

# Evaluation Of The Physicochemical Characteristics Of Ground Water From The Industrial Area Of Mahad M.I.D.C., Maharashtra, India

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**Abstract-** Because the ground water in the industrial area from Lote M.I.D.C. is used for drinking and household purposes, it is necessary to undertake an assessment of its quality. The local river receives the liquid waste from the several factories. At one-month intervals throughout the year, water samples were taken from wells located throughout the industrial area. To evaluate the effect of industrial wastes on ground water, the following parameters were estimated: pH, EC, Na<sup>+</sup>, Cl<sup>-</sup>, Ca<sup>2+</sup>, Mg<sup>2+</sup>, HCO<sub>3</sub><sup>-</sup>, SAR, and RSC. The findings indicate that the majority of the water samples in this investigation fall below the acceptable drinking water quality guideline

**Keywords-** Water pollution, factory waste, water quality, ground water, domestic.

## I. INTRODUCTION

All biotic groups need water, which is a vital component of life. Almost every business, including those in the agricultural, industrial, and service sectors, uses water as an element of production. Water is essential to society for waste disposal, irrigation, sanitation, and household requirements. Water is typically never chemically pure (Agale et al., 2013). Although there are very few pollutants in the water, the aquifer's equilibrium is upset by fast industrialisation, population growth, careless chemical usage, and groundwater exploitation (Ramesh et al., 2014). Industrial waste or effluents can occasionally seep through the subsurface and reach the ground water table, creating a contaminated pool that alters the chemical composition of the ground water and degrades its natural quality. When utilised for irrigation, contaminated water has an adverse effect on crop health and soil quality. The effects of industrial waste on soil health and ground water contamination are revealed by physico-chemical analyses of soil and ground water.

## II. MATERIALS AND METHODS

Parts of the Raigad district's Mahad M.I.D.C. (Maharashtra Industrial Development Corporation) are included in the study area. The selected area's geographical

coordinates are Latitude 18°6'12"N and Longitude 73°28'40"E, with an elevation above mean water level (meters) of approximately 177.5m. It has a semi-tropical climate that is hot and humid for the majority of the year. Summer (June-October), winter (November-mid February), and rainy (June-October) are the three distinct seasons in the study region (mid-February-May). The average annual temperature is 27.2 ° Celsius.

Twenty water samples were taken from the wells located around the industrial area at one-month intervals for a year (April 2015 to March 2016) in order to assess the seasonal change of ground water. These water samples were taken from the well in clear, sterile plastic bottles.

## III. RESULT AND DISCUSSION:

The physico-chemical characteristics of the ground water of the industrial area Lote MIDC, Maharashtra, changed from April 2015 to March 2016. Tables 1 and 2 show the outcome of the water quality status.

**Table1:**Physico-chemicalstatusofgroundwaterfromLote MIDC

Heavy metal	Summer	Monsoon	Winter	Mean
pH	5.973	5.656	5.775	5.801
EC (dSm <sup>-1</sup> )	0.040	0.056	0.075	0.057
Bicarbonate (mg L <sup>-1</sup> )	84.627	68.580	80.725	77.977
Chloride (mg L <sup>-1</sup> )	199.877	198.324	207.213	201.805
Sodium (ppm)	18.667	9.232	11.705	13.201
Calcium (mg L <sup>-1</sup> )	37.663	30.590	26.040	31.431
Magnesium (mg L <sup>-1</sup> )	9.457	8.718	5.210	7.795
SAR	0.773	0.433	0.648	0.618
RSC	0.468	0.328	0.587	0.461

**Table2:**Month-wiseperiodical changes in physico-chemical status of ground water

Heavy metal	March	April	May	June	July	August	Sept	Oct	Nov	Dec	Jan	Feb
pH	5.93	5.95	6.04	5.95	5.39	5.83	5.56	5.55	5.86	6.01	5.45	5.78
EC (dSm <sup>-1</sup> )	0.073	0.014	0.033	0.04	0.085	0.092	0.025	0.04	0.086	0.079	0.081	0.054
Bicarbonate (mg L <sup>-1</sup> )	101.57	71.27	81.04	82.86	53.58	63.34	74.3	68.82	70.66	84.07	78.59	89.58
Chloride (mg L <sup>-1</sup> )	190.66	200.58	208.39	211.94	189.24	199.18	193.5	197.76	216.2	209.81	214.89	195.63
Sodium (ppm)	11.9	20.43	23.67	13.69	10.79	7.43	6.1	8.15	11.87	11.82	11.49	11.64
Calcium (mg L <sup>-1</sup> )	34.16	40.86	37.97	42.17	40.77	28.95	25.14	15.92	24.54	25.54	27.14	26.94
Magnesium (mg L <sup>-1</sup> )	5	12.54	10.83	16.18	12.66	6.7	4.39	3.66	4.51	4.39	5.12	6.82
SAR	0.586	0.758	0.976	0.568	0.346	0.393	0.284	0.573	0.704	0.682	0.599	0.607
RSC	0.854	0.13	0.42	0.384	0.047	0.276	0.511	0.514	0.457	0.666	0.516	0.709

**pH:**

Water's acidity or alkalinity is gauged by its pH. According to Ladwani et al. (2012), it is known to be connected to the availability of macro and micronutrients for plants. The pH of the water in the current study ranged from 5.39 to 6.04, across the various seasons, with mean values of 5.97, 5.65, and 5.77 during the summer, monsoon, and winter seasons, respectively. But because laterite soil is naturally acidic, ground water is also naturally acidic. The water in that region had a low pH value during the monsoon season because of specific chemicals and metals that seep through rainwater and build in groundwater (Walakira, 2011). This could have been caused by the discharge of acidic industrial effluents that mixed with the well water (Sunil et al., 2011).

**Electrical Conductivity:**

The ability of a material to carry electricity is known as electrical conductivity. The concentration of dissolved ions in water has a roughly linear relationship with its conductivity (Kumar et al., 2012). During the summer, monsoon, and winter seasons, the electrical conductivity of water varied from 0.014 to 0.092 dSm<sup>-1</sup> with a mean value of 0.057dSm<sup>-1</sup>. As a result, every sample taken from wells falls into the excellent and good water classifications all year long. According to Ramesh et al. (2014), the electrical conductivity rose during the monsoon and winter seasons because of a rise in ions, which is corroborated by the salinity value, and

decreased during the summer because of a higher rate of precipitation (Kataria et al., 1994).

**Carbonates and Bicarbonates:**

Carbonate concentrations were not identified in any of the water samples collected during the research period. During the summer season, the bicarbonate content in water ranged from 53.58 to 101.57 mg L<sup>-1</sup>, with an average of 77.97 mg L<sup>-1</sup>. The concentration of bicarbonate decreases during the monsoon season due to the dilution impact of rainwater (Prasath et al., 2013). The data revealed that bicarbonate concentrations in groundwater samples were below the maximum allowed level.

**Chlorides:**

Chlorides are found in ground water from both natural and anthropogenic causes, including rock weathering and inorganic fertiliser leaching, dumps or landfills, industrial effluents, and so on (Yadav et al. 2014). Ground water chloride concentrations in the summer, monsoon, and winter seasons ranged from 189.24 to 216.2 mg L<sup>-1</sup>. The average value was 201.80 mg L<sup>-1</sup>, which is below the permissible limit for drinking purposes. The chloride concentration is lower during the monsoon season than during the summer and winter seasons, which could be attributed to evaporation, dilution, and anthropogenic impacts, as chloride is easily transferred via soil (Rao et al., 2013).

**Sodium:**

Sodium is a highly soluble chemical element that is naturally present in ground water. Ground water sodium concentrations ranged from 6.1 to 23.27 ppm, with an average of 18.66, 9.232, and 11.70 ppm during the summer, monsoon, and winter seasons, respectively. The highest salt concentration in ground water occurs during the summer season due to low water levels and substantial evaporation losses (Yadav et al., 2014). In the current investigation, the salt concentrations in ground water samples are less than the maximum permitted level.

**Calcium:**

Ground water calcium concentrations varied from 15.92 to 42.17 mg L<sup>-1</sup>, with a mean of 37.66, 30.590, and 26.040 mg L<sup>-1</sup> throughout the summer, monsoon, and winter seasons, respectively. The findings revealed that ground water samples contained less calcium than the maximum permitted amount. The calcium concentration in ground water is higher in the summer than in the monsoon and winter seasons, and it has consistently declined over the winter season. During the summer, greater calcium concentrations in ground water were reported due to industrial pollution, low water levels, and significant evaporation (Deshmukh, 2014).

**Magnesium:**

Magnesium concentrations in ground water ranged from 3.66 to 16.18 mg L<sup>-1</sup>, with a mean of 9.457 mg L<sup>-1</sup> in summer, 8.718 mg L<sup>-1</sup> in monsoon, and 5.210 mg L<sup>-1</sup> in winter. In the current investigation, the calcium concentration in ground water samples was below the maximum permitted limit for drinking purposes. During the summer, elevated magnesium concentrations in ground water may be caused by polluting industries near water sources, low water levels, and significant evaporation (Deshmukh, 2014).

**Sodium Adsorption ratio:**

The seasonal variation in Sodium Adsorption Ratio of ground water ranged from 0.284 to 0.976 with a mean value of 0.773 in summer, while 0.433 was an average value discovered in monsoon, and a mean value of 0.648 during the winter. All ground water samples had a Sodium Adsorption Ratio of less than 10, indicating a low sodium threat and making it appropriate for irrigation in practically any type of soil. The sodium Adsorption Ratio is lower during the monsoon season because groundwater contains fewer sodium salts (Bhadra et al., 2012).

**Residual Sodium Carbonate:**

Residual Sodium Carbonate levels in ground water varied from 0.04 to 0.854 with average values of 0.468, 0.328, and 0.587 throughout the summer, monsoon, and winter seasons, respectively. Throughout the investigation, the RSC values clearly demonstrated that the ground water did not contain any residual sodium carbonate danger. The residual sodium carbonate value in ground water is lower during the monsoon season than during the summer and winter seasons.

**IV. CONCLUSION**

An assessment of the environmental risk posed by water pollution, particularly industrial wastes, is especially important for agricultural and non-agricultural areas because it has a direct impact on water quality, which in turn affects soil health and human health. For ongoing research, that water is safe for irrigation purposes. However, long-term investigations on groundwater contamination are needed.

**Acknowledgment:**

The authors are grateful to the Department of Chemistry I.C.S. College of Arts, Commerce and Science Khed, Ratnagiri, Maharashtra.

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