THE EFFECTS OF CHANGES TO THE ENVIRONMENT ON BHINDAWAS LAKE

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Abstract

Water and environmental quality of Bhindawas wetland is degraded day by day because of many problems are associated with the wetland. In the absence of any restriction on urban immigration, an increase in urban population and slums create definite stress on the existing water resources. Photosynthesis is the fundamental process involved in primary production. Most of the organic matter of an aquatic ecosystem is produced within the water by phytoplankton, which initiates the whole aquatic food chain. Changes in the water quality are reflected in the biotic community structure. The temperature fluctuation in water was influenced considerably by air temperature, humidity, winds and solar radiation. High concentration of total dissolved solids increases water turbidity, this decreases the light penetration, thus effects the photosynthesis by suppressing the primary producers in the form of algae.

Paper Identification

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Introduction

Administratively, Jhajjar district is divided into three subdivisions and five community development blocks viz. Beri, Bahadurgarh, Jhajjar, Matanhail and Salhawas. In this district there are total 263 revenue villages and 250 Gram panchayats. Bhindawas bird sanctuary is located 25 kms south-east of Jhajjar and about 80 kms north-west of Delhi. It was notified as wildlife sanctuary on 7th May, 1986 and the sanctuary derived its name from Bhindawas village which is 4-5 kms away from the sanctuary. This Sanctuary spreads over an area of 1016.94 acres. Agricultural lands and villages surround the Lake. The Bhindawas Lake is favourite nesting place for resident, non-resident and some migratory birds. The Lake covered with full of aquatic vegetation, which increased protection of fish population and attraction to many birds. This Lake is extensively used for fishing since its inception. On the other hand, water quality is described by its physico-chemical and microbial characteristics.

Review of Literature

In the early 1990, the work on limnological aspects has been studied by several researchers viz; Vijaykumar and Paul (1991) on diurnal fluctuations in some physico-chemical parameters. Chatterjee (1992) studied on water quality of Nanadankanan Lake,

Bhuvaneshwar. Vijaykumar and Paul (1994) worked out the enrichment experiment on phytoplankton production in relation to physico-chemical parameters at Attikola pond in Dharwad. Singh and Singh (1996) studied seasonal variations of macro-zoobenthos of RajendraSarovar, Chapra, Bihar. Paka and Rao (1997) worked on interrelationships of physico-chemical factors of a moosi reservoir. Srivastava and Desai (1997) carried out work on macrofauna of Rihand reservoir (Uttar Pradesh). Swarnalatha and NarsingRao (1998) carried out ecological studies of Banjarastram, Hyderabad. Hosmani et al., (1999) studied on significance of biochemical parameters in certain freshwater bodies of Mysore. Prakasam and Joseph (2000) investigated the water quality of Santhamkotta lake, (Kerala) in relation to primary productivity and pollution from anthropogenic sources. Pendse et al., (2000) studied on hydrobiology of percolation tank of village Dasane. Vijaykumar et al., (2000) made an attempt to study seasonal trends in physico-chemical parameters and zooplankton in Chandrampalli reservoir Gulbarga. MalleshwarRao et al., (2003) made an attempt to estimate the chemical load of Kolleru Lake, Andhra Pradesh. Prathwiraj and Sudip (2003) conducted hydrobiological studies of Reservoir Mirik in Darjeeling Himalayas. The study revealed concentrations of nutrients at certain pockets of lake is due to increasing human influences in the system. Ojha and Mandloi (2004) observed a positive correlationship between pH and temperature of Adhartal freshwater fish culture pond of Jabalpur (M.P). Saha (2004) studied on net plankton diversity in coal mining areas of Jharkhand. Deshmukh and Kanchan (2004) attempt has been made to study limnological conditions.

Sampling

Water samples have been collected on monthly basis. Collections have been made on specific dates of every month. Surface samples have been collected using a clean plastic container for the study of various physico-chemical and biological parameters. Water samples have been collected from 5 different stations in the Bhindawas. All the sample collection and observation has been made between 6.00 am to 10.00 am throughout the study period. Water samples already collected for the purpose of estimation of various parameters has been brought to the laboratory and subjected to analysis immediately as for as possible. Standards Methods for Estimation of Water and Waste water 20th Edition, 1998 (APHA, AWWA, WWCF, and WCPF) has been referred for estimation of parameters viz., total dissolved solids, pH, dissolved oxygen, free carbon dioxide, total alkalinity hardness, calcium, magnesium, chloride, ammonia, nitrogen, phosphorus and biochemical oxygen demand.

Results and Discussions

The physico-chemical correlation coefficient values of Station I is shows that among the important parameters pH is significantly and negatively influenced by phosphate (- 0.45) and calcium (-0.61), whereas turbidity of the water also negatively influenced by total alkalinity (-0.43), sodium (-0.52) and sulphates (-0.53), but the electrical conductivity of the water in Stations II is positively influenced by chlorides (0.46) and potassium (0.47) whereas negatively influenced by total acidity (-0.46). Total alkalinity is positively influenced by nitrate (0.46) Sulphates (0.56) and sodium (0.43), whereas total acidity is negatively related to sulphates (-0.51).The other sampling station namely Station II indicate that pH is positively related with total alkalinity (0.55), BOD (0.64) and negatively related with calcium (-0.58). But turbidity is negatively influenced by sulphates (-0.41), whereas sulphates positively influenced with the total hardness (0.63) and total alkalinity (0.63) values. Whereas, at Station III, electrical conductivity and total dissolved solids are positively influenced by calcium (0.43) and turbidity of the water is negatively correlated with electrical conductivity (-0.48), TDS (-0.48) and positively related with phosphates (0.45), potassium (0.41). Chlorides negatively influenced by phosphates (-0.58), positively

influenced with BOD (0.45). Subsequently, turbidity of the water is negatively influenced by electrical conductivity (-0.46), total dissolved solids (-0.46), sulphates (- 0.47), whereas electrical conductivity of the water is positively related with sodium (0.45), potassium (0.58) and sulphates (0.52). Total hardness of the water is positively influenced by sodium (0.48) and sulphates (0.46) whereas negatively influenced by free carbon dioxide (-0.49). Finally, turbidity of the water showed negatively related with total alkalinity (-0.46) and positively related to potassium (0.48) and dissolved oxygen (0.45). Electrical conductivity and total dissolved solids are positively influenced by total alkalinity (0.73), sodium (0.79) and sulphates (0.73).

Table – 1 Correlation Co efficient Calculated among Physico-Chemical Characteristics Station I

	AT	WT	pH	Tur	EC	TDS	Cl	TH	T.Alk	T.Aci	NO_2	PO_4	Na	K	DO	BOD	FreeCO_2	Ca	Mg	SO_4
AT	1.00																			
WT	0.79	1.00																		
pH	-0.08	-0.19	1.00																	
Tur	-0.33	-0.26	-0.10	1.00																
EC	0.29	0.14	-0.05	-0.34	1.00															
TDS	0.29	0.14	-0.05	-0.34	1.00	1.00														
Cl	0.35	0.27	-0.37	-0.27	0.46	0.46	1.00													
TH	0.55	0.26	0.15	-0.15	0.34	0.34	0.45	1.00												
T.Alk	0.34	0.44	0.38	-0.43	0.32	0.32	0.11	0.19	1.00											
T.Aci	-0.36	-0.16	-0.15	0.32	-0.46	-0.46	-0.29	-0.53	-0.23	1.00										
NO_2	0.31	0.66	-0.12	-0.09	-0.11	-0.11	0.11	-0.05	0.46	0.13	1.00									
PO_4	0.00	0.37	-0.45	0.38	-0.22	-0.22	0.30	-0.08	-0.17	0.24	0.56	1.00								
Na	0.41	0.52	0.18	-0.52	0.06	0.06	0.40	0.24	0.43	-0.22	0.52	0.25	1.00							
K	0.11	-0.20	0.03	-0.35	0.47	0.47	0.10	0.05	0.06	-0.20	-0.59	-0.64	-0.14	1.00						
DO	-0.21	-0.29	-0.08	-0.02	0.03	0.03	-0.40	-0.32	-0.13	0.06	-0.52	-0.61	-0.60	0.44	1.00					
BOD	-0.10	0.04	0.29	-0.11	-0.20	-0.20	-0.55	-0.41	0.10	0.29	-0.06	-0.27	-0.19	-0.11	0.45	1.00				
Free C	0.15	-0.06	-0.14	0.30	0.20	0.20	0.34	0.18	-0.08	0.06	-0.17	-0.12	-0.03	0.39	0.08	-0.42	1.00			
Ca	0.11	0.05	-0.61	0.14	0.36	0.36	0.50	0.10	-0.06	0.06	-0.09	0.27	-0.19	0.18	0.00	-0.39	0.32	1.00		
Mg	0.13	-0.06	0.01	-0.24	0.00	0.00	0.31	0.60	-0.09	-0.30	-0.16	0.02	0.25	-0.09	-0.26	-0.13	-0.14	-0.17	1.00	
SO_4	0.66	0.36	0.14	-53	0.39	0.39	0.25	0.44	0.56	-0.51	0.03	-0.32	0.42	0.36	-0.09	-0.03	0.06	-0.01	0.38	1.00

The parameters have been represented in mg/L^{-1} approve air, pH & water temperature (ºC), Turbidity (NTU) & EC (µmhos/cm).

Table – 2 Correlation Co efficient Calculated among Physico-Chemical Characteristics Station II

	AT	WT	pH	Tur	EC	TDS	Cl	TH	T.Alk	T. Aci	NO_2	PO_4	Na	K	DO	BOD	FreeCO2	Ca	Mg	SO_4
AT	1.00																			
WT	0.80	1.00																		
pH	0.19	0.09	1.00																	
Tur	-0.43	-0.26	0.08	1.00																
EC	0.54	0.41	0.10	-0.40	1.00															
TDS	0.54	0.41	0.10	-0.40	1.00	1.00														
Cl	0.08	-0.02	-0.36	0.10	0.02	0.02	1.00													
TH	0.65	0.24	0.05	-0.20	0.19	0.19	0.17	1.00												
T.Alk	046	0.39	0.55	-0.25	0.42	0.42	-0.25	0.19	1.00											
T.Aci	-0.14	-0.02	0.32	0.37	-0.18	-0.18	-0.10	-0.22	0.16	1.00										
NO_2	0.41	0.56	0.09	0.03	0.27	0.27	0.09	0.11	0.10	0.08	1.00									
PO_4	-0.06	0.20	-0.16	0.30	-0.11	-0.11	0.09	0.02	-0.36	0.03	0.53	1.00								
Na	0.37	0.37	0.15	-0.30	0.33	0.33	0.02	0.01	-0.08	-0.13	0.44	0.38	1.00							
K	0.57	0.53	0.30	-0.27	0.47	0.47	0.05	0.11	0.21	-0.05	0.77	0.33	0.69	1.00						
DO	0.44	0.34	0.27	-0.12	0.62	0.62	0.03	0.38	0.57	-0.01	0.41	0.05	0.13	0.42	1.00					
BOD	0.21	0.19	0.64	0.31	0.22	0.22	-0.49	-0.06	0.80	0.36	-0.06	-0.31	0.05	0.16	0.36	1.00				
CO_2	0.08	0.03	0.05	0.22	-0.16	-0.16	0.08	0.08	-0.11	0.18	-0.011	-0.03	0.03	-0.14	-0.16	-0.22	1.00			
Ca	0.24	0.14	-0.58	0.07	0.20	0.20	0.66	0.39	-0.31	-0.30	0.19	0.29	0.00	0.04	0.16	-0.64	0.30	1.00		
Mg	0.25	-0.08	0.27	-0.22	-0.05	-0.05	-0.18	0.70	0.17	-0.11	-0.01	0.00	0.02	0.08	0.38	0.19	-0.08	-0.07	1.00	
SO_4	0.54	0.23	0.21	-0.41	0.34	0.34	0.06	0.63	0.63	0-0.33	-0.12	-0.47	-0.16	0.07	0.48	0.30	0.13	-0.14	0.50	1.00

The parameters have been represented in mg/L^{-1} approve air ,pH & water temperature (ºC), Turbidity (NTU) & EC

Table-3: Correlation Co efficient Calculated among Physico-Chemical Characteristics Station III

	AT	WT	pH	Tur	EC	TDS	Cl	TH	T.Alk	T.Aci	NO2	PO4	Na	K	DO	BOD	FreeCO2	Ca	Mg	SO4
AT	1.00																			
WT	0.57	1.00																		
pH	0.18	0.00	1.00																	
Tur	-0.51	-0.36	0.34	1.00																
EC	0.58	0.46	-0.11	-0.48	1.00															
TDS	0.58	0.46	-0.11	-0.48	1.00	1.00														
Cl	0.44	0.14	0.23	-0.26	0.23	0.23	1.00													
TH	0.08	0.22	-0.25	0.10	0.27	0.27	0.00	1.00												
T.Alk	0.43	0.40	-0.10	-0.34	0.57	0.57	0.03	0.15	1.00											
T.Aci	-0.32	-0.06	-0.06	0.25	-0.34	-0.34	0.08	-0.33	-0.29	1.00										
NO2	0.01	0.34	-0.17	0.06	0.18	0.18	-0.32	0.35	0.38	-0.04	1.00									
PO4	-0.59	-0.21	0.01	0.45	-0.40	-0.40	-0.58	0.02	-0.25	0.04	0.46	1.00								
Na	0.02	0.32	-0.32	-0.40	0.21	0.21	-0.19	-0.09	0.45	0.03	0.30	0.09	1.00							
K	-0.07	-0.13	-0.03	0.41	0.11	0.11	0.30	0.33	-0.04	-0.18	-0.12	-0.15	-0.25	1.00						
DO	0.14	0.14	0.36	0.15	0.27	0.27	0.32	0.28	0.37	-0.14	0.36	0.02	0.10	0.23	1.00					
BOD	0.13	-0.19	0.25	-0.17	0.06	0.06	0.45	-0.39	0.28	0.16	-0.21	-0.41	0.13	-0.07	0.36	1.00				
FreeCO2	0.14	-0.01	0.23	0.06	0.13	0.13	0.14	-0.01	-0.32	0.06	-0.11	0.02	-0.48	0.06	-0.11	-0.29	1.00			
Ca	0.25	0.41	-0.08	0.03	0.43	0.43	-0.06	0.67	0.07	-0.29	0.45	0.29	-0.02	0.15	0.16	-0.57	0.25	1.00		
Mg	-0.22	-0.24	-0.11	-0.04	-0.11	-0.11	0.04	0.45	0.04	-0.23	0.04	-0.09	-0.09	0.07	0.28	0.07	-0.17	-0.06	1.00	
SO4	0.57	0.24	0.12	-0.35	0.38	0.38	0.07	0.36	0.28	-0.57	0.08	-0.19	-0.22	-0.06	0.21	-0.22	0.32	0.38	0.24	1.00

The parameters have been represented in mg/L^{-1} approve air, pH& water temperature (ºC), Turbidity (NTU) & EC (µmhos/cm)

Table-4: Correlation Co efficient Calculated among Physico-Chemical Characteristics Station IV

	AT	WT	pH	Tur	EC	TDS	Cl	TH	T.Alk	T.Aci	NO2	PO4	Na	K	DO	BOD	Free CO2	Ca	Mg	SO4
AT	1.00																			
WT	0.59	1.00																		
pH	0.32	-0.11	1.00																	
Tur	-0.47	-021	0.19	1.00																
EC	0.65	0.26	0.03	-0.46	1.00															
TDS	0.65	0.26	0.03	-0.46	1.00	1.00														
Cl	-0.19	-0.41	0.11	0.10	-0.12	-0.12	1.00													
TH	0.10	0.29	-0.21	-0.19	0.04	0.04	-0.23	1.00												
T.Alk	0.66	0.40	0.14	-0.16	0.62	0.62	-0.26	0.17	1.00											
T.Aci	-0.01	-0..5	0.17	0.25	-0.19	-0.19	-0.04	-0.07	-0.13	1.00										
NO2	-0.02	0.23	0.26	0.00	-0.13	-0.13	-0.56	0.29	0.14	0.14	1.00									
PO4	-0.54	0.12	-0.44	0.32	-0.41	-0.41	-0.10	0.20	-0.33	0.02	0.49	1.00								
Na	0.37	0.09	0.08	-0.40	0.45	0.45	-0.01	0.48	0.25	-0.05	0.18	0.00	1.00							
	0.46	0.03	0.10	-0.39	0.58	0.58	-0.04	0.40	0.46	-0.05	0.11	-0.46	0.47	1.00						
DO	-0.18	-0.19	-0.13	0.31	0.01	0.01	-0.30	-0.02	0.13	0.43	0.36	0.09	0.01	0.07	1.00					
BOD	0.12	0.07	0.15	-0.24	-0.03	-0.03	-0.33	-0.04	-0.05	0.57	0.35	-0.06	0.05	0.12	0.38	1.00				
Free CO2	-0.17	-0.29	0.14	-0.04	-0.19	-0.19	0.35	-0.49	-0.47	0.03	-0.56	-0.11	-0.30	-0.49	-0.21	-0.13	1.00			
Ca	0.21	0.09	-0.20	-0.21	0.46	0.46	0.33	0.28	0.28	-0.35	-0.21	0.02	0.53	0.26	-0.23	-0.61	-0.19	1.00		
Mg	-0.21	0.01	-0.21	-0.18	-0.22	-0.22	-0.32	0.64	-0.10	-0.02	0.21	0.25	0.24	0.16	0.16	0.25	-0.23	-0.11	1.00	
SO4	0.34	0.18	0.02	-0.47	-0.25	-0.25	-0.25	0.46	0.44	-0.45	-0.03	-0.32	0.48	0.68	-0.03	-0.10	-0.38	0.39	0.37	1.00

The parameters have been represented in mg/L^{-1} approve air, pH& water temperature (ºC), Turbidity (NTU) & EC (µmhos/cm)

Table – 5 Correlation Co efficient Calculated among Physico-Chemical Characteristics Station V

	AT	**WT**	**pH**	**Tur**	**EC**	**TDS**	**Cl**	**TH**	**T.Alk**	**T.Aci**	**NO2**	**PO4**	**Na**	**K**	**DO**	**BOD**	**Free CO2**	**Ca**	**Mg**	**SO4**
AT	1.00																			
WT	0.68	1.00																		
pH	0.21	0.03	1.00																	
Tur	-0.22	-0.24	0.29	1.00																
EC	0.66	0.55	0.04	-0.33	1.00															
TDS	0.66	0.55	0.03	-0.33	1.00	1.00														
Cl	0.21	0.07	-0.17	-0.17	0.26	0.26	1.00													
TH	0.36	0.32	-0.05	-0.14	0.32	0.32	0.35	1.00												
T.Alk	0.53	0.44	0.31	-0.46	0.73	0.73	0.13	0.26	1.00											
T.Aci	-0.20	0.20	-0.01	-0.06	-0.16	-0.16	0.01	0.55	0.04	1.00										
NO2	-0.09	0.22	-0.23	0.18	-0.06	-0.05	-0.13	0.09	-0.11	0.42	1.00									
PO4	-0.24	-0.06	-0.18	0.28	-0.49	-0.48	-0.14	-0.42	-0.53	0.17	0.64	1.00								
Na	0.67	0.36	0.06	-0.28	0.79	0.79	0.38	0.43	0.57	-0.03	0.11	-0.37	1.00							
K	0.30	0.11	0.34	0.48	0.39	0.40	0.25	0.23	0.12	-0.12	0.08	-0.18	0.49	1.00						
DO	0.32	0.38	0.20	0.45	0.29	0.30	-0.14	-0.12	0.06	-0.01	0.49	0.29	0.25	0.52	1.00					
BOD	0.13	0.15	0.05	0.05	0.25	0.25	0.14	0.74	0.32	0.65	0.20	-0.28	0.31	0.28	0.01	1.00				
Free CO2	0.09	0.08	0.01	0.14	0.18	0.17	-0.42	-0.14	-0.11	-0.15	-0.07	-0.16	0.10	0.23	0.22	-0.02	1.00			
Ca	0.28	0.18	-0.20	-0.09	0.18	0.19	0.24	-0.15	-0.04	-0.24	0.10	0.18	0.178	0.03	0.40	-0.47	-0.19	1.00		
Mg	-0.04	-0.05	-0.25	-0.07	0.05	0.04	0.13	0.55	-0.02	0.38	0.09	-0.17	0.20	-0.07	-0.30	0.45	-0.07	-0.35	1.00	
SO4	0.59	0.33	0.00	-0.24	0.73	0.73	0.45	0.61	0.45	-0.10	-0.15	-0.60	0.84	0.47	0.06	0.34	0.07	0.08	0.40	1.00

The parameters have been represented in mg/L^{-1} approve air, pH & water temperature (ºC), Turbidity (NTU) & EC (µmhos/cm)

Conclusion

The atmospheric and water temperature followed a seasonal trend and varied at different times of a day and different months of the year. The temperature fluctuation in water was influenced considerably by air temperature, humidity, winds and solar radiation. The total dissolved solids were within the permissible limits of dinking standards and high total dissolved solids were observed during south-west monsoon while lower values were observed during north-east monsoon season. High concentration of total dissolved solids increases water turbidity, this in turn decreases the light penetration, thus affects the photosynthesis, there by suppressing the primary producers in the form of algae. The hydrogen-ion-concentration of natural water is an important chemical factor, which is linked with all processes of life and also influences the colonization of aquatic micro and macro-benthic in the Reservoir.

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