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Physicochemical analysis of water of Shiv Ganga Water, Deoghar Jharkhand

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Abstract : The objective of the present study is to determine various Physico - chemical parameters and its suitability for human consumption and domestic purposes and for agriculture. Polluted water will be analyzed for physicochemical characteristics (APHA, AWWA 1992)

Keywords : Physico-chemical parameters, encroachment, eutrophication, periurbanization, ISSI (Indian Standard Specification for drinking water), APHA, T.D.S., B.O.D., C.O.D. desirable limit, eutrophic.

INTRODUCTION

Pollution is defined as “the introduction by man into the environment of substance or energy liable to cause hazards to human health, harm to living resources and ecological damage, or interference with legitimate uses of the Environment” (Holdgate, 2003). Water is one of the most important natural resources without which life on Earth/planet cannot be imagined. We depend upon water for drinking, washing, bathing, irrigation, industries, domestic needs, farming, shipping, sanitation, and disposal wastages. Water bodies like ponds, rivers, impoundment, lakes etc came being in different ways and at different times. Corresponding author: ph no-09955987291.

Area of investigation- Deoghar is a holy city located in Jharkhand state, due to Baidyanathdham temple which is one of the one jyotirlinga among all 12 jyotirlinga across the India. Here in the month of sawan millions of pilgrims are used to come. Near the temple there is a holy river called Shive Ganga which is get polluted due to excessive discharge of sindur. which led to the increase the heavy

metals. This river also get polluted due to pilgrims taking bath there, excessive disposable of flower etc. The old name of Shivaganga is Varvoghar kund. It is situated just 200 meters away from the Baidyanath temple.

Materials and method- To meet the objective of the present work the experiment were conducted in the Lab of University dept of Botany, Ranchi University Ranchi. Following material and methodology will be adopted for the experiment.

Sample collection: Polluted water from Shive Ganga Doeghar Jharkhand

Methodology. Polluted water will be analyzed for physicochemical characteristics (APHA, AWWA 1992)¹

The parameters to be studied will be:-

Physical analysis of polluted water: Appearance, colour, odour and pH, Suspended solids.etc

Physico chemical analysis of polluted water: TDS, TSS, Conductivity, Turbidity, BOD, COD, Oil grease, free CO₂, Sulphate, Chloride, Dissolved phosphate, DO, NTU (Nephelometric Turbidity Unit), Ammonical nitrogen, nitrate, photosynthetic rate, Acidity, Total hardness as the water sample, Total Kjeldal Nitrogen, Alkalinity, etc

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Biochemical Analysis of sample: Samples for analysis with standard procedure in accordance with standard method.^{1,11} The instruments has used in the limit of precise accuracy and chemicals used of G.R. Grade. Sampling was done at regular intervals of every month. At sampling site various physical parameters like appearance, colour, odour, pH and temperature has been observed and noted down on the spot immediately after the collection. Air and water temperature by mercury thermometer, pH by digital pH meter and total dissolved

solid (T.D.S.) by pen type TDS meter. For chemical variables of water like total alkalinity and total hardness etc, the samples were collected in B.O.D. bottle, stored at 4 C and analysed in laboratory. The T-H, Ca-H, Mg-H has measured titrimetrically by using EDTA, Chloride by Mohr’s Argentometric titration and K₂CrO₄ as indicator, Total alkalinity has determined by titrimetric methods using phenolphthalein and methyl orange indicators. Sulphate, phosphate, Chloride and Nitrate measured by spectrophotometer.

Observation- OBSERVATIONS

Table 1: Showing the Physico - chemical analysis of water of Shiv ganga.

PARAMETERS	UNITS	Desirable Limit	SAMPLES		
			MAX	MIN	AVG
Temperature	0 C	Shall not exceed 50C above the receiving water temperature	29	18.9	23.95
pH	—	6.5-8.5	7.81	7.34	7.57
Turbidity	NTU	5-10	60.9	5.94	33.42
Total Solid	ppm	500-600	610	478	544
Total Alkalinity	ppm	200-600	200	145	172.5
Hardness	ppm	300-600	130	62	96
Ca hardness	ppm	75	43.40	97.80	74.86
Mg hardness	ppm	30	6.50	26.10	16.35
Sulphate	ppm	150	145	91	118
Phosphate	ppm	5	6	0.34	3.17
Chloride	ppm	250	185	142	163.5
Nitrate	ppm	50	4	0.7	2.35
B.O.D	ppm	30	51	0.34	25.67
C.O.D	ppm	250	312	30	171

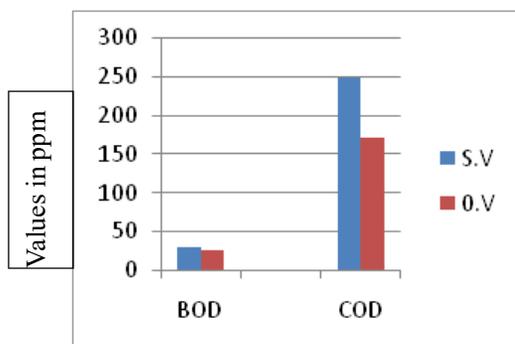


Fig 1: Histogram showing deviations in B.O.D. and C.O.D. Shiv ganga water.

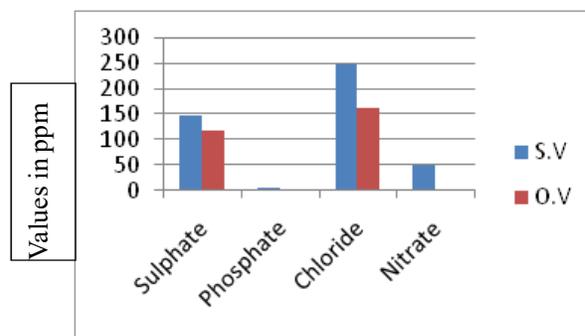


Fig 2: Histogram showing deviations in Sulphate, Chloride and Nitrate in Shiv ganga water.

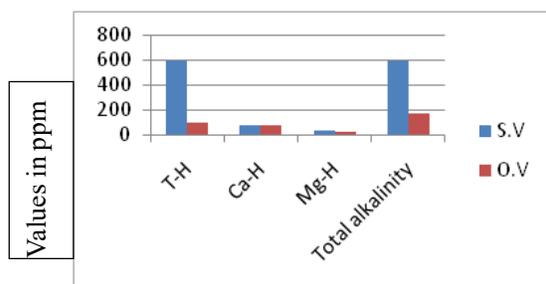


Fig 3: Histogram showing deviations in T-H, Ca-H and Mg-H, alkalinity of shiv ganga water.

S.V. = Standard Values, O.V.=Observed Values

RESULT

The present study has provided information about the variation in water characteristics of Shiv ganga. General observations showed that water samples of Shiv ganga are translucent in appearance, light green in colour, salty in taste and its odour is musty. All values of studied parameters are present as follows pH 7.57, temperature 23.95 C, turbidity 33.42 NTU, T.D.S. 544 ppm, total alkalinity 172.5 mg/l, hardness 96, calcium 74.86 mg/l, magnesium 16.35 mg/l, sulphate 118 mg/l, phosphate 3.17 mg/l, chloride 163.5mg/l, nitrate 2.35 mg/l, BOD 25.67mg/l and COD 171 mg/l.

DISCUSSION

In the present investigation of Shiv ganga water, most of the values of some physico-chemical parameters exceed the desirable limit according to ISSI (Indian Standard Specification for drinking water). pH of water is influenced by the presence of total alkalinity and carbon-di ioxide. Alkaline nature of inland water has been reported.¹² Increases in hardness of water is due to the natural accumulation of salts mainly calcium and magnesium. High concentration of salts and chlorides also get added to the water from the discharge of sindur and anthropogenic activity. Calcium is always present in natural water in the form of carbonate. Human activities and addition of nutrients increase the value Calcium.¹³ The low values of Sulphate, Phosphate, Chloride and Nitrate in the water of shiv ganga are mainly due to discharge of contamination by the use of pilgrims. The increased alkalinity was due to high concentration of nutrients in water of Shiv ganga

with run-off rainwater from the polluted soil. Rainfall is responsible for increasing the nitrates in water.¹⁴

More growth of micro organisms, plants and animals depletes oxygen. There is entry of sewage rich in bacteria. So the bacteria utilized the dissolved oxygen by the process of biodegradation. In oligotrophic water bodies, the amount of dissolved nutrient, salts remains low, therefore it supports spare plant and animal lives. This result in high dissolved oxygen gradually increased with depth. Besides in eutrophic water bodies, the organic matter accumulate abundantly which in turn are subjected to microbial decomposition. Therefore in Shiv ganga water lower values of B.O.D. and C.O.D. indicate the eutrophication of Shiv ganga due to anthropogenic activities. The factors on which BOD depends are concentration of organic matter, temperature, plankton population, density and population of micro-organisms.¹⁵ The analysis of sample water of Shiv ganga was done, following the standard methods recommended.¹⁶

In the present study some of the parameters are found within the prescribed limits of IS : 10500 e.g. pH, temperature, T.D.S., Ca-H While most are beyond the limits alkalinity, T-H, Mg-H, Sulphate, Phosphate, Chloride, Nitrate, B.O.D., C.O.D.

CONCLUSION

This result indicated that Shiv ganga water is non-portable for drinking and some level for irrigation. Permanent conservation strategies through scientific tools must be adopted for checking the entry of waste water into the Shiv ganga and thereby keeping the water healthy and hygienic.

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