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10. Physico - Chemical Analysis of Water with Reference to Calcium Contain in Jalna District

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Abstract

Paper discusses Physico-Chemical analysis of water from Jalna district with respect to Calcium. The highlight is on Calcium containment in water. This study analyses major areas of Jalna district giving statistical results. Paper gives regression analysis performed on the data collected after experimentation.

Keywords: Calcium, Regression, Polynomial curve, Industrial waste, Physico-Chemical analysis

1. Introduction

The paper shows physico-chemical analysis of water from Jalna district with respect to calcium content. Jalna district has developed into an urban city, showing disastrous signs of urbanization especially with respect to surface and ground water is getting contaminated. Jalna has big industrial estates under Maharashtra Industrial Development Corporation. Jalna is said to be Steel capital of India [1]. It is also known for its hybrid seed industries, bidi industry & agro based industries like dal and oil mills. These industries create lots of pollutants discharge released in open ditches or Nallah. Because of these pollutants the ground water gets polluted. 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. Calcium can be a natural constituent but high concentrations often suggest a source of water hardness. [2]

2. Area of Study

Eight places in Jalna district, S1- Ambad, S2- Ghansawangi, S3-Badnapur, S4-Bhokardan, S5-Partur, S6-Jafrabad, S7-Jalna City and S8-Mantha tehsils were selected for collection of water samples. Water samples were collected every month from each site in bottles of 5 litters as per APHA standards. [3] All chemicals used for experimentation are A. R. grade. Standard methods were adopted for collection, preservation and analysis of water.

3. Experimentation

Hardness of water is due to Calcium and Magnesium salts of Carbonate and Bicarbonates. These are being determined by "EDTA titrimetric method" (APHA, 1998, part 2340, C, p. 2-36). It is a measure of the capacity of water to precipitate soap. When hardness numerically is greater than the sum of carbonate and bicarbonate alkalinity that amount of hardness equivalent to alkalinity is called carbonate hardness and amount of hardness in excess of this called non-carbonate hardness. When hardness numerically equal to or less than carbonate and bicarbonate alkalinity all hardness is carbonate hardness and non-carbonate hardness is absent. EDTA solution of its disodium salt was prepared in distilled water, it was standardize by using Zinc ion solution at pH 10 and using soluchrome black T indicator. A definite amount of sample water was taken in conical flask. It was buffered to pH 10. Few drops of indicator soluchrome Blak T was added and titrated against standard EDTA Solution. EDTA solution of its disodium salt was prepared in distilled water, it was standardize by using Zinc ion solution at pH 10 and using soluchrome black T indicator. A definite amount of sample water was taken in conical flask. It was buffered to at higher pH. Few drops of indicator Murexide was added and titrated against standard EDTA Solution [4][5][6][7][8][9][10] Calcium is directly related to hardness. Permissible limit for calcium as per BIS is 200 mg/l but desired at 75 mg/l. 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.

4. Analysis for Calcium

Here this study graph representing whole Jalna district, the water samples collected for two years from 2016-18 was collected and different experiments were carried out to analysed and combine mean values of each site as shown below. From the analysis as per fig 1, we can come to results as follows.

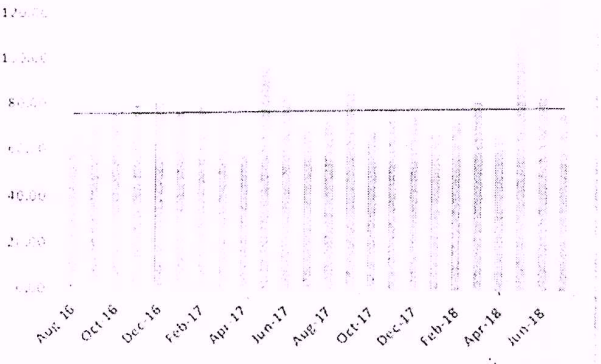

Fig 1: Average calcium in water from Jalna District

Calcium content in samples collected from all the sites throughout the study period shows constant and in permissible limits. Linear relation of regression was observed. Total Hardness in samples at all the sites throughout the study period shows varying but in permissible limits. Linear relation of regression was observed.

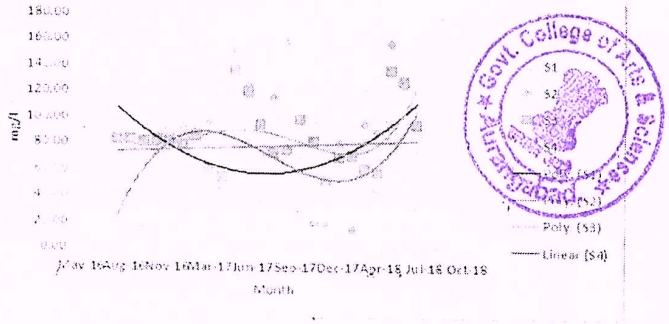

Fig 2: Calcium in water sample collected from sites S1, S2, S3 & S4

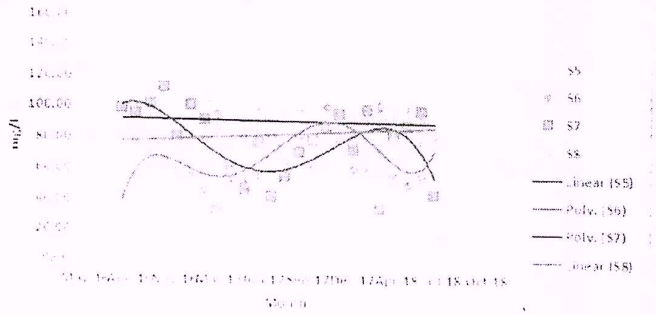

Fig 3: Calcium in water sample collected from sites S5, S6, S7 & S8

The overall average of calcium is 77.81 mg/l ranging from 58.13 mg/l to 108.29 mg/l as per fig 2 and fig 3 Month-wise variation shows maximum 160.00 mg/l in Sep-2017 at site S4 and minimum of 8.00 in Jan-2018 at site S1. On observing the pattern of curve, there are linear characteristics at data from S1, S4, S5 and S8, whereas polynomial values are obtained from values at site S2, S3, S6 and S7. Hence regression of all elements with respect to calcium is done.

5. Regression

Site	*Parameters*	*Coefficients*	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
S2	Fluoride	77.5027	37.9668	2.0413	0.0638	-5.2199	160.2252
	pH	-59.2662	29.7916	-1.9894	0.0699	-124.1765	5.6442
	Alkalinity	0.2720	0.1355	2.0073	0.0678	-0.0232	0.5672
	RC	-172.5291	72.5826	-2.3770	0.0350	-330.6731	-14.3852

S3	Sulphate	-0.5904	0.2373	-2.4874	0.0286	-1.1075	-0.0732
S5	Iron	-59.9476	22.4041	-2.6757	0.0202	-108.7620	-11.1332
	TDS	-0.0448	0.0217	-2.0651	0.0612	-0.0921	0.0025
	Alkalinity	0.1960	0.0555	3.5317	0.0041	0.0751	0.3169
S6	Iron	-476.7196	145.4948	-3.2765	0.0066	-793.7256	-159.7136
	Fluoride	51.8441	24.7741	2.0927	0.0583	-2.1339	105.8222
	Alkalinity	0.2035	0.0770	2.6432	0.0214	0.0358	0.3713
	Turbidity	-30.3486	14.2941	-2.1232	0.0552	-61.4928	0.7956
	Sulphate	0.5728	0.1754	3.2651	0.0068	0.1906	0.9551
	RC	251.4203	107.5653	2.3374	0.0376	17.0556	485.7851
S7	Sulphate	0.2242	0.0953	2.3515	0.0351	0.0182	0.4301

Discussion

Result of regression analysis with reference to Calcium, is as shown above. 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, S4 and S8 didn't show any significance between calcium and any of the parameter under study. At site S2 P value for RC (residual chlorine) is 0.0350 i.e. 3.50% means 96.50% significant. at site S3 P value for Sulphate is 0.0286 i.e. 2.86% means 97.14% significant, at site S5 P value for Iron is 0.0202 i.e. 2.02% means 97.98% significant and Alkalinity is 0.0041 i.e. 0.41% means 99.59% significant, at site S6 P value for Iron is 0.0066 i.e. 0.66% means 99.34% significant, for Alkalinity is 0.0214 i.e. 2.14% means 97.86% significant, for Sulphate is 0.0068 i.e. 0.68% means 99.32% significant and RC is 0.0376 i.e. 3.76% means 96.24% significant and at site S7 P value for Sulphate is 0.0351 i.e. 3.51% means 96.49% significant.

6. Conclusion

Water analysis of Jalna revealed that, water collected doesn't comply with BIS standards. The result shows hardness of calcium. If we neglect this contamination, big health hazards can be seen in long run. 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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