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ASSESSMENT OF PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES COLLECTED

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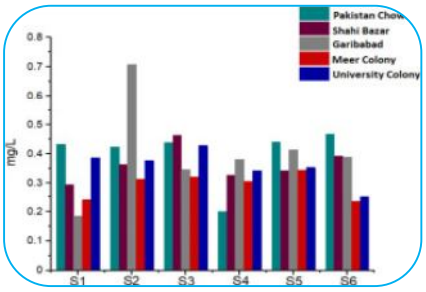
ABSTRACT:



Ground water is the principal source of drinking water in our country and indispensable source of our life. Water is most essential commodity for human consumption and is one of the most important renewable resources, which must be prevented from deterioration in quality. Various physic-chemical parameters like pH. Alkalinity, total hardness, total dissolved solid, calcium, magnesium, nitrate, Sulphate has a significant role in determining the portability of drinking water. The Problem of ground water quality is acute. The resulting degradation of water quality in water body creates a condition so that water cannot be used for intended beneficial uses including bathing, recreation and as a source of raw water supply.

KEYWORDS: *drinking water , calcium, magnesium, nitrate, Sulphate.*

INTRODUCTION :

Relationships between dependent and independent variables have been used to relate pollution increases day by day due to industrialization, population explosion, deforestation, and vehicular exhaust and by the burning of fossils fuels. Unfortunately, the quality of water has deteriorated immensely because of various types of pollution. The focus has been on regulating the point source pollution load from urban and Industrial sources and non-point or diffuse load from agriculture, animal husbandry and rural sources were largely ignored in water quality management. Increasing use of chemical, fertilizers, pesticides, perfumes, cosmetics, petrochemicals, harm aquatic life and human health Other chemical in recent years has caused the more diffused chemical Pollution. The Sources and causes of ground water pollution are closely associated with human use of water. A complex and interlinked series of modification to the natural water quality is created by the diversity of the human activities impairing hydrological cycle. For many years ground water was thought to be protected from contamination by the layers of rock and soil that acts as filters, but contaminants to make their way in to ground water and affect its quality. Pollution of ground water poses a serious problem. It has been reported that in developing countries, pollution of ground water cause 80% f human diseases. An important aspect of urbanization is the increase in demand and creation of potential with the possibility of pollution of ground water. Ground water which now accounts for 0% of rural and 60% of urban water supply in India is depleting at an alarming rate in several states. The ground water table has declined by more than 4meters compared to the level in 1980. Infect today at least 19 major cities of India already face chronic water shortage.[1-4]

Sidhi district comprises of variety of minerals including bauxity shale, laterite, flagstone, sandstone and granite etc. Soils derived from sandstone are generally non-permeable and have no water contents. The water table in sandstone is deper in general shalis show little percolation of ground water hence has limited reaining and explanation of it. Limestone allows movement of ground water due to the presence of such geology the ground water of study area is highly affected in its quality, the aim of present work is to assess the quality of drinking water of the sidhi district by analyzing various inorganic non-metallic constituent and heavy metls present in water.

Majhauli is a Tehsil in Sidhi District of Madhya Pradesh State, India. Majhauli Tehsil Head Quarters is Majhauli town. It belongs to Rewa Division. It is located 40 KM towards South from District head quarters Sidhi, 524 KM from State capital Bhopal towards west. Majhauli Tehsil is bounded by by Rampur Naikin Tehsil towards North , Sidhi Tehsil towards North , Kusmi Tehsil towards East , Beohari Tehsil towards west . Sidhi City, Rewa City, Mauganj City, Maihar City are the nearby Cities to Majhauli. Majhauli consist of 131 Villages and 55 Panchayats . It is in the 399 m elevation (altitude) . Rewa , Maihar , Satna , Baikunthpur , Vindhyachal are the nearby Important tourist destinations to see.Hindi is the Local Language here. Also People Speaks Bagheli,bagelkhand,dravidian,devanagari . Total population of Majhauli Tehsil is 128,893 living in 24,795 Houses, Spread across total 131 villages and 55 panchayats . Males are 66,437 and Females are 62,456

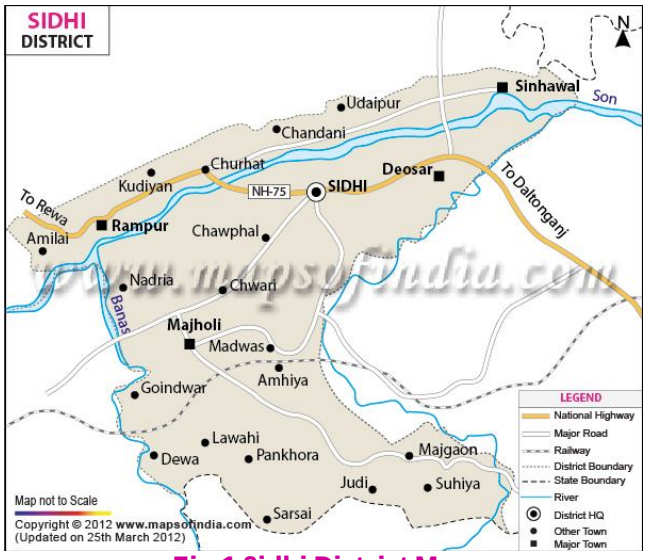


Fig-1 Sidhi District Map

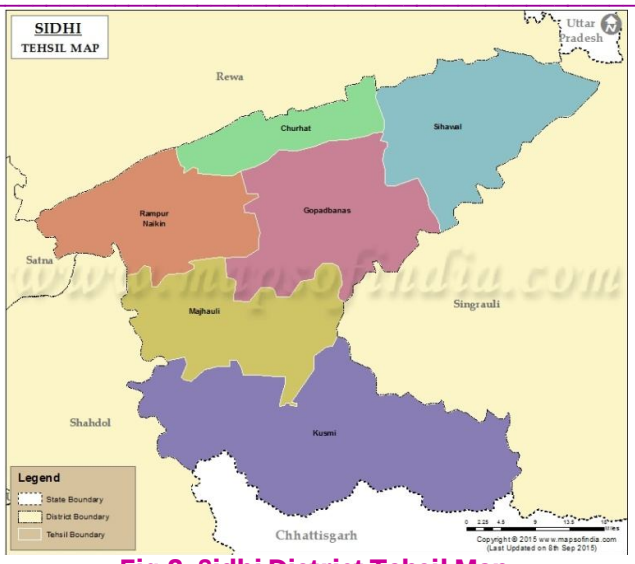


Fig-2: Sidhi District Tehsil Map

Table-1: Sampling Location, Majhouil Tehsil

S.N.	Sampling Location	Sampling Code
1	Majhauli Old Bus Station Dhanauli	MW_1
2	Ram Mandir , Market area Mjhauli	MW_2
3	PWD Rest House, Chullahi	MW_3
4	CHC Majhauli	MW_4
5	Gram panchayat Tala	MW_5
6	Near Panchmukh Press, Majhauli	MW_6
7	Near Govt. College, Diyadol	MW_7
8	Near Sarswti Gyan Mandir Madwas	MW_8
9	Near Indian Gas Agency, Madwas	MW_9
10	Near Marwas Gram Railway Station	MW_{10}
11	Near Devi Mandir ,Kotma	MW_{11}
12	Near Indian Gas Agency, Majhauli	MW_{12}

2: Materials and Methods:

pH

An electrometric method using glass and reference electrodes with a commercial pH meter is the standard procedure for measuring pH. Accurate measurements require strict adherence to the specific directions for the particular pH meter and electrodes used. Standardization of the instrument with two buffer solutions of different pH values serves as a check for proper instrument response.

Total Hardness:

The determination of hardness Place the sample (W1) in a conical flask and if necessary, dilute with distilled water to 100 ml. Add 5ml buffer solution, 5 ml triethanolamine solution, 5 ml magnesium EDTAsolution, and a sufficient amount of indicator, the solution should have a clear colour. Mix after each addition. Titrate with Na2EDTA solution until the blue, respectively green colour, does not change (volume used = V1).

TDS:

A measured volume of aqueous sample is filtered through a glass fiber filter disk. The filtrate is collected in a preweighed evaporating dish. The liquid is evaporated to dryness at 104 C and then placed in an oven at 180 C. The dish and residue are weighed with the mass of the residue being determined by difference.

8. CHLORIDES:

Chloride is one of the major anions in water and sewage. The salty taste produced by chloride concentrations is variable and dependent on the chemical composition of the water. Some waters containing 250 mg/l chloride may evidence a detectable salty taste with sodium ions. On the other hand, the typical salty taste may be absent in waters containing as much chloride as 1,000 mg/l when there is a predominance of calcium and magnesium ions. High chloride content also exerts a deleterious effect on metallic pipes and structures, as well as on agricultural plants.

Argentometric Method

In a neutral of slightly alkaline solution, potassium chromate can indicate the end point of the silver nitrate titration of chloride. Silver chloride is quantitatively precipitated before red silver chromate is formed.

Procedure

Sample preparation: Use a 100 ml sample of a suitable aliquot diluted to 100 ml If the sample is highly colored, add 3 ml Al $(OH)_3$ suspension, mix, allow to settle, filter, wash and combine filtrate and washing. If sulfide, sulfite, or thiosulfate is present, make the water alkaline to phenolphthalein with sodium hydroxide solution. Add 1 ml H_2O_2 and stir. Neutralize with sulfuric acid.

Titration: titrate samples in the pH range 7-10 directly. Adjust samples not in this range with sulfuric acid or sodium hydroxide solution. Add 1.0 ml K_2CrO_4 indicator solution. Titrate with standard silver nitrate titrant to a pinkish yellow end point. The means of consistent end-point detection are left to the individual analyst.

Standardize the silver nitrate titrant and establish the reagent blank value by the titration method outlined above. A blank of 0.2 to 0.3 ml is usual for the method.

Calculation

$$mg/l\ Cl = \frac{(A - B) \times N \times 35{,}450}{ml\ sample}$$

Where A = ml titration for sample, B = ml titration for blank, and N = normality of $AgNO_3$.

$$mg/l\ NaCl = mg/l\ Cl \times 1.65$$

DISSOLVED OXYGEN (DO):

Dissolved oxygen (DO) levels in natural and wastewaters are dependent on the physical, chemical and biochemical activities prevailing in the water body. The analysis for DO is a key test in water pollution control activities and waste treatment process control. Two methods for DO analysis are described: the Winkler or iodometric method and its modifications and the electrometric method using membrane electrodes. The iodometric method is a titrimetric procedure based on the oxidizing property of DO, while the membrane electrode procedure is based on the rate of diffusion of molecular oxygen across a membrane. The Choice of test procedure is dependent on the interferences present, the accuracy desired and in some cases, convenience or expedience.

Surface water samples are frequently collected in narrow-mouth glass-stoppered BOD bottles of 300-ml capacity with tapered ground-glass pointed stoppers and flared mouths. Special precautions are

required to avoid entrainment or dissolution of atmospheric oxygen. In sampling from a line under pressure, a glass or rubber tube attached to the tap should extend to the bottom of the bottle. Allow the bottle to overflow two or three times its volume and replace the stopper so that no air bubbles are entrained.

Azide Modification

The azide modification is used for most sewage, effluent and stream samples, and is recommended especially if they contain more than 50 μg/l nitrite nitrogen and not more than 1 mg/l ferrous Iron. Other reducing or oxidizing materials should be absent. If 1 ml fluoride solution is added before acidifying the sample and there is no delay in titration, the method is also applicable in the presence of 100-200 mg/l ferric iron.

Procedure

To the sample as collected in a 250-300 ml bottle, add 2 ml manganese sulfate solution, followed by 2 ml alkali-iodide-azide reagent, well below the surface of the liquid; stopper with care to exclude air bubbles and mix by inverting the bottle at least 15 times. When the precipitate settles, leaving a clear supernatant above the manganese hydroxide floc, shake again. With sea water, at least a 2-min period of contact with the precipitate will be required. After at least 2 min of settling has produced at least 100 ml of clear supernatant, carefully remove the stopper and immediately add 2.0 ml conc. H_2SO_4 by allowing the acid to run down the neck of the bottle, restopper, and mix by gentle inversion until dissolution is complete. The iodine should be uniformly distributed throughout the bottle before decanting the amount needed for titration. This should correspond to 200 ml of the original sample after correction for the loss of sample by displacement with the reagents has been made. Thus, when a total of 4 ml (2 ml each) of the manganese sulfate and alkali-iodide-azide reagents is added to a 300-ml bottle, the volume taken for titration should be 200 x 300/ (300-4) =203 ml

Titrate with 0.0250N thiosulfate solution to a pale straw color. Add 1-2 ml starch solution and continue the titration to the first disappearance of the blue color. If the end point is overrun, the sample may be back-titrated with 0.0250N biniodate solution, which is added dropwise, or by an additional measured volume of sample. Correction for the amount of biniodate solution or sample should be made. Subsequent recolorations due to the catalytic effect of nitrite, or to traces of ferric salts which have not been complexed with fluoride, should be disregarded.

$$mg/l\ DO = \frac{(P-u) \times 0.678}{35 + t}$$

and between 30 and 50 C by:

$$mg/l\ DO = \frac{(P-u) \times 0.827}{49 + t}$$

BIOCHEMICAL OXYGEN DEMAND (BOD):

The biochemical oxygen demand (BOD) determination described herein constitutes an empirical test, in which standardized laboratory procedures are used to determine the relative oxygen requirements of wastewaters, effluents and polluted waters. The test has its widest application in measuring waste loadings to treatment plants and in evaluating the efficiency (BOD removal) of such treatment systems. Comparison of BOD values cannot be made unless the results have been obtained under identical test conditions. The test is of limited value in measuring the actual oxygen demand of surface waters, and the extrapolation of test results to actual stream oxygen demands is highly questionable, since the laboratory environment does not reproduce stream conditions, particularly as related to temperature, sunlight, biological population, water movement and oxygen concentration.

Complete stabilization of a given waste may require a period of incubation too long for practical purposes. For this reason, the 5-day period has been accepted as standard. For certain industrial wastes, however, it may be advisable to determine the oxidation curve obtained. Conversion of data from one incubation period to another can only be made if such special studies are carried out. Analyses of BOD were carried out by azide modification method as per AWWA and APHA standard method[5].

Calculation

$$mg/l\ BOD = \frac{D_1 - D_5}{P}$$

3. REVIEW OF LITERATURE:

M.K. Singh et al., (2012) carried out, In the present study efforts has been made toassessthe extent of water pollution due to the excess use of fertilizers and pesticides in agriculture and its impact on ground water quality of three different dug wells in Dholpur district of Rajasthan, India. The different Physico-chemical parameters like PH, Temperature, TDS, Conductivity, Nitrate, Sulphate Dissolved Oxygen, Hardness, Sodium, Potassium, Chlorides and chemical oxygen Demand were determined. The present study reveals that water quality of the selected sampling station is within the limit prescribed by WHO and can be used for domestic purpose.

Indra Prsad Tripathi et al., **(2015),** worked ground water soil samples collected from 20 different locations and analyzed for the physical properties, chemical properties and heavy metals content in it. Pollution of water bodies is one of the areas of major concern to environmentalists. Water quality is an index of health and well being of a society. Industrialization, urbanization and modern agriculture practices have direct impact on the water resources. These factors influence the water and soil resources quantitatively and qualitatively the parameters like temperature, pH, turbidity, dissolved oxygen (DO), biochemical oxygen demand (BOD), chemical oxygen demand (COD), nitrate, nitrite, chloride, sulphate, phosphate and heavy metals for water analysis and temperature, pH, OC (organic carbon), Total nitrogen, phosphorus, exchangeable cat ion (Na^+, K^+, Ca^{++}, Mg^{++}) and heavy metals for soil analysis have been studied. The mean values of each parameter together with its standard deviation (SD) and coefficient of variation (CV) were calculated. The present study deals with the various relationship derived statistically by calculation 'r' and't' among the physic-chemical parameters. The ground water samples from few locations in the sidhi district are found to be polluted and not fit for the drinking purpose.

4. RESULT AND DISCUSSION:

In the present Study, the ground water sample collected from twelve different sampling locations were analyzed for Physico-chemical parameter in the year 2019. The maximum Temperature37.1^oC was found (MW_5) at Garmpanchayt Tala and minium Temperature 32.7 was found (MW_6) Near Panchmukh Press, Majhauli. pH was ranging from 6.3-9.5, values of pH at sampling station MW_1 (9.0), MW_{10} (9.5), MW_{12} (8.0) were found higher than the permissible limit prescribed by WHO.

Hardness is the property of water which prevents lather formation with soap and increases the boiling point of water. Hardness of water mainly depends upon the amount of calcium or magnesium salt or both. In our finding hardness value varied from 146 to 1050 mg/l. which are beyond the permissible limit as prescribed by WHO. Total dissolved solid, is an important parameter in drinking water quality standard. It develops particular taste to the water and at higher concentration, reduces its pot ability. Water with more than 500 mg/l. usually has a disagreeably strong taste. In the present study, TDs in the studied area varied between the 519 to 2140 mg/l. All sampling location showed the higher TDS concentration than the prescribed by WHO. Chloride concentration ranged from 10 mg/l to 123 mg/l and all the results were below the desirable limit set by WhO (1984) as 250 mg/l Near Sarswti Gyan Mandir Madwas of Majhouli Tehsil Showed the highest concentration of Chloride in water.

Dissolve oxygen (DO) is important parameter in water quality assessment and reflects the physical and biological processes prevailing in the water. The DO values indicate the degree of pollution in water bodies. DO values varied from 1.9 mg/l to 3.8 mg/l. DO values of all the sampling locations were showed below the permissible limit at 4.0 mg/l. Biochemical oxygen Demand is a direct measure of O2 requirement and indirect measure of biodegradable organic matter. The BOD of water was found to be 2.0 to 5.6 mg/l. BOD values were observed at all the samples lower than the limit (6.0) mg/l, prescribed by WHO.

Table-2 Physico-chemical Characteristics of Ground water Sample collected from Majhauli Tehsil.

Parameters / Sampling Code	MW_1	MW_2	MW_3	MW_4	MW_5	MW_6	MW_7	MW_8	MW_9	MW_{10}	MW_{11}	MW_{12}
Temperature °C	36.0	36.2	35.0	34.2	37.1	32.7	35.6	30.9	33.4	36.5	36.8	36.1
PH	9.0	8.9	6.3	7.2	6.9	7.2	6.7	6.4	6.8	9.5	7.5	8.0
Hardness	518	442	226	285	276	383	300	356	146	1050	356	532
TDS	1110	1169	596	784	578	612	650	663	670	2140	519	867
Chloride	90	60	20	36	49	30	52	123	82	10	45	26
DO	3.8	3.5	3.7	2.4	1.9	4	3.2	2	2.3	2.1	2.4	3
BOD	2.0	2.3	2.5	2.5	3.9	2.1	5.6	3.8	5.4	5.2	3.8	3.6

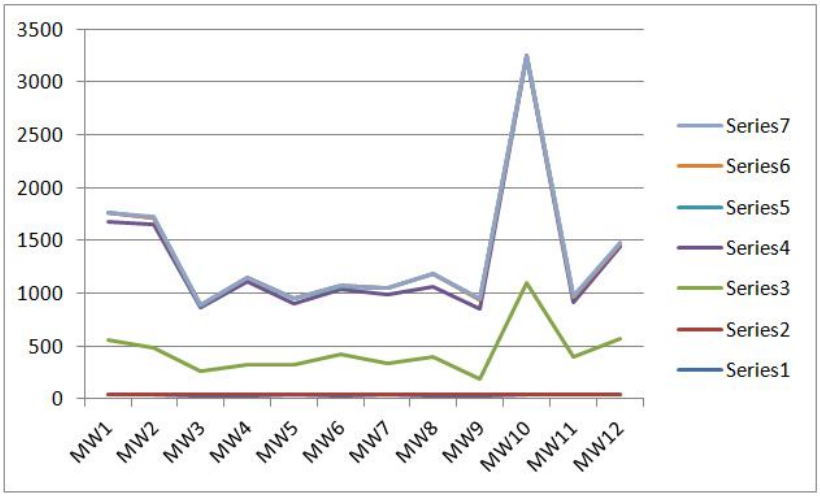


Fig-3 All the Physico-chemical parameters showed graphical representation.

5. CONCLUSION:

The present study was undertaken with an aim to analyze certain physic-chemical characteristics in the ground water samples of Majhauli Tehsil. Sample were collected from twelve different locations of Majhauli Tehsil and analyzed weekly, for Temperature, PH, Hardness, TDS, Chloride, DO and BOD using standard procedures. This analysis reveals that Hardness and TDS exceed the permissible limit prescribed by WHO[6] in most of the ground water samples. From obtained result it is suggested to monitor the ground water quality and assess periodically to prevent the further contamination.

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