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Analysis Of Groundwater Quality Index For Ghatanji City District- Yavatmal, Maharashtra

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Abstract:

Water is perhaps the most precious natural resource after air. Though the surface of the earth is mostly consist of water, only small part is usable. Unsafe drinking water is one of the main issues in developing countries. Water supplied throughout the villages mostly from boreholes, open wells, river, lakes as well as some piped waters. Natural resources such as water are the important wealth of our country. It is important for living organic, inorganic, substances. In the studied area there are several parameters of health and aesthetic concern. Today due to human activities ground water get polluted. Important source of ground water is polluted from seepage tanks, refused dumps, septic tanks, chemical and biological pollutants. In present research work ground water sample from ten different places of Ghatanji city was assessed during the year 2016-17. The different physicochemical parameters such as pH, Electrical conductivity, total dissolved solids (TDS), total hardness, chloride, Ca ions and chemical oxygen demand (COD) is studied.

Keywords: Ground Water Samples, Physico-Chemical Analysis, TDS, COD, BOD.

Introduction:

Ground Water plays significant role in the living organism that existing in this world. Water is essential for survival of all living organisms so water should be clean and fresh. The quality of the water should be free from pollution and other impurities in India because water is directly linked with human welfare. 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, it is observed that ground water get polluted drastically because of increased human activities. 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. Increase in the pollution of surface water & ground water due to agriculture activity and various human activities. Water should be free from the various contaminations such as Organic and inorganic pollutants, heavy metals, pesticides and parameter like pH, electrical conductivity, Calcium, Magnesium, total hardness, carbonate, bicarbonate, chloride, total dissolved solid, Alkalinity, Sodium, Potassium, Nitrate, DO should be within a permissible limit.

In this work highlighted researchers work in the said emphasizing these two decades and included the literature survey related to research exertion on water bodies in vicinity of mining areas and various

pollution causing industries. [1] The physico-chemical parameters such as pH, electrical conductivity(EC), chloride, Dissolved oxygen, total hadrness and total dissolved solids (TDS) were analyzed to check the quality of underground water.[2] Some physico-chemical characteristics as Temprature, pH, EC, DO, BOD, COD,Cl, TH,NOR 3R, Sor 4R and POR 4R. It is concluded from the study that the values of studied parameters are in the permissible limits and water of Neelona dam is useful for water supply[3]Although statistics, the WHO reports that approximately 36% of urban and 65% of rural Indian were without access to safe drinking water.[4] Over burden of the population pressure, unplanned urbanization, unrestricted exploration and dumping of the polluted water at inappropriate place enhance the infiltration of harmful compounds to the ground water.[5] Water quality assessment on the basis of physico-chemical analysis such as pH, electrical conductivity, turbidity, total dissolved solids (TDS), total hardness (TH), calcium (Ca^{2+}), magnesium (Mg^{2+}), chloride (Cl^{-}), sulphate, total alkalinity and dissolved Oxygen is studied using a statistical method.[6] The water quality is determined by taking water samples from urban and rural locations of Kaveri river near Bangalore by studing various quality parameter such as pH, Specific conductivity, total dissolved solids and total hardness.[7] Environmental studies were carried out on ground and surface water to find out the physico-chemical parameters like pH, BOD, COD, DO, hardness, alkalinity, fluorides, chlorides, TDS and turbidity around Chandrapur district to evaluate the drinking water quality.[8] A systematic study is carried out to assess the water quality index of river Ganga in Haridwar district. 90 water samples from five sampling stations were collected and analysed for physico-chemical parameters such as Temp, velocity, pH, dissolved oxygen, free CO_2, C.O.D., B.O.D., carbonate, bicarbonate, total alkalinity, hardness, turbidity, calcium, magnesium, sodium, potassium, nitrate, phosphate, chloride, sulphate, electrical conductivity, total dissolved solids and total suspended solids. [9] Bore well and dug well water sample were collected from a highly polluted industrial area Nacharam and analysed for physicochemical parameters by adopting the standard methods for examination for water and waste water.[10] Analysis of water samples for pH, colour, odour, hardness, chloride, alkalinity, TDS etc have been studied from different places of Kaithal.[11] Parameters such as pH, total alkalinity, total hardness, turbidity, chloride, sulphate, fluoride, total dissolved solids and conductivity have been reported for groundwater quality of Ambattur industrial area in Chennai City.[12] Ground water quality of industrial area of Kishangarh for various physicochemical parameters seasonally without and after addition of marble slurry in different proportions is studied. From the study it is clear that these parameters increase with the addition of marble slurry leading to deterioration of the overall quality of the groundwater.[13] The study was conducted to analyse the change in basic properties of water samples over a significant period of time under varied environmental conditions made up of different materials. Various environmental conditions like under direct sun light or in room temperature which shows sunlight causes the elimination of microbes from water due to photo-degradation process. The tests were conducted and their results were studied on various physicochemical parameters such as pH, total dissolved solids (TDS), biological oxygen demand (BOD), chemical oxygen demand (COD), and dissolved oxygen (DO).[14] Drinking contaminated water can cause diarrhoea, cholera, dysentery, and various other diseases like typhoid, amoebiasis, jaundice, enterobacteriaceae. Water contamination can

be caused by different types of disease causing organisms.[15]

Sample Collection:

The sampling locations consist different places of Ghatanji city. Ground water samples were collected from ten well at various locations within study area. Details of sampling locations are illustrated in Table1. Samples were collected in plastic container to avoid unpredictable changes in characteristic as per standard procedure.

Materials and Methods:

During water quality investigation, the selection of sampling points is more important than actual chemical analysis of water. The samples were collected from different places of Ghatanji city in polystyrene bottle of 1.5 L capacity. Before sampling, the bottles were washed thoroughly with the detergent, acid (1: 1 HNO3 and H2O by v/v) tap water, and then distilled water. Chemical parameters were determined by using standard methods immediately after taking them into the laboratory. The sampled bottle has been sealed with paraffin wax, some sample which were turbid and containing suspended matter were filtered at the time of collection. All the glassware, casserole and other pipettes were first cleaned with tap water thoroughly then finally with distilled water. The pipettes and burettes were rinsed with solution before use. The chemicals and reagents were used for analyse for Anala-R grade. The pH meter, conductivity meter was in good working condition. The procedure for calculating different parameters were conduct in laboratory.

The present work was carried out in vicinity of Ghatanji city in order to study the water quality of ten different sites. In the present work, different parameters such as pH, electrical conductivity, total dissolved solids (TDS), total hardness, chloride, Ca ions and chemical oxygen demand (COD) is studied.

Table - 1

Sampling locations within the study area code		Sampling location (Ghatanji)
Sample 1	(S1)	Open well water, Khapri area
Sample 2	(S2)	Open well water, Istari nagar area
Sample 3	(S3)	Open well water, Nehru nagar area
Sample 4	(S4)	Open well water, Bus stand area
Sample 5	(S5)	Open well water, Ghati area
Sample 6	(S6)	Open well water, Vasant nagar area
Sample 7	(S7)	Open well water, Shivaji nagar area
Sample 8	(S8)	Open well water, Rural hospital area
Sample 9	(S9)	Open well water, Waghadi river area
Sample 10	(S10)	Open well water, Gajanan ward area

Physico-Chemical Analysis of Ground Water:

The collected samples were analyzed for different physico-chemical parameters such as pH, electrical conductivity, turbidity, total dissolved solids (TDS), total hardness, chloride, Ca ions and chemical oxygen demand (COD) as per the standard methods and the results were compared with the Indian Standards for potable water.

Results and Discussion:

The water quality analysis of different ground water samples have been

carried out for pH, electrical conductivity, total dissolved solids (TDS), total hardness, chloride ions,Ca ions, and chemical oxygen demand (COD).The status of water quality of these ground water sources are presented in table 2.

Table -2

Concentration of various parameters in pre and post monsoon seasons pH		Turbidity (NTU)	Elec. Cond. (µmhos/cm)	Total Hardness (mg/l)	Ca ions (mg/l)	Chloride Ions (mg/l)	COD
Codes							
S1	6.2	2.7	550	124	211.3	34.4	22.4
S2	6.5	2.5	480	110	182.4	36.2	21.3
S3	6.3	3.1	610	143	245.3	36.5	23.2
S4	6.7	3.2	590	122	281.4	28.2	15.6
S5	7.0	4.2	560	132	217.3	19.2	16.4
S6	7.1	5.2	540	112	216.3	43.2	26.4
S7	7.2	4.4	720	136	194.4	42.2	24.2
S8	6.9	7.3	630	133	171.4	40.3	30.2
S9	5.9	8.4	590	181	182.7	31.5	40.2
S10	6.4	6.4	490	192	203.2	30.5	30.5
Mean	6.62	4.94	576	138.5	210.57	34.22	25.4

pH value of ground water samples varied between 6.2 to 7.1. pH values are well within the range given in the WHO recommendations and permissible limit of pH in drinking water is within 6.0 to 8.5. Generally, pH of water is influence by geology of catchments area and buffering capacity of the water. Turbidity in water is caused by suspended matter, such as clay, silt, finely divided organic and inorganic matter, soluble coloured organic compounds, planktons and other microscopic constituents. Turbidity of samples was found within the permissible limits. Electrical conductivity varied between 480 to 720 µmhos/cm. Ca ions in all the samples were found to be within standard limits between 170.4-215.3(< 300 mg/l as $CaCO_3$). Water hardness was understood to be a measure of the soap consuming capacity of water. Hard water causes harmful effect upon the health of consumer. Use of hard water causes excessive soap consumption in home, laundries, textile and paper industries. Total hardness in all the samples were found to be within standard limits. Chloride content of the ground water samples was in the range of 19.2 – 43.2 mg/l. The COD values of various ground water samples were found from 15.6 – 40.2 This concludes that water contains permissible amount of chemical oxygen demand (COD).

Conclusions:

In general ground water quality of Ghatanji city region is not harmful to human beings. More than 90% of sample in study area were found to be within the permissible limit. Water quality parameter of Ghatanji city shown that pH, TDS, total hardness, chloride, Ca ions values within permissible limit. There is an increasing awareness among the people of those areas to maintain the water at their highest quality and purity level.

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