

# ASSESSMENT OF GROUND WATER QUALITY PARAMETERS AT KANIGIRI MANDAL, ANDHRA PRADESH, INDIA.

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**Abstract**— This paper mainly deals with the estimation of quality of various physico-chemical parameters of ground water at Kanigiri Mandal, Prakasam Dist., Andhra Pradesh. For this study, we have collected water samples from various locations of the Kanigiri Mandal. And the various physico-chemical parameters of those samples like, pH, acidity, chlorides, electrical conductivity, total hardness, alkalinity, total solids and fluorides were analysed at the laboratory. All these parameters were within permissible limits and some were beyond the permissible limits. So, particular treatment methods also suggested at the end of this article to make those ground waters as drinkable and suitable for various purposes.

**Keywords**— Ground water, Acidity, Alkalinity, Chlorides, De-fluoridation, Fluorides, IS 10500:2012, Total hardness.

## I. INTRODUCTION

### A. General

The water which is available under the earth surface, in the pores of soils and in aquifers is called as ground water. The main source of ground water is infiltration of atmospheric precipitation and surface water of rivers, lakes and ponds. The ground water analysis for physical and chemical properties is very important for public health studies. These studies are also a main part of pollution studies in the environment.

### B. Ground water parameters

The quality of ground water generally depends upon its physical and chemical properties. So, the quality analysis mainly depends upon concentrations of various physical and chemical parameters of ground water. There is no probability to live microorganism in ground water, so ground is safe from biological activities. The physical parameters of ground water upon which the ground water quality depends are: water temperature, specific conductance, turbidity and colour. The chemical parameters of ground water which affect the ground water quality are: pH, total hardness,

chlorides, acidity and alkalinity, various types of dissolved gases, dissolved minerals and fluorides. The concentrations of each parameter will vary with place to place due to their geological conditions and physical and chemical properties of soils.

### C. Ground water scenario in India

India experiences an average precipitation of 1,170 millimeters (46 in) per year, or about 4,000 cubic kilometers (960 cu mi) of rains annually or about 1,720 cubic meters (61,000 cu ft) of fresh water *per person* every year. Some 80 percent of its area experiences rains of 750 millimeters (30 in) or more a year. However, this rain is not uniform in time or geography. Most of the rains occur during its monsoon seasons (June to September), with the north east and north receiving far more rains than India's west and south. The melting of snow over the Himalayas after winter season feeds the northern rivers to varying degrees. The southern rivers experience more flow variability over the year. For the Himalayan basin, this leads to flooding in some months and water scarcity in others. India harnessed 761 cubic kilometers (183 cu mi) (20 percent) of its water resources in 2010, part of which came from unsustainable use of groundwater. Of the water it withdrew from its rivers and groundwater wells, India dedicated about 688 cubic kilometers (165 cu mi) to irrigation, 56 cubic kilometers (13 cu mi) to municipal and drinking water applications and 17 cubic kilometers (4.1 cu mi) to industry.

### D. Drinking water standards

In India, the standards for public water supplies are laid down by the recommendations of the Environment Hygiene committee (1949). These

very old standard recommendations have further been utilised by the Bureau of Indian Standards in formulating the Indian Standard drinking water specifications (1991), and again modified those specifications in 2012. Table-1 gives the specifications for drinking water standards by Bureau of Indian Standards and tabulated in IS 10500:2012.

TABLE I  
 IS SPECIFICATIONS FOR DRINKING WATER

S. No.	Characteristic of substance	Desirable limit	Permissible limit in the absence of alternate source
1	Colour	20 Hazen units	25 Hazen units
2	Odour	Unobjectionable	-
3	Taste	Unobjectionable	-
4	Turbidity	5 NTU	10 NTU
5	pH	6.5 to 8.5	-
6	Total hardness	300 mg/l	600 mg/l
7	Iron	0.3 mg/l	1 mg/l
8	Chlorides	250 mg/l	1000 mg/l
9	Fluorides	1 to 1.5 mg/l	-
10	Dissolved solids	500 mg/l	1500 mg/l
11	Magnesium	30 mg/l	100 mg/l
12	Calcium	75 mg/l	200 mg/l
13	Copper	0.05 mg/l	1.5 mg/l
14	Manganese	0.1 mg/l	0.3 mg/l
15	Alkalinity	200 mg/l	600 mg/l

#### STUDY AREA

For the present study work, we chosen Kanigiri Mandal as the study area. Kanigiri is a Mandal in Prakasam District of Andhra Pradesh State, India. Kanigiri Mandal Head Quarters is Kanigiri town. It belongs to Andhra region. It is located 68 KM towards west from District headquarters Ongole. 289 KM from State capital Hyderabad towards North. Kanigiri consist of 104 Villages and 29 Panchayats. It is in the 156 m elevation(altitude). In the Kanigiri Mandal, various number of samples of

ground waters has been collected and tested in the laboratory.

#### EXPERIMENTAL METHODOLOGY

##### A. Collection of ground water samples

From some selected villages of Kanigiri Mandal, the samples of ground water were collected on 8<sup>th</sup> February 2018 at various times. Talbe-2 gives the places and respective times of sampling of ground waters. And the temperatures of those samples were measured by using thermometers at the time of collection.

TABLE III  
 VILLAGES/LOCATIONS OF SAMPLES COLLECTION

S.No.	Sample No.	Name of the village/ Location of sampling	Time
1	S-1	Kanigiri	10:20 PM
2	S-2	Chintala Palem	11:40 PM
3	S-3	Gaarla Peta	12:30 PM
4	S-4	Kothuru	01:45 PM
5	S-5	Mogalluru	03:00 PM
6	S-6	Chakirala	3:15 PM
7	S-7	Kasireddy Nagar	4:20 PM

##### B. Tests were conducted on those samples

After one day of sampling the ground waters from locations mentioned in talbe-2, those samples were brought into the Environmental Engineering lab at QIS Institute of Technology, Ongole, India. And then, the physical and chemical parameters were measured by using the BIS recommended procedures are: pH, Turbidity, Alkalinity, Total Hardness, Total Solids, Chlorides, Fluorides, Colour, Temperature and Acidity.

#### RESULTS AND DISCUSSIONS

The concentrations of various physical and chemical parameters of those collected samples, explained as following sections and tabulated in table-3.

TABLE IIIII  
 RESULTS OF ANALYSIS

Characteristic/ Parameter	S-1	S-2	S-3	S-4	S-5	S-6	S-7
pH	5.69	5.54	5.94	5.80	6.15	5.88	5.67
Turbidity (NTU)	7	8	10	6	4	6	6
Alkalinity (mg/l)	84	96	115	95	125	136	97
Total Hardness (mg/l)	215	135	110	265	340	265	195
Total Solids (mg/l)	26	225	365	275	355	320	340
Chlorides (mg/l)	83	107	75	55	40	60	23
Fluorides (mg/l)	5.2	4.6	3.2	3.3	4.4	4.1	3.5
Colour (Hazen's units)	8	2	2	4	5	4	6
Temperature (°C)	25	21	26	25	25	22	24
Acidity (mg/l)	200	85	130	25	60	85	60

#### A. pH

pH value is the indication of nature of water either acidic, alkaline or neutral. pH also used to denote the quantity of pollution caused by acidic or basic type of contaminations. The pH values of all samples were found in the range of 5.54 to 6.15. This much of values shows, all samples are acidic in nature. when compared with BIS standards of drinking water, these waters are not suitable for drinking purpose.

#### B. Turbidity

Turbidity is the indication of presence of suspended matter present in water. The turbidity of these tested samples found in between 6 to 10 NTU. As per IS 10500:2012 recommendations, the permissible limit of turbidity for drinking water is 5 to 10 NTU. Hence, we suggest that, these waters are suitable for drinking purpose.

#### C. Alkalinity

Alkalinity is the nature of water, which can be eliminated by adding acids. The alkalinity is mainly caused due to the presence of hydroxyl, carbonate and bicarbonate ions in water. The alkalinity of these tested samples found in between 84 to 136 mg/l. As per IS 10500:2012 recommendations, the permissible limit of alkalinity for drinking water is

200 mg/l. Hence, we suggest that, these waters are suitable for drinking purpose.

#### D. Total Hardness

Hardness is the most important parameter for ground waters for using them in various purposes. Mainly hardness is caused due to the dissolution of various types of metallic cations like calcium and magnesium in waters. The total hardness of these tested samples found in between 110 to 340 mg/l. As per IS 10500:2012 recommendations, the permissible limit of hardness for drinking water is 300 mg/l. Hence, we suggest, all the samples are suitable for drinking purpose, except one sample-7. But however, it's value not longer than the permissible limit.

#### E. Total Solids

The total solids of these tested samples found in between 26 to 365 mg/l. As per IS 10500:2012 recommendations, the permissible limit of hardness for drinking water is 500 mg/l. Hence, we suggest, all the samples are suitable for drinking purpose.

#### F. Chlorides

The concentration of chlorides in waters generally depends upon the dissolution of salts. The chlorides present in water in the form of salts only. The chlorides concentration in these samples, being from 23 to 107 mg/l. As per IS 10500:2012 recommendations, the permissible limit of chlorides concentration in drinking water is 250 mg/l. There, all these waters are safe for drinking.

#### G. Fluorides

The concentration of fluorides in these tested samples found in between 3.2 to 5.2 mg/l. As per IS 10500:2012 recommendations, the fluorides concentration in drinking water should be in between 1 to 1.5 mg/l. Hence, we conclude, all the samples are not suitable for drinking purpose. If these waters are used for drinking purpose, fluorosis will be attacked. These waters are very dangerous.

#### H. Colour

The colour of all these samples being within permissible limits and is not objectionable. We

suggest that, in the sense of their appearance or colour, these waters are safe for drinking purpose.

#### *I. Temperature*

Temperature of ground water contains no longer variations during entire year. The measurement of temperature will not have any practical significance. Anyhow, all these samples having temperatures near room temperatures.

#### *J. Acidity*

Acidity is the nature of water, which can be eliminated by adding bases. Acidity to ground water mainly due to the presence of minerals and dissolved carbon di oxide gas. The acidity of the sample is more than 50 mg/l are not suitable for construction purpose. The higher concentration of acidity in drinking water will cause many health effects. However, we suggest that, all these samples are suitable for drinking purpose in the sense of their acidity only.

#### CONCLUSIONS

The following conclusions were drawn from the present study:

- As per the results of pH tests, all these ground water are slightly acidic in nature.
- Rock weathering is the natural geogenic source influencing the groundwater chemistry. Anthropogenic sources are the secondary origin to alter the natural groundwater quality.
- The assessment of ground water quality parameters done, by measuring various parameters like, pH, turbidity, alkalinity, Total Hardness, Total Solids, Chlorides, Fluorides, Colour, Temperature and Acidity.

From the results of all these tests suggest that, these waters are not suitable for drinking purposes. Because these waters are higher in concentration of fluorides.

- The fluorides concentrations from these waters can be removed by employing various de-fluoridation techniques as treatment. The most common methods used for removing fluorides from waters are:
  - Adsorption by activated alumina
  - Reverse osmosis
  - Ion exchange method
  - Nalgonda technique
- The study suggestions will also help for other regions that who are facing similar situations.

#### REFERENCES

- [1] "Water Supply Engineering", by B.C. Punmia, Ashok Kr. Jain, Arun Kr. Jain, Lakshmi Publications, New Delhi.
- [2] "Water Supply Engineering", by S. K. Garg, Khanna Publishers, New Delhi.
- [3] Manual on Water supply and treatment –CPHEEO, Ministry of. Urban Development, New Delhi.
- [4] Ravi Kumar GARRE., (2017), Quality analysis of surface water using physico-chemical parameters in Kandulur water pond, Kandulur, Prakasam (Dist.), Andhra Pradesh, International Journal of advanced research in engineering and management, 03(06), pp 67-69.
- [5] Sarala.C, Ravi Babu. P, (2012), Assessment of ground water quality parameters in and around Jawahar nagar, Hyderabad, International journal of scientific and research publications, 2(10).
- [6] Shubhra Singh, N. Janardhana Raju1, Ch. Ramakrishna, (2015), Evaluation of Groundwater Quality and Its Suitability for Domestic and Irrigation Use in Parts of the Chandauli-Varanasi Region, Uttar Pradesh, India, Journal of Water Resource and Protection, 2015, 7, 572-587.
- [7] Jafari A, Mirhossaini H, Kamareii B and Dehestani S, Asian J Appl Sci., 2008, 1, 87-92.
- [8] Gupta D P, Sunita and Saharan J P, Res., 2009, 1(2), 1-5.