Chemical Analysis of Water from Some Chours (Water Bodies) of Mahishi Block of Saharsa District

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***Abstract* - Chemical analysis of water was analysed from some Chours (Water Bodies) of Mahishi block during Nov 12 to Oct 13 of Saharsa district. Chemical analysis of water was analysed from different physico-chemical parameters. Altogether 8 physico-chemical parameters were analysed which are pH, Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Nitrate, Phosphate, Total Solids, Alakalinity.**

It was observed that physico chemical parameters of all sites showed variations in which pH was maximum 8.30 in June 13 at site I and minimum was 6.40 in feb 13 at site II. DO was maximum 9.00mg/l in feb 13 at site II and minimum 7.00 in nov 12 at site III .BOD was maximum 4.00mg/l in oct 13 at site II and minimum in 2.00 mg/l in mar 13 at site I. COD was maximum 19.00mg/l in feb 13 at site II and minimum 9.00mg/l in nov12 at site III. Nitrate was maximum1.10mg/l in July 13 at site III and minimum 0.50mg/l in feb 13 at site II. Phosphate was maximum 0.90mg/l in July 13 at site II and minimum 0.10mg/l in oct 13 at site II. Total solids were maximum 110.00mg/l in oct 13 at site I and minimum 64.00mg/l in nov 12 at site III. Alkalinity at was maximum 15.00mg/l in feb 13 at site I and minimum 9.00mg/l in June 13 at site III.

***Index Terms* - pH, Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Nitrate, Poshphate, Total Solids, Alakalinity**

INTRODUCTION

The chemical analysis of water provides considerable insight into the health and workings of lakes, rivers, and groundwater. It also provides us clear understanding of the limits of a waterbody's ability to take in some level of pollution without harming the water system. Its aquatic plants and animals and humans who may use the water. It helped scientists to define the different currents and circulation of the world's oceans, improved their understanding of water's interactions with Earth's geologic materials and given insight into the impact of human activities on waterbodies, chemical analysis is essential of ensuring the chemical's safety, quality, productivity, control, consistency among other factors that affect everyday life.

METHODOLOGY

Water sample from selected chours were collected in 1 l. Plastic bottles and carried to the laboratory for chemical analysis.

pH: - pH was measured at each site using universal indicator. Water samples brought to the laboratory and pH was again measured using Systronic Ph meter.

Dissolved-Oxygen (D.O.): - It was measured by Winkler's modified method. The sample was fixed with MnSO4 and alkali azide iodide. The precipitate was dissolved in Conc. Sulphuric acid and titrated with sodium thiosulphate using starch as indicator. Calculation was done as per the following formula:

$$\text{Domgl}^{-1} = \frac{NxVx8x100}{ml\ sample\ used}$$

Where,

N= Normality of $Na_2S_2O_3$

V= Volume of titrant used

Biochemical Oxygen Demand (BOD): It is an estimate of the amount of oxygen required to stabilize biodegradable organic material in wastewater bodies by acclimatized microbes. Since long this parameter has proved relevance for water pollution assessment programmes. The sample was incubated in 300ml. BOD bottles at 20^0C for 5 days in dark and the final DO was measure. Dilution technique has been used frequently. The dilution of water was prepared by adding 1 ml. Each of phosphate buffer, magnesium sulphate (22.5g $MgSO_4.7H_2O$ in 1 l. ddw), calcium chloride (27.5 of anhydrous CaCl2 in 1 l. ddw) and ferric chloride solution (0.25 g $FeCl_3.6H_2O$ in 1 l. ddw) in 1 l. well aerated ddw. The calculation was done as follows-

$$\text{BOD5days} = DO_i – DO_f\ x \frac{300}{sample/bottle}$$

Where ,
DO_i = Dissolved Oxygen of the diluted sample after 15 min.
DO_f =Dissolved Oxygen of the diluted sample after 5 days. ml. Sample/bottle is equivalent to the dilution factor used.

Chemical Oxygen Demand (COD): **-** It is a measure of oxygen equivalent of those constituents in a sample which are susceptible to dichromate oxidation in acidic conditions. 50ml. of wastewater sample was taken into a 500ml flask. A little amount of AgSO4 and several glass beads were added to the effluent sample. Sulphuric acid (5ml.) was slowly added to dissolve HgSO4, 25 ml. Of 0.25N potassium dichromate solution was added, and the flask was gently stirred after which 70ml. of sulphuric acid and silver sulphate was added. The flask was attached to vertical condenser and was slowly heated. The mixture was refluxed for 2-3 hours, diluted and ferroin indicator was added to it for titrating against 0.25N ferrous ammonium sulphate solution. The blank was run simultaneously. Values were calculated using the following formula:

COD mg / l. = $\frac{(a-b)N\ X\ 8000}{ml.sample\ used}$

Where,
a= ml. $Fe(NH_4)_2\ (SO_4)_2$ used for blank
b= ml. $Fe(NH_4)_2\ (SO_4)_2$ used for sample
N= Normality of $Fe(NH_4)_2\ (SO_4)_2$

Nitrate: - Nitrate was estimated by the phenol disulphonic acid method. 25 ml. of sample gently evaporated to dryness over a heater. The residue was dissolved in 2ml. of phenol disulphonic acid and diluted with distilled water. The solution was cooled down on room temperature and slowly and carefully 6-7 ml. of ammonia solution was added. The entire solution was transferred to a 100ml. volumetric flask and the final volume of solution was made to 100 ml. The intensity of the yellow colour by the reaction between nitrate and phenol disulphonic acid was measured by recording the absorbance of solution at 420 nm against a reference blank prepared by mixing similar amounts of various reagents. Standard curve for nitrate was prepared by using the above procedure with different known nitrate concentrations.

Phosphate:- Stannous chloride method was used for the estimation of phosphate. This method is quite reliable below an ortho-phosphate level of 0.1 mg/l. To 50 ml. sample 4 ml. ammonium molybdate reagent (25g. $(NH_4)_6\ MoO_7.4H_2O$ in 175 ml ddw + 280 ml. conc. H_2SO_4 gm. $Sncl_2$. $2H_2O$ 1ooml. Glycerol) were added with thorough mixing. Exactly between 10-12 minutes all additions, the absorbance of solution was measured at 690 n.m. against a reference blank prepared with distilled water. The standard curve prepared by taking various concentrations of orthophosphate concentrations from the absorbance values. Temperature markedly effects phosphate determination by this method as every 1^oC rise in temperature increases the colour intensity to 1%. Therefore, all determinations were carried out with temperature fluctuations.

Total Solids: - It was measured by evaporating 100ml of water in pre weighed crucible to dryness. The difference in weight indicates the total dissolved solids.

Alkalinity: - It was measured by titrimetric method using 0.02 N sulphuric acid and two indicators viz., phenolphthalein and methyl orange. The total alkalinity was calculated by the following formula:

Total alkanility as mg/l $CaCO_3$ = $\frac{(V1+V2)N\ X\ 50,000}{ml.sample\ used}$

Where, V_1= Volume of acid used for phenolphthaline alkalinity
V_2= Volume of acid used for methyl orange alkalinity
N= Normality of titrant.

Result: - pH: - The pH of water showed range of variation. The lowest value was 6.5 and the highest value was 8.5. The maximum value at site-I was 8.30 and minimum was 6.70. The maximum value at site-II was 8.10 and minimum was 6.60. The maximum of site-III was 7.90 and minimum was 6.60.

Dissolved Oxygen (DO): **-** The pond water revealed a good amount of oxygen. The maximum concentration of dissolved oxygen was reported as site- II, the highest value of 9.0mg/l and the lowest value of 7.0 was recorded. But the highest and lowest value – at the site- III was 8.0 mg/l and 7.0mg/l respectively. The seasonal variation showed more or less similar pattern at all the sites. In general, dissolved oxygen was the highest during winter months and the lowest during monsoon.

Biochemical Oxygen Demand (BOD): - The biochemical oxygen demand showed range of variation. The lowest value was 2.0mg/l and the highest was 3.0 mg/l. The maximum and minimum values at different site were 3.0 mg/l and 4.0 mg/l respectively. The value was slightly high during summer month and low during winter months.

Chemical Oxygen Demand (COD): - Chemical oxygen demand at site I ranged from a minimum of 10.0 mg/l to a maximum of 18.0 mg/l . site II recorded a minimum- maximum range of 11.0 mg/l to 20.0 mg/l respectively. The maximum value at site III was 22.0 mg/l and minimum was 10.0 mg/l.

Nitrate: - Nitrate concentration was recorded to be 0.80 mg/l (minimum) and 1.0 mg/l (maximum) at site-II. The minimum value at site-III was observed to be 0.90 mg/l and 1.5 mg/l respectively. Showed a maximum of 1.5 mg/l and minimum of 1.0 mg/l little variation have been observed in the concentration of nitrate in different seasons.

Phosphate: - Phosphate concentration ranged between 0.08 mg/l to 0.15 mg/l at site-I. At site II the minimum and maximum values were reported to be 0.15 mg/l and 0.20 mg/l respectively. Phosphate concentration was highest at site-III whereas minimum value was 0.15 mg/l and minimum was 0.25 mg/l.

Total solids: - The maximum concentration was recorded in the monsoon period whereas the minimum was in winter. Summer values were in between the two extremes. A wide range was observed between minimum and maximum concentration.

Alkalinity: - The carbonate alkalinity was lower as compared to bicarbonate alkalinity. Carbonate alkalinity did not show any marked seasonal fluctuation. The carbonate alkalinity value ranged from 10 mg/l to 16.5 mg/l.

Range of physico-chemical parameters at site-I

Parameter	Nov. 12	Feb. 13	Mar. 13	Jun. 13	Jul. 13	Oct. 13
	Min.	Max	Min.	Max.	Min.	Max.
pH	7.10	6.70	6.90	8.30	8.10	7.50
DO	8.00	8.80	8.00	7.50	7.60	7.50
BOD	2.10	2.20	2.00	3.00	3.00	2.50
COD	10.00	17.00	16.00	14.00	14.00	12.00
Nitrate	0.85	0.60	0.80	0.85	0.95	1.00
Phosphate	0.15	0.20	0.20	0.07	0.11	0.15
Total Solid	66.00	95.00	100.00	100.00	105.00	110.00
Alkalinity	14.00	15.00	10.00	10.00	11.00	14.00

Values are expressed in mg/l

Range of physico-chemical parameters at site-II

Parameter	Nov. 12	Feb. 13	Mar. 13	Jun. 13	Jul. 13	Oct. 13
	Min.	Max.	Min.	Max.	Min.	Max.
pH	6.70	6.40	7.00	8.10	8.00	7.00
DO	7.10	9.00	8.10	7.50	7.50	8.00
BOD	3.00	2.50	3.00	3.90	3.50	4.00
COD	12.00	19.00	17.00	16.00	13.00	12.00
Nitrate	0.85	0.50	0.90	0.95	0.90	1.00
Phosphate	0.13	0.20	0.07	0.08	0.90	0.10
Total Solid	70.00	90.00	108.00	109.00	100.10	100.00
Alkalinity	13.00	14.00	12.00	10.00	10.00	13.00

Values are expressed in mg/l

Range of physico-chemical parameters at site-III

Parameter	Nov. 12	Feb. 13	Mar. 13	Jun. 13	Jul. 13	Oct. 13
	Min.	Max.	Min.	Max.	Min.	Max.
pH	6.60	6.80	7.10	7.90	7.40	6.60
DO	7.00	8.00	7.10	8.00	8.00	7.50
BOD	2.50	2.80	3.00	3.80	2.50	3.90
COD	9.00	11.00	17.00	18.00	15.00	14.00
Nitrate	0.80	0.90	0.85	0.90	1.10	1.00
Phosphate	0.14	0.30	0.70	0.80	0.70	0.20
Total Solid	64.00	85.00	90.00	85.00	100.00	90.00
Alkalinity	12.00	13.00	10.00	9.00	10.00	12.00

Values are expressed in mg/l

CONCLUSION

After Chemical analysis of water was analysed from some Chours (Water Bodies) of Mahishi block during Nov 12 to Oct 13 of saharsa district. It was observed that physico- chemical parameters of all sites showed variations. pH was maximum 8.30 in june at site I and minimum were 6.40 in feb 13 at site II. DO was maximum 9.00mg/l in fab 13 at site II and minimum 7.00 in nov 12 at site III .BOD was maximum 4.00mg/l in oct 13 at site II and minimum in 2.00 mg/l in mar at site I. COD was maximum 19.00mg/l in feb 13 at site II and minimum 9.00mg/l in nov12 at site III. Nitrate was maximum 1.10mg/l in july 13 at site III and minimum 0.50mg/l in feb 13 at site II. Phosphate was maximum 0.90mg/l in july 13 site II and minimum 0.10mg/l in oct 13 at site II. Total solids were maximum 110.00mg/l in oct 13 at site I and minimum 64.00mg/l in nov 12 at site III. Alkalinity at was maximum 15.00mg/l in feb 13 at site I and minimum 9.00mg/l in june 13 at site III.

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