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REARING OF FISH FRY OF INDIAN MAJOR CARPS IN SEWAGE STABILISATION PONDS

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Introduction

While much work has been done on the design, construction and performance of stabilisation ponds in India (1), very little information is available on the rearing of fish fry in them (2) even though utilisation of sewage for fertilising fish ponds is in practice since long in and around Calcutta (3). The present investigation was undertaken to study the suitability of secondary sewage stabilisation ponds for rearing cyprinoid fish fry and comparing their rate of growth with those reared in regular nursery ponds.

Materials and Methods

The observations reported in this communication were made in Shahpura sewage stabilisation ponds at Bhopal. These stabilisation ponds are located 3 k.m south of T.T.Nagar and are designed to treat 13.5 Mld of domestic sewage from different areas. Sewage from these areas is collected in a sump near Habibgunj Railway Station from where it is pumped to stabilisation ponds. There are four pond ponds each of 220 m x 55 m x 1.3 m. Each pond is divided into two equal compartments known as primary pond and secondary pond. There are three inlets and three outlets in both the primary and secondary ponds. The outlet of the primary and the inlet of the secondary pond are connected by cement pipes. The sewage enters the primary pond through three inlets and the effluent goes out from the second pond through these outlets.

Fish fry were introduced both in secondary stabilisation pond and the nursery pond in Patra Fish Farm, Bhopal and growth rates compared. A consignment of 48000 of fish by (C. catla 1.2% average size 30 mm, L. rohita 9.1% average size 25 mm, L. calbasu 0.8% average size 20 mm and C. mrigala 88.9% average size 30 mm) was put in one of the secondary ponds. Another consignment of 15000 fish fry (C. catla 0.5% average size 20 mm, L. rohita 0.5% average size 16 mm, L. calbasu 0.7% average size 18 mm and C.mrigala 98.3% average size 18 mm) from the same stock was put on the same day in a regular nursery pond of 26 m x 13 m x 1.3 m at Patra fish farm, Bhopal, about 11.2 km north of the stabilisation ponds for studying the comparative rate of growth of young fish. Before introducing the fish fry in rearing pond, the pond was dewatered, limed at 120 kg per hectare and manured with cow dung at 10000 kg per hectare after filling with water. The young fish in the pond were daily fed on powdered mustard oil cake.

Plankton samples were collected by passing 50 litres of sewage or effluent through a plankton net and samples were immediately preserved in 4% formaline. Chemical and biological analysis was carried out as per Standard Methods.

Physico-Chemical and Biological Conditions of Sewage in Stabilisation Ponds and Water in Nursery Pond

Physical

Sewage in waste stabilisation ponds was greenish in colour and was weak. Temperature varied from 26.5° to 32° C while turbidity varied from 60 - 150 mg/l.

Chemical

Chemical Composition of influent to and effluent from secondary stabilisation pond and water in nursery pond are shown in Table 1.

Biological

Secondary stabilisation pond was found to be devoid of macrovegation through out these investigations. Plankton samples were periodically

Table 1

Chemical Composition of Influent to and effluent from secondary stabilisation pond and nursery pond

Chemical Analysis	Influent to Secondary pond	Effluent from Secondary pond	Rearing or nursery pond
pH	7.8-10.0	8.2-9.6	7.8-8.0
Free Carbon-dioxide	0.0-6.0	0.0-6.0	0.0-4.0
Total alkalinity ($CaCO_3$)	104-256	142-270	186-274
Dissolved Oxygen	2.4-23.6	1.8-16.8	3.2-10.0
Hydrogen Sulphide	Nil	Nil	Nil
Total Phosphate(P)	2.1-4.3	0.6-1.8	2.6-5.8
B.O.D	39-76	30-44	-

collected and examined. Observations made are shown in Table 2.

Secondary stabilisation pond was found to be rich in zooplankton which are more needed for faster growth of young fish. Plankton present did not show any qualitative or quantitative uniformity. Among phytoplankton, Crucigenia and Apacystis dominated in secondary pond. Among zooplankton forms, Eubranchipus and Cyclops dominated.

Diurnal Variation in the Chemical Composition and Plankton in Secondary Pond

Diurnal variation in chemical composition and plankton was studied. Samples were collected round the clock at the interval of every three or four hours and they were analysed on the spot. Results obtained are

Table 2

Qualitative and Quantitative Composition of Plankton in Secondary Pond

Plankton	Percentage by number of plankton in secondary pond on different days			
	1	2	3	4
Total Plankton (ml/50 ml)	0.2	0.6	2.5	1.3
Zooplankton				
1. Protozoans	2.5	-	0.7	1.7
2. Crustaceans				
Cyclops	35.0	8.5	48.0	9.0
Eubranchipus	10.0	12.0	24.0	2.0
Diaphanosoma	10.0	2.1	-	-
Moina	2.5	-	0.6	-
Nauplis	7.5	1.4	10.0	-
Simacephalus	-	-	3.3	8.3
Scapholeberis	-	1.4	-	-
Polyphemus	-	0.7	-	-
3. Ostracods	7.5	-	-	10.0
4. Rotifers				
Branchionus	10.0	-	0.7	1.0
Chromogaster	-	-	5.3	-
5. Phytoplankton				
Myxophycea	2.5	-	4.7	72.0
Chlorophyceae	2.5	73.9	0.7	-
Closterium	2.5	-	-	1.0
Diatoms	7.5	-	2.0	4.0

shown in Table 3 and 4.

Dissolved oxygen in secondary pond was never below 4.8 mg/l. Hydrogen sulphide was also absent. Phytoplankton were represented by more varieties of forms in the afternoon than in the early hours of the day. Rotifers and crustaceans which form the basic food of young cypronoids, constituted majority of the zooplankton present in secondary pond.

Table 3

Diurnal variation in chemical composition of sewage in secondary stabilisation pond

Time	pH	D.O	Carbonate alkalinity ($CaCO_3$)	Bicarbonate alkalinity ($CaCO_3$)
1.30 PM	9.0	11.6	54	154
4.30 PM	9.5	16.8	50	148
7.30 PM	8.5	13.2	44	154
10.00 PM	9.0	11.2	22	158
1.30 AM	9.0	5.2	36	160
4.30 AM	9.0	4.8	36	160
7.30 AM	9.6	7.2	44	148
10.30 AM	9.9	7.6	40	156

Table 4

Diurnal variation in percentage Composition of Plankton in Secondary Pond

Plankton	Time			
	1.30 PM	7.30 PM	4.30 AM	10.30 AM
Total Plankton (ml/50 L)	0.5	0.7	1.9	1.1
	Percentage by number			
Protozoans	3.8	-	-	-
Crustaceans	31.4	12.7	47.9	48.3
Rotifers	1.9	-	-	-
Myxophyceae	57.1	78.2	51.2	48.5
Chlorophyceae	-	-	-	1.1
Bacillorophyceae	5.8	17.1	-	2.1

Growth of Fish Fry in the Secondary Stabilisation Pond and in the Rearing Pond

The growth rate of fish fry in secondary stabilisation ponds was compared with the growth rate of fish fry in a well managed nursery pond over a period of 2 months. The average size and weight of the fishes in all the ponds were found out at different times by netting them out using nursery nets. Results obtained are given in Table 5 and 6.

No fish mortality was noticed in the ponds during the period of study. Fish were found to be quite healthy both in secondary stabilisation pond and nursery pond.

The rate of growth of young fish in the secondary stabilisation pond was faster than in the nursery pond. It is known that it is difficult to maintain the same density of zooplankton in nursery ponds with a heavy population of fish fry in them (5). As sewage is fed regularly to the ponds the density of zooplankton is maintained in the secondary pond. The rate of growth of young fish was high in secondary sewage stabilisation pond as it maintained comparatively rich zooplankton crop and provided ideal hydrological conditions for the rearing of carp fry.

Conclusions

1. A study was made on the possibility of rearing fish fry in secondary sewage stabilisation pond. Rate of growth of fish fry of C.catla, L.rohita, L.calbasu and C.mrigala was compared in secondary waste stabilisation pond and a well managed nursery pond.

2. The rate of growth of fish fry was more in secondary sewage stabilisation pond as it was found to provide the optimum hydrological conditions for their growth. This was ascertained by analysing the samples from both the ponds on different days and by studying diurnal variation in chemical and biological characteristics on some other days.

Table 5

The growth rate of young fish in secondary stabilisation pond

Fish species	Days				
	0	17	30	43	49
C.catla					
Length (mm)	3.0	-	-	-	187
Weight (gm)	0.34	-	-	-	100.7
L.rohita					
Length (mm)	25	55	-	-	125.0
Weight (gm)	0.16	3.0	-	-	26.3
L.calbasu					
Length (mm)	20	-	94	128.5	142.0
Weight (gm)	0.1	-	11.4	26.9	33.0
C.mrigala					
Length (mm)	30	26	73	98.5	111
Weight (gm)	0.33	2.0	4.6	9.2	15.3

Table 6

The growth rate of young fish in nursery pond

Fish species					
	0	20	33	43	49
C.catla					
Length (mm)	20	45	70	120	120
Weight (gm)	0.08	0.55	18.2	30.0	30.0
L.rohita					
Length (mm)	16	-	65.0	72	72
Weight (gm)	0.3	-	3.05	3.33	3.35
L.calbasu					
Length (mm)	16	38.0	58.5	-	65.0
Weight (mm)	0.035	0.44	2.65	-	3.0
C.mrigala					
Length (mm)	18	48	65	-	68
Weight (gm)	0.03	0.50	4.02	-	6.00

3. Nutrient materials present in the effluent in the secondary pond can thus be profitably utilised for rearing fish fry in them.

References

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