>2</sub> and T<sub>1</sub> respectively. The highest average survival rate was recorded for treatment T<sub>2</sub> (72.30%) followed by treatment T<sub>1</sub> (61.95%) and treatment T<sub>3</sub> (52.50%).

### **Discussion**

During the study period the average temperature of pond water under different treatments were found in a suitable range favorable for carp fry nursing. Goolish *et al.* (1984) recorded maximum growth rate at 30°C temperature for juvenile of common carp and Rahman *et al.* (1982) mentioned that 26.06 to 31.97°C temperatures is the best for fish culture. The temperature ranges recorded in the present study are almost similar to the ranges reported by the authors.

During the experimental period the highest and lowest value of dissolved oxygen content were recorded for the treatments T<sub>2</sub> and T<sub>3</sub> at 1st sampling and 4th sampling respectively. The dissolved oxygen content of the investigated ponds were ranging from 5.05 to 8.20 mg/L which was within productive ranges as reported by Ali *et al.* (1982). DOF (1996) reported that the range of dissolved oxygen content of a suitable water body for fish culture would be 5.0-8.0 mg/L. From the above findings it can be stated that dissolved oxygen contents of water of the ponds under different treatments are found within the productive range.

The maximum and minimum values of pH were recorded for the treatments T<sub>3</sub> and T<sub>1</sub> during 1st and 3rd sampling respectively. No significant variation was observed among the pH values of the treatments. The pH values as recorded from different ponds (7.18 to 8.5) indicated good productivity of the pond water.

During the period of investigation, a wide variation in quantity and type (genera) of phytoplankton in terms of number and genera were observed. The major phytoplankton groups as identified composed of Bacillariophyceae, Chlorophyceae, Cyanophyceae and Euglenophyceae. Mumtazuddin *et al.* (1982) studied plankton in the ponds of AES, Mymensingh and 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, Euglenophyceae and Cyanophyceae. It is observed that Cyanophyceae dominated quantitatively in all the ponds during different stages of rearing. Wahab and Ahmed (1992) also found that cyanophytes dominated in the ponds containing Indian major carps. Bhimachar (1971) also reported the highest performance for phytoplankton production by the application of poultry manure. The presence of which was ensured in the present study by the presence of brown- green water color throughout the entire fry-rearing period. In the present study similar observation was noted in case of physico-chemical parameters of the water body and the presence and abundance of phytoplankton type as were reported by Mumtazuddin *et al.* (1982) and Dewan *et al.* (1991).

A wide variation of zooplankton population in term of quantity and type (genera) also observed. The zooplankton groups as identified are Crustacea, Hydrozoa and Rotifers. Zooplankton population in number and genera were found that almost similar to those listed in the earlier studies carried out by several workers in fish ponds. Mumtazuddin *et al.* (1982) studied plankton population of the ponds of AES, Mymensingh and identified 15 genera of zooplankton comprising Crustacea and Rotifers. Dewan *et al.* (1991) also identified 9 genera of zooplankton belonging to Hydrozoa, Crustacea and Rotifers in an identical study. Average higher amount of zooplankton were recorded for the ponds of treatments T<sub>2</sub> those treated with at a rate of chicken droppings 10 kg/decimal to enhance the production of zooplankton. Dhawan and Toor (1989) also discussed the role of poultry droppings alone and in combination with cowdung for higher production of zooplankton compare to application of cowdung alone.

The growth pattern of the fish shows rapid increase at the initial part of the experiment with a significant variation in the average gain in weight, and treatments T<sub>2</sub> showed significantly higher growth compare to other treatments. The cause of such high growth might due to the higher production of plankton food in the ponds under treatment T<sub>2</sub>. The role of poultry droppings for production of plankton food in a water body and promoting fish growth was also reported by several authors (Mitra *et al.* 1987., Varghese *et al.* 1981., Rappaport *et al.* 1977).

In the present study, the average survival rate was 61.95%, 72.3% and 52.5% in the treatments T<sub>3</sub> and T<sub>2</sub> and T<sub>1</sub> respectively. The highest (72.30%) survival rate was

recorded with the treatment T<sub>2</sub> and the lowest (52.50%) of the same was recorded with the treatment T<sub>1</sub>. From the facts stated above, it is clearly indicated that the chicken manuring (10 kg/decimal) in treatment T<sub>2</sub> is the best among all the treatments in case of fish growth. This might be due to the better ability of chicken manuring to enhance the production of plankton as the natural fish food organisms.

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