SEASONAL VARIATION AND PHYSICO-CHEMICAL ANALYSIS OF WATER ATRAHIKA WETLANDS, MADHUBANI DISTRICT, BIHAR

Ajay Kumar[*], Sheela[**]

[*]Department of Botany, Lalit Narayan Mithila University.
Darbhanga

[**]Head of Department Botany and Dean of science
Lalit Narayan Mithila University, Darbhanga

ABSTRACT

Water is the most important determinant for the establishment and maintenance of specific type of wetland and wetland process. the modification of physico-chemical environment has a direct impact on the biotic in wetland. Scientific information about the physico-chemical characteristic of wetlands are fragment as only a few literature is available. The wetlands of Madhubani are totally untouched till date. It was, therefore, thought desirable to study hydrology of wetlands of Madhubani for assessing the water quality aiming periodic fluctuation in physico-chemical properties of wetland water and their interrelationship, various physico-chemical parameters of water was analysed month-wise in the Rahika wetland evaluating at station I to III Madhubani during March 2014-Feb.2016, for a period of two year as a part of my Ph.D. thesis work.

The present paper deals with the analysed the water quality and seasonal variations of Rahika wetland of Madhubani district, North Bihar.

KEYWORDS: Water, Wetland, Physico-chemical, Madhubani, hydrology, Rahika.

INTRODUCTION

Water is the integral constituent and most vital resource for life.it is prime need for human survival. Scientifically water is the most important abiotic component of environment which regulates the eco-cycle and help in harmonic functioning of ecosystem. Aquatic-ecosystem plays an important role in the cycling of chemical substances and influence the growth and activity of terrestrial ecosystem. The state of Biharis very rich in natural and man- made wetlands are used for irrigation, drinking, bathing and also for hydroelectricity purpose (kumar, A., 2019).

The wetlands represent a stable environment where living things interact and materials are used over and over again. In the past year, Aquatic ecology has witnessed many alternations in its natural composition which is general cause's habitat destructions, fragmentation and loss of biological components. Various factors which play an important role in their growth of flora and fauna in water body i.e., Water temperature, transparency, p^H, electric conductivity, BOD, $Freeco_2$, dissolved oxygen, carbonate, Bicarbonate, Calcium, Magnesium, Total nitrogen, Potassium and phosphate. The data of which are depicted in Table, graph 1(a-c) and seasonal variation also in Table 2.The unique and hydrological condition in wetland is markedly influenced by physico-chemical characteristics of water, seasonal variation is also an important aspect

MATERIAL AND METHODS

All chemicals used were of pure analytical grade as required glass bottles were used for the collection of water samples of wetlands with necessary precaution. The sample were collected in and around Rahika block of Madhubani during research period 2014-2016 double distilled water was used for the preparation of reagent and solution. These major water quality parameters considered for the examination in this study are analysed for standard method by APHA (1989) and trivedy and goel (1986).

TABLE: 1(a)
PHYSICO- CHEMICAL CHARACTERISTICS OF WATER OF RAHIKA WETLAND MADHUBANI, SAMPLING STATION-I
MARCH- 2015- FEB-2016

Parameters	MAR.	APRIL	MAY	JUN.	JULY	AUG.	SEP.	OCT.	NOV.	DEC.	JAN.	FEB.
ATM Temp^{0}C	25.3	30.1	33.0	33.8	28.5	28.1	26.3	26.0	21.0	17.8	17.4	21.0
Water Temp^{0}C	24.0	24.80	27.8	27.9	26.5	25.0	25.60	21.80	21.0	20.0	18.0	19.60
Transparency(cm)	28.10	30.2	35.0	33.0	28.80	23.50	16.50	17.3	21.5	20.4	22.6	25.80
pH	8.0	8.1	8.4	8.5	8.0	7.3	7.0	7.4	7.5	7.7	7.9	8.3
E.C. (mhos/cm)	1.650	1.680	1.550	1.666	1.330	0.980	1.000	0.667	0.558	0.988	1.550	1.120
B.O.D (Mg/L)	7.40	7.80	7.30	8.00	7.60	7.55	7.40	7.35	6.00	5.00	5.60	5.30
Free CO$_2$ (Mg/L)	5.40	4.30	4.10	4.70	6.50	6.10	4.8	3.80	4.30	2.90	6.0	7.4
Dissolved O$_2$	8.6	5.9	3.8	6.20	6.50	7.40	8.0	9.10	11.0	12.10	13.90	11.40
Carbonate (Mg/L)	20.10	22.10	9.90	14.8	7.10	14.0	16.0	16.80	18.50	22.0	24.0	17.0
Bicarbonate (Mg/L)	185.10	170.0	99.10	88.0	14.50	118.40	128.8	86.10	78.50	82.40	101.5	105.8
Calcium	35.5	40.10	45.4	45.0	140.10	30.80	26.88	26.90	26.00	28.80	31.9	34.5
Magnesium (Mg/L)	14.4	20.5	20.5	23.8	42.10	6.4	3.8	7.1	8.9	10.5	10.0	12.6
Total Nitrogen(Mg/L)	23.5	22.5	17.8	18.6	17.6	0.42	0.49	0.50	0.26	0.28	0.30	0.280
Potassium (Mg/L)	220.4	236.6	247.5	26.15	209.5	208.0	204.40	204.0	108.10	118.40	113.40	110.80
Phosphate (Mg/L)	0.066	0.668	0.099	0.92	0.014	0.015	0.015	0.012	0.065	0.038	0.037	0.031

TABLE: 1(b)
PHYSICO- CHEMICAL CHARACTERISTICS OF WATER OF RAHIKA WETLANDMADHUBANI, SAMPLINGSTATION-II
MARCH- 2015-FEB-2016

Parameters	MAR.	APRIL	MAY	JUN.	JULY	AUG.	SEP.	OCT.	NOV.	DEC.	JAN.	FEB.
ATM Temp^{0}C	25.3	30.1	33.0	33.8	28.5	28.1	26.3	26.0	21.0	17.8	17.4	21.0
Water Temp^{0}C	24.5	24.80	27.5	27.8	26.40	25.20	25.66	21.80	21.5	20.5	18.0	19.80
Transparency(cm)	29.50	30.50	36.80	33.50	29.50	24.50	17.50	18.40	22.50	21.40	23.60	26.80
pH	8.1	8.2	8.3	8.6	8.0	7.4	7.01	7.50	7.60	7.80	7.9	8.3
E.C. (mhos/cm)	1.660	1.690	1.550	1.650	1.330	0.980	1.000	0.560	0.560	0.980	1.600	1.120
B.O.D (Mg/L)	7.30	7.70	7.20	8.00	7.80	7.60	7.30	6.50	4.40	6.00	5.60	5.10
Free CO$_2$ (Mg/L)	5.30	4.40	4.20	4.80	6.60	6.20	4.90	4.40	11.0	3.10	6.10	7.40
Dissolved O$_2$	8.6	6.0	3.9	6.60	7.20	7.50	8.10	11.0	18.80	12.20	13.80	11.40

Carbonate (Mg/L)	20.00	22.00	9 . 8 0	14.50	14.50	14.0	16.10	18.80	80.80	22.0	24.50	18.00
Bicarbonate (Mg/L)	186.10	172.10	99.80	140.10	140.10	118.40	126.60	80.80	27.0	82.50	102.0	107.0
Calcium	35.80	40.0	44.50	42.10	42.10	31.0	27.0	27.0	8.9	28.50	31.9	34.80
Magnesium (Mg/L)	14.10	20.0	20.50	18.0	18.0	7.10	4 . 8	8.9	0.78	10.50	10.0	12.80
Total Nitrogen(Mg/L)	23.0	22.11	1 8 . 0	0.48	0.48	0.46	0.68	0.78	0.72	0.26	0.28	0.290
Potassium (Mg/L)	222.10	234.5	248.5	208.5	208.5	208.5	205.0	204.90	110.80	118.50	114.40	110.80
Phosphate (Mg/L)	0.068	0.780	0.090	0.015	0.015	0.013	0.015	0.068	0.068	0.040	0.038	0.030

TABLE: 1(c)
PHYSICO -CHEMICAL CHARACTERISTICS OF WATER OF RAHIKA WETLANDMADHUBANI, SAMPLINGSTATION-III
MARCH- 2015-FEB-2016

Parameters	MAR.	APRIL	MAY	JUN.	JULY	AUG.	S E P .	OCT.	NOV.	DEC.	JAN.	FEB.
ATM Temp^{0}C	25.3	30.1	33.0	33.8	28.5	28.1	2 6 . 3	26.0	21.0	17.8	17.4	21.0
Water Temp^{0}C	25.0	25.50	27.50	28.80	26.50	26.00	25.50	21.50	21.0	20.50	18.0	19.50
Transparency(cm)	29.0	30.0	36.90	33.0	28.90	24.0	17.80	18.80	22.80	21.50	24.00	26.80
p H	8.0	8 . 2	8.4	8.6	8.0	7.6	7 . 1 0	7.50	7.70	7.80	7.90	12
E.C. (mhos/cm)	1.650	1.660	1.550	1.650	1.330	0.980	1.000	0.690	0.560	0.980	1.660	1.120
B.O.D (Mg/L)	7.40	7.60	7.20	8.00	7.90	7.60	7 . 3 0	7.25	6.50	6.00	5.60	5.10
Free CO$_2$ (Mg/L)	5.40	4.50	4.30	4.80	6.60	6.20	4 . 9 0	3.90	4.40	3.18	6.10	7.40
Dissolved O$_2$	8.0	6.50	4.10	6.50	7.20	7.50	8 . 4 0	9.50	11.0	12.20	13.80	11.40
Carbonate (Mg/L)	20.50	22.80	9.90	14.80	14.50	14.0	16.10	16.70	18.80	22.10	24.50	18.50
Bicarbonate (Mg/L)	188.50	174.10	98.50	88.10	141.10	120.5	126.50	90.50	82.50	84.10	104.0	108.0
Calcium	38.0	42.0	44.50	48.0	41.0	31.80	2 8 . 0	25.50	28.0	28.80	32.10	35.50
Magnesium (Mg/L)	14.50	20.50	21.50	24.50	19.0	7.50	4 . 9	8.2	8.8	11.50	11.10	12.80
Total Nitrogen(Mg/L)	24.0	23.50	19.0	19.5	0.48	0.4	0 . 4 9	0.80	0.90	0.30	0.35	0.30
Potassium (Mg/L)	220.0	236.0	248.0	268.0	210.0	208.5	203.5	20.35	112.60	118.0	116.0	112.50
Phosphate (Mg/L)	0.060	0.790	0.80	0.980	25.3	0.014	0.013	0.013	0.068	0.060	0.040	0.038

TABLE: 1(a) graph
PHYSICO-CHEMICAL CHARACTERISTICS OF WATER OF RAHIKA
WETLAND MADHUBANI SAMPLING STATION-I
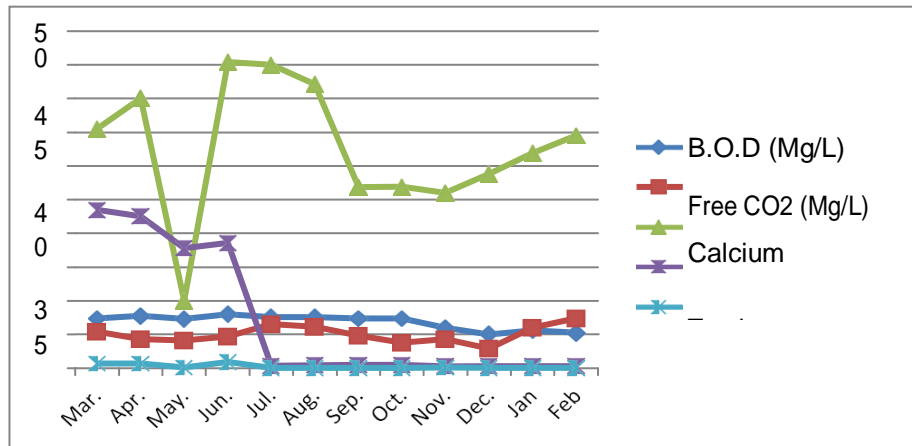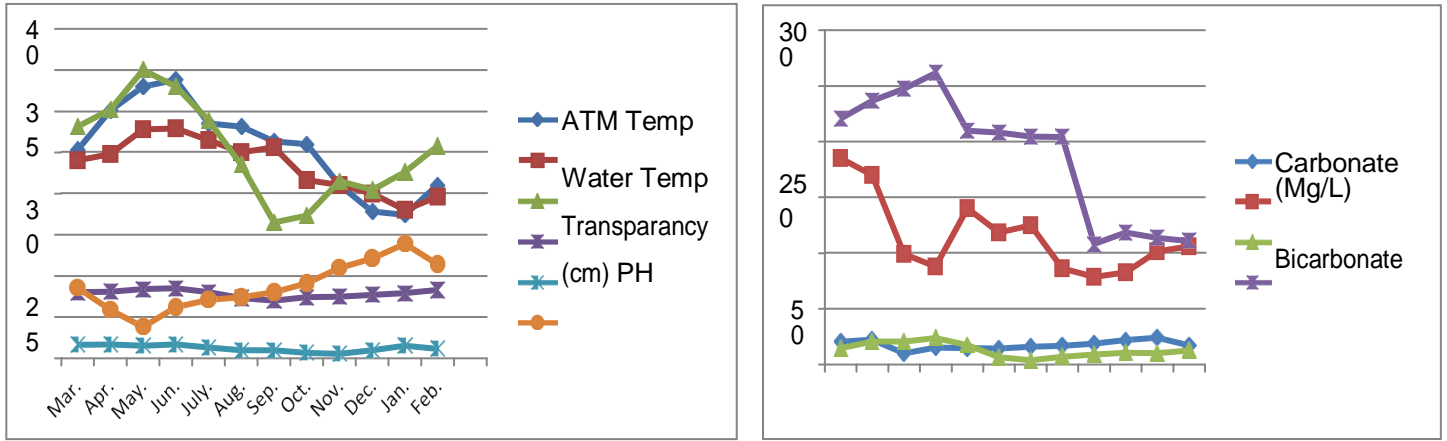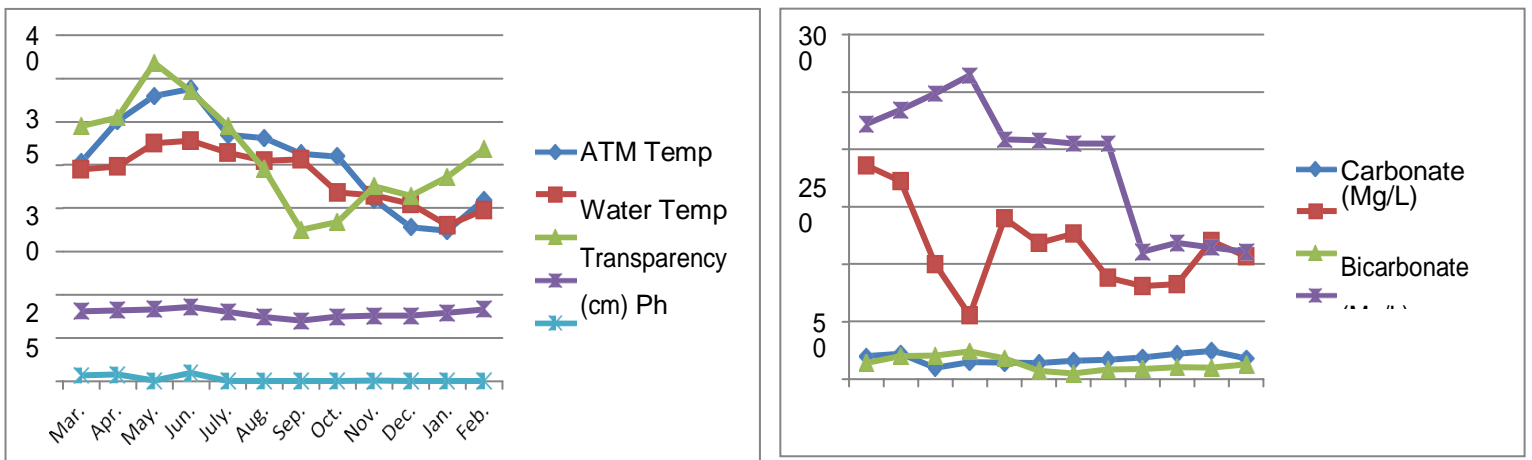**MARCH- 2015- FEB-2016**

TABLE: 1(b) graph
PHYSICO- CHEMICAL CHARACTERISTICS OF WATER OF RAHIKA WETLAND
MADHUBANI, SAMPLING STATION-II MARCH- 2015- FEB-2016

RESULT AND DISCUSSION

The physico-chemical parameters of water was analysed in several various seasonal variation like summer, rainy and winter season in the selected wetlands of Madhubani, Bihar during 2014-2016. The analytical results of various wetlands water have been shown in table-2.

Water temperature is most important for all metabolic and physiological activities and life process of aquatic organism. Water quality is maintained by temperature. During the present investigation the water temperature ranged from 19.65 to 26.7 ^{0}c. Highest temperature was attained during the summer season at station 3.

The **p^H** value of wetland water is an important index of acidity, alkalinity and resulting value of the acidic –basic interaction of a number of its mineral and organic components .in the present study pH ranged from 7.425 to 8.30. it is apparent from the data of pH that the water is always associated with some kind of alkalinity.

Electric conductivity is directly related to total dissolved solid [**TDS**]. in present study the electrical conductivity was ranged between 0.994 to 3.376 mhos/cm. electric conductivity found to increase during the winter season at station-1 having maximum values that gives a proof of mineralization.

The **DO** and BOD are the most important parameter for indication of pollution level of the water body. The Rahika wetland was recorded to be lowest DO is 6.125 (summer) and BOD is 5.475 Mg/l (winter)

Free co_2 is the lowest value at this site or spot was recorded 4.625 sampling station 1 summer season and highest 5.4 mg/l sampling station 2-3 rainy season.

Alkanity is the presence of different ions of carbonate, bicarbonate and free co_2. Alkanity measurement is an important factor for water quality and water treatment process .wetland water is rich in carbonate s and bicarbonate. Alkanity due to naturally occurring compounds like calcium carbonate is safe for consumption. Alkanity in itself is not harmful to human beings still the water with less than 100mg/l, are desirable for domestic use. In present study, carbonate ranged from(15.325 to 20.975 mg/l lowest at station 2 and 3 rainy season and highest at station 3 winter season), Bicarbonate ranged from(92.05 to 137.3 mg/l lowest at station 1 winter season and highest at station 3 summer season) and calcium ranged from(30.3 to 43.125 mg/l lowest at station 1 winter season and highest at station 3 summer season).

Magnesium:-the lowest value of magnesium at this spot was recorded 8.725 mg/l at station 1 rainy season and highest 20.25 mg/l at station 3 summer season.

Total nitrogen:-the lowest value of total nitrogen at this spot was recorded 0.28 mg/l at station 1 winter season and highest 21.375 mg/l at station 3 summer season.

Potassium:-the lowest value of potassium at this spot was recorded 112.675 mg/l at station 1 winter season and highest 243.0 mg/l at station 3 summer season.

Phosphate: - the lowest value of phosphate at this spot was recorded 0.014 mg/l at all station during rainy season and highest 0.657 mg/l at station 3 summer season.

CONCLUSION

For this study tends to be of maximum benefit to the farmers, residents, NGOs, miners, environmental policy makers, Bihar Government, researcher and the general public. The outcome of the study will be useful as a

guide for NGOs workers especially those working on environmental issues and human health to see WHO intervention on the behalf of the residents if need be.

Researchers will benefit from the study through consultation based on the work which will enable them go into further research which would be beneficial to both government and the general public. The general public will benefit through awareness creation and as well have good health or long life when the recommendations are put in place.

REFERENCE

1. Anamika.,(2006)Ph.D. thesis, Magadh university ,Bodh gaya.
2. APHA (1989) American public health association:standard methods for examination of water and waste water in 17th ed. APHA, Washington USA.
3. Kumar,A.(2018) Ecological Management of wetlands of Madhubani with special reference to wetland resources.Ph.D. thesis., L.N.M.U. Darbhanga Bihar pp-236.
4. Kumar,A.,(2019)water analysis of wetlands in Rahika block of Madhubani district Bihar,Academia 2019 in press.
5. Singh A.N.,(2018)study on seasonal variations of Gangasagar pond of Darbhanga , Bihar (India),international research vision 4(2):25-27.
6. Singh,R.k, and kumar ,k.,(2007) Analysis of water quality of village sardiha District saharsa,Bihar, souvenir,2nd Bihar vigyan congress,G4.26 p74.
7. Trivedy,R.K. and Goel, P.K.,(1986) chemical and biological methods for water pollution studies, Environmental publication, Karad.