

CHAPTER – V

Determination of Water quality parameters

Materials and methods:

Water samples collected from eight sampling stations selected for the analysis of different parameters were given below: S₁ Piduguralla – (Well Water), S₂ Nugendla (Bore well Water), S₃ Epuru (Well Water), S₄ Vinukonda (Bore well Water), S₅ Naramalapadu (Bore well water), S₆ Bollapalli (Bore well water) S₇ Karempudi (Bore well water) and S₈ Naguleru (Bore well Water). Samples for analysis were collected in sterilized bottles using the standard procedure for grab (or) catch samples in accordance with standard methods of APHA. The analysis of various physico – chemical parameters namely pH, temperature, total hardness, alkalinity, calcium, magnesium hardness, chloride, sulphate, nitrate, fluoride, DO, BOD, COD, TDS etc., were carried out – as per the methods described ⁵ .

All the chemicals and reagents used were of analytical grade. D.D water was used for the preparation of solutions.

Results and discussion:

The results of various physico – chemical parameters for the water samples collected are presented in Tables – 1& 2 Samplings were done in an interval of three hours commencing from 08.00 hrs. of September 2009 to 08.00 hrs. of the next day.

Temperature:

Temperature of water is basically important because it effects bio-chemical reactions in aquatic organisms. A rise in temperature of water leads to the speeding up of chemical reactions in water, reduces the solubility of gases and amplifies the tastes and odours.

The highest temperature being at 17.00 hrs. and the lowest at 05.00 hrs. The average temperature of the present study ranged from 26.78 - 28.37⁰ C.

PH:

It is known that pH of water (6.5 to 8.5) does not has no direct effect. But lower value below 5.0 produce sore taste and has higher value above 8.5 and alkaline taste. The pH values of the present investigation were within the ICMR standards (7.0 – 8.5) .Electrical conductivity is an important parameter for determining the water quality for drinking and agricultural purposes.

Many dissolved substances may produce esthetically displeasing colour, taste and odour. The average values obtained are in the range 0.4 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 305 to 729 mg/l.

Hardness:

Water with Hardness above 200 mg / lit. may cause scale deposition in the distribution system and results in excessive soap consumption and subsequent scur formation. Soft water with hardness of less than 100 mg/ lit may have lower buffer capacity and more corrosive to water pipes⁶. The hardness values in the present investigation were found to range between 209.3 to 592.5 mg/lit. 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 on persons un accustomed to it⁷. In the present study calcium and magnesium contents are found in the range of 49.3 – 198.8 and 25.82-76.2 mg/lt respectively.

Chloride:

Chloride occurs in all types of natural waters. 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 (212.4 mg /lt) in S₁ sampling station than other stations.

Fluoride:

The major sources of fluoride in ground water are fluoride bearing rocks such as fluorspar, cryolite, fluorspatite and hydroxylapatite etc. In India , approximately 62 million people including 6 million children suffer from fluorosis because of high consumption of high fluoride content⁸. Excess fluoride consumption affects plants and animals. The fluoride concentration in the water samples (0.18-2.25mg/lt) are above the permissible limits.

Bio-Chemical Oxygen Demand (BOD) & Chemical Oxygen Demand (COD) :

BOD & COD are the parameters used to assess the pollution of surface water and ground waters. Both of these parameter (BOD & COD) values obtained in the present study are within permissible levels (Table 1 & 2)

Sulphate:

Sulphate ion if present in excess amount produce cathartic effect upon human beings⁹. The sulphate ion concentration of the present study varied from 72.8-156.5 mg/lt.

Alkanity:

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 108.5 to 198.6 mg/lit.

Nitrate:

Nitrate is the most important nutrients in an ecosystem. The maximum value for the nitrate observed at 5.00 hrs. While minimum at 20.00 hrs. Which is inversely related to surface water temperature (Table-3). Generally water bodies polluted by organic matter exhibit higher values of nitrate¹⁰. In the present study water samples from different sampling point stations (s₁ to s₈) showed low concentrations of nitrate (1.08 to 2.47 mg/lit) well below permissible levels as per the standards.

Dissolved Oxygen (DO):

It is an important parameter which is essential to the metabolism of all aquatic organisms that possess aerobic respiration. Presence of DO in water may be due to direct diffusion from air and photosynthetic activity of autotrophs¹¹. Oxygen can be rapidly removed from the waters by discharge of oxygen demanding wastes. The DO values obtained in the present study are within ICMR standards.

Conclusion:

The fluoride content is beyond the limit prescribed by ICMR standards. Since drinking water is a basic need, the people should consume protected water containing fluoride within the prescribed limits. Hence the future generation in these areas will be protected from attacking dental and skeletal fluorosis

Table – 1**Physico – Chemical Parameters of Water Samples Collected on 11-08-2009**

parameter	S ₁	S ₂	S ₃	S ₄	S ₅	S ₆	S ₇	S ₈
Temperature °C	28.08	26.90	28.03	27.84	28.32	27.02	27.82	27.50
pH	7.65	7.68	7.35	7.93	7.84	7.80	7.82	7.60
Electrical Conductivity	1.3	1.9	0.4	1.8	0.5	0.5	1.7	1.6
TDS	580	729	305	632	365	385	690	572
TSS	57.9	42.0	46.2	39.6	26.7	22.7	34.7	57.0
Hardness	592.5	304.2	220.4	340.6	238.6	289.6	478.6	489.4
Calcium	157.2	126.1	85.4	159.3	89.04	129.2	198.8	94.2
Magnesium	68.5	56.0	27.0	66.0	25.7	48.5	66.6	32.4
Chloride	89.2	68.7	103.7	126.3	92.3	115.2	142.7	96.3
DO	5.2	4.0	5.0	4.5	5.7	4.6	4.3	4.5
BOD	1.6	0.5	1.2	0.7	0.8	0.8	0.9	0.7
Sulphate	130.8	82.0	142.2	135.0	73.4	128.5	156.5	129.0
Alkalinity	198.6	156.0	108.5	122.5	162.3	160.4	140.4	115.8
Nitrate	2.47	2.03	1.80	2.13	1.22	1.65	2.25	2.10
COD	5.2	5.8	3.2	5.3	6.0	4.9	6.2	5.2
Iron	0.002	0.004	0.004	0.001	0.002	0.003	0.004	0.005
Fluoride	1.24	1.48	0.38	2.06	2.25	0.18	1.65	1.20

All the parameters expressed in mg/lit. except pH and EC (mmhos)

- All the values are the average of 3 determinations.

Table – 2**Physico – Chemical Parameters of Water Samples Collected on 14-09-2009**

parameter	S ₁	S ₂	S ₃	S ₄	S ₅	S ₆	S ₇	S ₈
Temperature ⁰ C	28.13	27.12	27.05	28.20	27.09	27.04	28.37	26.78
pH	7.16	8.11	7.85	8.06	8.14	7.57	7.8	7.58
Electrical Conductivity	0.5	1.4	0.6	0.5	1.8	1.7	1.8	0.8
TDS	408	543	415	396	548	584.	576	474
TSS	63.2	47.2	48.4	58.3	68.3	58.4	53.2	42.3
Hardness	515.8	408.7	232.4	209.3	290.3	248.0	387.5	368
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	212.4	163.4	69.05	74.3	67.6	79.4	89.2	80.4
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	146.8	130.8	143.7	138.9	149.7	78.2	1.36	98.5
Alkalinity	133.4	168.5	117.9	153.4	183.3	132.6	141.0	113.6
Nitrate	2.21	1.38	1.08	1.61	1.23	1.82	1.55	2.07
COD	5.7	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	1.25	0.43	0,96	2.08	1.43	1.78	1.30

All the parameters expressed in mg/lit. except pH and EC (mmhos)

- All the values are the average of 3 determinations

Table – 3
Mean values of Physico –Chemical Parameter of Water samples

S. No.	parameter	8.00 hrs	11.00	14.00	17.00	20.00	23.00	2.00	5.00	8.00 hrs
1	Temperature °C	27.84	28.50	29.38	29.35	28.52	28.05	27.85	27.24	27.83
2	D.O	4.20	4.56	4.80	4.62	4.54	4.40	4.23	4.13	4.20
3	Nitrate	1.08	0.96	0.82	0.62	0.54	0.72	1.03	2.30	1.08

Table-4
Parametric ratios of water samples

parameter	Minimum	Maximum	Average	Parametric ratio	Values found
Temperature	26.78	28.37	27.575	pH / TDS	0.05337
pH	7.16	8.14	7.65	pH / Cl	0.19696
Electrical Conductivity	0.4	1.9	1.5	pH / AlK	0.1796
TDS	305	729	517	pH / Cal	0.2223
TSS	22.7	68.3	45.5	pH / DO	5.685
Hardness	209.3	592.5	400.9	pH / COD	5.8053
Calcium	49.3	198.8	124.05	Ec / Cal	0.00927
Magnesium	25.8	76.2	48.05	Ec / Cl	0.008214
Chloride	67.6	212.4	140.0	Ec / SO ₄	0.010004
DO	4.0	5.7	4.85	Cl / TDS	0.2708
COD	3.2	6.3	4.75	H / TDS	0.7754
Sulphate	73.4	156.5	114.95	----	-----
Alkalinity	108.5	198.6	153.55	-----	----
fluoride	0.18	2.25	1.215	----	-----