



PHYSICO-CHEMICAL ASSESSMENT OF GROUND

WATER QUALITY OF JALNA DISTRICT

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ABSTRACT

Paper analyses Physico-Chemical analysis of water from Jalna district. Here main emphasis is on Iron contamination because of many steel re-rolling mills present in MIDC discharging its waste. The paper analyses water samples from selected 8 tehsils of Jalna giving statistical results. Paper has introduction of topic and Jalna with area of study, parameters and conclusion.

Keywords: *Desirable Values, BIS-Bureau of Indian Standards, Pollution, Permissible Values, Water*

I. INTRODUCTION

Paper is Physico-Chemical analysis of ground water from Jalna district. Due to increase in urbanization of Jalna, surface and ground water is getting contaminated. Jalna also has many big industrial estates managed by MIDC (Maharashtra Industrial Development Corporation). MIDC's of Jalna houses many steel re-rolling mills. Jalna provides steel bars and sheets to almost all parts of India. It can be said as Steel capital of India. It is also known for its hybrid seed industries, bidi industry & agro based industries like dal mills. These industries create lots of pollutants discharge released in open ditches or Nallah. Because of these pollutants the ground water gets polluted. Special attention is required for free Fe⁺² ions polluting water. Stringent treatment of water is required to make portable. Ground water is checked for safety and portability for drinking of human. The study is therefore being carried out to check the physical and chemical analysis of water in Jalna. Nitrate can be a natural constituent but high concentrations often suggest a source of pollution. [1]

II. TOPOGRAPHY

Jalna is located in the central part of Maharashtra in Marathwada division and lies between 18.33° to 20.53° North Latitudes and 73.16° to 75.16° East Longitude. Jalna district comprises of Mantha, Bhokardan, Ghansawangi, Jafrabad, Badnapur, Ambad and Partur tahsil beside Jalna city. The climate of the district is dry as Marathwada region is drought prone region of Maharashtra. Moderate to less rain is observed in Jalna. Jalna experiences hot summer with temperature touching up to 42°C in summer and in winter it falls down to 4°C. Water is therefore precious and bore wells are used as a key water source. Municipal Councils are responsible for urban development of all the Tehsils. There are 8 Panchayat Samities and 4 Nagar Parishads.

III. AREA OF STUDY

Water samples were collected from eight places in Jalna district, S1- Ambad, S2- Ghansawangi, S3-Badnapur, S4-Bhokardan, S5-Partur, S6-Jafrabad, S7-Jalna City and S8-Mantha tehsils. Water samples are collected during 1st to 4th of every month early morning between 8 am to 10 am. Water is collected from each site tehsil in poly vinyl stopper bottles of 5 liters as per APHA standards. [2] All chemicals used for experimentation are A. R. grade. Standard methods are adopted for collection, preservation and analysis of water.

IV. PARAMETERS ANALYZED

Following parameters of water are analyzed (1) Temp. (2) Colour (3) Odour (4) Iron (5) Nitrates (6) Fluoride (7) Chloride (8) pH (9) TDS-Total Dissolved Solids (10) Alkalinity (11) Turbidity (12) Sulphate (13) Calcium (14) Hardness (15) Coli Form (16) Residual Chlorine [3][4][5][6][7][8][9]

Temp: The water temperature is largely influenced by ambient temperature. The heat released by the decomposition of organic matters and respiration may slightly raise the temperature in polluted aquatic bodies. The increase in temperature alters the concentration of DO, free CO₂ and other gases dissolved in water.

Colour: Colour of water indicates amount of dissolved and suspended particles. Industrial wastewater produces certain complex compounds of metal like nickel, copper, iron, chromium, zinc, etc. which changes the colour of water.

Odour: Water should be odourless as odour is released because of bacterial decomposition or presence of impurities in water.

Iron: If iron is present in water it forms Fe(OH)₃ in suspended forms. Excessive ferrous compounds may cause problems in respiration and hypertension. Drowsiness is also indicated with presence of Fe compounds in water. BIS standard shows maximum permissible limit of iron in water to be 1.0 mg/lit, but desirable is 0.3 mg/l.

Nitrate: Nitrate is produced from fertilizers and chemicals in the form of N₂ compound. It is also produced because of Industrial and domestic waste discharge and decaying of vegetations and animals. As per BIS maximum permissible limit of nitrates to be present in water is upto 100 mg/l and desirable upto 45mg/l

Fluoride: Fluoride is found in water because of water flowing through naturally occurring rocks phosphate, phosphorite crystals, etc. For fluoride to be present in water, BIS desirable limit is 1.0 mg/l whereas permissible limit is 1.5 mg/l.

Chloride: It is observed that chlorides are present in almost all type waters. It combines with water from human, agricultural & industrial activities. As per BIS permissible chloride limit in water is 1000 mg/l whereas desired level is 250 mg/l.

pH: pH indicates acidity or alkalinity of solution. pH scale is from 0 to 14 where solution with pH 7 is neutral, less than 7 is acidic whereas greater than 7 is alkaline. pH for drinking water as per BIS lies between 6.5 and 8.5.

T.D.S: Total dissolved solids can be filtered. As per BIS water can have permissible TDS of 2000 mg/l, but desired level is set at 500 mg/l.

Alkalinity: Components present in water that takes the pH of water to side of alkalinity is measured. Because of naturally occurring rocks and compounds water can become alkaline. As per BIS max permissible limits of alkalinity is 600 mg/l whereas desirable limit is 200 mg/l.



Turbidity: Suspended particles present in water create turbidity. This makes water looks turbid. BIS permissible limit is 10 NTU whereas desirable is 5 NTU.

Sulphate: Sulphate ions are water soluble. They are produced by oxidation of their ores, industrial wastes, etc. BIS permits 400 mg/l of Sulphate in water whereas desired of 200 mg/l.

Calcium: Calcium is directly related to hardness. Permissible limit for calcium as per BIS is 200 mg/l but desired at 75 mg/l.

Hardness: As per BIS, desirable limit for hardness of water is 300 mg/l and permissible limit for hardness is 600 mg/l. Scale formation is observed because of hard water.

Coli Form: As per Central Pollution Control Board (CPCB) total coli form present at point for a water treatment plant in India is set to be at 5,000 MPN/100ml. This is reasonable since clean water technologies and disinfection techniques at conventional water treatment plants can easily deal with this range. But in most of the Indian towns and cities, parameters' value exceeds their standard limits because of flowing untreated sewage into streams.

Residual Chlorine: It is chlorine that remains in water after a period. After testing the residual chlorine level it is released for distribution. Max desirable limit is 0.2 mg/l.

V. ANALYSIS

Here in this study we are concentrating on eight sites of Jalna districts. The water samples are collected from each site once a month. And twelve month data is analysed and combine mean values of each site are shown in table 1 below. From the analysis as per table 1, we can come to results as follows.

Table 1: Physico-Chemical analysis of water samples from 8 sites of Jalna district.

Site	Ambad	Ghansawangi	Badnapur	Bhokardan	Partur	Jafrabad	Jalna	Mantha
Elements	S1	S2	S3	S4	S5	S6	S7	S8
Iron	0.1	0.1	0.0	0.2	0.1	0.0	0.1	0.1
Nitrate	82.0	66.1	56.9	76.6	86.0	108.9	75.7	43.5
Fluoride	0.5	0.7	0.4	0.7	0.4	0.7	0.5	0.3
Chloride	156.0	142.4	147.3	177.1	113.4	220.1	163.7	70.6
pH	7.8	7.9	7.6	7.4	7.6	7.6	7.8	7.4
TDS	668.6	658.6	591.0	598.6	623.3	540.0	779.0	748.9
Alkalinity	141.1	136.9	166.1	176.1	135.6	189.6	128.0	196.0
Turbidity	0.8	0.7	0.4	0.8	0.5	1.6	0.6	0.7
Sulphate	151.4	112.7	100.4	87.6	208.6	18.5	225.2	120.9
Calcium	82.6	63.4	81.7	75.5	89.9	55.6	96.7	77.8
Hardness	238.9	221.6	240.7	281.4	284.0	345.6	318.7	175.7
Coli Form	17.9	0.0	2.3	16.0	0.0	0.0	16.0	0.0
Residual Cl ⁻	0.4	0.4	0.4	0.3	0.3	0.4	0.3	0.3

(All values are in standard units as per Bureau of Indian Standards)

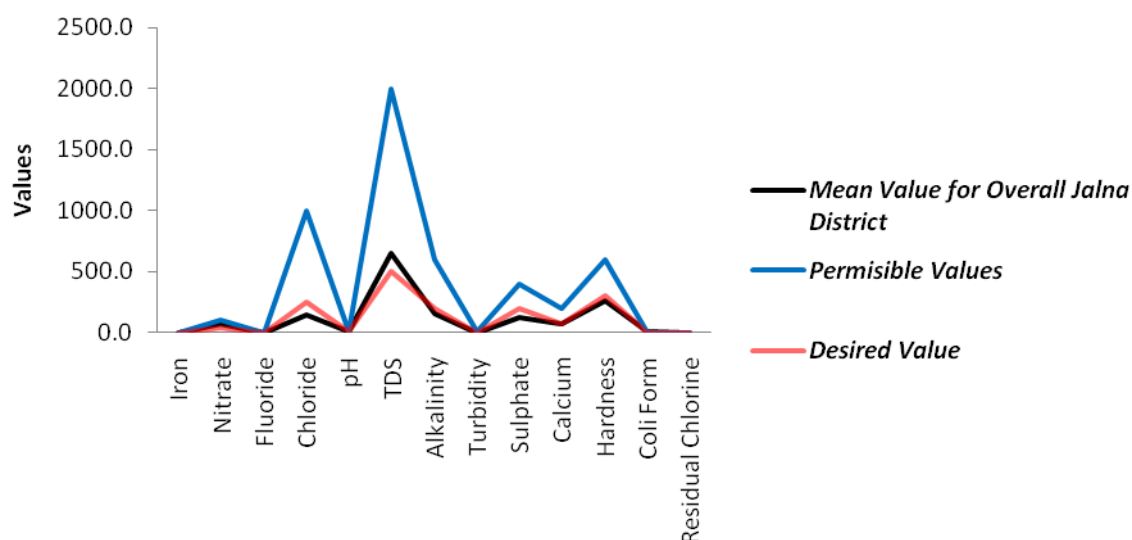


Chart1: Overall Mean Value data Representation from all 8 sites of Jalna district

Bhokardan site S4 shows increase in Iron value at the table, but under permissible value, whereas for rest of the Jalna the value is below desirable. Nitrate, TDS, Residual Chlorine and Calcium level at almost all the sites were found above desirable level. Fluoride, Chloride, pH, Alkalinity and Turbidity at all sites were below desirable level. Couple of sites showed increase in Sulphates and Hardness above desirable limit whereas 50% sites showed traces of Coli-form above desirable limits. From table it can also be analysed that site S6-Jafrabad showed increased level of Nitrates above permissible level whereas in almost all samples of all sites we found Coli-form which was undesirable. These two results are disturbing and hence we conclude our analysis.

VI. CONCLUSION

Jalna district water analysis revealed that samples of water collected from different sites of Jalna do not comply with BIS standards. The result shows contamination of Coli form Nitrates and residual chlorine. If we neglect residual chlorine, even than coli form and nitrates are a big health hazards. So it is concluded that pollution check is required and that water for domestic and drinking purposes is required to be purified to a substantial degree of purification before being used.

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