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STUDIES ON DRINKING WATER QUALITY IN MORIGOAN DISTRICT, ASSAM

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ABTRACT

The present study deals with the physico-chemical and microbial analysis of drinking water quality in Morigoan district, Assam. Water samples were collected from 5 sampling station (A-E) and analyzed for parameters, such as color, odour, temperature, electric conduction, pH, residual chlorine, DO, TAA chlorine, TH, TDS, Ca, Mg, MPN. The study reveals that physico-chemical parameters of the water samples tested are well within the quality standards WHO and ISI. The significance of the result are further discussed.

Key words: Physico-chemical, Microbial analysis, Morigoan (Assam).

INTRODUCTION

Water plays an important role in the development of a healthy society. Excluding the 97.5 percent of water of high salinity contained in the oceans and seas groundwater accounts for about one third of the fresh water resources of the world. Ground water is highly valued because of certain properties not possessed by surface water. Thus it is used for different purposes viz. drinking, domestic, irrigation and industrial depending upon its intrinsic quality. Therefore, it is of prime importance to have prior information on the quantity and quality of water resources available in the region. Lack of awareness, the main features of groundwater systems are poorly known or even misunderstood. Use of ground water resources is fundamental to human life and economic activities and their proper management and protection are correspondingly vital.

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The supply of safe potable water has a significant impact on the prevention of water transmissible diseases. The abundance of organic compounds, toxic metals radio nuclides, nitrites and nitrates in potable water may cause adverse effects on human health. Therefore assessment of water quality is important for knowing its suitability for various purposes.

A lot of work has been done on groundwater geochemistry at international levels and national levels. For north eastern region works has been done by Singh on arsenic contamination in Ganga Brahmaputra river basin. Few studies initiated by NERIWALM, Tezpur and Gauhati University for arsenic and fluoride. A few work in district levels also done by some workers (e.g. H. P. Sarma and coworkers). Works on limited sites also done by Central Water Board.

Some important findings of these works are -

High arsenic contamination in groundwaters in deltaic plain of Gangas-Maghna-Brahmaputra is because, FeOOH is microbibly reduced and releases its sorbed load of arsenic to groundwater.

With respect to Yarlung Tsangpo basin it is found that there can be nonsilicate sources of Na^+ such as sodium carbonate or borax.

Some of the work on arsenic contamination show that the majority of chemical constituents including parameters such as pH and specific conductivity remain fairly constant and that the groundwater quality was not influenced by seasonal variations in the local and that oxidation of primary arsenic bearing sulphide minerals was not responsible for the variations in groundwater.

The main processes influencing the groundwater chemistry are salination mineral precipitation and dissolution, cation and human activity.

So far the study indicates that arsenic contaminated groundwater is found within the sediments between 20-100 m bgl in Brahmaputra alluvial plain.

Analytical results for arsenic in Assam that groundwater adjacent to foothills is highly arsenic contaminated. This area lies within alluvial basin bounded by Himalayan mountains probable reason may be heavy deposits by sediments due to surface erosion from surrounding hills and crerating aquifers.

The purpose of this study is to quantify the concentration of heavy metals and trace metals and inorganic anions in groundwater in Morigaon district.

Morigaon district is spread over an area of 1451.12 Sq. Km. The district is surrounded on the west by Kamrup district, on the North by river Brahmaputra, on the East by Nagaon District and on the South by Karbi Anglong district. The major land area of the district is an alluvial plain with many waterways, rivers and marshes. The northern part of the district is flooded by the river Brahmaputra, while rivers Killing, Kollong and Kapili rivers flow through the south of the district.

Water for domestic use (drinking, washing, cooking, flushing toilet, watering gardens) is mainly drawn from ground water and surface. Water is being polluted from agricultural, industrial and municipal run off. Owing to public concerns over the quality of domestic water. Many people prefer to drink bottled mineral water. Various public stations are having drinking water may decrease from source to receiver along with path, hence for effective maintains of water quality by appropriate treatment. The water supply system is constantly expanded depending upon increasing population. Therefore it is imperative that the evaluation of physical, chemical and microbial quality of water supply is essential and remedial measures and hence the present investingation has been taken up.

EXPERIMENTAL

Material and method

Study area

Morigaon district is spread over an area of 1451.12 Sq. Km. The district is surrounded on the west by Kamrup district, on the North by river Brahmaputra, on the East by Nagaon District and on the South by Karbi Anglong district. The major land area of the district is an alluvial plain with many waterways, rivers and marshes. The northern part of the district is flooded by the river Brahmaputra, while rivers Killing, Kollong and Kapili rivers flow through the south of the district.

Morigaon district is located between 26.15° to 26.5° Northern latitude and 92° to 95.5° Eastern longitude. Geographical features of Morigaon District indicate that its general appearance is extremely picturesque. For present study 5 sampling stations (A – E) were fixed, namely (A) Jagiroad Railway station tap water, (B) Dharamtul Raileway station (Tap

water), (c) Marigoan Bus stand, (Tap Water), (D) Buragoan (Tap Water road area), (E) mineral water (Generally used in Morigoan town).

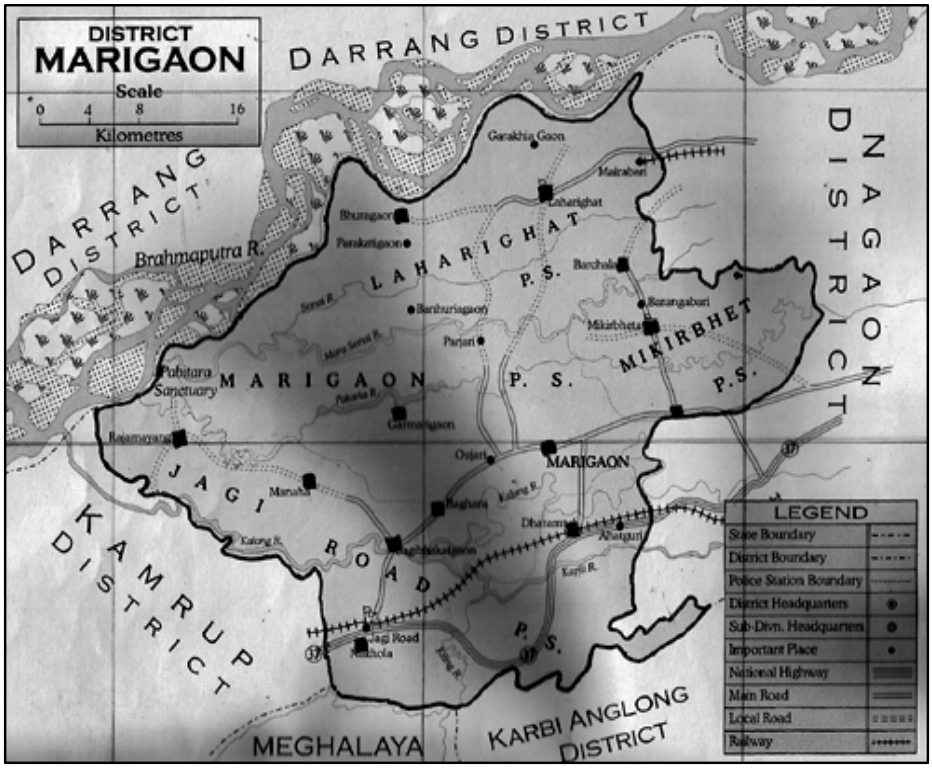

Fig. 1: Sampling sites

Analysis of physico-chemical parameters.

Water samples were collected monthly from each samplihg station during the period of 3 month (Dec. 2011 – Feb 2012) (Figure 1). Physical parameters, such as colour, odour, temperature and EC for water samples water samples were carried out and chemical parameters such as pH. Residual chlorine, DO, TA, chlorine, TH, TDS, Ca and Mg were measured following the describe[1,2].

Microbiological analysis

Most probable number (MPN) of water samples were carried out for all selected sampling stations. Water samples were collected in sterilized bottles. The microbial analysis were conducted after 5 hr of sample collection. MPN of sample was estimated using multiple tube fermentation technique (% tubes) following the method of APHA[1].

RESULTS AND DISCUSSION

The average values of physico-chemical and microbiological parameters, such as colour odour, temperature, pH, residual chlorine, DO, TA, chlorine, TH, TDS, Ca, Mg and MPN for the water samples of Marigoan water works are presented in Table 1. The data reveals that the sample from all stations (A – E) were colourless and odourless. The values of temperature ranges from 19 to 27^{o}C in the station A to D. It reveals that the different in temperature irrespective of collection point slight variation. No temperature has been heck up for mineral water. Temperature has an influence on water treatment and in limnological evaluation. The World Health Organization has not issue limit on the temperature. The fluctuation in EC was observed between 754 and 853 mhos/cm in water samples. For mineral water EC was found to be 143 mhos/cm. EC values were higher than prescribed limit for WHO, ISI and mineral water.

Table 1:

Parameter	Sampling station					WHO	ISI
	A	B	C	D	E		
Temp. ^{o}C	27.1	19.0	23.0	24.6	-	-	-
EC, µmhos/cm	853	849	781	754	143	600	-
pH	8.3	8.35	8.44	8.32	7.53	7-8.5	6.5-8.5
Resi. Chio	0.14	0.14	0.09	1.76	NIL	0.2-03	0.2
DO	6.6	7.8	6.7	7.5	5.6	-	-
TA	14.5	133	166	124	23	150	200
Chloride	96.4	96.5	78.5	102.3	30.2	250	250
TH	150	154.6	166	123.6	23.3	150	200
TDS	205	242.3	340	183	20.66	500	500
Ca	27.2	26.1	28	26.4	6.13	75	75
Mg	19.1	21.7	23.1	28.4	3.4	50	50
MPN per 100 mL	12	14	15	8	< 2	-	10

The pH values in the sampling stations ranges between 8.3 to 8.44, which were within the limit prescribed by ISI. Knowing pH value is suitable for domestic use and for irrigation. The pH does not have any adverse health effect but it alter taste of water. A lower

value of pH below 6.5 will produce sour test and higher value above 8.5 a bitter test. Though it has no direct effect of human health the recommended value for devising purposes is 8.0 to 8.5[3]. Water are generally chlorinated in order to control bacteria and slime forming organisms in water supply scheme. The presence of the residual chlorine ensures effective check over the reduction of bacteria in water in safe limit. The value of residual chlorine for the water samples ranges from 0.09 to 1.76 ppm, which were low in samples A, B, C while sample D shows large value than desirable in the consumer end will be 0.2 to 0.3 ppm[4]. However, this will be obtained only when residual chlorine of 2-3 ppm maintained at the treatment units.

The level of fairly good dissolved oxygen was observed in the water samples ranges between 6.6 to 7.8 mg/L. The water deficient in oxygen shelter for bacteria and other pathogens, which are anaerobic and injurious to human health. The oxygen content is therefore good indication of quality of water. It is suggested that the level of oxygen 3 to 5 mg/L is indicative of healthy state of aquatic system and values below 3 mg/L are hazardous and may lead to lethal consequence. Total alkalinity values for water samples ranges between 123.6 to 165 mg/L, which is very high as compare to the mineral water sample (23.3 mg/L). These observed values were in the prescribed limit (ISI)[5] although alkalinity has little public health significance highly alkaline waters are unpalatable and are not used for domestic water supply.

Chlorides in drinking water are generally not harmful to the humankind. Higher concentrations, however may affect some persons who already suffer from disease of heart or kidneys. Chloride values for the water samples ranges between 78.5 to 102.3 mg/L, which were below desirable limit prescribed by ISI and WHO. Mineral water shows very less value (30.2 mg/L) than other water samples. Water containing chloride in excess of 250 mg/L are considered suitable for drinking purposes. Chloride are also corrosive and impart permanent hardness to water. Total hardness value for the water samples ranges between limit prescribed by ISI. As it compare with mineral water (30.6 mg/L).

Concentration of the total dissolved solids were in the range between 223 to 337 mg/L, which were below the desirable limit prescribed by ISI. As it compare with mineral water (20.66 mg/L) the samples shows large variation. If TDS is more water cannot be used for drinking as well as construction purpose. TDS affects strength and solidify of concrete and palatability of food cooked. It also cause intestinal irritation. Ca and Mg values for the water samples were ranges from 25.1 to 28 mg/L and 18.4 to 29.06 mg/L respectively. Hardness of water is mainly depends upon the amounts of Ca or Mg salts or both. In the

present study, the Ca and Mg contents of water samples are well within the prescribed limit for ISI and WHO. Ca and Mg were essential elements for human beings. Approximately human body requires 0.7 to 2.0 g of Ca per day as food element the amount, which cannot be supplied even by hard water. Mg is relatively non toxic to man. However higher concentrations causes unpleasant tastes to water.

Most probable number (MPN) values of total faucal coli from estimated for water samples from Bhusawal Corporation area and ranged from 8 to 15 MPN/100 mL. The mineral water shows MPN < 2, by comparing this value with other samples MPN is 10/100 mL (ISI). Our data reveals that sample A, B, C were infected so for the microbial analysis of water sample is concerned. This could be possible due to secondary pollution caused by sewage contamination or contaminated during distribution and also the improper maintenance of the storage tank.

In order to prevent secondary pollution in this station, the storage tank should be cleaned periodically and chlorinated properly. Similar studies were carried out by Kerla and Mark[6], Mohamed et al.[7], Bhattacherjee et al.[8] and Gowari Shankar et al.[9] Standard limits of MPN is 0-10 organisms/100 mL. Even though the water quality prescribed standards limit of WHO. ISI the quality of public places (sample A, B, C) were found to be infected by secondary pollution when compared with that of mineral water and tap water.

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