



ANALYSIS OF PHYSICO-CHEMICAL PARAMETERS OF GROUNDWATER OF SAHARSA DISTRICT

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ABSTRACT

It is very essential and important to test the water before it is used for drinking, domestic, agricultural or industrial purpose. Water must be tested with different physico-chemical parameters. Selection of parameters for testing of water is solely depends upon for what purpose going to use that water and what extent need of its quality and purity. Water does content different types of floating, dissolved, suspended as well as microbiological impurities. Some physical test should be performed for testing of its physical appearance such as temperature, color, odour, pH, turbidity, TDS ets. While chemical tests should be perform for its BOD, COD, dissolved oxygen (DO), alkalinity, hardness and other characters.

KEYWORDS : groundwater, physico chemical parameters, alkanity

INTRODUCTION

Groundwater is the water present beneath Earth's surface in soil pore spaces and in the fractures of rock formations. A unit of rock or an unconsolidated deposit is called an aquifer when it can yield a usable quantity of water. The depth at which soil pore spaces or fractures and voids in rock become completely saturated with water is called the water table, Groundwater is recharged from the surface; it may discharge from the surface naturally at springs and seeps, and can form oases or wetlands. Groundwater is also often withdrawn for agricultural, municipal, and industrial use by constructing and operating extraction wells. The study of the distribution and movement of groundwater is hydrogeology, also called groundwater hydrology. groundwater is thought of as water flowing through shallow aquifers, but, in the technical sense, it can also contain soil moisture, permafrost (frozen soil), immobile water in very low permeability bedrock, and deep geothermal or oil formation water. Groundwater is hypothesized to provide lubrication that can possibly influence the movement of faults. It is likely that much of Earth's subsurface contains some water, which may be mixed with other fluids in some instances. Groundwater may not be confined only to Earth. The formation of some of the landforms observed on Mars may have been influenced by groundwater. Ground water is an essential and important resource which is utilized for drinking irrigation and industrial purposes in many parts of the world, usually ground water is less susceptible to pollution compared to surface water. However, during the past few decades, ground water quality has been under threat for a number of reasons such as extensive abstraction, increased population, changing land uses and above all, improper disposal of municipal and industrial waters, Natural facts like weathering of rocks, rock water interactions and occurrence of more deposits also contribute a lot to ground water pollution. Ground water accounts for more than 80% of the urban and rural water needs in the developments of the country like India. Due to lake of adequate facilities and piped drinking water system in these countries.

MATERIALS AND METHODS

For the present study of quality assessment of drinking water of Saharsa district 25 open well, 20 hand pumps, 10 tube wells, one ponds and four river ghats have been selected for sampling, covering the entire area of the District. The sampling was done during October and November of 2018-2019. Samples were collected in 2.5 litre capacities of clean polythene bottles. The bottles were rinsed with the groundwater to be taken for analysis. Tightly sealed after collection and labelled in the field area. In the case of well water, samples were taken from at least two meters deep from

the surface of water in wells. In the case of hand pumps, it was run at first for two or three minutes and sample was collected at the distance of at least 10 s from the bank and 5 s deep from the surface. Similar treatment was done with the sampling on river water. Collected samples were analysed for Temperature, pH, Conductivity, Alkalinity, Total hardness, Chloride and TDS parameter during study period. The temperatures, pH of the water samples was determined on the spot using a thermometer and portable pH meter respectively. Conductivity measured by conductivity meter, Total Alkalinity was determined by visual titration method using methyl orange and phenolphthalein as indicator. Total hardness was measured by EDTA titrimetric method using EBT indicator. Chloride contents by argentometric method using potassium chromate as an indicator. TDS determined by standard method. (APHA, Trivedi & Goel) The quality of groundwater has been assessed by comparing each parameter with the standard desirable limits prescribed by BIS and WHO.

RESULTS AND DISCUSSION

Altogether 25 wells (open) well from different villages covering the entire area of nine block of Saharsa district have been selected for water collection and they were analysed for the different parameters like pH, alkalinity, fluoride, chloride, phosphate, arsenic, total iron, dissolved carbon dioxide (DCO₂), chemical oxygen demand (COD), biochemical oxygen demand (BOD) etc.

According to given data below in table 1, the river water samples record the highest average value of COD followed by pond water samples and then open well water samples. The tube well water samples record the minimum average value of COD. Since river water is highly exposed to domestic waste that carry. Organic as well as inorganic substance to river water adding to its pollution land. However, the data reveal that the water sources of the District are of good quality in respect of COD.

According to given data below in table 2, the order of the different water resources in respect of BOD content may be given as - Pond Water Samples > River Water Samples > Open Well Water Samples > Hand Pump Water Samples > Tube Well Water Samples. the high content of BOD in pond and river water may be attributed to the free inflow of run off of agricultural field which carry the fertilizers, and several insecticides, pesticides etc. to increase the BOD load of pond water and river water.

The table 3 reveals that the pond water samples record the highest concentration of dissolved CO₂ while tube well water samples record the lowest. The order is given as - Pond Water

> River Water > Well Water > Hand Pump Water > Tube Well Water.

The perusal of the comparative values of the total alkalinity reveals clearly that the highest value of total alkalinity goes to pond water sample followed by open well water samples. The lowest value is recorded by tube well water samples. The order may be given as - Pond Water Sample (379±2.12 mgm/L) > Open Well Water Samples, > Hand Pipe Water Samples > River Water Sample.

Table 5 reveals that the order of the average pH values of different sources is Pond water> River Water > Well Water > Hand Pipe Water > Tube Well Water.

As the tube well water is most protected from surface contamination, it is least polluted from surface contamination, it is least polluted while open well ponds and river are most exposed to anthropogenic activities and hence, they are most polluted in regards to pH. However, all the values lie well within the desirable limit of BIS, Indian standards and maximum allowable limit of WHO (1958).

Table 1: - The Average values of chemical oxygen demand (COD) of different water sources

Well Water Sample	Hand Pipe Water Sample	Tube Well Water Sample	Pond Water Samples	River Water Samples
Mg/L	Mg/L	Mg/L	Mg/L	Mg/L
0.3272	0.074	0.035	1.055	1.09
±0.414172	±0.0104	±0.0135	±0.205	±0.118

Table 2: - The Average values of BOD in different water sources

Well Water Sample	Hand Pipe Water Sample	Tube Well Water Sample	Pond Water Samples	River Water Samples
ppm	ppm	ppm	ppm	ppm
1.132	0.596	0.439	4.215	3.315
±0.258	±0.0476	±0.49	±0.148	±0.0117

Table 3: - The Average values of Fluoride concentration in different water sources

Well Water Sample	Hand Pipe Water Sample	Tube Well Water Sample	Pond Water Samples	River Water Samples
1.0708	0.943	0.729	0.875	0.5775
±0.442	±0.038	±0.349	±0.06364	±0.08

Table 4: - The Average values of total alkalinity in different water sources

Well Water Sample (mg/mL)	Hand Pipe Water Sample (mg/mL)	Tube Well Water Sample (mg/mL)	Pond Water Samples (mg/mL)	River Water Samples (mg/mL)
95.8-462.00	325-356	278-325	378-381	310-378
AV 375.9±78.44	343.8±7.75	291.4±14.94	379.5±2.12	332.75±30.7

Table 5: - The average values of pH of well water, hand pipe water, tube well water, pond water and river water samples

Well Water Sample	Hand Pipe Water Sample	Tube Well Water Sample	Pond Water Samples	River Water Samples
4.102±0.473	7.9±0.645	7.49±0.156	8.365±0.064	8.22±0.210

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