REVIEW OF RESEARCH
IMPACT FACTOR : 5.7631(UIF) UGC APPROVED JOURNAL NO. 48514 ISSN: 2249-894X
VOLUME - 8 | ISSUE - 6 | MARCH - 2019

STUDIES ON EVALUATION OF GROUND WATER QUALITY OF DARBHANGA TOWN ON THE SUBJECT OF SEASONAL VARIATIONS IN A FEW PHYSICO-CHEMICAL RESIDENCES AND ITS IMPACT ON PEOPLE

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ABSTRACT

This paper explores the physico-chemical parameters of the Darbhanga District, Bihar Gangasagar Pond. Monthly modifications to physical and chemical parameters, such as temperature of the water, clarity, turbidity, dissolved solids, pH, free carbon dioxide, total hardness, chloride, phosphate and nitrates. Choose the following physical and chemical parameters:Were evaluated from 1 January 2018 to 31 December 2018 for a period of one year. Both conditions have been within the limits permissible.

KEYWORDS: *Water pollution; Surface Water Quality; Ground Water Quality; Physico-chemical features, Biological Characteristic.*

INTRODUCTION

Water is a vital resource and most widely used for the life of the whole living organism. Normal and abundant safe and pure water sources are a precondition for healthy survival and maintenance.The fifth century B. C. Greek thinkers like Pinder declared water to be the best of all and Agrigento empedocles postulated that water had been one of the four principal elements or roots of the word.Water is used for a range of purposes, of which drinking and personal hygiene are the most important. Both our country's main streams, however, face water pollution problems. And underwater polluting itself and not drinking safely.Groundwater containing fluoride above the allowable limit was found in several places in the state (standard level=1 to 1.5 ppm). Similar concentrations of iron have been identified in some areas in groundwater. The appropriate norm limit is 2 ppm for iron.

Darbhanga has been ranked as one of Bihar's fastest growing cities with rapid population growth and urbanisation. There is constantly rising demand for water sources. About 71% of the earth's surface is made of water. About 97% of surface water is fresh with salt water remaining.Water contributes to the health of the Earth's atmosphere and dilutes the toxins. Water is one of our life's most important substances. It constitutes approximately 50% to 97% of the total plant and animal weight and about 70% of our organism. It is also an important resource for agriculture, development, transport and various human activities.It is therefore asignificant factor in a community and nation's economic, social and cultural growth. Groundwater contamination is of great concern firstly because it is increasingly used for human needs and, secondly, because the growing industrial activities have adverse repercussions.Ground water contamination sources include runoff of liquid waste and solid wastes properly disposed of. Leakage from wastewater may also lead to some degree to contamination by the introduction into groundwater of high-organic, nitrate-chemicals or bacteria. Pollution of the ground water will happen if industrial wastes are deposited in nalas, pools and rivers.

GROUND WATER

Different groundwater quality requirements have been investigated, e.g. from different sources. A number of researchers tube well, Dug well, Bore well etc. Some of them were identified. Karnchanawong et al. (1993) have measured the quality of the well water at the Mae-Hia waste disposal site.Well water was not suited to drink in the study region due to high Total and Fecal coliforms and moderate nitrate and manganese emissions. The levels in the soil water of wells next to the disposal site were reported to be higher than other fields, namely electrical conductivity, total solids, colour, chloride, chemical oxygen demand, sodium, coper and lead, respectively.The possible impacts of mine wastes on ground and surface water is analysed by Herzog (1996) at 14 cities in Northern China due to nitrogen fertilisers. Zhang et al.(1996). Zhang et al.(1996). Zhang et al.Mikkelsen et al. (1997) confirmed pollution by groundwater due to stormwater infiltration. Lind et al (1998) documented the effect of mining activation on the pH of ground water.In Slovenia, Maticie (1999) was also analysing the effect of agriculture on the quality of groundwater. The number of a nitrate exceeds the permitted level (50 mg / l) of drinking water from 12 main groundwater aquifers in Slovenia.Egypt, Shamruck et al. in the Nile Valley aquifer. (2001) the effect of chemical fertilisers on the groundwater quality has been investigated and the nitrate (20 to 340mg / l), sulphate (96 to 630mg / l), phosphate (7 to 34mg / l) or potassium (7 to 28mg / l) have been identified in highest ion levels. The pollution from groundwater ruin was documented (2003). Almasri etal. analysed agricultural watershed nitrate in Whatcon County, Washington. (2004), at regional level.

Malik (1994) investigated the relationship between increased intestinal diseases and the current quality of water in the Haora Municipal Corporate Area tube well water quality. In Birbhu district of West Bengal, Nag et al. (1994) researched the consistency and high concentration of Manganese, Iron and Zinc in drinking water.The quality evaluation of well water in rural areas around Rewa has been demonstrated by Gupta et al. (1994). The possible contamination of septic-tank effluents and their effect on groundwater quality in the unsewered Tirupati region were stated by Raja Sekher et al. (1994).In some of the groundwater samples in Dhanbad City Venkata et al. (1994) find some heavy metals. Abbasi et al (1995) studied the water quality of the open wells in the Malappuram, Kerala coast and found that the majority of wells' parameters in compliance with ICMR and WHO norms are below permissible.In the bore well water of the city of Bhopal, Kataria et al. (1995) found turbidity within the scope from 2.0 up to 102.0 NTU. The seasonal changes in groundwater quality had been studied by sharma et al. (1995) in Gwalior and it found that different parameters had exceeded WHO limit. Pande et al., (1996) studied the existence of drinking water traces in the port of the city of Paradeep and found the seasonal fluctuation from a variety of sources including water from Mohanadi river, Taladanda, tap water, tube well and open water.

GROUNDWATER RESOURCES

Groundwater recharge is mainly caused by precipitation in the region. The current use of groundwater for drinking purposes in hard rock areas is predominantly by dug wells. Even for drinking / domestic uses, primarily by means of shallow or moderate tube wells. The average hand-pump pipe yield varies from 20 lpm and 30 lpm. As stated above. Rourkela's groundwater is not suitable for industrial use for public supply, with the exception of hand pumping water wells.

Water samples from Gangasagar Pond have been taken from four separate stations in the morning hours from 9 am to 11 am, regularly for every month in polythene bottles. At the time of sample collection using the thermometer and pocket digital pH metre, the water samples were immediately taken to a laboratory to estimate various physico-chemical parameters, such as water temperature clarity and pH.With the help of Secchi Disk, transparency was assessed. Although other Laboratory Dose, TDS, Free CO2, Hardship, Chlorides, Alkalinity, Phosphate and Nitrate Parameters are calculated by the APHA, AWWA, Trivedy and Goel, Kodarkar Standard Metering.

Analysis of Physico-chemical Parameters of Water Samples:

The standard methods of determining different physical-chemical parameters were generally recommended by APHA, AWWA, WPCF (1985), Trivedi and Goel (1984) and NEERI (1986). The following is a concise summary. Total dissolved solids (TDS) and electrical conductivity (EC) were determined by using water test kit model 191 E using physico-qualified parameters such as temperature, pH, turbidity, dissolving oxygen(DO).All five of the kit 's multi-samples (except Temperature) were calibrated together using the same parameters. Potassium chloride standard solutions were optimised to 0.005, 0.05 and 0.5 M for electricity conductivity. The normal buffer solution pH-4 and pH-9.2 are calibrated.Dissolved oxygen was calibrated with the Zero (Sodium Sulphite) solution and the Winkler air was tested with a saturated beaker of water. Temperature is set in the factory without being adjustable, but the accuracy between the multi-samples was tested against a standard Mercury thermometer. Hydrazine Sulphate and Hexamethylenetetramine were calibrated with a normal 400 N.T.U solution.Oxygen dissolved was also tested on site with Winkler 's updated process. A total of 50 ml of water samples were measured through a philtre paper of Whatmann 41 by means of TSS (total suspended solids). 50 ml of the sample is buffered with the pH 8-10 (NH_4Cl and NH_4OH) and titrated with Erichrom Black T as an indication against regular EDTA.Calcium was measured using murexide indicator by titrating the water sample to standard EDTA. The formula measurement system used was used to evaluate the magnesium (APHA, AWWA, WPCF, 1985).

Mg (mg/l) = (Total Hardness – Calcium Hardness) X 0.243

A sample was titrated to N/50 sulphuric acid solution using the methyl orange indicator for the Total alkalinity measured. Titrating N/50 of silver nitrate solution using potassium chromate as an indicator calculated chloride content.Due to a measured ozide depletion after three days of incubation with 270 C Biological Oxygen Demand (BOD3 at 270 C), was estimated. Chemical oxygen request (COD) was calculated by the oxidisation of the excess potassium dichromat solution with the oxidation and the titration by means of ferrion indicators of the excess dichromate to normal ferrous ammonium sulphate solution.

Spectrophotometrically determined according to standard protocol suggested by APHA, AWWA, WPCF(1985) fluoride, sulphate, Nitrate-Nitrogen, Iron, Chromium, Zinc and Plum. For river water, six additional parameters such as Free CO_2 were controlled, as the quality of the river water was highly affected by these parameters: cyanides, ammonial-nitrogen, oils and grate, faecal coliform and complete coliforme.Free carbon dioxide has been calculated using the phenolphthalein indicator by titrating the sample against N/40 caustic soda. The ion analyser accompanied by the normal protocol was used to evaluate cyanide and ammoniac nitrogen. The traditional methods practised by APHA were used for the determination of oil and grease. For members of the coliform community, a multi-tube fermentation technique was carried out.The basic coliform test can either be conducted using the multifunctional tube or the membrane philtre technology. Due to its applicability to almost all waters, the multiple tube fermentation technique is more in use. The procedure included the inoculation of the sample in an effective liquid medium and/or its different dilutions.The tubes were examined by the coliform species for the gas generation after the expiry of the incubation cycle. This test is classified as an alleged test. Since species other than cotiforms are also able to respond to the gas output, a confirmatory test was performed on the positive tubes from the presumptive test. Often, the completed test is performed for a very particular presence of coliform bacteria.

RESULTS AND DISCUSSION: -

The Monthly Variation of Physico-chemical Parameters is presented in Table

Table 1: Gangasagar Pond District, Darbhanga physical parameters(ref.-6)

Month	Temperature °C	Transparency cm	Turbidity NTU	TDS gm/lit	pH
Jan	23	12	9.95	0.37	8.4
Feb	25	10.5	12.41	0.39	8.4
Mar	26	9.75	12.2	0.4	8.8
Apr	23.5	7.5	8.4	0.1	8.3
May	25	6.0	7.1	0.6	8.0
Jun	23.5	9.5	11.6	2.2	8.1
Jul	23.5	60.75	1.0	1.13	8.1
Aug	24.5	61.75	2.2	0.2	8.3
Sept	25.5	58.5	2.2	0.3	7.3
Oct	25	92.0	0.4	0.4	7.5
Nov	24	82.5	1.35	1.8	7.9
Dec	22.5	67.25	1.8	0.4	8.2

Groundwater is the principal source of domestic water supply in both urban and rural India. There are many explanations why drinking surface water is not available and there is a common belief that groundwater is purer and more stable than surfaces because of earthenware.More than 200 chemical constituents, including about 175 organic and over 50 inorganic and radio-nucleotides, have been identified in groundwater. Both natural and anthropogenic sources of these chemical substances. In 466 randomly chosen public soil water supply systems, USEPA found volatile organic compounds (VOCs).Trichloroethylene and tetrachloroethylene (OTA, 1984) were the most common occurrences. Contamination of the water supply by organic compounds is of little to no concern in the developing world.The key health issues in these areas are caused by pollution with inorganic substances, poor health conditions and disease caused by pathogens. Once the groundwater on a site is polluted, for decades or centuries it can remain in an unusual or dangerous state.A contaminant feather can therefore maintain high concentration, because it moves slowly from recharge points to waste zone, due to the low speed of the subsurface water which prevents a great number of mixtures and dilutes (Pattyjohns, 1979).

Water's physical, chemical and biological quality can differ to a large extent. The (natural or anthropogenic) cause of many issues with water quality is difficult to discern. The form and quantity of soluble and insoluble substances with which it comes into contact is expressed in natural quality.Groundwater quality is the product of waste disposal and land use most often. In excavations such as dumps and mines, another significant cause of pollution for the disposal of waste materials. Solids dumped, spilled, distributed or stored on the land surface can eventually infiltrate water-soluble substances.The drainage of fluids by wells, and by sinkholes into the aquifers directly on lime stone fields, may also contaminate groundwater.

WATER TRANSPARENCY-

Water Transparency Flows 6.0 cm to 92.0 cm. Water Transparency In October (winter) the maximum (92.0 cm) and in summer a minimal (6.0 cm) have been reported. In winter as well as in summer, there were no rain, runoff and flood water and a gradual settlement of the suspended particles, Khan and Chowdhury[8] stated that there is more clarity. Similar observation was reported by Kadam et al.

Turbidity-Water turbidity ranges between NTU 0.4 and NTU 12.41. In February (summer) maximum values were reported (12.14 NTU), which could be caused by human activity, a decrease of water levels and the presence of suspended particles and minimum values (0.4NTU) in October.

Total dissolved solids-The total solids are dissolved between 0.1g / l and 2.2g / l. In the month of June, the maximum value was entered (2.2g / l). This is attributed to heavy precipitation and low (0.1g / l) in April

pH-The pH ranged from 7.3 to 8.8 with alkaline values. In May(summer), the maximum pH value (8.8) and in September (7.3) were recorded. Factors such as air temperature induce water pH changes. The pH is affected by most bio-chemical and chemical reactions.

Dissolved Oxygen-The DO values differ between 6.40 mg / l and 15.5 mg / l. In the month of May (summer) the maximum values (15,5mg / l) were reported and in the month of November (winter) the minimum values (6,40 mg / l). The high DO in summer has an effect on percentage of soluble gases due to an increase in temperatures and the length in light sunlight (O^2& Co^2).

Free Carbon dioxide-The free Co2 values differ between 0.0 mg / l and 28.6 mg / l. In December (winter), the maximum value (28.6 mg / l) was recorded and in January- March a minimal value (0.0 mg / l) was recorded. The alkalinity and hardness of the water body may be significant.

Hardness –The hardness value ranges between 70 mg / l and 179 mg / l. In April (summer), a maximum (179 mg / l) and a minimum (70 mg / l) value was registered in October.

Phosphate –The phosphate value ranges in size between 0.12 mg / l and 12.38 mg / l. In August (Monsoon) the maximum value (12,38mg / l) and in October (Winter) the minimum value were reported.

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