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## Evaluation of Water Quality in the Vicinity of Amudalavalasa, Srikakulam District, Andhra Pradesh.

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### ABSTRACT

Physico – Chemical analysis of surface well and bore water samples from eight sampling stations in Amudalavalasa, Srikakulam Dt., A.P. has been carried out during different seasons for a period of one year (2011). 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, 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 – fluoride, TDS, DO and E. coli were found above the prescribed limits.

**Keywords:** water quality parameters – Amudalavalasa- Srikakulam

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## INTRODUCTION

In view of tremendous growth in population and economic development people are facing a serious problem of natural resources such as fresh air and water etc[1]. It is a well known fact that water is essential for the survival of any form of life.. All biochemical reactions in the biological systems take place in water medium. It is estimated that 97% of the rainfall is used for agriculture, 3% for domestic use and 1% for industrial activity. However, strictly speaking chemically pure water does not exist for any appreciable length of time , pure water is considered to that which has low dissolved or suspended solids and obnoxious gases as well low in biological life[2]. Such high quality of water may be required only for drinking purposes while for other uses like agriculture and industry, the quality of water can be quite flexible and water polluted up to certain extent in general sense can be regarded as pure[3]. Indiscriminate discharge of waste water into natural water resources to such an extent, the water would become unfit for further use. 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 eight stations [namely- S<sub>1</sub>-Thogaram, S<sub>2</sub>-Dusi Railway station ,S<sub>3</sub>- Kalivaram S<sub>4</sub>- Peersahabpeta and S<sub>5</sub>- Muddhada peta , S<sub>6</sub>-Boddepalli, S<sub>7</sub> -Belamam and S<sub>8</sub>-Raagolu in the vicinity of Amudalavalasa , Srikakulam Dt. AP.

## MATERIALS AND METHODS

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].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 4.

### 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 26.8to 29.3<sup>0</sup> 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 trihalo methanes which are toxic [7]. The pH values of the present investigation were within the levels [8] as per Indian standards (7.29-8.12)

**Table – 1; Physico – Chemical Parameters of Water Samples collected in different seasons (2012)**

Parameter(min-max)	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>	S <sub>5</sub>	S <sub>6</sub>	S <sub>7</sub>	S <sub>8</sub>
Temperature °C	27.2-28.2	27.0-29.1	26.9-28.5	27.5-28.5	27.2-28.8	26.8-29.0	27.7-28.9	27.2-29.3
pH	7.29-7.89	7.45-8.02	7.63-7.82	7.51-7.76	7.42-7.87	7.50-8.03	7.25-7.92	7.74-8.12
EC(µmhos/cm)	347-538	441-1072	382-874	315-712	388-970	368-762	354-822	408-902
TDS	211-463	393-664	293-559	232-476	365-619	315-538	263-576	315-594
Hardness	83-205.	118-237	104-218	95-119	102.-267	97-228.	106-242	91.-214
Chloride	53-76	82-241.	114-205	102-232	86.-207	94-217	78-125	67-188
DO	4.2-4.9	3.8-5.2	4.2-5.0	4.0-5.3	4.0-4.9	3.2-5.0	3.6-4.9	4.0-5.2
BOD	2.2-5.2	1.8-3.6	1.5-4.2	4.2-4.9	4.2-5.6	1.2-4.7	1.4-4.2	4.0-4.9
COD	1.8-4.0	2.2-4.5	1.8-3.5	1.4-3.2	2.4-4.2	2.0-4.8	3.2-5.0	2.8-4.8
Sulphate	7.2-38.9	21-81	15.-102	30.2-96.5	17.2-76	36.5-72.8	8.5-43.7	22.4-70.5
Alkalinity	73.5-113	109-243	99-202.5	176-213	94.6-179	101.-226	76.9-172	91.8-182
Nitrate	0.94-4.2	1.3-15.2	1.12-8.5	1.6-18.4	0.79-11.2	0.68-12.9	1.3-5.5	0.7-6.3
fluoride	0.65-0.12	BDL	0.22-0.49	0.41-0.87	0.18-0.53	0.15-0.42	BDL-0.33	0.31-0.48
Ecoli/General coliform[No./100ml]	BDL-1/10	BDL /12	BDL /18	BDL-2/20	BDL-1/13	BDL-2/23	BDL-1/14	BDL 1/18

**Table – 2: Analysis of heavy metals for Water Samples Collected in summer season**

Parameter	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>	S <sub>5</sub>	S <sub>6</sub>	S <sub>7</sub>	S <sub>8</sub>
Fe	0.031	0.05	0.039	0.086	BDL	0.32	0.21	0.14
Cr	BDL	0.025	BDL	0.042	BDL	0.019	Nil	Nil
Cu 0.05	0.03	0.012	0.04	0.016	0.022	0.028	0.018	0.033
Hg	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Mn	0.031	0.05	0.039	0.08	BDL	0.032	0.021	0.014
Zn	0.14	0.22	0.17	0.56	0.14	0.10	0.28	0.32

Al, Hg and Pb are found Below Detectable Limit BDL

**Table – 3: Analysis of heavy metals for Water Samples Collected in rainy season**

Parameter	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>	S <sub>5</sub>	S <sub>6</sub>	S <sub>7</sub>	S <sub>8</sub>
Fe	0.064	0.042	0.013	0.078	0.15	0.25	0.16	0.18
Cr	BDL	0.035	BDL	0.032	0.014	0.022	BDL	Nil
Cu	0.033	BDL	0.034	0.021	0.030	0.038	0.026	0.040
Mn	0.024	0.058	0.036	0.06	0.026	0.035	0.027	0.018
Zn	0.10	0.28	0.32	0.43	0.14	BDL	0.22	0.39

**Table – 4: Analysis of heavy metals for Water Samples Collected in winter season**

Parameter	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>	S <sub>5</sub>	S <sub>6</sub>	S <sub>7</sub>	S <sub>8</sub>
Fe	0.08	0.01	0.02	0.06	BDL	0.03	0.19	0.14
Cr	BDL	BDL	BDL	BDL	BDL	Nil	Nil	Nil
Cu	BDL	0.022	BDL	0.027	0.019	0.024	BDL	BDL
Mn	BDL	0.045	0.027	0.053	0.030	0.041	0.029	0.036
Zn	0.12	0.18	0.26	0.36	0.11	0.032	0.33	0.41

### Electrical conductivity

Its value depends on the concentration and degree of dissociation of the ions as well as the temperature and migration velocity of the ions in the electric field.. Thus, as concentration of dissolved salts increases conductivity also increases. It depends upon the presence of ions, their total concentration, mobility, valence and temperature. Many dissolved substances may produce aesthetically displeasing colour, taste and odour. The data obtained are in the range 315  $\mu$ mhos/cm to 1072  $\mu$ mhos/cm.

### 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 may produce aesthetically displeasing color, taste and odour [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 211 mg/lit to 664 mg/lit.

### 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 causing cations are calcium, magnesium bicarbonate, carbonate, chloride and sulphates. The hardness values of the present study were found to range between 83 and 267 mg/lit.

### Chloride

Chloride occurs in all types of natural waters. Excess of chloride in inland water is usually taken as index of pollution. The salts of sodium, potassium and calcium contribute chlorides in water. Large contents of chloride in freshwater is an indicator of pollution. The high concentration of chloride is considered to be an indication of pollution due to high organic waste of animal origin [11]. Chloride values obtained in the study are found in the range between 63-232 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.

Bio-Chemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) are the parameter used to assess the pollution of surface water and ground waters. The values obtained for both these parameters are well within permissible levels.

### **Alkalinity**

Alkalinity is a total measure of substance in water that has “acid-neutralizing” capacity. 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/lit is desirable for domestic use. However, in large quantities imparts bitter taste to water. In the present investigation the total alkalinity of the water samples is found in the range 73.5 to 243.0 mg/lit.

### **Sulphate**

Sulphate ion does not affect the taste of water, if present in low concentrations [12]. Sulphate cannot readily be removed from drinking water, except by expensive process such as distillation, reverse osmosis or electro dialysis. The sulphate ion concentration in the present investigation varied from 7.2-102 mg/lit.

### **Nitrate**

Generally water bodies polluted by organic matter exhibit higher values of nitrate [13] concentration of nitrate depends 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 0.68 and 18.4 mg/lit are below the permissible level as per the standards.

### **Fluoride**

In India, approximately 62 million people including 6 million children suffer from fluorosis because of high consumption of high fluoride content [14]. Excess fluoride consumption affects plants and animals. The recommended limit of fluoride in water as per standards is 1.5 mg/lit. In the present study the fluoride concentration samples (BDL-0.87mg/lit) are well below the permissible levels.

### **Total coliforms**

It includes bacteria that are found in the soil, in water that has been influenced by surface water, and in human or animal waste. Escherichia coli is commonly abbreviated E. coli is a Gram-negative, rod-shaped bacterium that is commonly found in the lower intestine of warm-blooded organisms (endo therms). Most *E. coli* strains are harmless, but some serotypes can cause serious food poisoning in humans, and are occasionally responsible for product recalls due to food contamination. The harmless strains are part of the normal flora

of the gut, and can benefit their hosts by producing vitamin K<sub>2</sub>, and by preventing the establishment of pathogenic bacteria within the intestine [15].

## Metals

Iron deficiency is quite common among people throughout the world. However iron exposure results in siderosis (mottling of lungs) [16]. Standards of iron in drinking water is 0.3mg/lit. In the present study iron content varied between Cr (VI) is more toxic than Cr(III). It is also responsible for chrome ulcer and kidney damage. The 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 [17].

Problem of Hg concentration is increasing due to extensive use of mercury containing compound, fungicides, algacides, paper pulp industry and agriculture. The result of the present study indicates the mercury content in these waters is well below the permissible levels.

The possible health hazard is associated with lead entering feed ingredients from the soil. Contamination of feeds is mostly by surface contamination of particulate matter. The toxicity of lead is attributed to the fact that it interferes with the normal function of enzymes.

Industrial sources or toxic waste sites may cause the zinc amounts in to reach levels that can cause health problems [18]. Zn content varied between BDL to 0.087 mg/lit

## CONCLUSIONS

All the parameters except TDS, fluoride and total bacterial count (slightly above) are within the limits prescribed by Indian standards. Since drinking water is a basic need, the people should consume protected water without any contamination. Hence the future generations in these areas have to take necessary steps to protect themselves from water borne diseases.

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