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A Study of Water Quality of Ramgarh Tal and Ground Water Quality of Its Adjoining Areas, Gorakhpur (U.P.)

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ABSTRACT

A study was carried at the Ramgarh Tal and its adjoining areas, which is situated in Gorakhpur district (U.P.). To assess the water quality of Ramgarh Tal lake and enclosed catchment areas and compare with IS 10500:2012 to analyses the pollution on Surface water and Ground water due to discharge of domestic and commercial effluent in Ramgarh Tal lake. In which surface water sample was taken from mid-stream of Ramgarh Tal and ground water sample was taken around of catchment areas of Ramgarh Tal lake as for as possible. Ground water sample was drawn from India Mark-II (recognized by State Govt.) and Shallow depth hand pump. Ground water was taken around Ramgarh Tal at Six stations. The study was carried out during October 2017 to February 2018. The samples were taken of surface water and ground water subjected to test for Physico-chemical analysis. The physico-chemical result was showed that most of the water samples higher than the permissible limit.

Key words—Physico-chemical parameter, Surface Water, Ground Water, India Mark-II hand pump, Shallow depth hand pump

I.INTRODUCTION

Water is a primary requirement for humans and other living being, without water cannot consider any things about life. Generally developed and popular historical cities grow near catchment of river because need of water for survive. Water pollution is rapidly getting ahead to raise a question mark on ens of life. Human are completely depends on water for various type of activities. Due to globalization and industrialization increase the demand of water for their activities and further raise pollution of Surface water and ground water also. An approximately all water bodies are get polluted including Ground Water. Polluted water is facilely intermingled in water and dissipate the original quality of water. Ground water resource plays a very vital role drinking water by hand pump or piped water supply system. Ground water resource widely demanded by Urban and Rural areas by use of different type of water supply system. Disposal of industrial effluents and domestic sewage in river causes a reduction in water quality. Due to disposal of effluents in river gradually deteriorate ground water. Ground Water pollution is irreversible once ground water polluted it is difficult to treat.

Ramgarh Taal is a large natural lake situated on Gorakhpur in eastern Uttar Pradesh. It lies within the floodplain of Rapti River and effusion into it through a drain called Gurrah Nalla. The lake had a maximum water spread of about 723 ha in 1970s but has now constricted to 678 ha. Its maximum water depth has also declined from 4.5 m in 1990s to less than 3.5 m at present. The lake has a catchment area of more than 11500 ha most of which is urbanized and densely populated. The lake and its catchment are under the control of the Gorakhpur Development Authority (GDA). The lake receives storm water runoff and wastewater through several drains, domestic and commercial effluents such as the Kuda Ghat Nalla, Gordhaiya Nalla, Mohaddipur Power House Nalla, Golf Ground Nalla and Padley Ganj Nalla.

II.LITERATURE REVIEW

Abhishek Kumar Bharti(2015) was studies the water quality of Ramgarh Tal lake and its adjoining areas and analyses monthly variation during January 2015 to June 2015. He was selected nine stations and analyses physic-chemical and biological parameters of collected sample. He observed that surface water and ground water sample higher than the permissible limit and recommended that to avoid use of shallow depth hand pump.

Promod Kumar Vishwakarma (2010) was studies the water quality of Ami River and observed the monthly variation during August 2009 to February 2010. He was selected the nine sampling stations along length of river and analyses physic-chemical and biological characteristics of collected sample. He was occurred that untreated industrial effluents drained into Ami River, which highly contaminates the river water.

Sumant Kumar Verma (2015-2016) was studies the water quality of Ami River and its adjoining areas of ground water quality. He was observed monthly variation during August 2015 to February 2016. He was selected five surface water stations and collected over all 30 water sample of five stations. He was analyses the physic-chemical and biological characteristics of all collected sample and observed that Khalilabad, Adilapar, Unwal and Kauriram stations surface and ground water sample highly contaminated.

Sanjeev Kumar (2015-2016) was studies the designated best use of water quality of Ami River. He was observed monthly variation during August 2015 to February 2016. He was selected nine surface water sample and analyses the physic-chemical and biological characteristics of all collected sample and observed that most of the time at all location of Ami River is highly polluted except point of origin. The overall class of Ami River is below-E.

Uday Bhan Prajapati and Anil K. Driwedi (2011) were studies the impact of industrial waste on water quality of Ami River and observed the seasonal variation of water quality of Ami River. They were selected the five sampling station along length of river and statistical analysis of selected parameter were done.

Ayush Kumar Rai (2015) was studies the ground water quality at one side of and only two ground water sample at each stations i.e. (one sample Shallow depth and one India Mark-II hand pump) taken of Ami River basin.

III.STUDY AREA

Ramgarh Tal lake located between the latitude of 26.42 to 26.44 and longitude of 83.23 to 83.24 in Gorakhpur, U.P. and the area of the lake is approximately 678 Ha. Six sampling stations that is S1, S2, S3, S4, S5 and S6, name given in Table-1.

Table-1

S.No.	Location Name	Detail of location	
		Latitude	Longitude
S1	Ramgarh Tal	26.73	83.39
S2	Indira Nagar	26.73	83.38
S3	Taramandal	26.73	83.38
S4	Yaman Block	26.71	83.41
S5	Veer Bahadurpuram	26.72	83.42
S6	AvashVikas Colony	26.73	83.42

IV.MATERIAL AND METHODS

A total number of 6 samples of water were taken from the residential areas situated around the Ramgarh Tal. Before Sampling, all the sampling containers were washed and rinsed thoroughly with the groundwater to be taken for analysis. Samples were collected in pre-rinsed plastic polyethylene bottles and glass bottles of 1 litre capacity and were tested for pH, alkalinity, total hardness, acidity, chloride, and TDS respectively in Environmental Engineering Laboratory Buddha Institute of Technology, Gida, Gorakhpur. Parameters were determined using standard procedures. In this study groundwater samples were collected from the shallow depth hand pumps of the residential areas near the Ramgarh Tal during the four months October, November, December and February that is six samples were collected in each month to determine the monthly variation in the ground water quality parameters. During sample collection, Handling, and preservation, standard were followed.

V.RESULTS AND DISCUSSION

5.1 pH

pH is important parameter for measuring acidity and alkalinity of water. The term pH means concentration of H^+ ions in water sample. According to IS 10500:2012 the permissible limit of pH about 6.5 to 8.5. The pH range of all collected water samples observed within 6.5 to 9.62 i.e. in month of December pH value of S1 sample not in permissible limit.

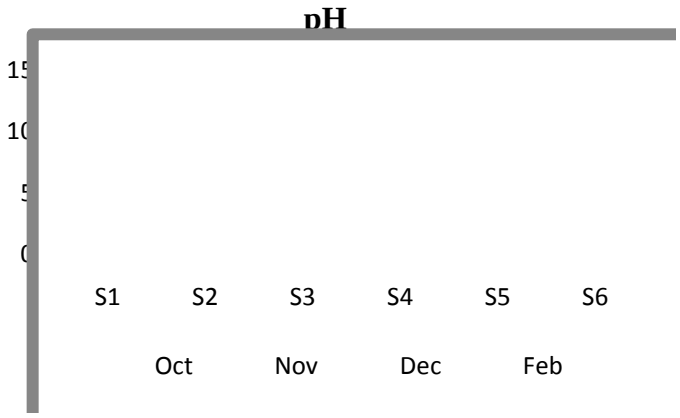

Fig. 1

5.2 Turbidity

Turbidity is measures the haziness of water and it is caused by suspended organic matter like sand, clay particles, corrosive elements, tiny plants etc. The turbidity observed of all sample within about 1 to 25 NTU. The permissible limit of 1 NTU given in IS 10500:2012 and most of the water sample not follows the permissible limit.

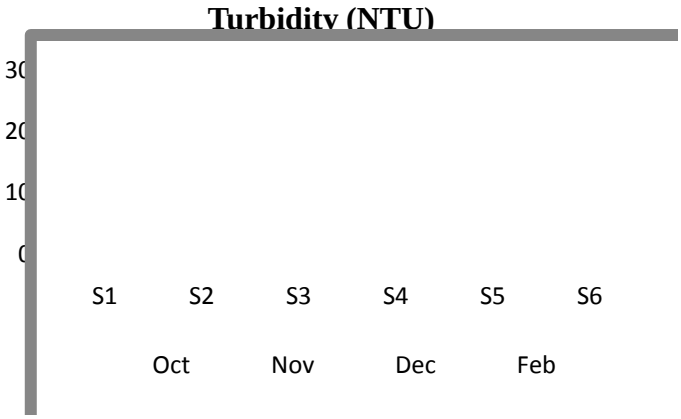

Fig. 2

5.3 Hardness

Hardness is measures the presence of carbonate and bicarbonate of Ca^{+} and Mg^{+} ions in water. It is causes greater soap consumption, boiler scaling, incrustation, corrosion, food became tasteless. According to IS 10500:2012 the permissible limit of Hardness about 300 mg/l. The Hardness range of all collected water samples observed within 125 to 450 mg/l. Most of the water sample not permissible limit.

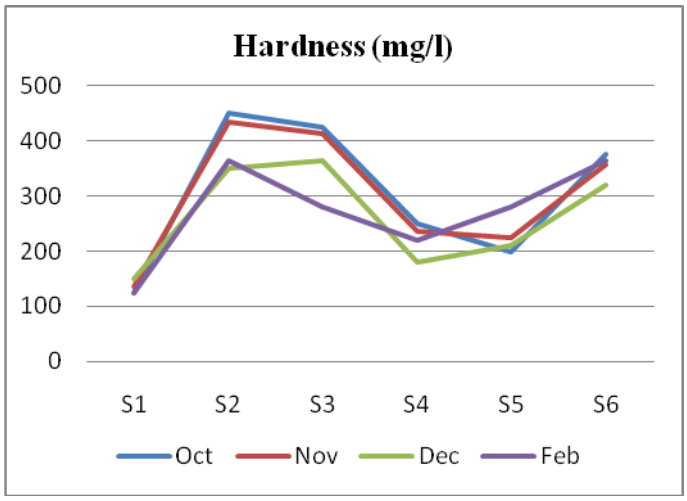

Fig. 3

5.4 Chloride

Chloride in water is responsible for domestic sewage, industrial effluents, and agricultural waste. It is commonly present in form of sodium chloride i.e. common salt. Chloride observed within range of 24 to 150 mg/l and permissible limit is 250 mg/l.

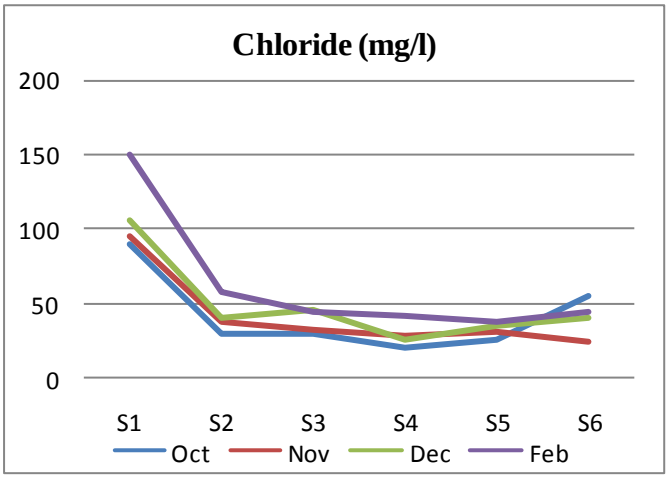

Fig. 4

5.5 Alkalinity

Alkalinity is measure alkaline matter present in water like carbonates, bicarbonates and hydroxides. It is helpful for neutralization of acidic compound in water. Alkalinity observed in collected water sample within 180 to 482 mg/l and permissible limit is 200 mg/l.

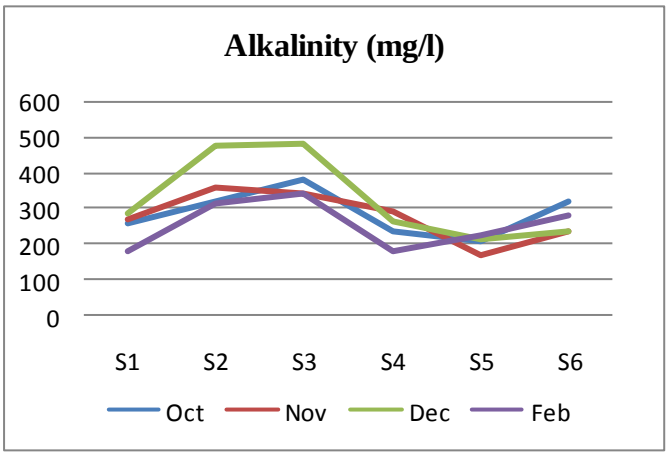

Fig. 5

5.6 Acidity

Acidity is measures the amount of dissolved carbon dioxide in water. Which is responsible by high organic contamination resulted as growth of bacteria. The acidity is observed within 26 to 95 mg/l.

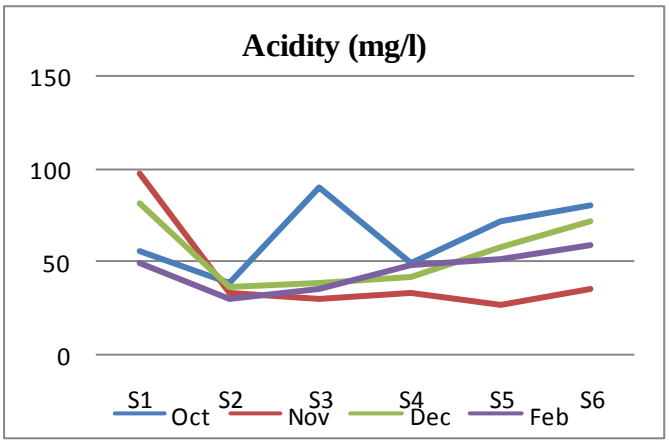

Fig. 6

5.7 Total dissolved Solid (TDS)

TDS is measured the total solid matter present like suspended and dissolved solid. In water TDS may responsible for carbonate and bicarbonate of Ca^{+} and Mg^{+} ions. About 55 to 65% these organic matter is responsible for T.D.S. and remain other organic matters like, Na, K, Mn, CO_3^{-}, HCO_3^{-},Cl^{-}, salt etc. TDS is observed within 235 to 651 mg/l and the permissible limit of TDS is 500 mg/l.

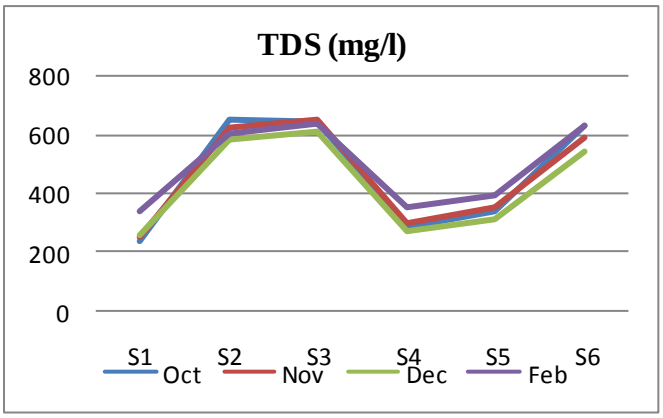

Fig. 7

VI.CONCLUTION

The discussion to this point is very poor condition of water quality of Ramgarh Tal and adjoining ground water. Over contamination is continuously degrading the water quality of lake. Over contamination of Ramgarh Tal is alarming the ground water pollution to government authority and citizen. There is need to understand the importance of water resource and how to industrial and domestic effluents discharge into surface water, impact to our ground water resource.

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