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Studies on the Phisico- chemical characteristics of water in Pidaparthi village [Anaparthi mandal] E.G.Dt., A.P.

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ABSTRACT

Physico – Chemical analysis of well and bore well water samples was carried out from eight sampling stations of Pidaparthi village [Anaparthi mandal] E.G.Dt., A.P during different seasons for a period of one year [2011] . The analysis of different parameters namely- pH, turbidity, color, total alkalinity, total hardness, chloride, sulphate, nitrate, TDS, DO, BOD, COD and fluoride were carried out as per standard methods. The parametric ratios and variation of temperature with D.O and Nitrate were also calculated. The results indicate that the fluoride and calcium in some sampling stations were found above the permissible limits.

Keywords: Physico- chemical Parameters – Pidaparthi village- Anaparthi mandal.

INTRODUCTION

Groundwater is main source for irrigation and industrial purposes. A variety of land and water based activities are causing pollution of water and over-exploitation is causing aquifer contamination in certain instances. The three percent of global fresh water is large enough to meet the requirements of man for millions of years. Majority of rural population living in India depends on ground water for domestic use. Tremendous increase in world's population resulting in spurt in urbanization, industrialization, agriculture etc., has put tremendous presence on the limited fresh water resources there by threatening the fresh water bodies with pollution[1]. In adequate management of water resources as directly or indirectly resulted in the degradation of hydrological environment[2]. Therefore, it is essential to protect the water quality which is needed for different purposes[3]. The present study was carried out to assess the suitability of water collected from ten different areas of Dt., A P, exclusively for domestic applications.

MATERIALS AND METHODS

Analysis of water samples has been done from eight sampling stations as mentioned below: S_1 S_1-SC new colony , S_2 –Ambedkar street- S_3-Community centre area , S_4-Pachayati office , S_5 Meda street area–, S_6 – Sivalayam street , S_7 – Main school and S_8 –Ramalayam street. Samples for analysis were collected in plastic sterilized bottles using the standard procedure for grab (or) catch samples in accordance with standard methods [4] . The analysis of various physico – chemical parameters namely pH temperature, total hardness, alkalinity, calcium hardness, magnesium hardness, chloride, sulphate, nitrate, fluoride, DO, BOD, COD, TDS etc., were carried out – as per the methods described [5] . D.D water was used for the preparation of solutions. All the chemicals and reagents used were of analytical grade.

RESULTS AND DISCUSSION

The average values of various physico – chemical parameters of the water samples collected are presented in Tables – 1to3.

Temperature: Water Temperature is a controlling factor for aquatic life. Water temperature is also influenced by the quantity and velocity of stream flow. The highest temperature being at 14.00 hrs. and the lowest at 05.00 hrs. The average temperature of the present study ranged from 26.52 - 28.02^0 C.

pH : It is known that pH of water (6.5 to 8.5) does not has no direct effect on help. But lower value below 5.0 produce sore taste and has higher value above 8.5 and alkaline taste [5]. Throughout the three seasons, comparable pH was observed which is well within the permissible limit of World Health Organization (WHO).

Electrical conductivity : It is an indirect measure of the presence of inorganic dissolved solids such as chloride, nitrate, sulfate, phosphate, sodium, magnesium, calcium, iron and aluminum. The presence of these substances increases the conductivity of water. It is an important parameter for determining the water quality for drinking as well as agricultural purposes. Many dissolved substances may produce an esthetically displeasing color, taste and odor. The average values obtained are in the range 0.5 to 1.9 mmhos.

Total Dissolve Solids: TDS values are useful to determine whether water is suitable for drinking purpose, agriculture and industrial purposes. The TDS values in the present study ranged within 380 to 702mg L^{-1}

Hardness: Hardness is frequently used as an assessment of the quality of water supplies. .Water with Hardness above 200 mg L^{-1}. may cause scale deposition in the distribution system and results in excessive soap consumption and subsequent scum formation. Soft water with hardness of less than 100 mg L^{-1} may have lower buffer capacity and more corrosive to water pipes[6]. The hardness values in the present investigation were found to range between 225.8 to 447.8 mg L^{-1} which are slightly above the permissible levels. Calcium is one of the most abundant metals which play an important role in biological system. Magnesium though an essential and beneficial metal is toxic at higher concentrations. Magnesium hardness particularly associated with sulphate ion has laxative effect an persons un accustomed to it[7]. In the present study calcium and magnesium content**s** are found in the range of 89.3 – 142.9 and 45.8-80.2 mg L^{-1} respectively.

Chloride: The high concentration of chloride is considered to be an indication of pollution by sewage waste of animal origin. Industries are also important sources of chloride in water. Chloride values obtained in the study are found to be higher (132.5mg L^{-1}) in S_7 sampling station than other stations which is well below the standards.

Fluoride: The major sources of fluoride in ground water are fluoride bearing rocks such as fluorspar, cryolite, fluorspatite and hydroxyl apatite etc[8]. Excess fluoride consumption affects plants and animals. The fluoride concentration in the water samples (0.18-0.61mg L^{-1}) are below the permissible limits.

Sulphate: Sulphate ion if present in excess amount produce cathartic effect upon human beings[9]. The sulphate ion concentration of the present study varied from 69.9-131.5 mg L^{-1}.

Alkalinity: Most of the alkalinity in natural water is formed due to dissolution of carbon dioxide in water. Carbonates, bicarbonates, thus formed are dissolved to yield hydroxyl ions. In the present investigation the total alkalinity of the water samples is found in the Range 102.7 to 183.3 mg L^{-1}.

Nitrate: Generally it occurs in trace quantities in surface water. It is the essential nutrient for many photosynthetic autotrophs and has been identified as the growth limit nutrient. The maximum value was observed at 5.00 hrs while minimum at 20.00 hrs. which is inversely related to surface water temperature . Generally water bodies polluted by organic matter exhibit higher values of nitrate[10]. In the present study water samples from different sampling points, S_1 and S_8 showed low concentrations of nitrate (0.8 to 3.04 mg L^{-1}) well below permissible levels as per the standards.

Dissolved Oxygen (DO): The presence of aquatic plants in a stream affects the dissolved oxygen concentration. Green plants release oxygen into the water during photosynthesis [11]. Oxygen can be rapidly removed from the waters by discharge of oxygen demanding wastes. The DO values obtained in the present study are within the standards.

BOD and COD: These are the parameters used to assess the pollution of surface water and ground waters. BOD is the amount of oxygen consumed by bacteria in the decomposition of organic material. It also includes the oxygen required for the oxidation of various chemicals present in the water, such as sulfides, ferrous iron and ammonia. COD is used as a measure of the oxygen equivalent of the organic matter content of a sample that is susceptible to oxidation by a strong chemical oxidant. BOD and COD values obtained in the present study are within permissible limits which is clear from the results in Tables.

Iron: Not all metals are acutely toxic in small concentrations. Some water quality characteristics which affect metal toxicity include temperature, pH, hardness, alkalinity, suspended solids, redox potential and dissolved organic carbon. Metals can bind to many organic and inorganic compounds which reduces the toxicity of the metal. Excessive concentration of Fe^{3+} in circulation is objectionable for a number of reasons which includes; its precipitation as insoluble ferric hydroxide, which stains laundry and plumbing fixtures, Fe^{3+} also promotes growth of "Iron Bacteria" which deposits slimy coating in the pipes. The iron content in the current study was well below the prescribed limits.

Table. 1 Physico – Chemical Parameters of Water Samples Collected in summer season

parameter	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8
Temperature^0 C	27.70	27.93	27.63	27.80	27.72	28.02	27.86	27.92
pH	7.85	7.68	7.83	7.90	7.86	7.90	7.72	7.66
Electrical Conductivity	1.0	0.9	0.6	1.3	0.5	0.9	1.7	1.8
TDS	380	702	412	619	427	482	674	542
TSS	51.9	71.0	46.2	59.6	46.7	42.7	64.7	49.5
Hardness	392.5	304.2	280.4	343.6	438.6	382.6	447.8	399.4
Calcium	52.2	116.4	95.2	85.9	99.6	119.2	128.2	84.8
Magnesium	62.5	46.5	57.0	60.3	55.7	68.5	80.4	62.6
Chloride	109.2	102.8	93.8	106.9	102.7	85.2	132.5	103.5
DO	5.0	5.0	4.9	4.4	5.1	5.3	4.6	4.5
BOD	1.6	1.5	1.6	0.9	0.7	1.2	1.1	0.9
Sulphate	90.3	82.0	102.8	112.4	83.4	98.5	118.2	99.5
Alkalinity	159.8	146.2	108.5	142.0	165.3	130.9	102.7	105.2

Nitrate	2.17	1.73	2.60	3.04	1.52	1.25	1.95	2.42
COD	5.7	5.4	4.8	5.3	6.2	4.9	6.0	5.0
Iron	0.004	0.008	0.008	0.005	0.004	0.006	0.003	0.005
Fluoride	0.34	0.18	0.61	0.04	0.25	0.48	0.35	0.28

All the parameters expressed in mg L^{-1} except pH and EC (mmhos) All the values are the average of 3 determinations.

Table. 2 Physico – Chemical Parameters of Water Samples Collected in rainy season

parameter	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8
Temperature^0 C	27.43	27.62	27.35	27.20	27.79	27.42	27.70	26.98
pH	7.46	7.81	7.80	8.02	7.46	7.52	7.85	7.68
Electrical Conductivity	0.6	1.6	0.9	0.8	1.6	1.4	1.6	0.9
TDS	512	594	519	492	508	478.	612	494
TSS	62.2	57.2	68.6	54.8	61.5	58.1	59.2	40.8
Hardness	225.8	398.7	262.4	309.3	329.7	348.0	417.5	403.6
Calcium	82.3	64.5	78.4	53.8	52.8	49.3	89.4	74.6
Magnesium	76.2	57.2	36.2	25.8	40.2	32.5	38.2	33.8
Chloride	118.2	103.7	79.05	74.5	67.6	89.4	68.9	98.4
DO	4.8	5.2	4.3	5.3	5.3	5.3	5.6	5.2
BOD	1.3	1.2	0.7	0.9	1.3	1.4	1.2	1.5
Sulphate	82.8	69.9	103.1	111.9	120.9	92.2	131.6	122.5
Alkalinity	133.4	168.5	117.9	153.4	183.3	132.6	141.0	113.6
Nitrate	2.08	1.64	1.32	1.91	1.43	1.20	1.85	2.14
COD	5.5	5.2	3.2	3.8	6.3	5.6	5.0	6.0
Iron	0.007	0.004	0.005	0.004	Nd	0.003	0.005	0.003
Fluoride	0.33	0.25	0.49	0,36	0.18	0.53	0.43	0.30

All the parameters expressed in mg L^{-1} except pH and EC (mmhos) All the values are the average of 3 determinations ; nd-not detectable.

Table . 3 Physico – Chemical Parameters of Water Samples Collected in winter season

parameter	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8
Temperature^0 C	27.33	27.12	27.05	26.52	27.29	27.04	27.37	26.88
pH	7.16	8.11	7.85	8.06	8.14	7.57	7.8	7.58
Electrical Conductivity	1.2	1.4	0.6	0.9	1.8	1.7	1.8	0.8

TDS	408	543	415	396	568	614	576	474
TSS	63.2	47.6	48.4	58.8	68.3	78.4	53.5	42.3
Hardness	315.8	408.7	232.4	269.3	290.3	248.0	387.5	358.3
Calcium	82.3	64.5	78.4	53.8	52.8	49.3	89.4	77.6
Magnesium	76.2	57.2	36.2	25.8	40.2	32.5	38.2	33.8
Chloride	112.5	107.3	67.3	86.6	67.8	79.2	123.8	90.8
DO	5.0	4.8	4.6	5.0	5.2	5.3	5.0	4.9
BOD	1.5	1.0	0.9	0.9	1.4	1.5	1.6	1.4
Sulphate	106.8	97.6	103.2	131.9	99.7	88.6	113.6	109.5
Alkalinity	173.4	168.5	137.9	153.4	180.3	162.6	141.0	113.6
Nitrate	2.20	1.26	1.08	1.61	1.23	1.82	1.55	2.07
COD	5.7	5.4	4.0	4.6	6.0	5.4	5.6	6.2
Iron	0.005	0.006	0.005	0.004	Nd	nd	0.004	nd
Fluoride	0.23	0.25	0.47	0.56	0.53	0.33	0.42	0.22

All the parameters expressed in mg L^{-1}. except pH and EC (mmhos) All the values are the average of 3 determinations ; nd-not detectable

APPLICATION.

The results are applicable for the assessment of quality of water in the local area and useful to Public.

CONCLUSIONS

All the parameters studied in the present investigation are well within the limits prescribed by WHO standards. Since drinking water is a basic need, the people in any area should consume protected water without any contamination. Hence the future generations have to take necessary steps to protect water resources for proper utilization.

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