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Seasonal Variations in Drinking Water Quality of Some Bore wells in Pedavegi Mandal of West Godavari District, Andhrapradesh, India

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Abstract: *To assess the suitability of ground water for drinking, industrial and agriculture purpose, analysis of water quality is very essential. Quality of water mainly depends upon the place of origin, movement of water through the soil etc. Natural process such as Soil water rock interactions and infiltration of agriculture run off causes changes in ground water quality directly or indirectly. In the present study, different Water samples were collected from the same bore wells located in different areas of pedavegi mandal of west Godavari district during summer season, rainy season and winter season. The water samples are analyzed for Chloride, Fluoride, and Sulphate concentrations and the results are compared with the drinking water quality standards [1]. The results reveals that significant changes in the water quality during different seasons of the year. The result also shows that, all the sources of bore water in all the seasons in the study area are Suitable for drinking purpose, yet it needs few treatments to minimize some contaminations especially fluorides which are reported to be higher than WHO standards.*

Keywords: *- Bore well water, chemical parameters, Permissible limit, Soil – rock – interactions, seasonal changes of Water quality.*

I. Introduction

Ground water is one of the important source for drinking, human activities, in addition to industrial and agriculture sectors. There are various ways through which bore water [2] gets contaminated such as use of fertilizers and pesticides manure for forming, effluent discharged from industries without proper treatment, lime, septic tank, refuse damp etc. The hydro geological conditions are also responsible for significant variations in ground water quality. The quality of the water varies from place to place, with the depth of the water table, from season to season and also the extent dissolution of dissolved solids present in it.[3,4] As the water moves through the hydrological cycle, various physical, chemical and biological processes change its original quality through reactions with soil, rock and organic matter. The present study was initiated to determine the concentrations of Chlorides, Fluorides, sulphates in summer season, rainy season and winter season. Quality of water is assessed by comparing the results with water quality parameter as prescribed by WHO. The results of the samples vary with different collecting places because of the different nature of the soil [5].

II. Study Area

Present study deals with study of various chemical parameters of drinking water collected from bore wells located in the study area of pedavegi mandal , west Godavari district. The West Godavari district consists of 46 mandals, out of which 24 mandals are upland areas and 22 mandals are delta areas. One upland mandal ,pedavegi is selected for the analysis of various parameters of bore water samples seasonally . Pedavegi is located in between 17.18358 to 17.31718 North latitude and 81.25935 to 81.45478 East longitudes.

III. Sample Collection

Twenty water samples are collected from different bore wells located in Pedavegi mandal of west Godavari district. The collected water samples are labeled. The samples are collected in a clean polythene bottle as per standard procedures recommended in APHA (1998)[6] .Samples were brought to the laboratory for analysis of various chemical parameters.

Figure 1-view of AP in India

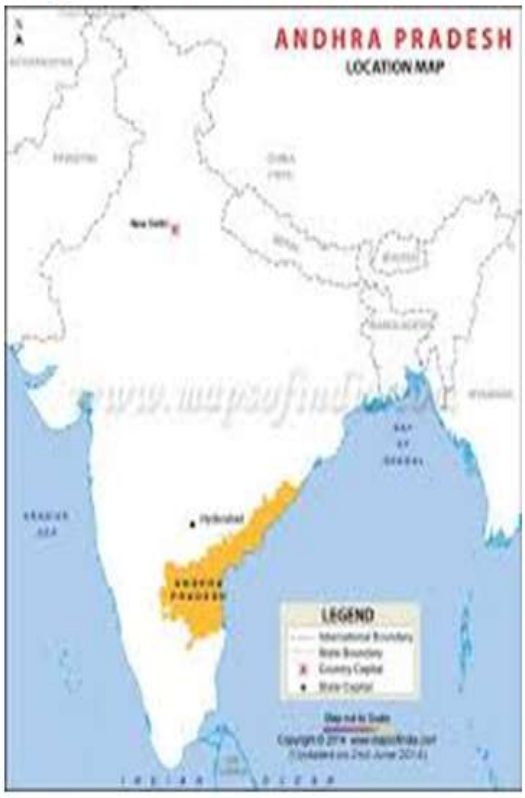
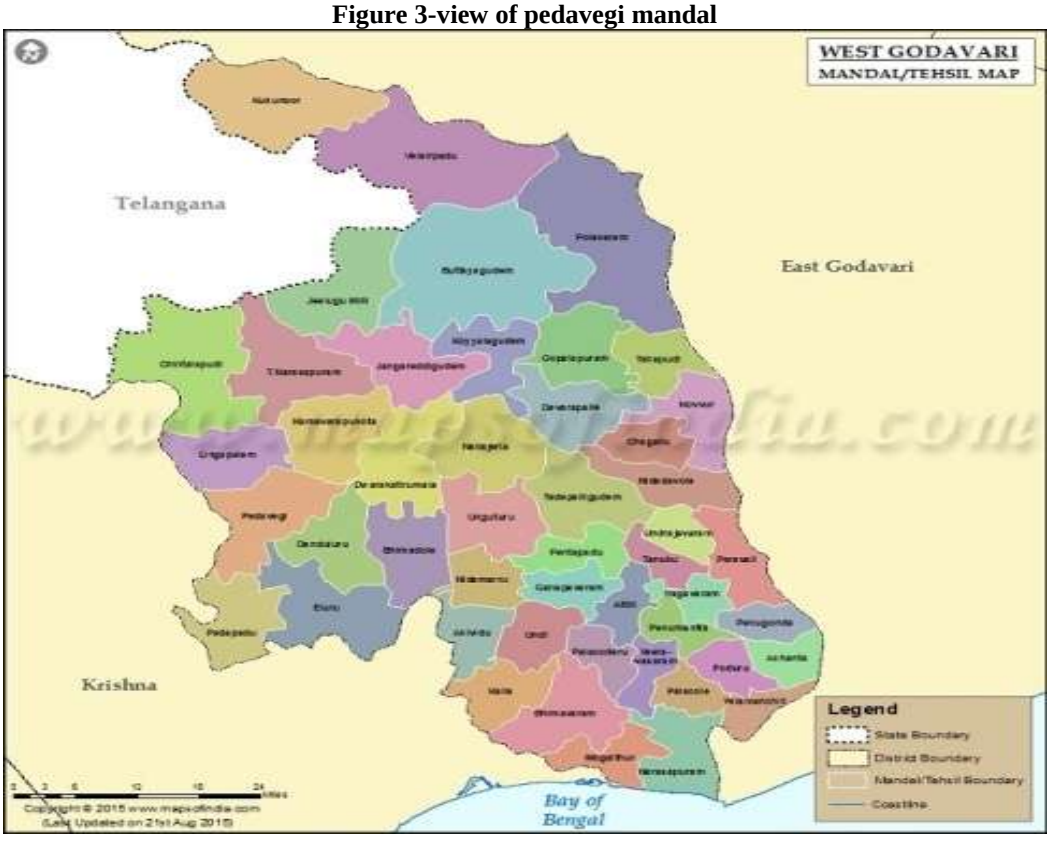


Figure 2-view of districts in AP

Figure 3-view of pedavegi mandal



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IV. Methodology

It is very important and essential to analyze the water before using for drinking, domestic, agriculture and industrial use. To assess the quality, water must be analyzed for various chemical parameters such as chloride, fluoride, sulphate etc. The results were compared by WHO standards for drinking water. The results revel that te water is safe for drinking and other domestic purpose in the study area.

Flourides, Chlorides, Sulphates.:- Flourides, Chlorides, Sulphates of water samples are measured by ion selectivity meter- Eutech 2700.

Table 1. Specifications for drinking water as per IS 10500 ; 2012 &WHO Limits

S.No	Parameter	IS 10500 2012		WHO Limits
		Higher Desirable limit	Maximum Permeable limit	
1	Chlorides	250 mg/L	600 mg/L	250 mg/L to 1000 mg/L
2	Flourides	1.0 mg/L	1.5 mg/L	1.0 mg/L to 1.5 mg/L
3	Sulphates	200 mg/L	400 mg/L	200 mg/L to 400 mg/L

V. Results and Discussion

The results obtained from analysis of different water samples of chloride concentration in summer season, rainy season and winter season are shown in table -1.
Sulphate concentration in summer, rainy and winter seasons are shown in table-2
Flouride concentration in summer, rainy and winter season are shown in table -3

VI. Chlorides

Chloride concentration in the studied area ranges from 43.4mg/l to 512 mg/l in the summer season, and 45.3 mg/l to 437 mg/l in the winter season and 31.7 mg/l to 480mg/l in the rainy season. Presence of chlorides in water above the permissible limit is an indicator of pollution. Higher concentrations of chlorides results from agricultural activities and dissolution of chloride from chloride containing rocks. High concentrations of chlorides have no adverse effects to human being, but it gives bad taste to water, laxative effect etc.[7,8] . The permissible limits of chlorides for drinking water are 500 mg/L. The present study indicates that the concentration of chlorides in some samples is above permissible limits.

VII. Fluoride

Fluoride concentration in the studied area ranges from 0.361mg/l to 2.06 mg/l in the summer season, and 0.458 mg/l to 1.99mg/l in the winter season and 0.218 mg/l to 1.21 mg/l in the rainy season The main source of fluoride in water is, leaching of fluoride containing minerals in to the ground water as the rain water percolates through the earth. In the present analysis Fluoride concentration was found to be varied from 0.288 to 1.99. For few samples the values are more than the permeable limits of WHO standards (1.0 to 1.5 mg/l). Soil – water – rock interactions play an important role in this regard. If the fluoride concentration is between 0.9 to 1.2 ml/l then dental flourosis is started and fluoride concentration exceeds the level of 3 mg/l skeletal flourosis is started in living beings [9,10] .

VIII. Sulphate

Small quantities of sulphates are generally found in ground water. Sulphate concentration in the studied area ranges from 2mg/l to 85 mg/l in the summer season, and 2mg/l to 84 mg/l in the winter season and 8.4 mg/l to 66.5 mg/l in the rainy season. Sulphate may come into bore water by industrial or anthropogenic additions in the form of fertilizers. All the samples analyzed for sulphate concentration in all the seasons are within the permissible limits of WHO standards. Higher concentrations of Sulphate cause Laxative effect to the children in hot weather climates [11].

Table 2.1 Flouride concentration in different bore well water samples of Pedavegi Mandal during rainy season, winter season & summer season

S.No	Sample No	Rainy season	Winter season	Summer season
01	S_1	0.601	0.476	0.399
02	S_2	0.591	0.605	0.486
03	S_3	0.788	1.260	0.970
04	S_4	0.593	0.589	1.050
05	S_5	0.871	1.110	1.000
06	S_6	0.616	0.722	0.806
07	S_7	1.190	1.990	1.920
08	S_8	1.210	1.770	2.060
09	S_9	0.352	0.562	0.484
10	S_{10}	0.860	1.290	1.000
11	S_{11}	0.532	0.915	0.806
12	S_{12}	0.218	0.458	0.361
13	S_{13}	0.402	0.626	0.486
14	S_{14}	0.700	1.050	0.924
15	S_{15}	0.486	0.679	0.609
16	S_{16}	0.652	0.760	0.920
17	S_{17}	1.250	0.695	1.650
18	S_{18}	0.465	1.090	1.250
19	S_{19}	0.288	1.970	0.394
20	S_{20}	0.338	0.904	0.455

Table 2.1Chloride concentration in different bore well water samples of Pedavegi Mandal during rainy season, winter season & summer season

S.No	Sample No	Rainy season	Winter season	Summer season
01	S_1	480	407	418
02	S_2	396	437	453
03	S_3	221	202	373
04	S_4	109	160	96
05	S_5	274	298	492
06	S_6	256	400	512
07	S_7	219	270	452
08	S_8	139	103	510
09	S_9	109	171	185
10	S_{10}	126	149	146
11	S_{11}	99.3	159	160
12	S_{12}	31.7	183	201
13	S_{13}	45.3	45.3	54.5
14	S_{14}	133	72.5	80.5
15	S_{15}	133	130	103
16	S_{16}	115	218	220
17	S_{17}	44.4	151	176
18	S_{18}	104	69.7	89.6
19	S_{19}	38.3	142	74.6
20	S_{20}	42.3	102	43.4

2.1 Sulphate concentration in different bore well water samples of Pedavegi Mandal during rainy season, winter season & summer season

S.No	Sample No	Rainy season	Winter season	Summer season
01	S_1	54.5	84	85
02	S_2	32.5	38	38
03	S_3	41.5	40	41
04	S_4	50.6	42	46
05	S_5	50.3	84	40
06	S_6	66.5	26	56
07	S_7	37.7	56	02
08	S_8	56.5	02	41
09	S_9	33.0	40	35
10	S_{10}	25.3	34	29
11	S_{11}	47.9	29	45
12	S_{12}	16.9	30	38
13	S_{13}	8.40	38	06
14	S_{14}	18.2	06	18
15	S_{15}	34.5	18	34
16	S_{16}	29.8	34	46
17	S_{17}	49.6	46	22
18	S_{18}	35.4	22	10
19	S_{19}	46.1	10	24
20	S_{20}	21.6	24	76

IX. Conclusion

The quality of bore well water collected from twenty one different locations of Pedavegi mandal is analyzed. On the basis of the analytical findings the fallowing conclusions can be drawn. The results of the samples vary with different collecting places because of the different nature of the soil. The present study indicates that the concentration of chlorides in some samples is above permissible limits. Higher concentrations of chlorides results from agricultural activities and dissolution of chloride from chloride containing rocks. For few samples the fluoride concentration is more than the permeable range of WHO standards, it will effect to the teeth and bones. All the samples analyzed for sulphate concentration in all the seasons are within the permissible limits of WHO standards. The result reveals that all the sources of bore water in all the seasons in the study area are Suitable for drinking purpose, yet it needs few treatments to minimize some contaminations especially fluorides which are reported to be higher than WHO standards.

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