WATER QUALITY ASSESSMENT OF WAINGANGĀ RIVER, TUMSAR, DIST. BHANDARA WITH RESPECT TO ITS PHYSIOCHEMICAL PARAMETERS

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Abstract

Water is the most important constituent as well as factor for the maintenance of any ecosystem anywhere in the world. The quality of water determines the biological components of the aquatic ecosystem. In present study the Physico-chemical parameters of the Wainganga River at Tumsar in Bhandara district of Maharashtra are studied during Feb 2015 to Jan 2017. The parameters were analyzed by using standard procedures described in APHA (1992), IAAB (2006). These samples are analyzed for Physico-chemical parameters like Temp, pH, Free Co2, Dissolved Oxygen (DO), Carbonate, Bicarbonate, total alkalinity (TA), chloride (Cl-), total hardness (TH), calcium (Ca2+), magnesium (Mg2+), Phosphorous, Nitrate, electrical conductivity (EC) are determined. The results are compared with standards prescribed by WHO. The results revealed that there was significant variation in some Physico-chemical parameters were in the normal range and indicated better quality of river water. The present study will be helpful for the society and the government polices.

Keywords: Physico-chemical Parameters, Waingangā River, Tumsar.

Introduction

Water plays an essential role in human life. Fresh water is one of the most important resources crucial for the survival of all the living beings. It is even more important for the human being as they depend upon it for food production, industrial and waste disposal, as well as cultural requirement (Akpoveta, et al. 2011). Good water quality resources depends on large number of physicochemical parameters and the magnitude and source of any pollution load; and to assess that, monitoring of these parameters is essential. The polluted water caused serious problems for human health as well as hampered ecological and environmental agents (Zaidi, 1994). Moreover, the range of health risks from climate change include direct, indirect (mediated), and diffuse and delayed effects. The health risks posed by climate change are now beginning to challenge the skills, creativity, and policy engagement of researchers, policy analysts, and stakeholders (Tong & McMichael, 2011). Shahare (2015) studied Assessment of Physico-Chemical

parameters of Chulband dam in Gondia District. and Shahare (2016) investigated the Assessment of Physico-chemical parameters were carried out from Chulband River at Dodake-Jambhali in Gondia District. By considering immense importance of Physico-chemical parameters of water studies, present work is undertaken for "Water Quality Assessment in Wainganga River, Tumsar, Dist. Bhandara"

Materials and Methods

Sampling and analysis of water

The water samples of Wainganga River were collected and analyses at regular monthly intervals for a period of 2years from Feb 2015 to Jan 2017. The sample were collected between 9:00 AM to 11:00 AM from sampling site (fig.1) in pre-cleaned, BOD bottle, polythene containers of one liter capacity and brought to the laboratory for the analysis of various Physico-chemical parameters. The following Physico-chemical parameters were analyzed Temp, pH, Free Co2, Dissolved Oxygen (DO), Carbonate, Bicarbonate, total alkalinity (TA), chloride (Cl-), total hardness (TH), calcium (Ca2+), magnesium (Mg2+), Phosphorous, Nitrate, electrical conductivity (EC). The parameters were analyzed by using standard procedures described in APHA (1992), IAAB (2006).

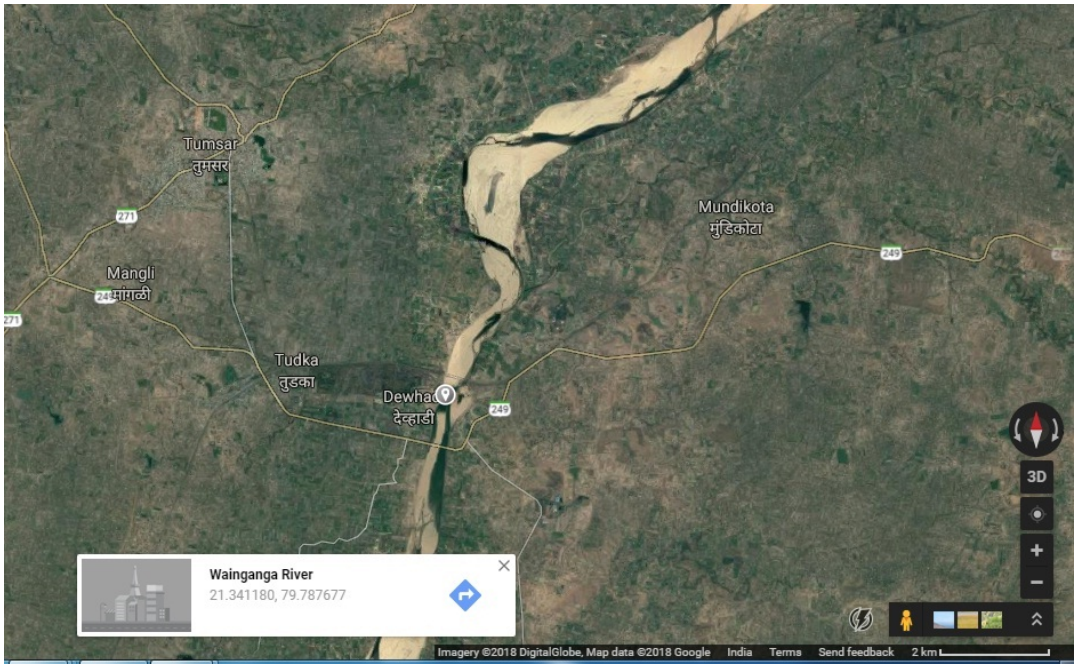


Fig.1: Sampling site Wainganga River, Tumsar. Source: Google Map.

Results & Discussion:

Results of various Physico-chemical parameters of Wainganga river water have been depicted in Table 1.

Water Temperature: The water temperature is one of the important parameter in aquatic ecosystem. In the present study of Wainganga river, difference in the fluctuation of water temperature was recorded 34^{o}C to 22^{o}C(Graph.1).The water temperature was maximum in the month of May and minimum in the month of Jan

PH: Hydrogen ion concentration plays an important role in the biological processes of almost all aquatic organisms. In the fluctuation of pH were recorded 9.1 to 7.1. The pH value was

maximum in the month of June and minimum in the month of Nov (Graph.2).

Free Carbon dioxide: Free Co_2 is released during the decomposition of certain substances and metabolic activities of the living organism. The Carbon dioxide was varied from 4.6 to 11.6 mg/lit. The Carbon dioxide was maximum in the month of Apr. and minimum in the month of Aug. (Graph.3).

Dissolved Oxygen (DO): The DO is one of the most important factors in any aquatic ecosystem. The main source of DO is from dissolution from atmosphere and the photosynthesis. The DO was varied from 4.1 to 8.2 mg/lit. (Graph.4). The DO was maximum in the month of Nov. and minimum in the month of May.

Carbonate: In present study, the Carbonate value varies from 22.3 to 12.3 mg/l, which are within the permissible limit of WHO. The Carbonate was maximum in the month of Oct. and minimum in the month of April (Graph.5).

Bicarbonate: In present study, the Bicarbonate values varies from 114.5 to 195.2 mg/l, which are within the permissible limit of WHO (Graph.6). The Bicarbonate was maximum in the month of Oct. and minimum in the month of June.

Total Alkalinity (TA): Total Alkalinity of water is its capacity to neutralize acids and it is normally due to the presence of bicarbonates, carbonates and hydroxide compound of calcium, sodium and potassium. In present study, the alkalinity value varies from 132.7 to 215 mg/l, which are within the permissible limit of WHO. The Total Alkalinity was maximum in the month of Oct. and minimum in the month of June (Graph.7).

Chloride: Chloride is a natural substance present in all the potable waters. The Chloride was varied from 1.7 to 4.1 mg/lit. The Chloride was maximum in the month of Jul. and minimum in the month of Feb (Graph.8).

Hardness: Total hardness of water is due to the presence of calcium and magnesium ions in the water. Hardness was found to fluctuate between 62.5 mg/l in the month of March and 39.6 mg/l in the month of July (Graph.9).

Calcium: The presence of calcium in the water is more likely in the form of carbonate, which is also indicated by high values of hardness in water samples. Calcium ranged between 27 mg/l in the month of May. And47 mg/l in the month of Nov. (Graph.10).

Magnesium: Magnesium is an essential element for all living organisms as it takes part in chlorophyll biosynthesis and enzymatic transformation (Weztel, 1975). The Magnesium of the water sample varied between 9.4 mg/l in the July month and 24.1 mg/l in the month of Feb. (Graph.11).

Phosphorous: In general, phosphorous is an essential nutrient to living organisms. Phosphorous is one of the most important nutrients limiting the growth of autotrophs and biological productivity of the system. The phosphorous was varied from 1.1 to 2.4 mg/lit. The phosphorous was maximum in the month of March and minimum in the month of September (Graph.12).Similar result were reported by Chavan (2009) in Wainganga River near Bramhapuri District Chandrapur.

Nitrate: Nitrates are the most oxidised forms of nitrogen and the end product of the aerobic decomposition of organic nitrogenous matter. The evaluation of

nitrogen is therefore an important parameter in understanding the nutritional status of water bodies. The phosphorous was varied from 1.63 to 0.11 mg/lit (Graph.13). The Nitrate was maximum in the month of Oct and minimum in the month of Dec.

Electrical Conductivity (EC): Conductivity is directly related to the concentration of ionized substances in water. EC of water was fluctuated within the range of 245.3 to 415.3micro-Siemens; The EC was maximum in the month of Nov. and minimum in the month of Jan. (Graph.14).

Conclusion:

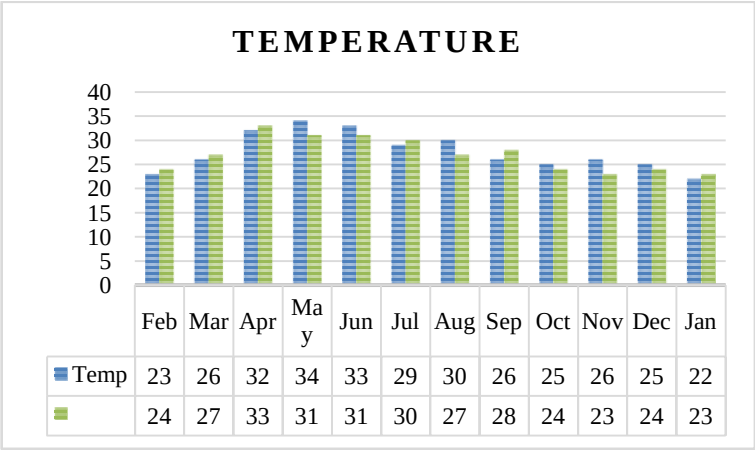
The results revealed that there were significant alterations in the physicochemical parameters and most of the parameters were within the permissible limit and indicated better quality of river water. The results indicate that the Wainganga riveris non-polluted and can be used for Domestic, Irrigation and Pisciculture. River water level is not up to the pollution level but the increasing trend are need to be of concern if this trend fallow, soon the level will increase and this river will become unsafe for human use. Further detailed analysis in different seasons involving other related parameters as well, will throw more light on the status of these river.

Table No. 1: Physico-chemical parameters of Wainganga River, Tumsar.

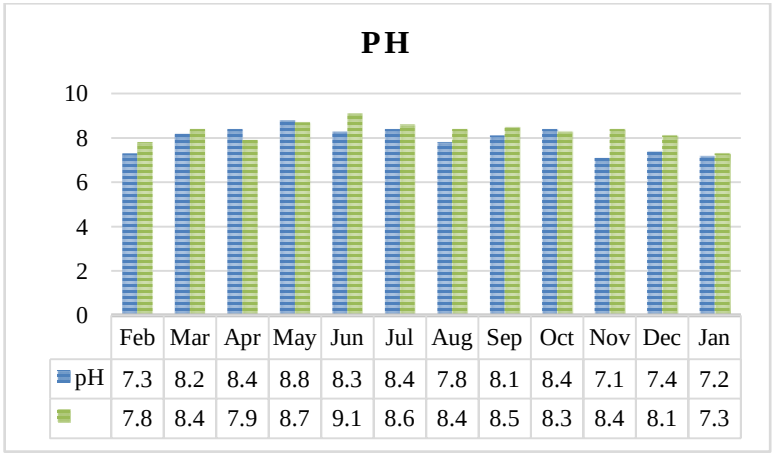
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Temp	23	26	32	34	33	29	30	26	25	26	25	22
	24	27	33	31	31	30	27	28	24	23	24	23
pH	7.3	8.2	8.4	8.8	8.3	8.4	7.8	8.1	8.4	7.1	7.4	7.2
	7.8	8.4	7.9	8.7	9.1	8.6	8.4	8.5	8.3	8.4	8.1	7.3
Free Co2	9.1	10.6	11.5	8.2	6.5	5.8	4.6	5.7	7.6	8.6	9.1	9.8
	10.7	9.8	11.6	8.4	6.1	5.9	5.2	6.4	7.3	9.4	9.8	8.6
DO	7.1	5.6	5.1	4.6	5.1	5.4	5.7	5.1	6.9	6.3	7.3	6.7
	6.1	5.4	4.9	4.1	4.3	5.3	5.8	6.7	7.8	8.2	7.8	6.9
Carbonate	16.8	15.6	14.8	16.7	18.2	20.4	19.6	21.7	22.3	18.6	17.6	15.2
	17.5	13.7	12.3	16.4	19.5	21.8	18.4	17.1	19.8	17.4	19.1	14.6
Bicarbonate	135.1	147.3	152.1	139.4	114.5	154.2	181.7	168.4	172.8	192.5	175.4	127.6
	152.9	146.8	165.2	184.6	182.4	174.3	164.2	183.2	195.2	165.3	176.8	137.2
Total alkalinity	151.9	162.9	166.9	156.1	132.7	174.6	201.3	190.1	195.1	211.1	193	142.8
	170.4	160.5	177.5	201	201.9	196.1	182.6	200.3	215	182.7	195.9	151.8
Chloride	38.	48.	50.	53.	46.	41.	47.	41.	31.	33.	28.	31.

	4	1	2	4	1	5	3	2	8	4	9	5
	33.1	37.6	48.6	52.1	50.8	38.6	41.6	38.7	42.6	31.7	33.1	36.1
Hardness	59.5	56	60.9	47.3	40.4	39.6	56.8	48.7	44.6	62.3	57.5	57.7
	60.4	62.5	57.5	40.5	50.9	51.2	59.3	54.8	49.6	56.1	58.1	46.4
Calcium	35.4	37.6	41.5	32.8	28.6	29.4	38.6	34.1	29.4	47.1	40.8	45.2
	41.7	42.9	37.4	27.1	34.5	41.8	42.6	38.4	33.4	36.7	42.5	36.8
Magnesium	24.1	18.4	19.4	14.5	11.8	10.2	18.2	14.6	15.2	15.2	16.7	12.5
	18.7	19.6	20.1	13.4	16.4	9.4	16.7	16.4	16.2	19.4	15.6	9.6
Phosphorous	1.8	2.4	1.6	1.3	1.5	1.2	1.6	1.1	1.6	1.4	1.3	1.3
	1.7	2.1	2.3	2.2	1.4	1.6	1.2	1.3	1.4	1.2	1.4	1.4
Nitrate	0.84	0.26	0.65	0.78	0.82	0.26	0.67	1.26	1.63	0.61	0.78	0.66
	0.65	0.69	0.15	0.57	0.48	0.62	0.78	0.16	0.48	0.74	0.11	0.74
EC	364.5	324.5	398.5	324.5	375.2	394.5	284.5	266.5	388.2	415.3	390.1	245.3
	354.4	328.7	387.2	354.1	412.8	335.5	278.2	378.4	355.8	394.4	297.6	288.3

(All parameters are in mg/l except pH and EC. EC is in micro-Siemens)

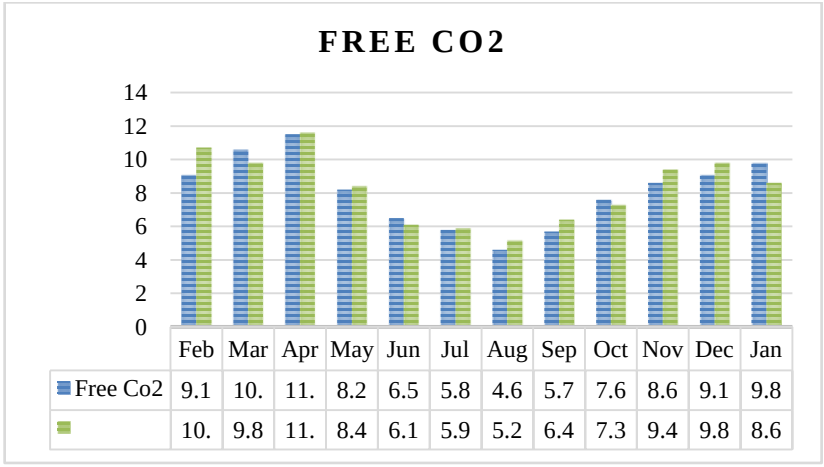


Graph.1: Temperature



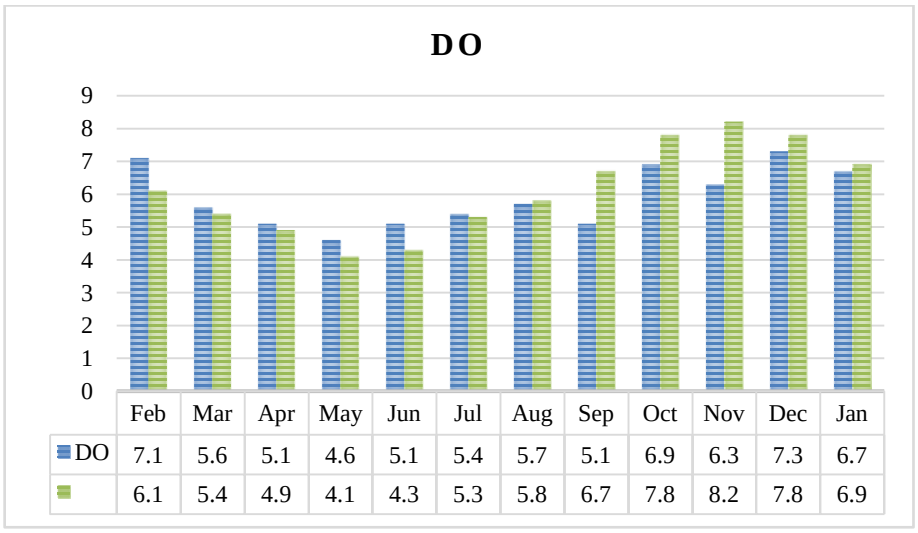
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
pH	7.3	8.2	8.4	8.8	8.3	8.4	7.8	8.1	8.4	7.1	7.4	7.2
	7.8	8.4	7.9	8.7	9.1	8.6	8.4	8.5	8.3	8.4	8.1	7.3

Graph.2: pH



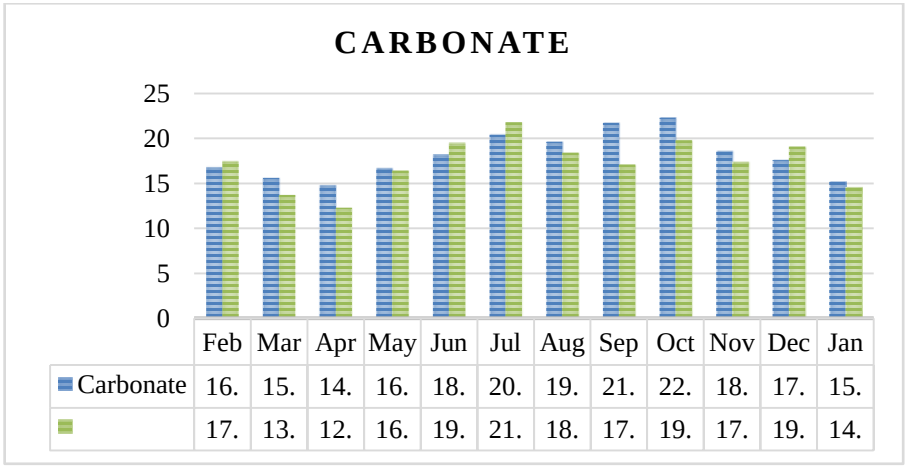
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Free Co2	9.1	10.	11.	8.2	6.5	5.8	4.6	5.7	7.6	8.6	9.1	9.8
	10.	9.8	11.	8.4	6.1	5.9	5.2	6.4	7.3	9.4	9.8	8.6

Graph.3: Free Co2



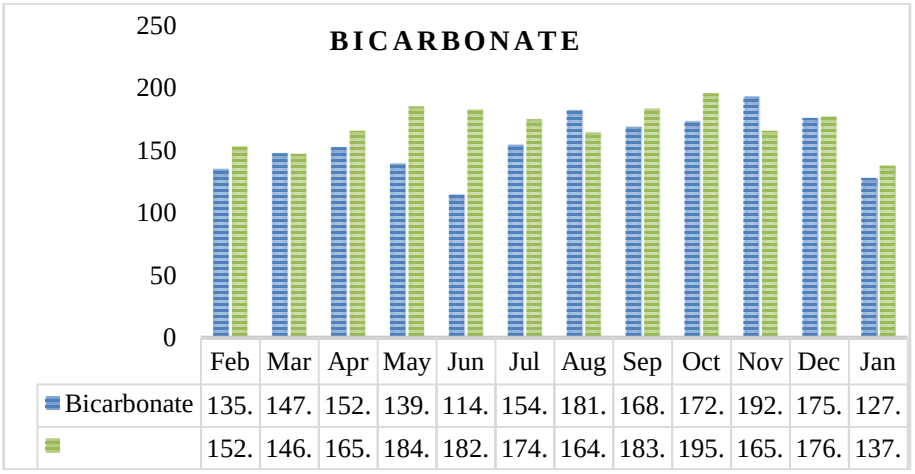
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
DO	7.1	5.6	5.1	4.6	5.1	5.4	5.7	5.1	6.9	6.3	7.3	6.7
	6.1	5.4	4.9	4.1	4.3	5.3	5.8	6.7	7.8	8.2	7.8	6.9

Graph.4: DO



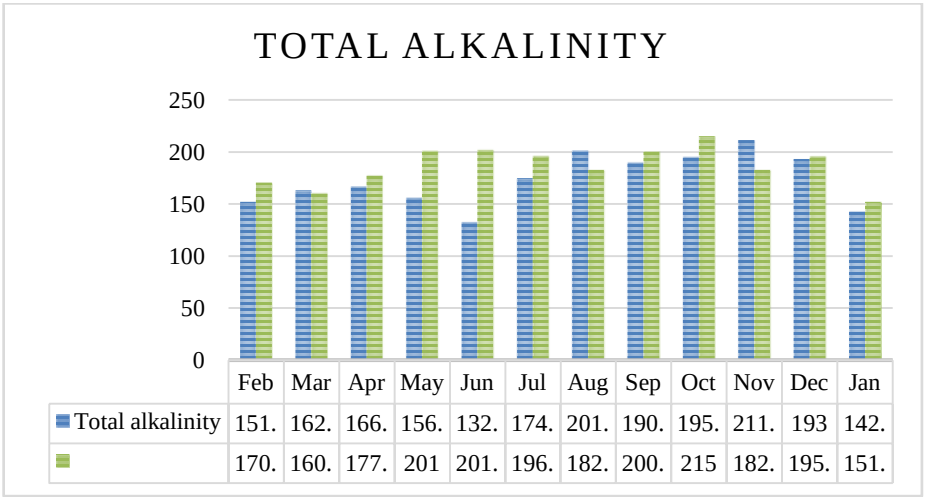
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Carbonate	16.	15.	14.	16.	18.	20.	19.	21.	22.	18.	17.	15.
	17.	13.	12.	16.	19.	21.	18.	17.	19.	17.	19.	14.

Graph.5: Carbonate



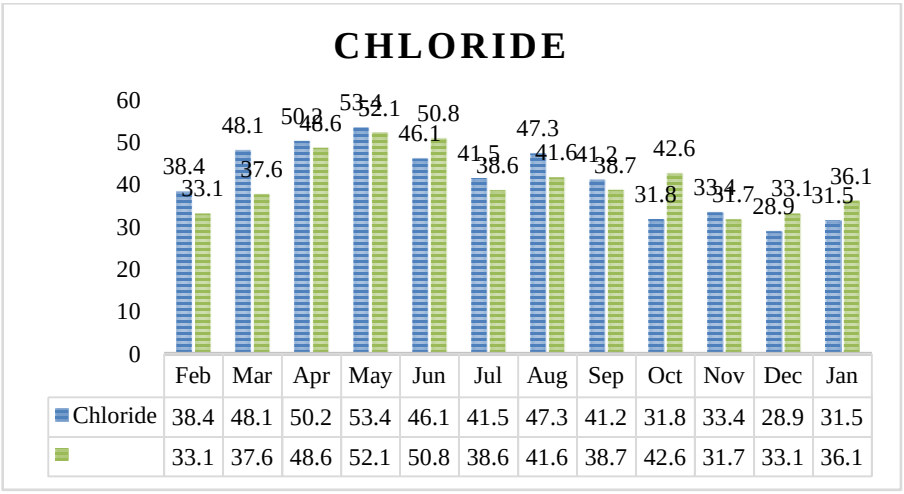
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Bicarbonate	135.	147.	152.	139.	114.	154.	181.	168.	172.	192.	175.	127.
	152.	146.	165.	184.	182.	174.	164.	183.	195.	165.	176.	137.

Graph.6: Bicarbonate



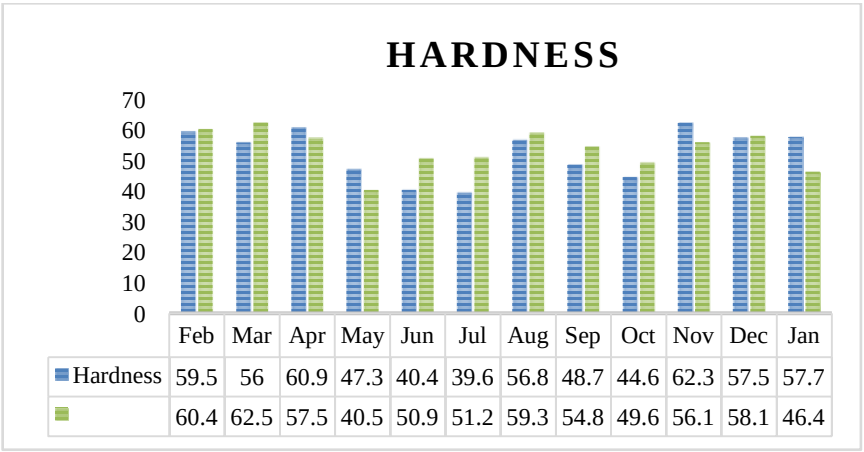
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Total alkalinity	151.	162.	166.	156.	132.	174.	201.	190.	195.	211.	193	142.
	170.	160.	177.	201	201.	196.	182.	200.	215	182.	195.	151.

Graph.7: Total Alkalinity



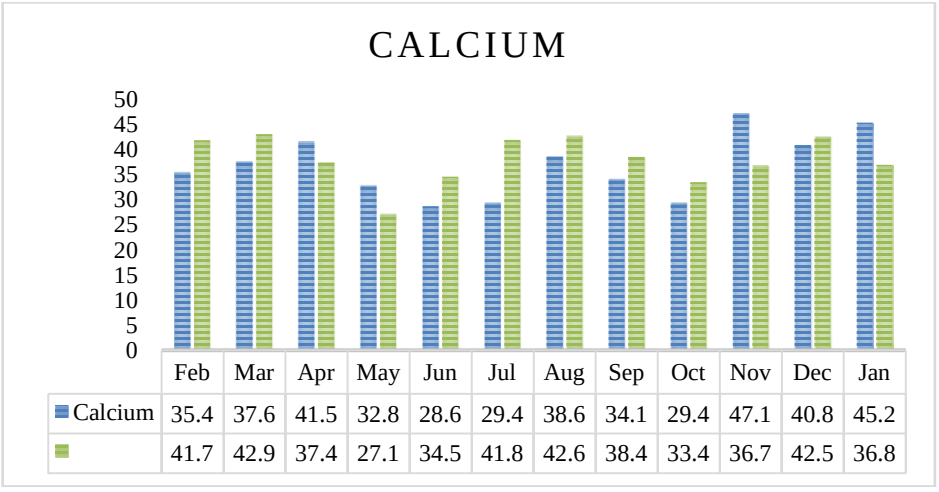
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Chloride	38.4	48.1	50.2	53.4	46.1	41.5	47.3	41.2	31.8	33.4	28.9	31.5
	33.1	37.6	48.6	52.1	50.8	38.6	41.6	38.7	42.6	31.7	33.1	36.1

Graph.8: Chloride



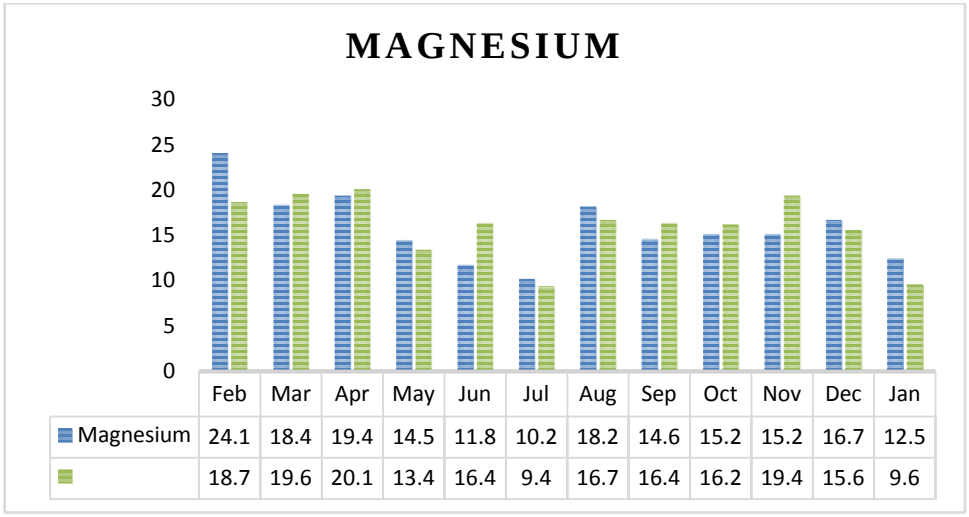
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Hardness	59.5	56	60.9	47.3	40.4	39.6	56.8	48.7	44.6	62.3	57.5	57.7
	60.4	62.5	57.5	40.5	50.9	51.2	59.3	54.8	49.6	56.1	58.1	46.4

Graph.9: Hardness



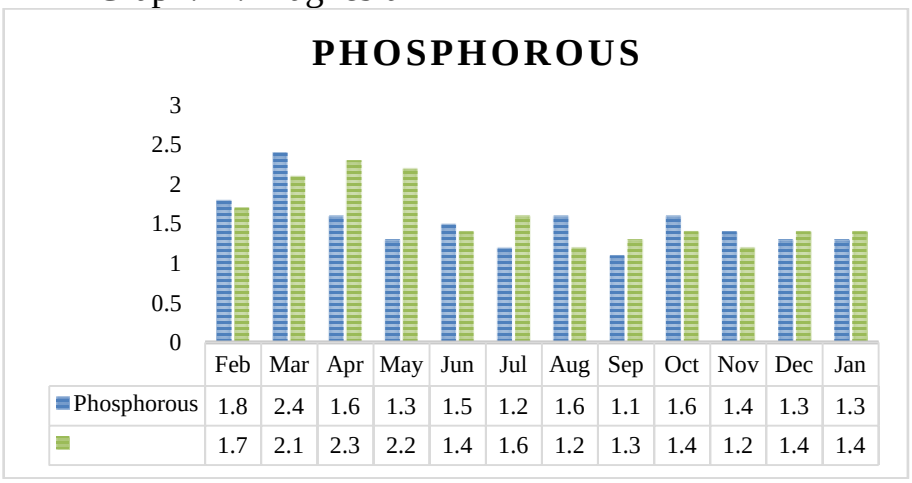
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Calcium	35.4	37.6	41.5	32.8	28.6	29.4	38.6	34.1	29.4	47.1	40.8	45.2
	41.7	42.9	37.4	27.1	34.5	41.8	42.6	38.4	33.4	36.7	42.5	36.8

Graph.10: Calcium



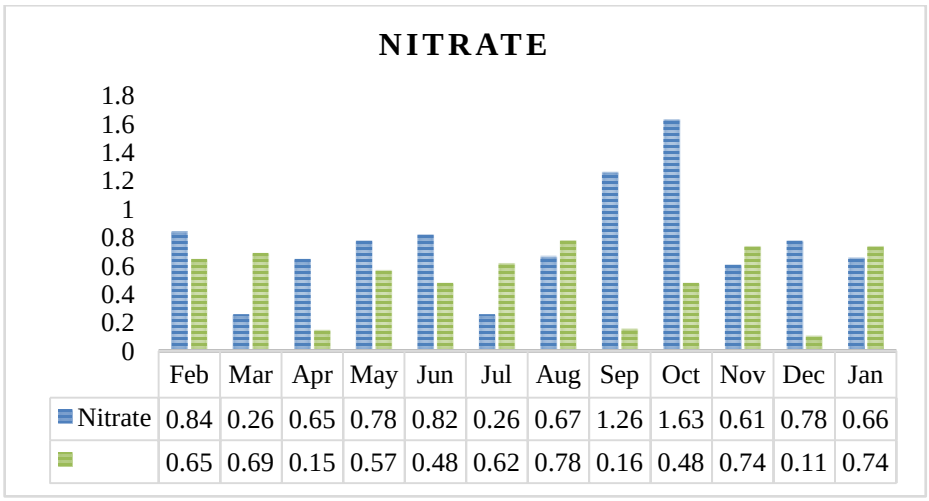
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Magnesium	24.1	18.4	19.4	14.5	11.8	10.2	18.2	14.6	15.2	15.2	16.7	12.5
	18.7	19.6	20.1	13.4	16.4	9.4	16.7	16.4	16.2	19.4	15.6	9.6

Graph.11: Magnesium



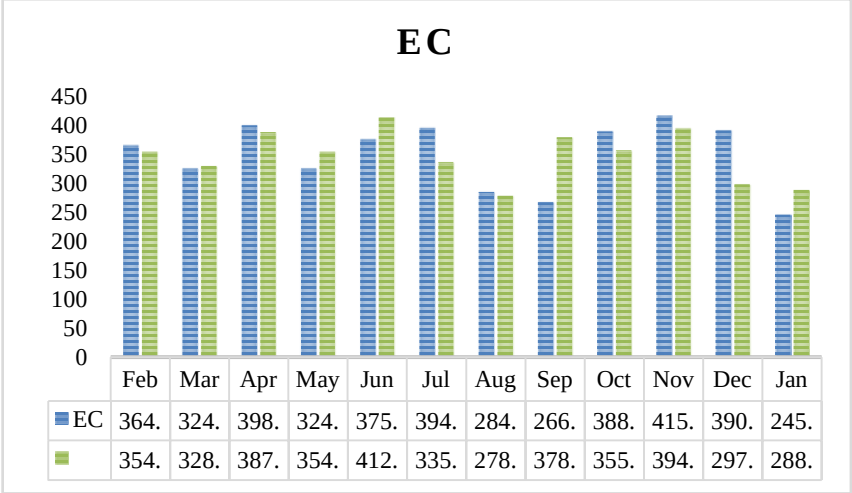
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Phosphorous	1.8	2.4	1.6	1.3	1.5	1.2	1.6	1.1	1.6	1.4	1.3	1.3
	1.7	2.1	2.3	2.2	1.4	1.6	1.2	1.3	1.4	1.2	1.4	1.4

Graph.12: Phosphorous



	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Nitrate	0.84	0.26	0.65	0.78	0.82	0.26	0.67	1.26	1.63	0.61	0.78	0.66
	0.65	0.69	0.15	0.57	0.48	0.62	0.78	0.16	0.48	0.74	0.11	0.74

Graph.13: Nitrate



Graph.14: Electrical Conductivity

References:

1. Akpoveta O.V., Okoh, B.E., Osakwe, S.A., (2011), "Quality assessment of borehole water used in the vicinities of Benin, Edo State and Agbor, Delta State of Nigeria", Current Research in Chemistry, 3, pp 6269.
2. APHA (1992), Standard Methods for the Examination of Water and Wastewater. American Public Health Association, Washington, USA.
3. Chavan, A.W. (2009). Observation on Water quality and biodiversity in Wainganga River near Bramhapuri Dist. Gadchiroli PhD Thesis, submitted to RTM Nagpur University, Nagpur.
4. IAAB (2006). (Indian Association of Aquatic Biologists) manual.
5. Shahare, P. C. (2015). Assessment of Physico-Chemical parameters of Chulband dam Gondia District. (MS), INDIA. I J R B A T, Vol II (7), (484–488).
6. Shahare, P. C. (2016). Physico-Chemical analysis of Chulband River at Dodake-Jambhali, Gondia District. (MS), INDIA.I J R B A T, Vol. IV, Issue (2), 52-57.
7. Tong, S., A.J. McMichael, (2011). Climate Change and Health: Risks and Adaptive Strategies. In O. N. Editor-in-Chief: Jerome (Ed.), *Encyclopedia of Environmental Health* (pp. 690-698). Burlington: Elsevier.
8. Zaidi, S., (1994). Human health effects of oil development in the Ecuadorian Amazon: A challenge to legal thinking. *Environmental Impact Assessment Review*, *14*(5-6): 337-348.