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QUALITY ASSESMENT OF WATER: A CASE STUDY OF TUMSAR AREA IN BHANDARA DISRICT

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Abstract:
The present study was carried out with a view to have an understanding about the pollution status of water from Tumsar area (Bhandara district) particularly water quality in vicinity of industrial area. Evaluation of physico-chemical parameter was carried out. Twelve samples were collected from various selected sites. The analysis of parameter using standard methods and their comparison with standard values suggested that most of the parameters are within the permissible limit. The present paper accounts water quality of various sites of Tumsar area in Bhandara district.
Keywords: Surface water, bore well water, physicochemical parameters

Introduction:

Rapid industrialization and urbanization is leading to deterioration of environmental conditions on global scale. In recent years environmental pollution has become a critical problem which affect on atmospheric properties, human health, soil, water, vegetation, animal and the whole ecosystem. Due to intense industrial activities and dense settlement in urban and industrial areas, the environmental pollution becoming growing hazards to human health.

Water plays an essential role in human life and its elemental composition is important to life processes as it provide all the essential nutrients to living organism**.** Due to tremendous increase in pollution, technological; advancement and industrial growth, the lack of safe drinking water emerge as major problem for significant proportion of global population. Although statistics, the WHO reports that approximately 36% of urban and 65% of rural Indian were without access to safe drinking water [Saxena, 2011]. 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 [Agrawal, 1982]. Human and ecological use of ground water depends upon ambient water quality. Human alteration of the landscape has an extensive influence on water hydrology [Claessence, 2006]. Ground water plays a vital role in human life .The consequences of urbanization and industrialization leads to spoil the water for agricultural purposes. Ground water is explored in rural especially in those areas where other sources of water like dam and river or a canal is not considerable. During last decade, this is observed that ground water get polluted drastically because of increased human activities. Consequently number of cases of water borne diseases has been seen which a cause of health hazards. An understanding of water chemistry is the base of the knowledge of the multidimensional aspect of aquatic environmental chemistry which involves the source, composition, reactions and transportation of water. The quality of water is of vital concern for the mankind since it is directly linked with human welfare. It is a matter of history that facial pollution of drinking water caused water-borne diseases which wiped out entire population of the studied. At present potable water consumed by 80 to 90% of the population is of poorer quality by international standards.

Water is a prime natural resources and a basic human need. The present work is carried out in vicinity of Tumsar area in Bhandara district in order to study the water quality. Tumsar Taluka is situated on North – Eastern side of Maharashtra state and shares the state border of Madhya Pradesh, lies between degree of 21.38°N 79.73°E, the adjoining districts are Gondia on eastern side, on Northern side Balaghat district of Madhya Pradesh, on western side Nagpur District. The Taluka falls under the Wainganga basin and Wainganga River being Main River with tributaries like Bawanthadi, Chulbandh and Sur rivers.

2)Materials And Method

2.1) Study Area: - The Physico-chemical parameters of ground water of 12 stations in Tumsar Taluka were studied. The geographical area are shown in Fig.1. The water samples was collected from well and bore wells located in these area. Ellora Paper Mill and Wainganga Sakhar Karkhana is located near this area. The samples were collected in clean polythene bottles without air bubbles, the bottles were rinsed using double distilled water before sampling and tightly sealed after collection and labelled. The temperatures of the samples were measured in the field itself at the time of sample collection. Analysis of DO, alkalinity, chlorides, total hardness, and turbidity was carried out in laboratory and data is reported in Table. No.2

Table.1. Description of water sampling sites.

Sampling Code	Source	Location
W1	Bore well	Ghatkurda
W2	Well	Mundikota
W3	Bore well	Patiltola
W4	Bore well	Ghogra
W5	Well	Dehwada Khurd (A)
W6	Bore well	Dehwada Khurd (B)
W7	Well	Mohagaon
W8	Well	Nilaj BK
W9	Well	Jamblapani
W10	Bore well	Navegaon BK
W11	Bore well	Devhada BK
W12	Well	Narsingtola

Table.2. Methods used for estimation of various physico chemical parameters.

Parameters	Method
Temperature	Thermometer
pH	pH meter
Total Alkalinity	Titration method
Total Hardness	EDTA Titration
Turibidity	Turbitity Meter
Chloride	Silver nitrate Method
Total Dissolved Solids	Conductivity Meter
Conductivity	Conductometry
DO	Titration method

3) Result and Discussion

The samples collected from Tumsar area was analyzed. The analysis of water samples includes determination of physico chemical parameter which were analysed in monsoon (1st July 2013) season have been shown in Table 3. The water collected from Tumsar area has no colour and no odour. Taste of the water sample is pleasant. The atmospheric temperature was recorded between 27 ^{o}C to 30 ^{o}C. The temperature is one of the important factor in aquatic environment since it regulates physico-chemical as well as biological activities[Kumar and Gupta,1996]. The water temperature was recorded 27 ^{o}C to 30 ^{o}C and has close relation to the variation of atmospheric temperature [Sunkad, 2004] .Water temperature above 30 ^{o}C is unfit for public use[Zajic,1971].

The desirable pH range necessary for drinking water is from 7.0 to 8.5. It is the major ecological factor of most importance in controlling the activities and distribution of aquatic flora & fauna. pH values of water samples in the study area ranged from 6.1 to 8.7.On an average pH of all samples was in desirable limit[APHA18thed] as prescribed for drinking water standards. This shows that pH of water samples was slightly alkaline. Most of the fresh water reservoirs are neutral. Generally pH of water is influence by geology of catchment area and buffering capacity of the water. The pH value was found in the range of 8.3 and 8.7 in site W7 and W12 indicating slight alkalinity. High pH indicates the free availability of heavy metals as result of their precipitation in hydroxide for.

Alkalinity of natural water may be attributed to the presence of salts of weak acids such as bicarbonates, phosphates, silicates and borates [Dara S.S, 2011] which induce buffer capacity and lowering of pH. Alkalinity of different sites in Tumsar area varied from 217 ppm to 311.9 ppm. The values of total alkalinity were comparatively moderate. The

water for domestic use having alkalinity less than 100 ppm is safe. High content of alkalinity is due to confluence of indusrial and domestic waste. An anionic radicals such as carbonates ,bicarbonates, hydroxide and phosphate contribute to increase in alkalinity.

Hardness was originally defined as the soap consuming capacity of water. This soap consuming capacity is mainly due to presence of calcium & magnesium ions in the water Total hardness is the total soluble magnesium and calcium salts present in water expressed as its $CaCo_3$,equivalent.In most natural water the predominant ions are those of bicarbonates associated mainly with calcium to lesser degree with magnesium and still less with sodium potassium.Total hardness of different sites in Tumsar area varied from 106 ppm to 288 ppm, which shows that water is safe for drinking purpose. Hardness has no adverse effect on health. However, maximum permissible level prescribed by WHO for drinking water is 500 ppm. On this basis, the results shows that all the samples were moderately soft except sample W6

In potable water the salty taste produced by chloride concentration and it is variable and dependent on chemical composition on water.Some water containing concentration 25mg/lit chorides may have a detectable salty taste if cation is sodium.It is one of the major inorganic anion of water high concentration of chloride indicates pollution due to organic waste, in this study chloride was found in range of 48 ppm to 274 ppm high concentration of chloride which may indicate high concentration of pollutant. Chloride content of the water samples was low in rainy season .According to WHO,maximum permissible limit for chloride is 500 ppm.The values observed in present study is in the range of permissible limit.

Total dissolved solids(TDS) is measure of the combined content of all inorganic and organic substances contained in a liquid in molecular ,

ionised or micro granular suspended form TDS refers to suspended matter for dissolved in water or waste water. High TDS in ground water may be due to ground water pollution due to Industrial and Agricultural activity . TDS is a general indicator of overall water quality . Increased TDS may impart a bad odour or taste to drinking water,as well as cause scaling of pipes and corrosion.The average value of TDS in water samples ranges from 198 ppm to 733 ppm.The permissible limit of TDS of drinking water is 500 ppm (WHO). The observation shows that the TDS is with in the permissible limit as prescribed by (WHO).

Electrical conductivity of water samples ranges from 118.7 µS to 613.2 µS. The maximum permissible limit of this parameter for drinking water is 300 µS. Howevwer the average conductivity exceeds this limit because of high values during rainy season. In rainy season due to floods and rains, water level increases , which contains more electrolytes.

Turbidity in water caused by suspended matter such as clay, slit, finely divided organic & inorganic matter. Soluble coloured organic compounds, planktons and other microscopic constituents. Turbid water interferes in self purification of water by reducing photosynthetic activity of aquatic plants.

In natural & waste water DO level depends on the physical, chemical & biological activities of the water body. The analysis of DO plays key role in water pollution control activities & waste treatment process control [Day A.K, 2012] In general, oxygen levels during mid day at the surface are near saturation (the maximum level sustained at the temperature) and drop as the water depth increases. Dissolved oxygen levels are an indicator of water quality. Oxygen levels may be reduced because of warm water temperature and poor flushing. Run off from farms or lawns containing fertilizers and other nutrients can over fertilize aquatic plants. At first, aquatic vegetation will flourish and raise the dissolved oxygen

levels found in the water. As the plants begin to die, the process of decomposition will deplete the oxygen content of the water. Eutrophication is the term used when high nutrient levels cause an excess of phytoplankton. DO values of water samples in the study area ranged from 4.2 ppm to 7.0 ppm.

Table.2. Physicochemical parameters of twelve water samples of Tumsar area.

Sr. No.	Parameter Studied	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12
1	Colour	Clear	Clear	Clear	Clear	Clear	Clear	Pale Yellow	Clear	Clear	Clear	Clear	Clear
2	Temp. °C	27	27	28	30	30	30	29	29	27	28	28	29
3	pH	7.5	7.2	7.0	7.8	6.1	7.3	8.3	7.6	7.2	7.9	7.5	8.7
4	Alkalinity , Ppm	222	273	255	268	217.8	229	242	208	236	231	311	231
5	Hardness, ppm	200	234	240	106	126	288	114	180	254	160	142	158
6	Chlorides	298	217	274	45.1	145	264	48.6	90.3	86.8	239	121	170
7	TDS, Ppm	334.0	160.8	164.9	319.4	493.8	729.5	198.2	335.6	455.5	733.6	472.7	661.7
8	Electrical Conductivity	613.2	288.9	164	582	885	130	358	602	817	131	851	118.7
9	Turbidity, NTU	10.7	8.5	7.8	6.5	3.3	6.3	11.9	10.3	4.1	5.6	3.6	4.3
10	DO ,ppm	4.2	4.6	5.1	5.0	5.3	6.6	7.0	6.4	5.1	6.0	6.8	4.9

Conclusion

From Table 2, it can be concluded that most of the sampling stations shows permissible range of concentration. The parameters were in normal range and indicate better quality of water. The people from this area uses well and bore well water for domestic purpose.

References:-

Agrawal A,.Sharma C , (1982) State India Fresh Water, A citizen Report Centre for Science and Environment, News, Delhi.

APHA (1989) Standard Methods for the Examination of Water and Waste water, American Public Health Association, Washington, 18th Edition.

Banerjee S.K, (2009), Environmental Chemistry, second edition PHI Learning Pvt. Ltd, New Delhi

Claessens L, Hopkinson C, Rastetter N, Vallino J, (2006), Water Resources Research, 42,03426.doi:10.1029/2005WR004131.

DARA S.S., (2011), A Text Book of Experiments in Engineering Chemistry, S.Chand Publisher , New Delhi

De A.A. (2012) Environmental Chemistry ,Seventh Edition,New Age International New Delhi

Kumar A, Gupta H.P., and Singh D.K. ,(1996), "Impact of sewage pollution on chemistry and primary productivity of two fresh water bodies in Santal Paragana" J.Ecol.23(2):82-86.

NEERI, (1986), Manual for Water and Waste water.

S.J.Asia etal (2012), "Physicochemical Analysis of Borewell water samples of Bhandara" District. Int. J. Chem.Sci. and Tech., Vol.2, 202-204.

Saravanakumar K, Ranjithkumar (2011)Analysis of water quality near Ambattur area of Tamilnadu, India", Indian J. of Sci. and Technology. 4(5), 660-662.

Sexena N,.Mishra S.N, (2011), J.Chem.Pharma.Res.,,3(2),162-167.

Sunkad B.N. and Patil H.S, (2004), "Water quality assessment of fort lake of Belgaum". J. Environ Biol., 25,99-102.

Tambekar etal (2012),"Quality Assessment of Drinking water: A case study of Chandrapur District" J. Chem. And Pharm..Researh .4(5);2564-2570.

Zajic.J.C. (1971):Water pollution Disposal and Re-use.Vol.1,Marel Dekkar,Inc.,New York.