Studies on the water quality parameters of Sagarnagar, Visakhapatnam Dt. (A.P.)

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Well and bore water samples from six sampling stations belonging to Sagarnagar, Vskp Dt. TS were analyzed for physico – chemical analysis of has been carried out during different seasons for a period of one year (Sept.2021-Aug.22). The analysis consists of parameters such as pH, total dissolved solids, total hardness, fluoride, nitrate, sulphate, biological oxygen demand, sulphate, nitrate, TDS, DO, BOD, COD, fluoride and heavy metals- Al, Fe, Cr, Cd,Cu, Hg ,Mn , Pb & Zn were carried out as per standard methods in those selected areas .The results indicate that values obtained for some parameters namely – TDS,Cu and E. coli from two sampling points were found slightly above the prescribed limits.

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Key words: **Water quality- Parameters –Pollution- Sagarnagar-Visakhapatnam**

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Introduction

People are facing serious problem of natural resources such as fresh air and water etc. due to increase in population and economic development[1]. Water is very much essential commodity for the survival of any form of life[2]. High quality of water may be required only for drinking purposes where as in case of other purposes like agriculture and industry, the quality of water can be quite flexible[3]. Industrial effluents discharged into the aquatic system change the physico -chemical properties of water such as hardness, conductivity, pH value, turbidity, total dissolved solids (TDS) and Dissolved oxygen (DO) there by affecting the aquatic flora and fauna. Keeping in view of this, it is proposed to carry out a systematic study on the water samples collected from six stations [namely- S_1- Gitam College (Analytical Chemistry Lab), S_2- Kokila Sadan,S_3- Nirmala Sadan), S_4- Sagar Nagar (Hostel), S_5- Beside Ration Shop, and S_6- Yendada Road] in the vicinity of Sagarnagar,Visakhapatnam Dt. AP.

Experimental

Water samples were collected in clean polythene bottles (2 or 5 liters capacity). Bottles were cleaned with hydrochloric acid then washed with tap water and then rinsed with distilled water twice and again rinsed with the water sample to be collected and field up one-liter bottles with the water samples[4,5]. All the reagents used were of analytical grade.DD water was used throughout the study. The procedures adopted for the estimation of various physical and chemical parameters as described in the standard methods[6,7]. For the estimation of dissolved oxygen, BOD bottles have been used as recommended and the dissolved oxygen was fixed at the site of collection. All the chemicals, reagents used in this work were of analytical grade E. Merck, India.

Results and Discussion:

The physico – chemical parameters of the water samples are presented in Tables 1 to 2.

Temperature: Temperature of water is basically important because it effects bio-chemical reactions in aquatic organisms. The average temperature of the present study ranged from 26.8 to 28.8^0 c.

pH:**.** The pH value of natural water changes due to the biological activity and industrial contamination. It is an important factor in water analysis since it enters into the calculation of acidity, alkalinity and processes like coagulation, disinfection and corrosion control. Higher pH includes the formation of trihalomethanes which are toxic. The pH values of the present investigation were within the levels[8] as per Indian standards (6.57 -8.21).

Total Dissolve Solids: They originate from dissolution or weathering of the rocks and soil, including dissolution of lime, gypsum and other slowly dissolved soil minerals. Dissolved mineral gases and organic constituents are responsible for color, taste and odor in water [9.] TDS values are useful to determine whether water is suitable for drinking purpose, agriculture and industrial processes. The results obtained on TDS values of the water samples are found to be ranging from 532.7 mg/lt to 645.2mg/lt.

Hardness: Hardness in water is due to the natural accumulation of salts from contact with soil and geological formations or it may enter from direct pollution by industrial effluents [10]. The principal hardness producing cations are calcium and magnesium along with anions bicarbonate, carbonate, chloride and sulphates. Hardness values of the present study were found to range between 103.9 and 254.7 mg/lit.

Chloride: All types of natural waters contain chloride. Salts of sodium, potassium and calcium contribute chlorides in water. High concentration of chloride indicates pollution due to high organic waste of animal origin [11] .Chloride values obtained in the study are found in the range between 62.8-125.2 mg /lt.

Dissolved Oxygen (DO): Presence of DO in water may be due to direct diffusion from air and photosynthetic activity of autotrophs. Oxygen can be rapidly removed from the waters by discharge of oxygen demanding wastes. It is the most important parameter in evaluating water quality. The DO values obtained in the present study are found within the standards for drinking water.

Biochemical oxygen demand (BOD) and chemical oxygen demand (COD):

Bio-Chemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) are the parameter used to assess the pollution of surface water and ground waters [6].The values obtained for both these parameters are well within permissible levels [(1.5 -5.0) and (1.4-4.8 mg/lt) respectively].

Alkalinity: The main sources of natural alkalinity are rocks which contain carbonate, bicarbonate and hydroxide compounds; silicates and phosphates may also contribute to alkalinity. Alkalinity value with less than 100mg/lt is desirable for domestic use. However, large quantities impart bitter taste to water. Total alkalinity of water samples in the current present study is found in the range 89.2 to 206.8 mg/lt.

Sulphate: Sulphate cannot readily be removed from drinking water, except by expensive process such as distillation, reverse osmosis or electro dialysis Sulphate ion does not affect the taste of water, if present in low concentrations[12]. The sulphate ion concentration in the present investigation varied from 7.5-76.6 mg/lt.

Nitrate: Concentration of nitrate depends up on the activity of nitrifying bacteria which in turn get influenced by DO. In the present study water samples from different sampling stations showed nitrate concentration between 0.69 and 12.7 mg/lt are below the permissible level as per the standards.

Fluoride: In a recent survey it was noticed that in India, approximately more than 62 million people including 6 million children suffer from fluorosis due to consumption of high fluoride content [13]. Excess fluoride consumption affects plants and animals[14]. The recommended limit of fluoride[15] in water as per standards is 1.5 mg/lt. In the present study the fluoride concentration of the samples are found well below the permissible levels (BDL-0.53mg/lt).

Total coli forms: It includes bacteria that are found in the soil and in water. Most *E. coli* strains are harmless, but cause serious food poisoning some times[16]. The harmless strains are a part of the normal flora of the gut, and can benefit their hosts by producing vitamin K_2, and by preventing the establishment of pathogenic bacteria within the intestine.

Metals: Iron deficiency is quite common among people throughout the world. However iron exposure results in siderosis (mottling of lungs) [17]. A standard of iron in drinking water is 0.3mg/lt. Cr (VI) is more toxic than Cr (III) .It is also responsible for chrome ulcer and kidney

damage[18]. Maximum concentration of Cr(VI) permitted in domestic water supplies is 0.05 ppm. Mining, electroplating, smelting operations contribute to copper contamination in natural waters. Excess amounts of Cu are undesirable because it irritates stomach[19, 20]. Cd enters into our body due to smoking mining, paint sludges, waste bacteria's etc damages kidney more.

The possible health hazard is associated with lead entering feed ingredients from the soil. Toxicity[21] of Pb interferes with the normal function of enzymes, headache, arthritis and vertigo etc. Problem of Hg concentration is increasing due to extensive use of mercury containing compound, fungicides, algaecides, paper pulp industry and agriculture. The results of the present study indicate not an even trace of mercury content is available in the water samples.

Industrial sources or toxic waste sites may cause the zinc amounts in to reach levels that can cause health problems[22]. The current study results indicate that the concentration of metals was found within the permissible levels. **Zn content varied between BDL to 0.52mg/lt**. (Table **-2**).

Conclusions:

All the parameters except TDS and E. coli and total bacterial count (slightly above) are within the limits specified for drinking water as per Indian standards. As drinking water is a basic need, people should consume protected water without any contamination. Hence the future generations in these areas have to take necessary precautions to protect themselves from water borne diseases.

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Table – 1; Physico –Chemical Parameters of Water Samples collected in different seasons (2021-2022) 0k

Parameter(min-max)	S_1	S_2	S_3	S_4	S_5	S_6

Temp ^{0}C	27.6-28.2	27.2-29.1	26.9-28.8	27.2-28.3	27.5-28.8	26.8-29.0
pH	6.57-7.54	7.18-8.21	7.53-7.82	7.21-7.74	6.57-7.87	7.18-8.02
TDS	587.6-623.2	547.4-606.2	612.7-632.5	537.6-645.2	453.2-532.7	470.6-573.8
Hardness	126.6-218.4	109.1-162.6	103.9-176.6	107.5-234.8	164.4-254.7	160.4-228.9
Chloride	77.8-85.6	62.8-90.5	67.5-97.2	69.2-109.7	82.5-121.2	69.6-98.4
DO	4.5-4.9	3.9-5.1	4.2-5.2	4.0-5.1	4.0-4.9	3.0-5.1
BOD	2.1-4.0	1.8-3.8	1.5-4.7	4.2-4.6	4.2-5.0	1.5-4.7
COD	1.8-4.2	2.1-4.8	1.8-3.7	1.4-3.5	2.2-4.0	2.0-4.8
Sulphate	71.5-87.9	26.2-41.6	38.2-98.4	30.7-92.5	26.2-76.2	43.1-70.8
Alkalinity	89.2-98.5	98.4-175.6	99.6-186.5	176.2-206.8	94.6-175.6	116.2-178.7
Nitrate	0.69-3.2	1.3-11.2	0.92-6.9	1.5-12.7	0.87-10.5	0.75-11.2
fluoride	0.21-0.35	BDL	BDL	0.25-0.64	0.18-0.48	0.15-0.52
Ecoli/General coliform[No./100ml]	BDL1/15	BDL-1/20	BDL /11	BDL1/12	BDL-1/15	BDL-2/20

Table – 2: Analysis of heavy metals in water Samples collected from different stations (2021-2022)

Parameter (min-max)	S_1	S_2	S_3	S_4	S_5	S_6
Al	BDL-0.08	BDL-0.018	Nil	BDL-0.016	Nil	BDL-0.022
Fe	0.031-2.12	0.045-1.66	0.039-1.56	0.05-0.86	0.14-0.32	0.05-0.86
Cr	BDL-0.037	0.015-0.043	0.023-0.042	0.015-0.048	0.022-0.036	0.015-0.048
Cd	BDL-0.039	BDL-0.012	BDL-0.005	0.016-0.027	BDL- 0.016	0.016-0.027
Cu	BDL-0.053	0.011-0.027	BDL-0.018	0.022-0.035	Nil	0.021-0.032
Hg	Nil	Nil	Nil	Nil	Nil	Nil
Mn	BDL 0.071	0.023-0.064	0.018-0.039	BDL-0.082	BDL -0.064	BDL-0.082
Zn	0.031-0.29	BDL- 0.41	0.011-0.16	0.13-0.45	0.023-0.34	0.17-0.52
Pb	0.001-0.003	0.001-0.004	0.001-0.002	0.006-0.009	BDL- 0.003	0.006-0.009

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