

**ASSESSMENT OF GROUND WATER QUALITY IN MUKKAM, CHEPALAKANCHERU  
AND DALLIPETA: COASTAL VILLAGES OF VIZIANAGARAM DISTRICT OF ANDHRA  
PRADESH**

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**ABSTRACT :** The present work was under taken to analyze the various water quality parameters, viz. pH, electrical conductivity, total dissolved solids, total alkalinity, total hardness, chloride, calcium, magnesium, sodium, potassium and to assess the water quality in bore well and well water samples of three coastal villages Mukkam, Chepalakancheru and Dallipeta of Vizianagaram district of Andhra Pradesh. From each of the village, different sampling stations were identified and by composite sampling methods water samples were collected and analyzed for the various parameters. The results were compared with the values stipulated by World Health Organization (WHO), and ARE: 10500 for drinking water quality. In the present investigation the authors found that the overall quality of the three villages is poor and not recommended as potable.

**Keywords:** Ground water quality, Vizianagaram district, statistical approach.

## INTRODCUTION

Water is one of the most indispensable resources and is the elixir of life. Water constitutes about 70% of the body weight of almost all living organisms. Life is not possible on this planet without water. About 97.2% of water on earth is salty and only 2.8% is present as fresh water from which about 20% constitutes groundwater. Groundwater is highly valued because of certain properties not possessed by surface water.

Water quality is the physical, chemical and biological characteristics of water. It is a measure of the condition of water relative to the requirements of one or more biotic species and or to any human need or purpose. It is most frequently used by reference to a set of standards against which compliance can be assessed. The most common standards used to assess water quality relate to health of ecosystems, safety of human contact and drinking water (Goel P K, 2000). In the present study, thirteen different water quality parameters were analyzed for the water samples collected from the three coastal villages. The results were compared with IS: 10500 standards. It was found that TDS, total hardness, chloride and magnesium were beyond the prescribed standard permissible limits. Hence focusing the three parameters specially the present work was emphasized.

## EXPERIMENTAL

### Study Area

Vijayanagaram (Fig.1) district is in the north coastal districts of Andhra Pradesh, India., adjoining Bay of Bengal. It is situated within the geographical co-ordinates of 17- 15' and 19 – 15' of the northern latitudes and 83– 00' and 83-45'' of the eastern longitudes. There are 8 villages and 16 hamlets consisting of 6,993 fishermen. They are all situated in Pusapatirega and Bhogapuram mandals. Bhogapuram is a town and Mandal in Vizianagaram district of Andhra Pradesh, India. Bhogapuram is located at 18.0667°N 83.50°E.

There are 22 revenue villages and 22 panchayats in Bhogapuram mandal. For the authors present study three coastal villages of Bhogapuram mandal were selected. The villages selected are Mukkam, Dalipeta and Chepalakancheru. The geographical details are incorporated in Table.1. Chepala Kancheru (Fig.2) is a Village in Bhoghapuram Mandal in Vizianagaram District in Andhra Pradesh. It is 2.4km away from the shoreline of Bay of Bengal, 7.1 km far from its Mandal Main Town Bhoghapuram. Chepala Kancheru is located 20.5 km distance from its District Main City Vizianagaram.

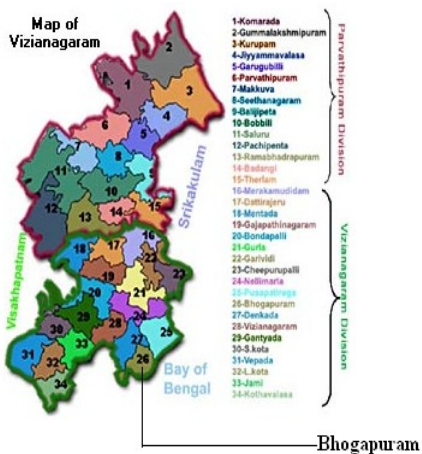


Fig.1 Vizianagaram map, Bhogapuram (26)

Fig.2 Chepala Kancheru Village under study

Table.1 sampling station information

S.NO	SS	Village	Purpose	S.NO	SS	Village	Purpose
1	BORE1	Chepala Kancheru	Drinking	8	BORE	Dallipeta	Drinking
2	BORE2		Drinking	9	BORE		Drinking
3	BORE3		Drinking	10	BORE		Drinking
4	BORE4		Drinking	11	BORE		Drinking
5	WELL1		Drinking	12	WELL		Drinking
6	WELL2		Drinking	13	WELL		Drinking
7	BORE5		Drinking	14	WELL		Drinking
15	WELL1	Mukkam	Drinking	Chepala Kancheru-18.0023N 83.3204E, 56ft  Dallipeta- 18.0032N 83.3214E, 33ft  Mukkam- 18.0019N 83.33E, 46ft			
16	BORE1		Drinking				
17	BORE2		Drinking				
18	WELL2		Drinking				
19	WELL3		Drinking				
20	BORE3		Drinking				
21	BORE4	Drinking					

Mukkam (Fig.3) is one of the Villages in Bhoghapuram Mandal in Vizianagaram District in Andhra Pradesh State. Mukkam is 2.7km away from the shoreline of Bay of Bengal, 13.4 km far from its District Main City Vizianagaram. Dallipeta (Fig.4) is one of the Villages in Bhoghapuram Mandal Vizianagaram District, Andhra Pradesh State. Dallipeta is 2.2 km away from the shoreline of Bay of Bengal 13.4 km distance from its District Main City Vizianagaram.



**Fig.3 Mukkam Village under study**



**Fig.4 Dallipeta village of understudy**

### Sampling

From each of the village aforesaid, seven sampling stations were identified and samples were collected from wells and bore wells. In totality 21 sampling stations were chosen for sample collection. Composite sampling procedures were carried out for the collection of samples. The samples were collected in clean high quality polyethylene bottles. EC, temperature, pH and DO of the collected samples were measured on spot. The present work was carried out during October 2010 to may 2011.

### Methodology

The concentration of chloride ion in water sample was determined by Mohr's method using potassium chromate as indicator. Concentrations of calcium and magnesium were determined by using EDTA with EBT and murexide as indicators. DO of the samples was determined by a DO meter with gold electrode on the spot. An ELICO scanning visible spectrophotometer (SL-177) with 1 cm glass cell was used for the determination of nitrite in the water samples. An ELICO flame photometer (CL-361) is used for the determination of sodium and potassium. For the pH measurements ELICO digital pH-meter (LI-127) and for conductance measurements ELICO conductivity meter (CM-180) was used. Standard methods of APHA (Lenore S C, et.al.1989) were used for the analysis of water samples. All the chemicals and reagents used were of Analytical grade and the aqueous solutions were freshly prepared by double distilled water.

### RESULTS AND DISCUSSION

The analysis report of the water samples of the three villages analyzed presented in Table.2 and Table.3. The results were compared with World Health Organization (WHO Guidelines of Drinking Water Quality, 3<sup>rd</sup> Edition 2004) and IS: 10500 standards (Fig.5, Fig.6, Fig.7, and Fig.8). It was found that the values of TDS, total hardness, magnesium and chloride were higher when compared to all the other parameters. During post monsoon 43% samples were found to be within desirable value, 52% beyond the desirable and 5% beyond permissible limit for chloride (Fig.9a). 10% samples were found to be within desirable value, 19% beyond desirable and 71% beyond permissible limit for Total hardness (Fig.10a). For TDS 10% of samples were found to be within desirable value, 90% beyond desirable value (Fig.11a). For magnesium 5% of samples were found within the desirable value, 52% beyond the desirable value and 43% beyond permissible limit value (Fig.12a).

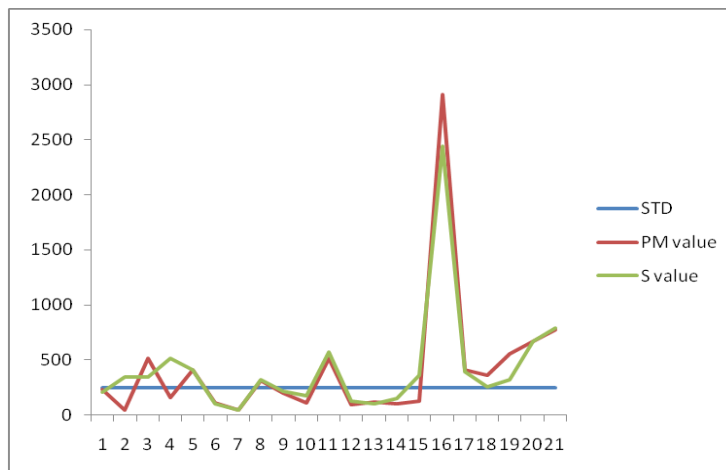


Fig.5 Comparison of chloride concentration in post monsoon and summer

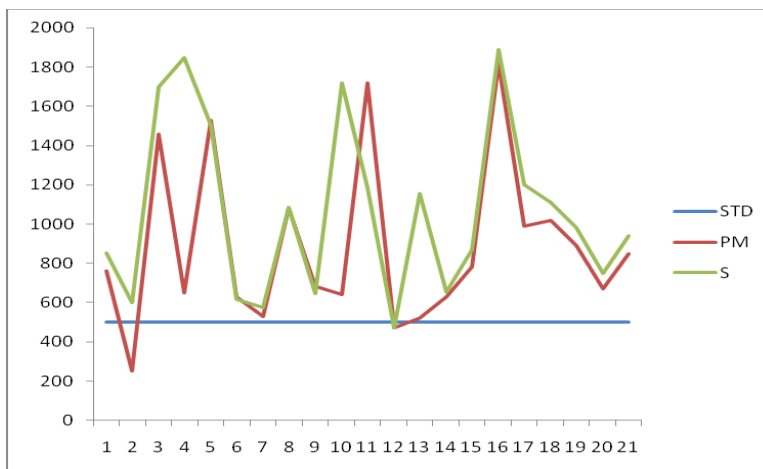


Fig.6 Comparison of TDS in post monsoon and summer

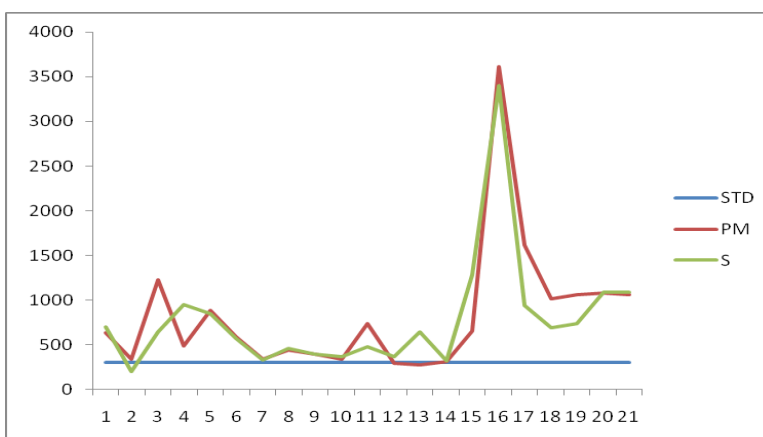


Fig.7 Comparison of total hardness of water in post monsoon and in summer

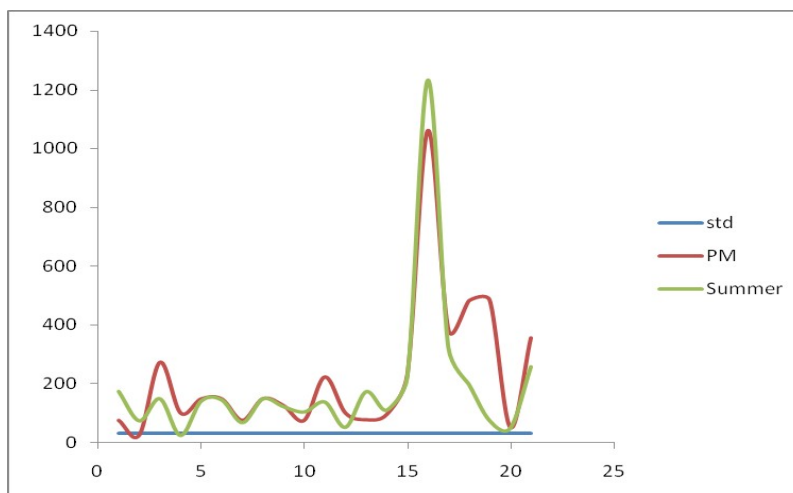


Fig.8 Comparison of magnesium in post monsoon and in summer

Table.2 Physico – chemical characterization of water during post monsoon

S.No	pH	EC	TDS	THW	Ca	Mg	Na	K	Cl <sup>-</sup>	PO <sub>4</sub> <sup>3-</sup>	NO <sub>2</sub> <sup>-</sup>	F <sup>-</sup>	DO
1	7.3	1700	760	641	242	74	85	6	233	25	0.2	0.4	
2	7.2	700	250	345	147	24	52	5	49	14	0.1	0.4	
3	7.2	2800	1460	1232	345	272	95	9	516	20	0.3	0.4	
4	7.1	1400	650	493	147	99	80	6	166	20	0.1	0.6	
5	7.2	1400	1530	887	296	147	78	5	416	18	0.1	0.2	7.2
6	7.3	800	630	592	147	147	75	5	116	16	0.4	0.2	7.4
7	7.1	600	530	345	98	74	72	6	50	16	0.1	0.4	
8	7.3	2100	1085	444	74	148	63	4	316	9	0.2	0.8	
9	7.3	1500	680	396	74	124	41	4	200	9.2	0.3	1.0	
10	7.3	1400	640	345	99	74	46	5	116	7	0.4	0.8	
11	7.8	3300	1720	740	148	222	70	4	517	9.9	0.2	0.2	
12	8.0	1200	470	296	49	99	41	3	100	9.7	0.1	0.2	
13	7.5	2600	520	278	63	76	43	4	122	9.1	0.4	0.7	6.8
14	7.6	1700	626	319	65	94	45	5	106	9.4	0.3	0.6	6.9
15	7.5	1200	1250	660	102	228	15	4	127	12	0.1	0.1	7.2
16	7.3	8800	1180	3610	736	1062	65	1	2907	16	0.1	0.2	
17	8.0	3000	1475	1016	124	381	34	1	415	12	0.1	0.1	
18	7.6	2300	1285	1016	75	482	27	1	365	8	0.1	0.4	7.8
19	8.0	3000	1120	1067	51	483	56	2	557	9	0.1	0.1	7.5
20	7.5	3000	1050	1085	425	50	34	3	660	17	0.1	0.1	
21	7.6	2500	1250	1075	425	355	42	3	665	13	0.1	0.1	
STD	6.5-8.5	500	500	300	75	30	200	10	250	5	1.0	1.2	4-8
PL	9.2	2000	2000	600	200	100			1000			1.5	



Table.3 Physico – chemical characterization of water during summer

S.No	pH	EC	TDS	THW	Ca	Mg	Na	K	Cl <sup>-</sup>	PO <sub>4</sub> <sup>3-</sup>	NO <sub>2</sub> <sup>-</sup>	F <sup>-</sup>	DO
1	7.5	600	850	697	174	174	74	5	207	24	0.3	0.4	
2	7.2	1600	600	199	74	74	42	3	35	19	0.1	0.2	
3	7.6	2000	1700	648	174	149	84	1	345	20	0.2	0.4	
4	7.3	2900	1850	946	224	24	72	4	517	18	0.2	0.4	
5	7.1	1400	1505	852	286	141	72	5	410	17	0.1	0.3	6.8
6	7.2	700	617	573	140	145	74	5	107	15	0.3	0.1	7.1
7	7.0	600	574	331	96	68	70	5	50	15	0.1	0.3	
8	7.3	2100	1086	454	78	149	67	4	320	9.2	0.2	0.8	
9	7.3	2900	646	392	74	122	43	5	216	9.2	0.1	1.0	
10	7.5	2700	1720	370	81	104	47	5	174	7.5	0.4	0.6	
11	8.3	1400	1186	474	98	138	70	6	574	9.6	0.2	0.4	
12	8.1	1800	470	364	137	52	48	3	132	9.9	0.4	0.4	
13	7.3	2400	1156	642	148	173	72	5	102	9.7	0.1	0.6	7.1
14	7.5	2100	654	320	50	110	47	4	152	9.6	0.1	1.0	7.2
15	7.4	2400	1550	1282	419	222	32	4	367	15	0.1	0.2	7.5
16	7.2	9500	1280	3404	468	1234	14	7	2444	17	0.1	0.1	
17	7.7	3100	1375	937	188	322	55	5	399	14	0.1	0.2	
18	7.4	3000	1345	690	188	197	32	2	255	10	0.1	0.2	7.6
19	7.5	3100	1050	740	288	74	36	8	319	11	0.1	0.2	7.8
20	7.5	3100	1110	1085	298	49	40	8	671	19	0.1	0.2	
21	7.5	7500	1350	986	286	258	45	6	585	17	0.1	0.2	
STD	6.5-8.5	500	500	300	75	30	200	10	250	5	1.0	1.2	4-8
PL	9.2	2000	2000	600	200	100			1000			1.5	

STD- Standard Value; PL- Permissible Limit; EC in µmho/cm all other expressed in mg/L

During summer, 33% samples were found to be within desirable value, 62% beyond the desirable and 5% beyond permissible limit for chloride (Fig.9b). 5% samples were found to be within desirable value, 14% beyond desirable and 81% beyond permissible limit for Total hardness (Fig.10b). For TDS 5% of samples were found to be within desirable value, 95% beyond desirable value (Fig.11b). For magnesium 5% of samples were found to be within desirable limit value, 23% beyond desirable value and 72% of samples beyond permissible limit value (Fig.12b).

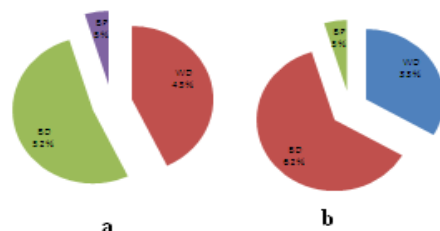


Fig.9 Comparison of samples within the limit, beyond the limit and beyond permissible limit in post monsoon and in summer for chlorides

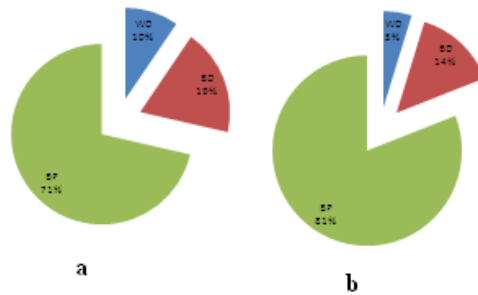


Fig.10 Comparison of samples within the limit, beyond the limit and beyond permissible limit in post monsoon and in summer for THW

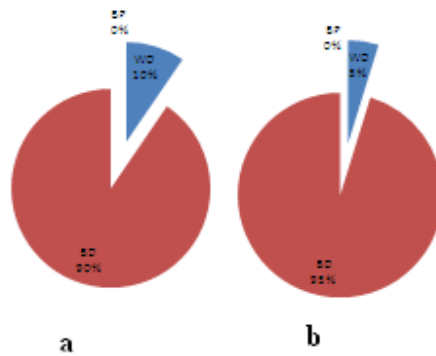


Fig.11 Comparison of samples within the limit, beyond the limit and beyond permissible limit in post monsoon and in summer for TDS

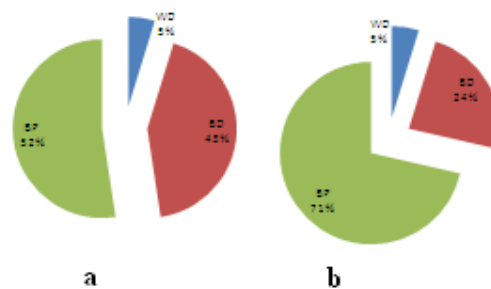


Fig.12 Comparison of samples within limit, beyond the limit and beyond permissible limit in post monsoon and in summer for magnesium

The pH values of the samples analyzed were found to be in the range 7.1-8.3 in summer and 7.1-8.0 in post monsoon which is well within the prescribed standard value. Electrical conductance was found to be in the range of 600-9500 in summer and 600-8800 in post monsoon, which is beyond the permissible limit value indicating the presence of higher levels of salts in the waters analyzed. TDS was found to be 470-1720mg/L in summer and 250-1720mg/L in post monsoon also exceed the prescribed value. DO values of the surface waters analyzed were found to be in the 6.8-7.8 which is well within the limit value.

Total hardness of water in summer was 199-3404mg/L, in post monsoon is 278-1232mg/L; Calcium in summer was 50-468mg/L, in post monsoon 49-736mg/L; Magnesium in summer was 24-1234mg/L, in post monsoon 24-1062mg/L; Sodium 14-84mg/L in summer and 15-95mg/L in post monsoon; potassium 1-8mg/L in summer and 1-9mg/L in post monsoon; chloride in summer was found to be as 35-2444mg/L and 49-2907mg/L in post monsoon; phosphate in summer 7.5-24mg/L and in post monsoon 8-25mg/L; nitrite in summer was 0.1-0.3mg/L and in post monsoon 0.1-0.4mg/L; fluoride in summer as well as in post monsoon was found to be 0.1-1.0mg/L.

From the results, it was found that most of the water samples of the three villages analyzed has higher concentration levels than the prescribed standard values, and not recommended as potable. As it is well known that increased concentrations of magnesium, chloride and sodium in drinking water leads to ill health to human.

## CONCLUSIONS

Most of the water samples analyzed, collected from the three coastal villages of Vizianagaram district are found to have higher concentration levels compared to the standard values prescribed. Hence the water is not recommended as potable.

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