

Studies on ecological status of rural area Gaura pond of Darbhanga, Bihar

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ABSTRACT

Physico-chemical and biological parameters of any pond are used to check the water quality and presence of microbiological organisms.

In the present study the rural area Gaura pond of Chanaur Block of Manigachi village of district Darbhanga, Bihar was selected for Ph.D. work. The parameters of water quality and plankton studies were investigated during the year 2014-15.

Keywords: *Physico-chemical profiles, Ecological status, Gaura pond, Planktons*

INTRODUCTION

Ponds are noted for their copious and rich varieties of plant and animal life, which all are maintained in an insubstantial ecological balance. Life ranges from microscopic bacteria to insects, fish, small animals and water birds. The pond's age, the number of species living in it progressively increases until the growth of larger plants; algae and the accumulation of wastes convert it into a marsh or causes it to dry up. The ponds represent a stable environment where living things interact and materials are used over and over again. This is considered an ecosystem.

In the past years, pond ecology has witnessed many alterations in its natural composition which in general causes habitat destruction, fragmentation and loss of biological components (Azmi *et al.*, 2015; Kumari and Verma, 2014; Sharma *et al.*, 2015; Ramulu and Banerjee, 2013, and Yadav and Kumar, 2014). Various factors which play an important role in their growth of flora and fauna in water body i.e. temperature, turbidity, nutrient, hardness, alkalinity, dissolved oxygen and biological oxygen demand indicates the pollution level of the water body (Singh and Shashi, 2014; Jha *et al.*, 2015, and Alam *et al.*, 2016). Therefore a regular monitoring of ponds is a need to maintain and improve the ecological environment of the pond. The present study is a part of Ph.D. work and is an investigation on some physico-chemical and population density of phytoplanktons of rural area of Gaura pond.

MATERIALS AND METHODS

Samples of selected Gaura pond from different sites were collected for a period of twelve months, starting from February 2014 to January 2015 for investigation of physico-chemical profiles and March 2014 to February 2015 for seasonal variations in planktonic community. Samples were collected in triplicate from each site during the different seasons (summer, winter and monsoon) using PET bottles as per standard procedures and analysed as per work plan employing methods as prescribed by APHA, 2005.

RESULTS AND DISCUSSION

Physico-chemical and seasonal variations in planktonic community of Gaura pond in different seasons and at different sites was investigated. As temperature is the important

factor which influences the chemical, biochemical and biological characteristics of any aquatic system (Ramulu and Banerjee, 2013), drastic changes were observed in winter (22.975 ± 0.92), summer (26.925 ± 0.77) and monsoon (20.125 ± 1.89) (Table 1). The pH also exceeded in winter and in summer. Remaining all the physico-chemical profiles like transparency, conductivity, DO_2 , FCO_2 , CO_3 , HCO_3 , total alkalinity, calcium hardness, magnesium hardness, and total hardness showed indirect effect of toxicity intensifying deoxygenating and finally increasing the biomagnifications.

Different plankton communities are also reported to prefer water with different physico-chemical characteristics. Kumari and Verma, 2014 observed that abundant growth of blue green algae in pond water as inorganic nitrogen and phosphorus concentration were less than detectable limit. In Gaura pond members of Cyanophyceae, Chlorophyceae and Bacillariophyceae class and member of Phylum Rhizopoda, Rotifera, Copepoda and Cladocera were observed in all seasons, all months. The fluctuation seems to be mainly due to water temperature (Table 2). Total phytoplankton density showed direct and significant correlation with water temperature in relation to the total Zooplankton showed its maximum density during winter in all the sites and minimum density during rainy season. Present investigations also confirmed the earlier works done by many workers (Singh and Shashi, 2014; Alam *et al.*, 2016; and Azmi *et al.*, 2015).

Table 1
Physico-chemical profiles of rural area Gaura pond of Darbhanga
(From February 2014 to January 2015)

Parameters & Months	Winter	Summer	Monsoon
Temperature	22.975 ± 0.92	26.925 ± 0.77	20.125 ± 1.89
Transparency	13.95 ± 0.54	16.725 ± 0.765	13.425 ± 0.341
Conductivity	22.975 ± 0.93	16.725 ± 0.765	13.425 ± 0.341
pH	8.65 ± 0.074	8.5 ± 0.066	7.50 ± 0.072
DO_2	9.15 ± 0.166	7.77 ± 50.20	11.6 ± 1.39
FCO_2	5.45 ± 0.790	5.65 ± 0.604	2.45 ± 0.11
CO_3	27.9 ± 1.40	34.8 ± 2.369	43.475 ± 2.264
HCO_3	132.05 ± 3.348	136.375 ± 2.286	156.11 ± 2.81
Total Alkalinity	159.95 ± 3.74	171.175 ± 4.55	199.575 ± 4.789
Calcium Hardness	171.575 ± 2.58	88.05 ± 1.452	122.65 ± 1.59
Magnesium Hardness	55.675 ± 0.246	25.35 ± 0.58	34.2 ± 0.772
Total Hardness	225.075 ± 2.144	113.4 ± 1.457	156.85 ± 1.891

Table 2
Seasonal variation in planktonic community of Gaura pond of Darbhanga
 (From March 2014 to February 2015). PP=Phytoplankton, ZP=Zooplanktons

Seasons		Total Planktons	Cyanophyceae (U/L)	Chlorophyceae (U/L)	Basillariophyceae (U/L)	
Summer	PP	22397	12410±135.66 (55.409)	8117±107.7 (36.24)	1870±13.16	
Winter		17362	7613±81.45 (43.85)	2019±12.18 (11.63)	7730±146.48	
Monsoon		15935	10170±63.3 (64.45)	2445±21.16 (15.34)	3320±69.84	
	ZP		Rhizoda (U/L)	Rotifera (U/L)	Copepoda (U/L)	Cladocera (U/L)
Summer		7817	(00)	809±4.65 (10.34)	2298±26.3 (29.40)	4710±16.49 (60.26)
Winter		9901	405±8.38 (4.06)	845±4.28 (8.52)	4795±30.53 (48.43)	3859±16.46 (38.98)
Monsoon		7651	20±0.61 (0.26)	32±0.63 (0.42)	3350±18.76 (43.78)	4249±29.23 (55.54)

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