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EFFECT OF DOMESTIC SEWAGE ON GROWTH, FECUNDITY AND SURVIVALITY OF *AMBLYPHARYNGODON MOLA* AND *CHANDA NAMA*.

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Inland water bodies are subjected to heavy stress due to enormous addition of domestic waste water. Experiments were conducted with domestic sewage effluents to determine their effects on fishes like *Amblypharyngodon mola* and *Chanda nama*. The 96 hours static bioassay studies showed LC5-LC90 values ranging from 23.60-67.89% and 25.67 – 76.46% respectively. Exposure to three different dilutions (5%,50%, 90%)) of domestic sewage effluents for 100 days resulted in significant changes (P<0.05) fecundity and survivality and GSI of fish as compared to control. Among physicochemical parameters, significant alterations were noticed in dissolved oxygen (DO), of bottom sediment. The data indicated higher number of faecal coliform and aerobic nitrogen fixers (ANF) and also high heterotrophic bacterial density.

Key words: Sewage, GSI, Aquatic ecosystem, fecundity.

INTRODUCTION

Domestic sewage mainly composed of high amount of nitrogenous memtabolites, fecal coliform and heterotrophic bacteria. The inland freshwater resources are increasingly subjected to heavy stress due to huge discharge of domestic waste water. It results in deterioration of water quality and effects on Ichthyonecton diversity (Choudhury & Mitra, 2005). Waste water although rich in nutrients but it poses problem such as toxicity to fish and their natural food, bioaccumulation of pesticides, heavy metals and detergents, etc. in fish (Buras, 1988). It also acts as potential vectors for the transmission of pathogens (Geldrich and Clark, 1996).

A number of studies have been made earlier in India on the use of waste water in aquaculture (Ghosh, et.al., 1988; Jana, 1998). Reports on the toxicological influences of waste water on anchovy fishes and aquatic ecosystem are very limited. Present study was made to evaluate the impact of crude domestic sewage water on two anchovy fishes *Amblyopharyngodon mola* and *Chanda nama*. A study was also made to determine the degree of impact of the sewage water on their exposed ecosystem.

MATERIALS AND METHODS:

Two separate experimental set up were made for two different species of anchovy fish. The experiments were perform in a water reservoir of 500 litter tank for 100 days using three different concentrations of sewage (5%, 50%, 90%). One similar arrangement was made without giving the sewage water was treated as control. The total concentrations were calculated and given in three monthly instalments. Unchlorinated tap water was used as diluents.

Each tank was stocked with 25 fries of *Amblyopharyngodon mola (*length 38.4 ± 5.6mm*) and weight 0.95*±0.08 gm) and *Chanda nama* (length 34.40 ± 1.2 mm and weight 0.84 ± 0.09 gm)separately. Appropriate control was maintained.

The control tank fishes were feed with rich bran and groundnut oilcake (1:1) thrice a week @ 2% of fish biomass. No supplementary feed was given in experimental sets. The fishes were collected from farm pond and acclimatized for 7 days in the same tank in laboratory. Among them, only healthy fishes were selected for experimental purpose. Fishes were exposed for 96 hours in 20 litter glass aquaria containing 10 litters of tap water. Initial hydrological parameters were measures as

pH=7.3±0.1, DO= 2.5 mg/lit, Total alkalinity 246 mg/lit., Hardness 120 mg/lit. Free Co_2 9.7mg/lit., Temperature= 27.4^0 C).

Crude sewage water was collected from a drain and physicochemical, biological and bacteriological studies were made following the standard methods (APHA, 1985). The values were given in Table-1. The total aerobes were determined by pour plate methods after 48 hours of incubation in sodium caseinate baird and Parker agar mediuim Other microbial groups were counted by MPN methods using three tubes. Observation on behavioural changes and mortality of fish were made daily. At the end of the experiment, weight, length, maturity indices (MI) and Gastrosomatic index (GSI) of test fishes were calculated separately for the two exposed fishes. The statistical significance between the treated and control set was calculated by t-test at 5% level of significance.

RESULTS AND DISCUSSION:

The physicochemical and microbiological features of collected sewage water used for the present study is given in table-I.

Table-I: Shows physicochemical and microbiological features of collected domestic sewage water.

Parameters	Values	Parameters	Values
pH	7.3	Temperature	29^0C
DO	0.4 mg/lit.	Total Alkalinity	245 mg/lit.
Total Hardness	450 mg/lit	HCO_3 ions	550 mg/lit.
Chloride	120 mg/lit	BOD_5	168 mg/lit.
Nitrate	0.23 mg/lit	COD	277 mg/lit.
Coliforms count	$4.0x10^4$ per ml.		

The present study shows the 96 hours LC5, LC50 and LC95 values of waste water for *Amblypharyngodon mola* was 25.43, 56.43, and 69.87% respectively. In case of Chanda nama, the values were 34.26, 63.87 and 78.12% respectively. It was observed that toxic effects of sewage water on both the fishes occurred with first 48 hours.

Acute toxicity values of domestic waste water were measured using different species of fish by earlier workers (Gill and Toor, 1975, Sarkar *et al.,* 1993, and Bhowmik *et al.,*1995). The 96 hours LC50 for fry of *Cyprinus carpio* was 34% of domestic waste water as reported by Ghosh *et al*., (1985). Sarker *et. al., (*1993) reported the values as 31-33% in case of fry of *Labeo rohita*. The previous data indicated that both the exposed fishes in the present study were more resistant than other species of fishes studied earlier.

The present study also indicates the reaction of domestic sewage water on fishes. Fishes exposed to 70% dilutions (70:30 sewage water: tap water) lost body balance within 5-6 hours for both the exposed fishes. The opercular movements of the fishes were reduced and later lethargic movements with frequent surfacing were noticed in the present study for both the cases.

In 50% dilution, both the fishes are lethargic after about 24 hours of exposure. When the fishes were exposed to lower concentration (10%) for sewage water, they remain very much active and behaved normally throughout the study. No notable behavioural changes were observed in case of both the fishes when exposed to different concentrations of wastewater during the whole study period. The survival rate of *Amblypharyngodon mola* was 81% in 5% sewage water concentrations. 75% in 50% sewage water and 55% in case of 90% sewage water concentrations. In case of *Chanda nama*, the survival rates were 74%. 65% and 40 % respectively in three sewage concentrations. This shows that *Amblypharyngodon mola*, more or less moretolerant that *Chanda nama* in experimental conditions. In both the cases, the control shows about 95% survival rate.

The mean growth increasement of *Amblypharyngodon mola* recorded were 0.03, 0.021 and 0.05 gram per day in 5%, 50% and 90% sewage water respectively. The mean growth of the control was seen 0.01gm per day. The mean growth increasement of *Chanda nama* recorded were 0.01, 0.02 and 0.031 gm per day in 5%, 50% and 90% sewage water respectively. The mean growth of the control was seen 0.016 gm per day in case of *Chanda nama*. The results showed that the fish

production in 90% sewage water was higher in case of both the fishes, might due to the presence of higher concentrations of organic maters.

These results tally with the observation of Bayoumi and Khalil (1988), and Ghosh et. al., (1988). The fecundity was observed in case of *Amblypharyngodon mola* was 138± 0.08 eggs in control, 138± 0.08 eggs in 5% sewage waters, 103± 0.63 eggs in case of 50%sewage water while 79±0.59 eggs in case of 90% sewage water. These results slightly contradict with the earlier observations. Earlier observations showed slight increasement of fecundity in sewage water in case of *Oreochromes mossambicus* . (Sarkar, *et. al.,* 2000). In case of *C.nama*, the fecundity was observed as 126 ± 0.05 eggs in control, 54±0.04 eggs in case of 5% sewage water, 67±0.65 eggs in case of 50% sewage water while 90 ± 0.71 eggs in case of 90 % sewage water.

The gastrosomatic index (GSI) in case of *A. mola* was 6.15 ±0.03 in case of control. 5.47±0.65 in case of 5% sewage water, 6.36±0.49 in case of 50% sewage water and 6.98± 0.38 in case of 90% sewage water. GSI in case of *C.nama* was 5.45±0.62 in case of control, 5.34±0.37 in case of 5% sewage water, 5.06±0.72 in case of 50% sewage water and 5.08 ± 0.29 in case of 90% sewage water. In this case the GSI remained more or less unchanged in three different experimental conditions in comparison to the control.

In case of Amblypharyngodon mola

	Control 0% Sewage water	5 % Sewage water	50% Sewage water	90% Sewage water
Survivality	95 ±0.61%	81 ±0.05%	75 ± 0.45%	50±0.34%
Growth rate (gm/day)	0.01±0.002	0.03±0.001	0.021 ±0.002	0.05±0.001
Fecundity (Number of eggs)	138 ±0.08	67±0.04	103±0.63	79±0.59
GSI	6.15 ± 0.03	5.47±0.65	6.63 ±0.49	6.98±0.38

In case of Chanda nama

	Control 0% Sewage water	5 % Sewage water	50% Sewage water	90% Sewage water
Survivality	95± 0.38%	74±0.27%	65±0.53%	40±0.67%
Growth rate (gm/day)	0.016±0.001	0.01±0.001	0.02±0.002	0.031±0.054
Fecundity (Number of eggs)	126±0.05	54±0.04	67±0.65	90±0.71
GSI	5.45±0.62	5.34±0.37	5.06±0.72	5.08±0.29

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