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PHYSICO-CHEMICAL ANALYSIS OF WATER NEAR ANAKAPALLI HIGH WAY IN VISAKHA DISTRICT, ANDHRAPRADESH

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Abstract: Water is essential to life. ***Water analysis is carried out to quantify the physical and chemical components of water samples. The type and sensitivity of the analysis depends on the purpose of the analysis and the anticipated use of the water. In ordered to assess the quality of water in moon soon we have determined physico-chemical analysis in some areas near to national highway of Anakapalli city, Visakhapatnam District of Andhrapradesh State, India in 2018. In this analysis, various quality parameters are measured including pH, Specific Conductivity, Dissolved Oxygen, Total hardness, Alkalinity, Calcium, Magnesium, Chlorides, Sulphates, Nitrites, Phosphates and Nitrates compared with Indian standards 10500: 2012 of water quality. The assessment of these parameters is essential to identify magnitude and source of any pollution load. These characteristics can identify certain condition for the ecology of living organisms and suggest appropriate conservation and management strategies.***

Keywords: Water samples, water quality parameters and Indian standards 10500: 2012.

I. INTRODUCTION

The quality of water is defined in terms of its physical and chemical characteristics. Variations in the groundwater quality depend upon the geochemical composition, the seasonal and climatic conditions and physical activities in any area [1].Water quality is very important for drinking and other domestic purposes and it is a major concern all over the world. The various constituents of drinking water have a direct bearing on human health. When these parameters exceed a certain limit, they may lead to health problems to the user. It is essential to understand the major constituents of water and their impact on human health.

A. Temperature

The temperature is basically important for its effect on the chemical and biological reactions

in the organisms in water [2]. A rise in temperature of water speeds up the chemical reactions in water, reduces the solubility of gases and amplifies the taste and odour [3]. At elevated temperature, metabolic activity of the organism increases, requiring more oxygen but at the same time the solubility of oxygen decreases thus accentuating the stress[4].

B. pH

pH is important in defining the alkalinity equilibrium levels of carbon dioxide, bicarbonate, carbonate and hydroxide ions. Low pH does not cause any harmful effect but it may lead to an increased adsorption of metal cations due to competition by H^+ ions [5]. When the pH is below 6.5 the water starts corroding the pipes thereby releasing toxic metals such as Zn, Pb, Cd and Cu into the water.

C. Electrical Conductivity

Electrical conductivity (EC) is a measure of the ability of water to conduct electrical current. The conductivity of water depends upon the concentration of ions and its nutrient status. Based on the EC values the water quality can be classified as poor, medium or good [6]. Higher EC causes scale formation on cooking utensils and corrodes the pipes [7].

D. Dissolved Oxygen

Dissolved oxygen (DO) values show the ability of the ground water to purify itself through biochemical process. Moving water, because of its churning, dissolves more oxygen than still water. Respiration by aquatic animals, decomposition of organic matter and various chemical reactions consume DO. Thus, DO is an important water quality parameter to assess the waste assimilative capacity of the waters.

E. Hardness

Hardness in water is caused primarily by calcium and magnesium, although iron and manganese also contribute to the actual hardness. Water hardness is a measure of the capacity of water to precipitate soap. Soap is precipitated chiefly by the calcium and magnesium ions. Other polyvalent cations also may precipitate soap, but they often are in complex forms, frequently with organic constituents, and their role in water hardness may be minimal and difficult to define.

F. Calcium

Small concentrations of calcium combat corrosion of metal pipes by laying down a protective coating. Appreciable calcium salts, on the other hand, precipitate on treating to form harmful scale in boilers, pipes and cooking utensils. It is one of the most important elements, which influence the distribution of diatoms in

water bodies. It is beneficial in reducing the corrosion of the sewage water pipes due to the formation of a thin layer of scale.

G. Magnesium

Magnesium is an essential mineral for the living body and is relatively non-toxic in concentration normally encountered in nature. Mg also adds to the hardness of water and along with calcium possesses the problem of scale formation [8]. It was found that in ground and surface waters the value of Mg was minimum in monsoon season and maximum in summer season. The increase in the Magnesium value can be attributed to domestic waste, industrial effluents and also fall in water level.

H. Alkalinity

Total alkalinity is the measure of bicarbonates, carbonates and hydroxides present in the water. These alkaline compounds in the water remove H^+ ions and lower the acidity of the water. Large amount of alkalinity imparts a bitter taste to water. If a sample contains considerable amount of alkali metal (sodium and potassium) bound to bicarbonates they also contribute to the alkalinity and in such cases value of alkalinity does not correspond to carbonate hardness [9].

I. Chloride

In potable water, the salty taste produced by chloride is variable and dependent on the chemical composition of water. High chloride content may harm metallic pipes and structures, as well as growing plants. Accumulation of chloride at higher concentration may affect some persons who are already suffering from diseases of heart and kidney [10]. Presence of chlorides above the usual background concentration in a water source is also used as an indicator of pollution by domestic sewage [11].

J. Nitrate and Nitrites

Nitrates and nitrites are the most abundant forms of dissolved nitrogen in groundwater and surface water due to agricultural and domestic activities [12]. Cyanosis due to methemoglobinemia (blue baby disease) may result from drinking waters with high nitrate contents. Numerous studies indicated a possible link between nitrate and cancer [13].

K. Total Dissolved Solids

Many dissolved substances such as dissolved minerals, gases and organic constituents are undesirable in water, as they may produce aesthetically displeasing color, taste and odor. High concentrations of dissolved solids of about 3000 mg/L may produce distress in livestock [14].

L. Sulphates

High concentration of sulphates in water can cause dysfunctioning of the alimentary canal. In an aerobic decomposition of wastewaters, sulphates are reduced and sewer is corroded.

M. Phosphate

Public **water** systems (PWSs) commonly add phosphates to the drinking water as a corrosion inhibitor to prevent the leaching of lead and copper from pipes and fixture

II. MATERIALS AND METHODS

The Water Samples were collected from different areas in the Morning Hours between 9 to 11am, in Polythene Bottles which were cleaned with acid water, followed by rinsing twice with distilled water. The water samples are chemically analyzed [15]. The analysis of water was done using procedure of standard methods.

III. METHODOLOGY

A. pH and Temperature

Measurement of pH and temperature of all the water samples was measured at the time of collection by using portable battery operated pH meter. The calibration was carried out with two standard buffer solution of pH 4.0 and 7.0. The pH of the sample should lie between these values. The sample temperature is determined at the same time. The reading is taken after the indicated value remains constant for about 1 min. After each measurement, the electrode of the pH meter was washed with distilled water and was cleaned with tissue paper.

B. **Total Dissolved Solids**

The total dissolved solids (TDS) of the samples was measured using pre-calibrated conductivity meter model **Zeal tech**. Before measurement, the beaker and electrode must be washed several times with the solution under test. The measurement was taken at room temperature. The samples were transferred into beaker in specific volume to dip the electrode, after which the button was pressed and the scale was set before the TDS of each sample was noted.

C. **Electrical Conductivity:**

The conductivity of the samples was measured using pre-calibrated conductivity meter **Zeal tech**. Before measurement, the beaker and electrode must be washed several times with the solution under test. The measurement was taken at room temperature. The samples were transferred into beaker in enough volume to dip the electrode, after which the button was pressed and the scale was set before the conductivity of each sample was then noted.

D. **Total Hardness**

1 ml of hardness buffer solution was added to 50 ml of water sample followed by the addition of 1 to 2 drops of indicator. Then, this solution is titrated against versenate solution (EDTA solution) from burette, end point reddish to blue colour.

E. **Alkalinity**

Alkalinity is the measure of hydroxide and carbonate ion content of water sample. Water sample is titrated with standard H_2SO_4 using indicator. Pink colour of solution changes to colourless. This is the indication of end point.

F. **Chlorides:**

A solution of potassium chromate is used as indicator. Chlorides are precipitated as brick red in the solution because silver ion reacts with chloride ion forming brick red precipitate of AgCl, end point is the brick red coloration.

G. Dissolved Oxygen:

Add 3 ml of 50% hydrochloric acid, by inserting the pipette tip close to the settled precipitate in DO bottle. Stopper the bottle immediately and shake vigorously till all the precipitate dissolves. Pipette out 50 ml of the clear solution in a conical flask and titrate against thiosulphate solution from the burette using starch as an indicator.

H. Sulphates

Sulphate present in water can be measured by using Napthalometer. Measure the turbidity of sample-blank, a sample in which no $BaCl_2$ is added. Prepare SO_4^{2-} standards at 5 mg/L increments in the range of 0 to 40 mg/L. Determine turbidity of standards and draw calibration curve between turbidity and SO_4^{2-} concentration, mg/L. By using the calibration curve determine the concentration of sulphate sample water.

I. Nitrite

Place the analysis sample in a volumetric flask of 100 ml and fill to approximately 80 ml. Add 2 ml Na^{2-}EDTA solution, 5 ml sulfanilamide solution and 2 ml hydrochloric acid. Add after 3 min 1 ml N-(1-Naphtyl)ethylenediamine-dihydrochloride solution. Fill up to the graduation mark and mix. Make a calibration graph of 5 solutions with known nitrite content, prepared from the standard nitrite solution. By using the calibration curve determine the concentration of sulphate in sample water.

J. Phosphate :

A series of 0.1 to 0.6 ppm standard phosphate solutions are prepared with 0.5 ml of 0.387M Ammonium molybdate and 3ml of 0.25N sulfuric acid .Make a calibration graph between standards and absorbance. By using this graph calculate the phosphate in sample water.

K. Nitrates:

Add 1 mL HCl to 50 mL clear/filtered sample. Prepare calibration standards in the range of 0-7 mg NO_3^- standard solutions. Determine absorbance of standards and draw calibration curve between absorbance and NO_3^- concentration, mg/l using spectrophotometer.

IV. SAMPLING AREAS

All the sampling points are selected on National highway of Anakapalli city. All these areas are below 5 Km radius distance from Anakapalli city. Nearly 20,000 peoples are living in these areas. From the Anakapalli city the distance of Sirasapalli and Pisinikada are 5Km, Kothuru is 4 Km, N.G.O's Colony is 4Km, Koppaka is 3Km, Ummalada is 2Km and Sunkarametta is 1Km. The analysis of these sampling areas are given below

V. RESULT AND DISCUSSION

The physical and chemical analysis results of sampling are are given table 1 and table 2. In this all physical and chemical parameter results are in between the Indian standards 10500:2012.

Parameter	Indian Standards 10500:2012		Sirasapalli	Kothuru	Koppaka	Sunkarametta	Ummalada	N.G.O's Colony	Pisinikada
	Desirable limits	Permissible limits							
pH	6.5-8.5	No relaxation	6.5	7.5	7.4	7.4	7.3	7.5	7.7
Conductivity	0.005S	0.05S	0.7	1.3	1.7	2.2	0.5	3.6	2.2
Colour	5	25	<2	<2	<1	<2	<1	<2	<1
Turbidity (NTU)	5	10	3	2	2	3	2	2	3
TDS	500	2000	80	84	76	90	71	95	90
Odour	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
Temperature	---	---	27^0C	27^0C	27^0C	29^0C	28^0C	27^0C	28^0C
Taste	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable

Table 1: Physical parameters of sampling water areas

Table 2: Chemical parameters of sampling water areas

S.No	Parameter	Indian Standards 10500:2012		Sirasapalli	Kothuru	Koppaka	Sunkarametta	Ummalada	N.G.O's Colony	Pisinikada
		Desirable limits mg/l	Permissible limits mg/l							
1	**Dissolved Oxygen**	**4.0**	**7.0**	2.7	3.8	7.2	1.8	3.2	2.4	4.8
2	**Total Hardness**	**200**	**600**	200	310	400	530	130	560	320
3	**Calcium**	**70**	**200**	100	100	220	200	70	180	140
4	**Magnesium**	**30**	**300**	100	210	180	330	60	380	180
5	**Alkalinity**	**200**	**600**	99	99	198	198	88	264	209
6	**Chloride**	**250**	**1000**	46	103	170	266	25	507	206
7	**Nitrite**	**0.1**	**0.4**	0.12	0.05	BDL	0.12	BDL	0.14	BDL
8	**Phosphate**	**------**	**-------**	16	10.9	11.9	8.4	11.2	8.6	8.7
9	**Nitrate**	**45**	No relaxation	22	25	30	20	40	20	30

All parameters are expressed in terms of ppm except pH and Conductance

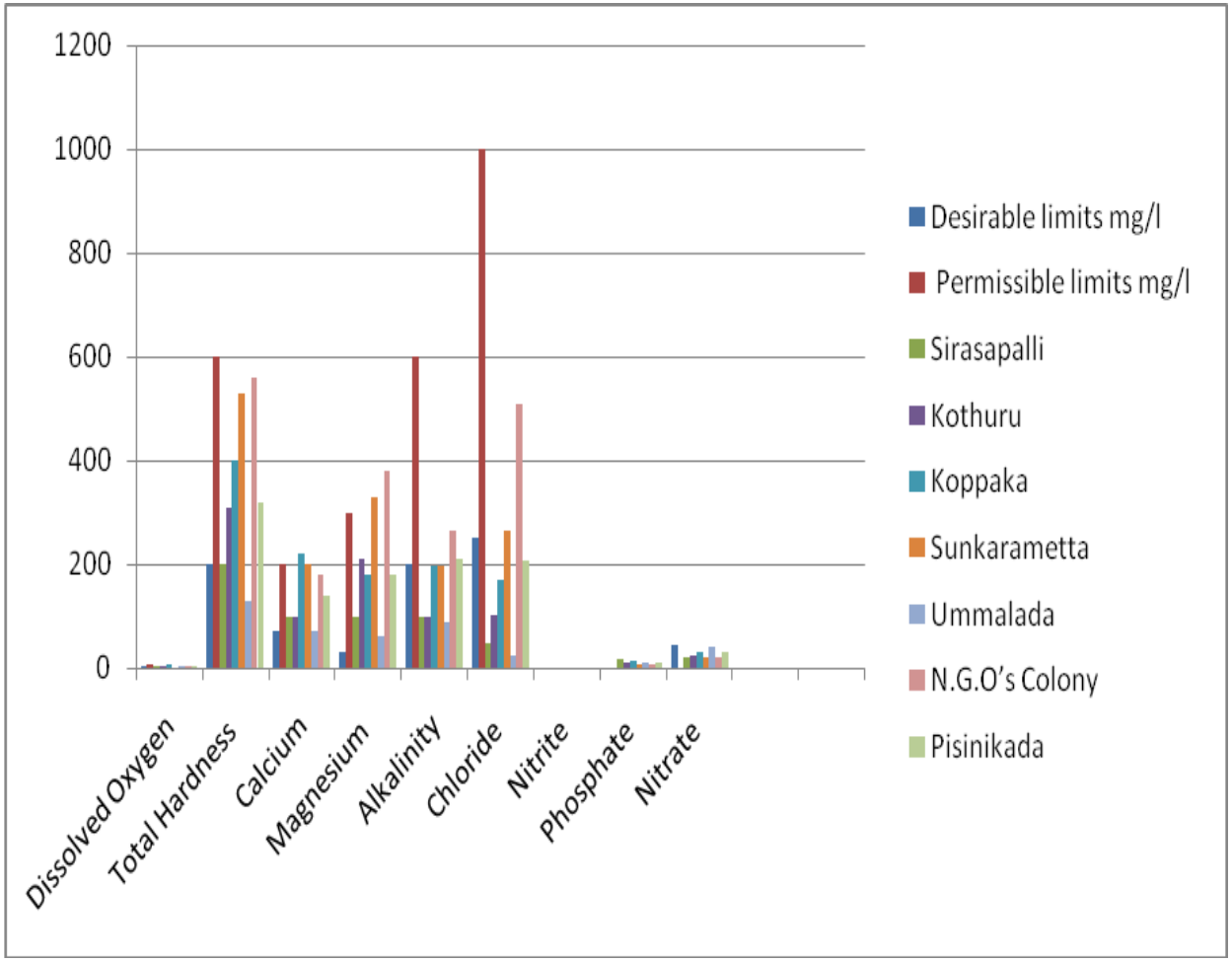

Fig.1: Comparison of Chemical parameters with Indian Standard limits.

VI. CONCLUSION

The sources of drinking water supply are public pipe borne water and underground supply system through sinking of boreholes and dug wells. However, underground supply system (boreholes and wells) accounted for the highest source of drinking water supply. Only 10% of the population had access to constant supply of public pipe borne water. To assess the quality of water for these samples each parameter was compared with the standard desirable limits prescribed by Bureau of Indian Standards [16]. The results of the present research work show that drinking water collected from various stations on national highway of Anakapalli city, Visakhapatnam district was found to be suitable to human health.

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