

## Studies on Ecosystem analysis of Model Pond located at North, Patna

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**ABSTRACT:** *Physico-chemical characteristics of the surface water of a model pond located at Phulwarisharif, Patna, India were studied. Both abiotic and biotic components were investigated. Physico-chemical parameters were estimated along with the biomass of both the phytoplankton and zooplanktons. The study aimed to analyze the aquatic ecosystem in reference to the network of food and energy transfer between different trophic levels.*

**Key Words:** *Physico-chemical parameters, phytoplanktons, zooplanktons*

### Introduction:

The model pond refer (red/s) here exists (ing pond) in the Phulwari Sharif locality of the district, (of) Patna (Bihar), India. Geographic location is as follows:

Latitude:- 25.53417N

Longitude:- 85.105789E area of the pond is 12,240 sq.ft. Physico-chemical features of the pond were studied to evaluate the ecosystem network and analysis.

**Method of water samples for chemical analysis:** -Sampling in the model pond was done in winter, summer and monsoon seasons separately. Water samples were collected in the morning between 9 to 10 am. The samples of water were taken from a depth of 0.5 m. The water samples were collected in neutral glass container of 5 liters with double cap device. The samples were collected up to the top. Prevent the release of dissolved gases during the transit period.

**Water samples for plankton analysis:**-The plankton samples were collected from different sites of the pond seasonally by using plankton net having mesh size of 50 $\mu$ , during December. The 100 liter water sample was filtered through the plankton net in 10 ml sampling bottle attached to the plankton net. The collected plankton sample was immediately preserved with 4% formalin.

Temperature and pH were estimated by centigrade thermometer and pH meter respectively. Electrical conductivity was recorded by conductivity meter. TDS was measured by evaporation method. Sampling of the water body, physico-chemical parameters of the pond during all three seasons and biomass of planktons and consumer organisms (except the fish and detritus) were estimated according to Saxena (1987).

### Discussion:-

Physico-chemical parameters of the pond are presented in Table 1. In present study the maximum and minimum value of pH are 8.94 and 7.54 respectively which are under the desirable range.

Minimum temperature was recorded in winter (14.2<sup>o</sup>C) while in summer it went up to 31.4<sup>o</sup>C in the investigation. Temperature is defined as the degree of heat or cold in the body of a living organism either in water or on land (Lucinda and Martin, 1999). Higher temperature causes increase in oxygen demand.

Conductivity is related with salt. The higher is the salt content, EC is higher. In the model pond, the minimum conductivity was recorded in the winter and maximum in monsoon. EC is the measure of the ability of an aqueous solution to conduct electricity (Paul et al 2015). TDS is a good measure of total amount of salt present in water which is indicated by electrical conductivity. It is an excellent indicator of TDS (Krishnamoorthi and Selvakumar, 2010). TDS was found maximum in monsoon and minimum in winter (Table 1). They are very useful parameters which describe the chemical constituents of water. It can be considered as edaphically related contributing to the productivity within the water body (Goher, 2002).

Free CO<sub>2</sub> was maximum in summer (6.52 mg/l) and minimum in winter (5.11 mg/l). There is negative correlation between DO and free CO<sub>2</sub>. In present study, it was observed that DO declined with increase in temperature. When DO levels drops to 4-2 mg/l, there are undesirable changes in odour, taste and color which reduce the usefulness of water and it results in an aquatic life distressed (Tank and Chippa 2013). The BOD value ranged from 2.96 mg/l in winter to 6.7 mg/l in the summer in model pond. The unpolluted water

has BOD < 1.00 mg/l, moderately polluted water has 2.00-9.00 mg/l of BOD value while the BOD >9.00 indicates highly polluted water (Yadav *et al.*, 2013). In present study, the COD value was minimum in winter (11.54 mg/l) and maximum in summer (16.48 mg/l).

Minimum value of chloride obtained was 29.7mg/l in summer and maximum observed value of chloride was 43.2 mg/l in monsoon.

Minimum value of total phosphate was observed 0.11mg/l in winter and maximum 0.23mg/l in monsoon. In this investigation, TH (Total hardness) was recorded between 62.72mg/l -113.54mg/l in summer and winter respectively. Stone and Thomforde (2004) observed that the desirable range is 50-150 mg/l as CaCO<sub>3</sub> and acceptable range is above 10 mg/L as CaCO<sub>3</sub>. Physico-chemical parameters are shown in table I. In table II the biomass of Phytoplanktons and in table III Zooplanktons are shown.

Phytoplankton is the vital source of energy as primary producers and it also serves as a direct source of food to the other aquatic plants and animals (Battish, 1992).

Plankton status of Model Pond				
Model Pond	No. of classes found		No. of species observed	
	No. of group found		Phytoplankton	Zooplankton
	Phytoplankton	Zooplankton	Phytoplankton	Zooplankton
	1	4	6	9

Total six phytoplankton species were found in the model pond. There were *Ankistrodesmus falcatus*, *Ulothrixaequalis*, *Stichococcus*, *Subtilis*, *Pediastrum simplex*, *Ulothrixvariabilis*, *Mougeotiopsis calospora*. Nine zooplankton species were recorded from the model pond. They were *Brachionus calyciflorus*, *Brachionus forficula*, *Keratella tropica*, *Filinia terminalis*, all belonging to Rotifera group. *Streptocephalus dichotomus* belongs to Arthropoda. *Heliodyptomus viduus* belongs to Copepods. *Amoeba proteus*, *Amoeba radiosa* and *Amoeba discoids* belong to Rhizopods.

From the aforesaid investigation we come to the conclusion that most of the physico-chemical parameter such as temperature, pH, DO, chloride, phosphate, TDS were within safe limit. DO was negative correlated with CO<sub>2</sub> and BOD. DO was increased with pH increase. Phytoplankton which belongs to the first trophic level is autotrophs. It is the most sensitive floating community and also the first target of water pollution. This is the reason why any undesirable change in aquatic ecosystem affects diversity as well as biomass of this community.

## References

- Battish, S.K. 1992. Freshwater zooplankton of India. Published by Oxford & IBH publishing Co. PVT. LTD. New Delhi.
- Goher MEM 2002. Chemical studies on the precipitation and dissolution of some chemical element in lake Qarun, Ph.D. Thesis faculty of sciences, Al-Azhar University, Egypt
- Krishnamoorthi A and Selvakumar S 2010. Seasonal variation in physicochemical characteristics of water bodies in and around Cuddalore district, Tamil Nadu: Nature Environment and Pollution Technology 9(1):89-92
- Lucinda, C. and Martin, N., (1999), Oxford English Mini- Dictionary Oxford University Press Inc, New York, pp 200-535.
- Paul DK, Sanyal S, Swarna S and Kumari R 2015. Impact of Saraswati idol immersion on the water quality of Ganga river at Patna (Bihar), India. Journal of Patna Science College, 3 147-162.
- Saxena M. M., 1987. Environmental analysis, Agro-Botanical Publishers, Bikaner, India.
- Stone, N. M. and Thomforde H. K., (2004), Understanding Your Fish Pond Water Analysis Report. Cooperative Extension Program, University of Arkansas at Pine Bluff Aquaculture / Fisheries.
- Tank SK and Chippa RC 2013. Analysis of Water Quality of Halena Block in Bharatpur Area, International Journal of Scientific and Research Publications 3, 1-6.
- Yadav P, Yadav VK, Yadav AK and Khare PK 2013. Physico-Chemical Characteristics of a Fresh Water Pond of Orai, U. P., Central India. Octa Journal of Biosciences. 1 177-184.

Table I					
Model pond					
Sl. No.	Parameters	Unit	Winter	Summer	Monsoon
1	pH		8.94	7.54	7.94
2	Temperature	°C	14.2	31.4	25.6
3	Conductivity	µ/cm	267	326.1	435.1

4	TDS	mg/l	194	254	418
5	Free Co2	mg/l	5.11	6.52	5.54
6	DO	mg/l	7.83	5.12	5.98
7	BOD	mg/l	2.96	6.7	5.3
8	COD	mg/l	11.54	16.48	12.98
9	Chloride	mg/l	36.9	29.7	43.2
10	T.P. (PO4)	mg/l	0.11	0.15	0.23
11	TH	mg/l	113.54	62.72	84.41

Table II			
Biomass of Phytoplankton			
Group	Phytoplankton	Availability	Composite biomass
		<i>Model Pond</i>	<i>Model Pond</i>
Chlorophyceae	Ankistrodesmus falcatus	+	1.27x10 <sup>-6</sup> g/l
	Ulothrixaequalis	+	
	Stichococcus subtilis	+	
	Actinastrum hantzschii	-	
	Closteriopsis longissima	-	
	Dactylococcus smithii	-	
	Dactylococcus raphidioides	-	
	Pediastrum simplex	+	
	Ulothrix variabilis	+	
	Mougeotia scalaris	+	
Cyanophyceae		-	
Euglenophyceae		-	

Table III			
Biomass of Zooplankton			
Group	Zooplankton	Availability	Composite biomass
		model pond	model pond
Rotifera			1.14x10 <sup>-5</sup> g/l
	Brachionus calyciflorus	+	
	Brachionus forficula	+	
	Keratella tropica	+	
	Filinia terminalis	+	
Arthropoda			
	Daphnia lumholtzi	-	
	Streptocephalus dichotomus	+	
	Cletocamptus albuquerquensis	-	
Copepods			
	Heliodiaptomus viduus	+	
Rhizopods			
	Amoeba proteus	+	
	Amoeba radiosa	+	
	Amoeba discoids	+	