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๑ CONTENTS OF ENGLISH PART - VIII ๑

11. Physico - Chemical Analysis of Water with Reference to Iron Contain in Jalna District

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Abstract

This research paper gives Physico-Chemical analysis of water with respect to Iron from Jalna district. Main stress is projected on Iron contamination. This study was performed because, Jalna district has many steel re-rolling mills which discharges its waste. The paper gives analysis of 8 talukhas of Jalna from where water samples were collected giving statistical results. Paper introduces the topic and other parameters before conclusion.

Keywords: Iron. Water. Standards. Pollution, Permissible Values

1. Introduction

Urbanization causes contamination of water. Jalna is an industrial city. There are eight industrial sectors of MIDC in Jalna district. It has many steel rolling mills which provide steel bars and sheets to almost all parts of India [1]. There are many other industries of seed production and other agro based products. Pollutant from these industries is discharged in open. These pollutants contaminate the ground water of the area. Special attention is required for free Fe^{+2} ions polluting water. Water needed to be treated before it is made available for domestic use. Industries are needed to perform treatment of waste water before discharge otherwise ground water becomes hazardous for human use. The study carried out gave physical and chemical analysis of water of the region. [2] The study was performed during October 2016 to September 2018.

2. Area of Study

Water samples were collected from eight different places in Jalna district. The tallukhas selected were Ambad. Ghansawangi, Badnapur, Bhokardan, Partur, Jafrabad, Jalna City and Mantha. Water samples were collected monthly in poly vinyl stopper bottles as prescribed by APHA standards. [3] AR Grade chemicals were used for experimentation. Standard methods were adopted for collection, preservation and analysis of water.

3. Parameters Analyzed

There are many parameters considered for analysis of water like Temperature, Colour, Odour, Iron, Nitrates, Fluoride, Chloride, pH, TDS-Total Dissolved Solids, Alkalinity, Turbidity, Sulphate, Calcium, Hardness, Coli Form and Residual Chlorine [4][5][6][7][8][9][10] Temperature of water defines the CO_2 pollution and decomposition of organic matter. Iron present in water forms $Fe(OH)_3$ which in form of excessive ferrous compounds may cause problems in respiration and hypertension. Nitrate produced from fertilizers is hazardous for human and animal consumption. Fluoride beyond 1.5mg/l is not permissible for human use. Same is with the chlorides present waters. Water with TDS above 500mg/l is not recommended by BIS. Alkalinity and Turbidity above permissible limits is dangerous. Calcium is directly related to hardness. Permissible limit for calcium as per BIS is 200 mg/l but desired at 75 mg/l.

4. Analysis

In this paper we are concentrating Iron contamination of eight sites of Jalna districts. The water samples are collected monthly from each site. Two years 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: Variation in Iron Analysis of samples collected from all site

Sr No	Month	Iron mg/l							
Sample Site =>		S1	S2	S3	S4	S5	S6	S7	S8
1	Oct-16	0.04	0.07	0.01	0.06	0.07	0.06	0.05	0.19
2	Nov-16	0.06	0.40	0.01	0.09	0.13	0.06	0.09	0.17
3	Dec-16	0.07	0.20	0.02	0.69	0.07	0.06	0.07	0.19
4	Jan-17	0.09	0.03	0.02	0.07	0.07	0.03	0.07	0.07
5	Feb-17	0.08	0.07	0.07	0.07	0.06	0.06	0.01	0.09
6	Mar-17	0.07	0.09	0.07	0.06	0.07	0.01	0.08	0.07
7	Apr-17	0.04	0.09	0.07	0.07	0.07	0.01	0.01	0.13
8	May-17	0.05	0.06	0.07	0.07	0.08	0.05	0.02	0.02
9	Jun-17	0.08	0.01	0.07	0.07	0.08	0.05	0.02	0.09
10	Jul-17	0.07	0.08	0.04	0.06	0.08	0.03	0.02	0.12
11	Aug-17	0.02	0.09	0.06	0.06	0.08	0.08	0.02	0.08
12	Sep-17	0.02	0.03	0.10	0.03	0.08	0.03	0.04	0.08
13	Oct-17	0.04	0.05	0.08	0.05	0.08	0.04	0.08	0.08
14	Nov-17	0.50	0.57	0.04	0.10	0.15	0.13	0.06	0.08
15	Dec-17	0.54	0.53	0.02	0.20	0.28	0.20	0.02	0.28

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16	Jan-18	0.51	0.13	0.01	0.06	0.05	0.07	0.04	0.03
17	Feb-18	0.17	0.14	0.08	0.10	0.45	0.10	0.06	0.06
18	Mar-18	0.12	0.05	0.08	0.20	0.42	0.20	0.02	0.11
19	Apr-18	0.02	0.11	0.01	0.10	0.43	0.20	0.01	0.11
20	May-18	0.51	0.02	0.21	0.20	0.26	0.10	0.03	0.12
21	Jun-18	0.08	0.01	0.23	0.25	0.28	0.05	0.04	0.13
22	Jul-18	0.07	0.08	0.04	0.23	0.27	0.03	0.03	0.09
23	Aug-18	0.02	0.05	0.20	0.06	0.41	0.08	0.03	0.08
24	Sep-18	0.03	0.03	0.10	0.03	0.36	0.03	0.04	0.08

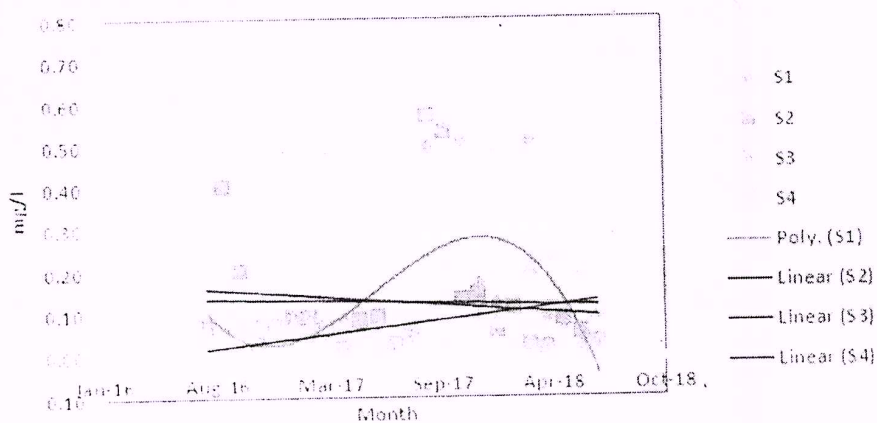(All values are in standard units as per Bureau of Indian Standards)

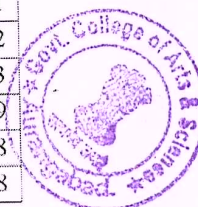
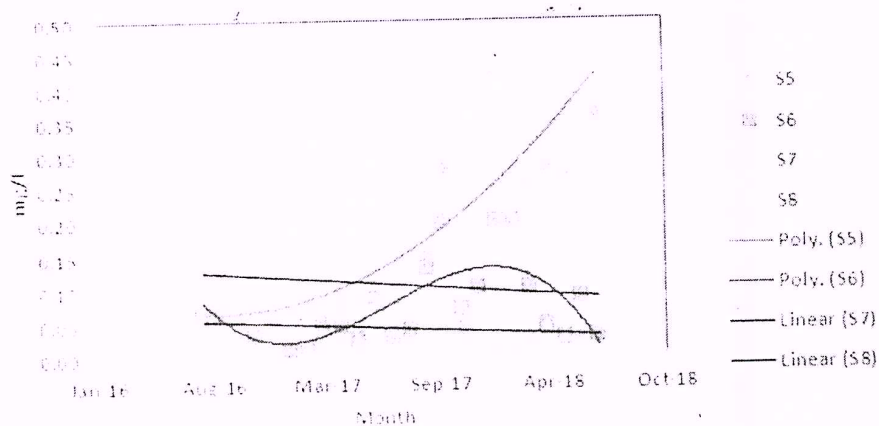Fig 1: Iron in water sample collected from sites S1, S2, S3 & S4

Fig 2: Iron in water sample collected from sites S5, S6, S7 & S8

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The average Iron content of groundwater is 0.11 mg/L. The month wise maximum is 6.9 mg/l in the month of Oct 2016 at site S4. Solubility of Iron is control by pH-Eh system. There may be 1 to 10 mg/l concentration of Fe in groundwater. Although, it is abundant in the earth's crust, it is absorbed in different forms at different rates and Iron deficiency is quite common among the people throughout the world but at 1.0 mg/l, it can cause bitter astringent taste to water.
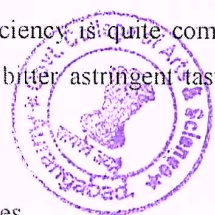
5. Regression Analysis

Table 2: Regression analysis values of parameters of different sample sites

Site	Parameters	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
S1	Fluoride	0.2442	0.1153	2.1177	0.0558	-0.0070	0.4954
S3	Nitrate	-0.0013	0.0004	-3.0241	0.0106	-0.0022	-0.0004
	Fluoride	-0.1405	0.0609	-2.3083	0.0396	-0.2731	-0.0079
	Chloride	-0.0015	0.0005	-3.1620	0.0082	-0.0026	-0.0005
	TH	0.0012	0.0005	2.6339	0.0218	0.0002	0.0022
S4	Nitrate	0.0026	0.0009	2.7959	0.0151	0.0006	0.0046
	pH	-0.2129	0.0875	-2.4342	0.0301	-0.4019	-0.0239
	Alkalinity	0.0022	0.0011	2.0049	0.0663	-0.0002	0.0045
	TH	-0.0010	0.0005	-2.1422	0.0517	-0.0020	-0.0000
S5	Calcium	-0.0062	0.0023	-2.6757	0.0202	-0.0113	-0.0012
	Nitrate	0.0034	0.0010	3.5234	0.0042	0.0013	0.0054
	Alkalinity	0.0017	0.0007	2.5466	0.0256	0.0002	0.0031
S6	Calcium	-0.0010	0.0003	-3.2765	0.0066	-0.0016	-0.0003
	Fluoride	0.1029	0.0293	3.5116	0.0043	0.0390	0.1667
	Chloride	-0.0004	0.0001	-2.6766	0.0202	-0.0007	-0.0001
	pH	0.0368	0.0160	2.3018	0.0401	0.0020	0.0715
	Turbidity	-0.0453	0.0203	-2.2310	0.0455	-0.0896	-0.0011
	TH	-0.0002	0.0001	-2.5608	0.0250	-0.0004	0.0000
S7	Fluoride	0.0728	0.0217	3.3582	0.0051	0.0260	0.1197
	Sulphate	0.0002	0.0001	2.3125	0.0378	0.0000	0.0004

Discussion

Result of regression analysis with reference to Iron is as shown in table 2. In this analysis individual site from S1 to S8 was considered and P value was considered with 5% variations. In this analysis it was observed that site S1, S2 and S8 didn't show any significance between iron and any of the parameter under study. At site S3 P value for Nitrate is 0.0106 i.e. 1.06% means 98.94% significant. Florida is 0.0396 i.e. 3.96% means 96.04% significant. Chloride is 0.0082 i.e. 0.82% means 99.18% significant and TH is 0.0218 i.e. 2.18% means 97.82% significant at site S4 P value for Nitrate is 0.0151 i.e. 1.51% means 98.49% significant and pH is 0.0301 i.e. 3.01% 96.99% significant. at site S5 P value for Calcium is 0.0202 i.e. 2.02% means 97.98% significant. Nitrate is 0.0042 i.e. 0.42% means 99.58% significant and Alkalinity is 0.0256 i.e. 2.56% means 97.44% significant. at site S6 P value for Calcium is 0.0066 i.e. 0.66% 99.34% significant. Fluoride is 0.0043 i.e. 0.43% 99.57% significant. Chloride is 0.0202 i.e. 2.02% means 97.98% significant. pH is 0.0401 i.e. 4.01% means 95.99% significant. Turbidity is 0.0455 i.e. 4.55% means 95.45% significant and TH is 0.0250 i.e. 2.50% 97.50% significant and at site S7 P value for Fluoride is 0.0051 i.e. 0.51% means 99.49% significant and Sulphate is 0.0378 i.e. 3.78% means 96.22% significant.

6. 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 Iron. We cannot neglect this analysis as it may lead to big health hazard for all living things. 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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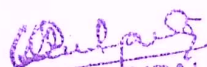
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