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Physico-chemical Characteristics of Ground Water Samples Collected from Chitrakoot Region, Satna District

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Abstract: *The present study was investigated varicose physic-chemical parameters like Temperature, PH, DO, COD, TDS, TSS, Alkalinity, Total Hardness, Nitrate, Chloride and Sulphate etc. Eleven ground water samples were collected form Chitrakoot region of Satna District. Geographical information of Chitrakoot district Satna in located at $24^0$48'to $25^0$12'N, and longitude at $80^0$58' to $81^0$34'E. Chitrakoot area lies on the border of Madhya Pradesh area have great historical mythological and religious significance. The experimental values were compared with standard values recommended by world health organization (WHO). After analysis of physico-chemical Parameters of Ground Water samples from different location of Chitrakoot region, it has been observed that some parameters are within the permissible limit while few were very higher than their maximum permissible limit.*

Keywords: *Physico-Chemical Parameters, Ground Water, Chitrakoot Region, Satna District.*

1. INTRODUCTION

The quality of ground water is highly related with local environmental and geological conditions. Today human activities are constantly adding industrial, domestic and agricultural waste to ground water reservoirs at an alarming rate. Ground water contamination is generally in irreversible i.e. Once it is contaminated it is difficult to degrades water quality producing an objectionable taste and excessive hardness. It is always better to protect ground water first rather than recycling on technology to clean up water from contaminated source. Polluted ground water is the major cause for the spread of epidemics and chronic diseases of man. It causes typhoid, jaundice, dysentery, diarrheic, tuberculosis and hepatitis. In India almost 80% of the rural population depends on untreated ground water for potable water supplies. As a result, farmers in the adjoining areas find the ground water unsuitable for irrigation. Drinking water wells may also get affected. Environmental problems related to industrial effluent disposal on land have been reported from various parts of the country. Disposal on creates local/regional environmental problems .Watershed management for any city requires the estimation of both point and non-point sources of water pollution. An effective land-use planning plays a crucial role in efficient management of water resources of any area[1].

Geographical information of chitrakoot district Satna in located at $24^0$48'to $25^0$12'N, and longitude at $80^0$58' to $81^0$34'E distance covered by district from east to west is 62km and north to south is 57.5km district is bounded in the north by kaushambi in the south by Satna (M.P.) in the east of Allahabad in the west by Banda, Distance between Satna and chitrakoot is 77 km. The Chitrakoot area lies on the border of Madhya Pradesh area has great historical mythological and religious significance. It is believed to have sheltered lord ram for a long period during his exile. Hence river mandakini is piously called "Ganga ji" and is work shipped every day. River is believed to wash away all sins being obsessed by such faith people bathe in this river especially on some auspicious.[2]

The present study was investigated varicose physic-chemical parameters like Temperature, PH, DO, COD, TDS, TSS, Alkalinity, Total Hardness, Nitrate, Chloride and Sulphate etc. The ground water samples were collected different sampling stations are as Sati-anusuiya, rjola, Arogyadham, Jankikund, Pramodvan, Bus –stand, Ramghat, parikrama, Akshayvat, Peelikothi.

2. MATERIAL AND METHODS

Eleven ground water samples were collected form Chitrakoot region of Satna District. Sampling was done in accordance with Grab sampling method in polyethylene bottles of one liter capacity to avoided leaching of methods and interaction with the surface wall of the containers bottles were first

cleaned with detergent and then socked in 1:1 HNO_3 for 24 hours. Finally the bottles were cleaned and rinsed with distill water .During sampling bottles were two to three times with the sample to be examined before filling with it. Samples were collected by immersing the rinsed bottles in ground water[3-4].All the samples were labeled, showing the source date and time of collection. The samples were refrigerated at 4^0C in the laboratory [3-5-6] and analyzed for various water quality parameters as per standard procedures (AWWA, 1999)[7]. The experimental values were compared with standard values recommended by world health organization (WHO) and Indian standards for drinking purposes. All the sampling stations are presented in **table-1**

For the purpose of representative of groundwater quality in the study area following locations is

Presented the in table

Table1. *List of sampling stations in Chitrakoot region*

S.N.	Code	Name of Sampling station	Description of Sampling Locations
1	G1	Sati Anusuiya	In front of Satianusuiya Temple, Chitrakoot
2	G2	Rajola	Govt. High School Rajola ,Chitrakoot
3	G3	M.G.C.G.V.V.	Inside the M.G.C.G.V.V. ,Chitrakoot
4	G4	Aroghadham	Infront of DRI Hospital, Chitrakoot
5	G5	Jankikund	Inside the Jankikund Hospital, Chitrakoot
6	G6	Pramodvan	Near the Court , Chitrakoot
7	G7	Bus-Stand	Chitrakoot Bus Stand Satna, Chitrakoot
8	G8	Ramghat	Near the Purani Lanka, Chitrakoot
9	G9	Kamtanath	Pratham Mukharbindu , Chitrakoot
10	G10	Akshayvat	Near the Gayatri Mandir, Chitrakoot
11	G11	Peeli-kothi	Kamtan Tola, Chitrakoot

3. RESULT AND DISCUSSION

In the present study we are analyzed some physicochemical characteristics of ground water sample in Chitrakoot region, all the values where, shown in **table**-2 and graphical representation of all the parameters are presented in **Fig – 1 to 11**.

3.1. Physico-Chemical Characteristics of Ground Water Samples Collected from Chitrakoot Region

Temperature of ground water samples ranged from 24.5^0C to 30^0C as show in **table 2**. Minimum temperature was record 24.5^0C at Satianusuiya. Maximum temperature was record 30^0C at Bus-stand. Pushpam etal, 2014[8] studied assessment of water quality of mathusooth anapercemal swamy temple pond in Parakkai, kanya kumari and temperature was recorded varied from 28.53^0C to 28.95^0C. The value of pH was found between 8.4-8.65. Minimum value of pH was observed 8.4 at Ramghat while maximum 8.65 at Arogyadham. Shrivastava etal, 2014[9] studied ground water quality assessment of Birsinghpur Area, Satna District, Madhya Pradesh and PH Concentration was found ranged from 6.8 to 7.8. Dissolved oxygen (DO) was ranged from 5.69 to 7.80mg/l. Minimum value of DO was found 5.69-mg/l at Ramghat and maximum value 7.80mg/l at Pramodvan. Das etal, 2013[10] studied physico-Chemical characteristics of selected ground water samples of Ballarpur city of Chandrapur District, Maharashtra, India and observed the Dissolve oxygen values were found ranged from 6.4 to 9.3 mg/l. Chemical oxygen demand (COD) was found ranged from 12.0 to 33.3 mg/l. Minimum value of COD was found 12.0mg/l at Pramodvan while maximum value was found 33.3mg/l at Ramghat. All the COD values of all the sampling locations are higher than the permissible limit prescribed by WHO. Chaurasia etal, 2013[11] carried out Pollution sources and water quality of River Mandakini at Chitrakoot, Analyzed the Chemical oxygen Demand in mandakini River Chitrakoot found COD ranged between 12-140 mg/l.

Total dissolved solid (TDS) ranged from540 to 800mg/l and total suspended solid was found in the range of 110 to 190 mg/l as show in **table -1**. Minimum value of TDS 540mg/l was observed at M.G.C.G. while maximum value of TDS was found 800mg/l at Ramghat. Minimum value of TSS 110 mg/l was observed at Satianusuiya while maximum value of TSS was found 190mg/l at Satianusuiya. TDS and TSS were found all the sampling stations with in limit of WHO. Mohanty etal, 2013[12] Studied assessment of ground water quality due to coal mining at tilapia-I coal mine, Sumbalpur, odisha and TDS values was reported varied from 183 to 251 mg/l. Alkalinity was found in the range

of 36.8 to 200mg/l. Minimum value of Alkalinity 160mg/l was observed at Satianusuiya while maximum value of Alkalinity 200mg/l at Ramghat, the Alkalinity value of All the location are within the range of permissible limits set by WHO. Nitrate in ground water samples were recorded in the range of 0.68 to 20.5 mg/l. Values of nitrate all the sampling locations are below the permissible limits set by WHO as 45 mg/l. Suman etal, 2014 [13]studied water quality management of water resources of Bhopal city: Challenges and Scope observed the nitrate ion ranged from 0.68 mg/l to 1.36 mg/l. Chloride was recorded in the range of 19to 39 mg/l, All the Chloride Value were recorded below the recommended level set by WHO as 250 mg/l. Total Hardness values were recorded in the ground water samples ranging from of 694-1688mg/l. Minimum value was found of 694mg/l at Satianusuiya while maximum value 1688mg/l was found at Kamtan. Total hardness values of all the sampling locations were observed higher than the permissible limits prescribed by WHO. Sunita etal, 2005[14] studied hydrogeo-chemistry of ground water, gooty Area, Anantapur District, Andhrapradesh and total hardness values were found ranged between 360 to 4040 mg/l.The value of sulphate was recorded in the range of 211to 360 mg/l. Minimum value of sulphate was found 211.0 mg/l at Peeli-Kothi while maximum value was recorded 360 mg/l at Bus Stand. Tripathi etal, 2014[15] studied assessment of ground water quality in Umaria District, Vindhya Pradesh India, reported the sulphate content ranged between 5.0 to 398 mg/l.

Table2. *Physico-chemical characteristics of ground water samples collected from Chitrakoot region*

S.N.	Parameters	G1	G2	G3	G4	G5	G6	G7	G8	Gy9	G10	G11
1	Temp.	24.5	28.7	27.9	25	29.5	26.5	30	26.9	29.3	28.5	27.7
2	pH	8.19	8.40	8.40	8.65	8.42	8.15	8.15	8.4	8.54	8.18	8.10
3	DO	7.47	6.82	7.15	7.15	6.50	7.80	7.31	5.69	6.82	6.50	5.36
4	COD	22.6	32	16	26.6	26	12	29.6	33.3	20	13.3	13.3
5	TDS	562	583	540	623	670	720	750	800	740	710	705
6	TSS	110	117	130	147	135	170	177	190	180	150	165
7	Alkalinity	36.8	44.67	56.73	87.22	95.1	100	105	200	162	186	177
8	Nitrate	0.68	20.5	5.52	20.0	14.9	3.47	4.01	18.8	0.68	6.04	321
9	Chloride	22	19	24	33	39	35	36	38	32	30	27
10	Sulphate	310	250	340	300	296	349	360	348	310	279	211
11	Hardness	694	700	940	886	870	1300	800	1422	1688	1544	1200

Table3. *Water Quality Parameters and Drinking Water Standards*

S.N.	Parameter	WHO(1993) mg/L		BIS(1991) mg/L	
		Max. desirable	Max. permissible	Max .desirable	Max .permissible
1.	Temp.	-	-	-	-
2.	pH	7.0	8.5	6.5	8.5
3.	DO	4	6	-	-
4.	BOD	6-0	-	2.0	-
5.	COD	10	-	-	-
6.	TDS	500	1500	500	1000
7.	TSS	100	-	-	-
8.	Alkalinity	200	600	200	-
9.	Nitrate	100	45	10	10
10.	Chloride	200	600	250	1000
11.	Sulphate	200	400	150	400
12.	Hardness	300	600	300	-

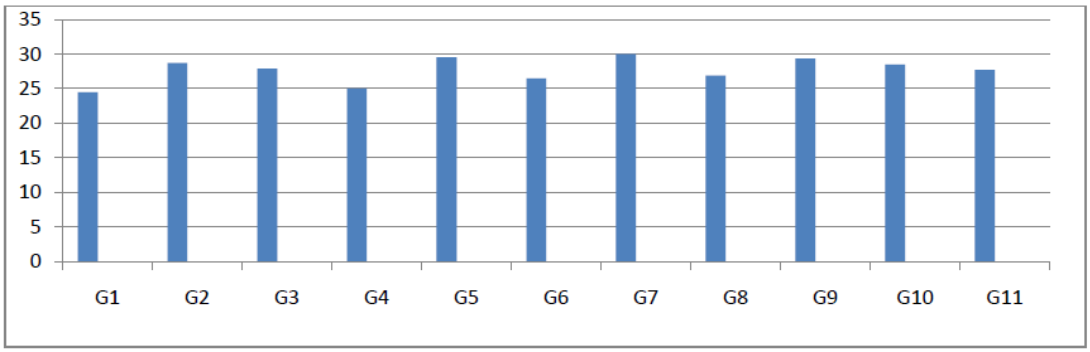

Fig1. *Graphical representation of Temperature*

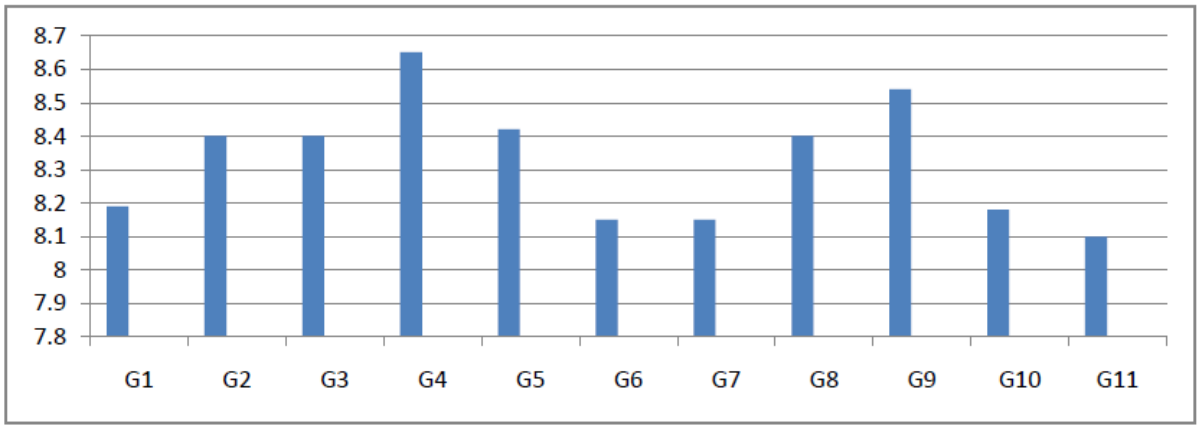

Fig2. *Graphical representation of pH*

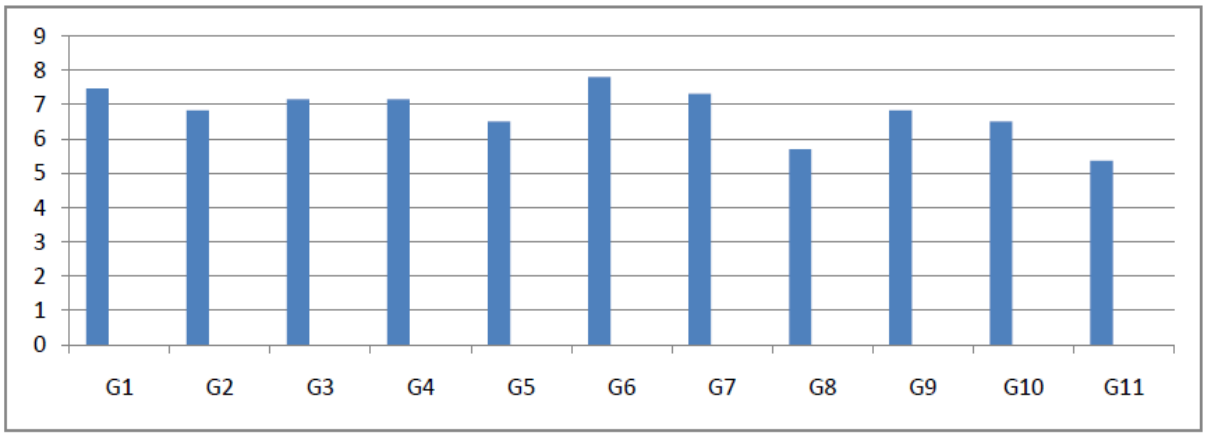

Fig3. *Graphical representation of DO*

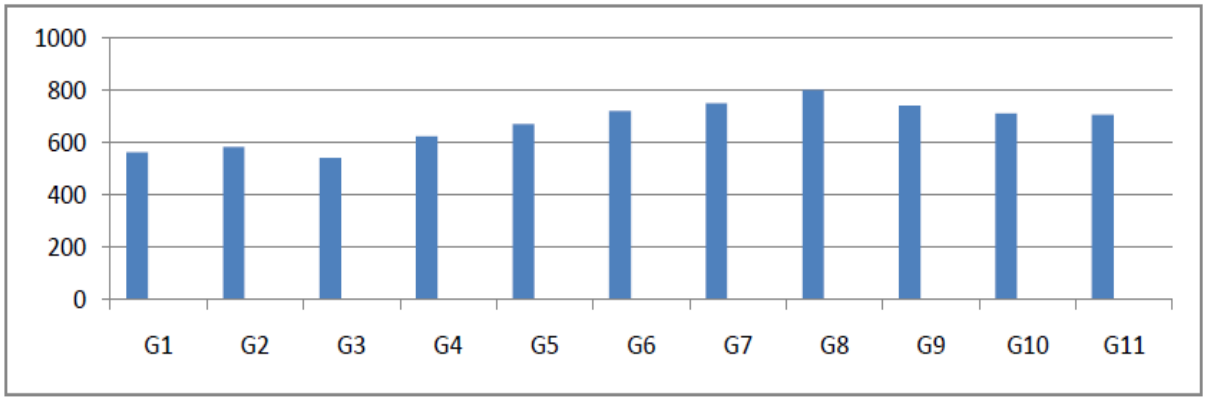

Fig4. *Graphical representation of COD*

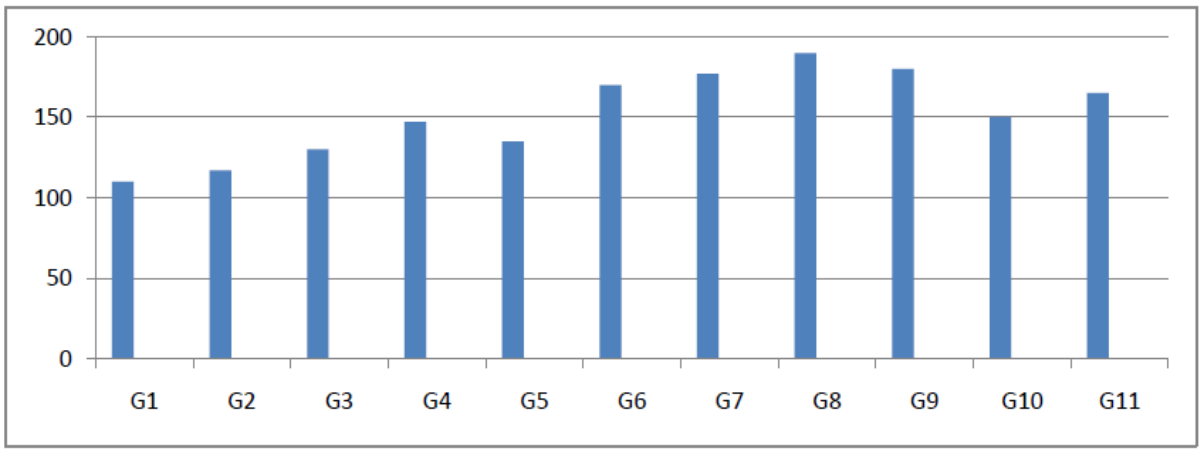

Fig5. *Graphical representation of TDS*

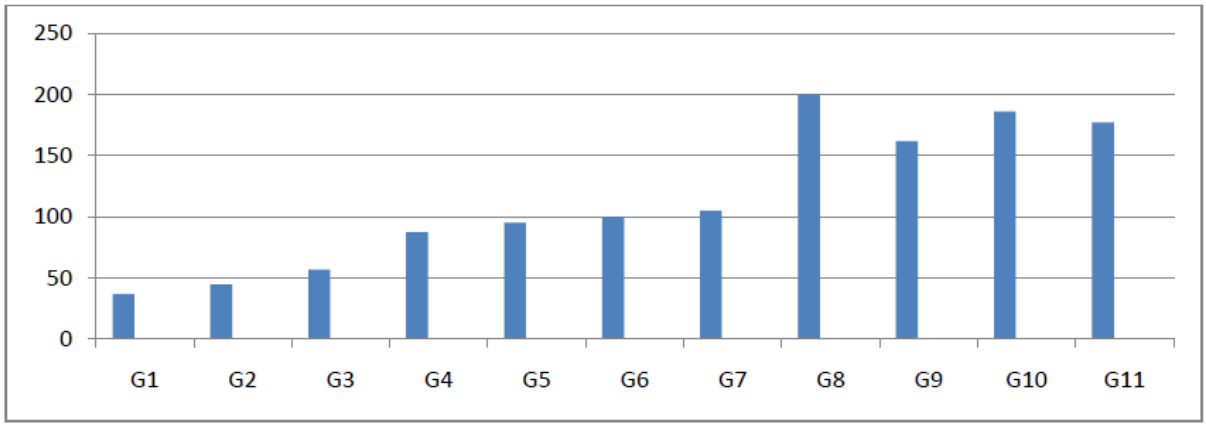

Fig6. *Graphical representation of TSS*

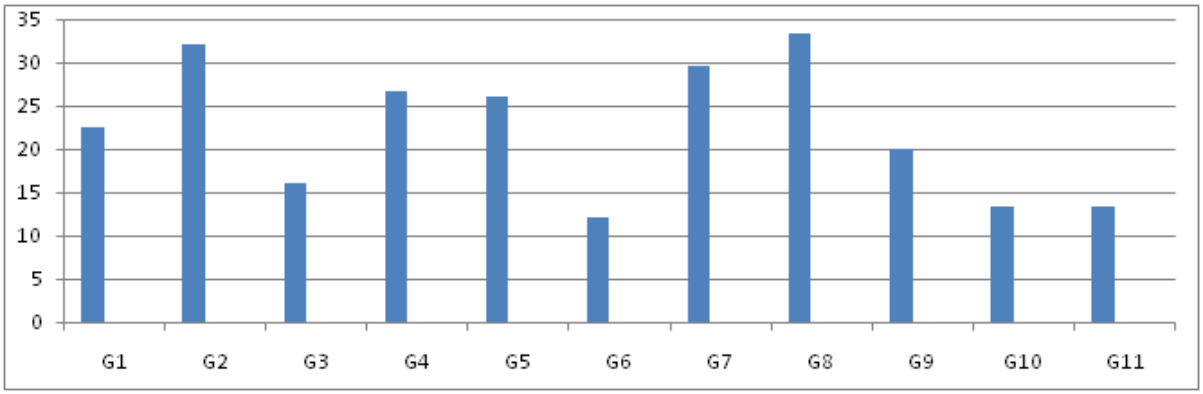

Fig7. *Graphical representation of Alkalinity*

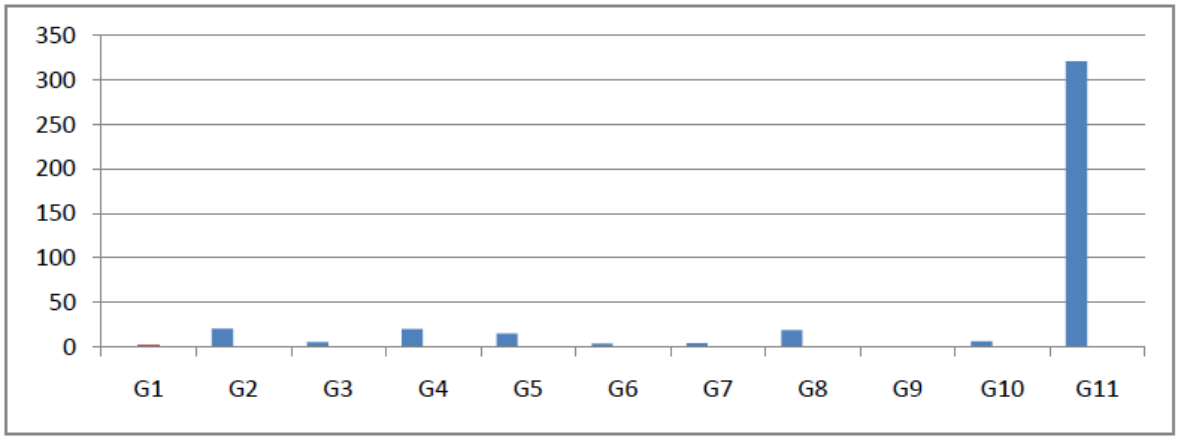

Fig8. *Graphical representation of Nitrate*

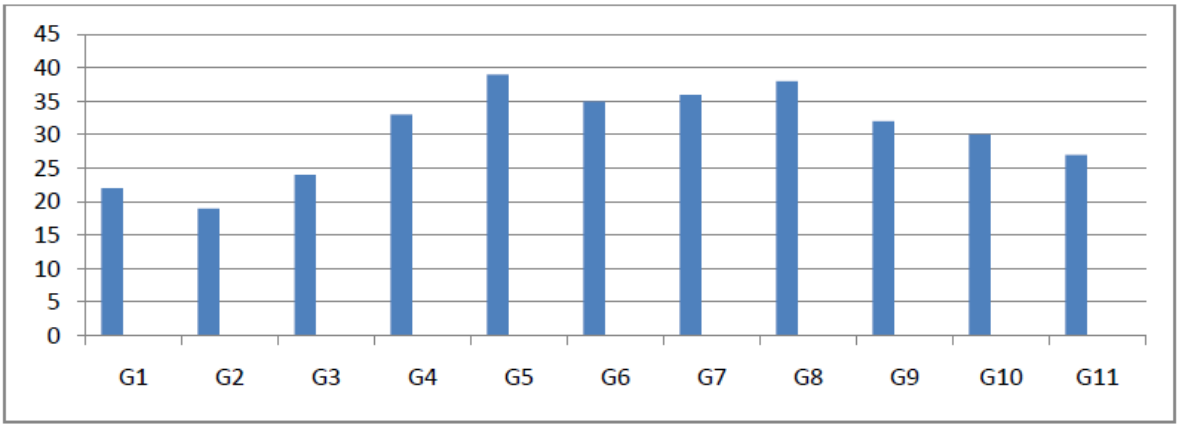

Fig9. *Graphical representation of Chloride*

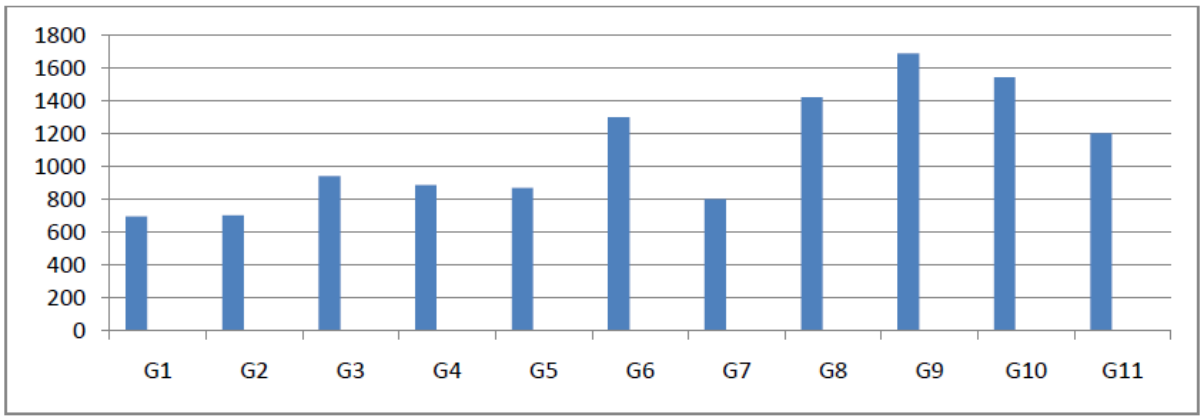

Fig10. *Graphical representation of Total Hardness*

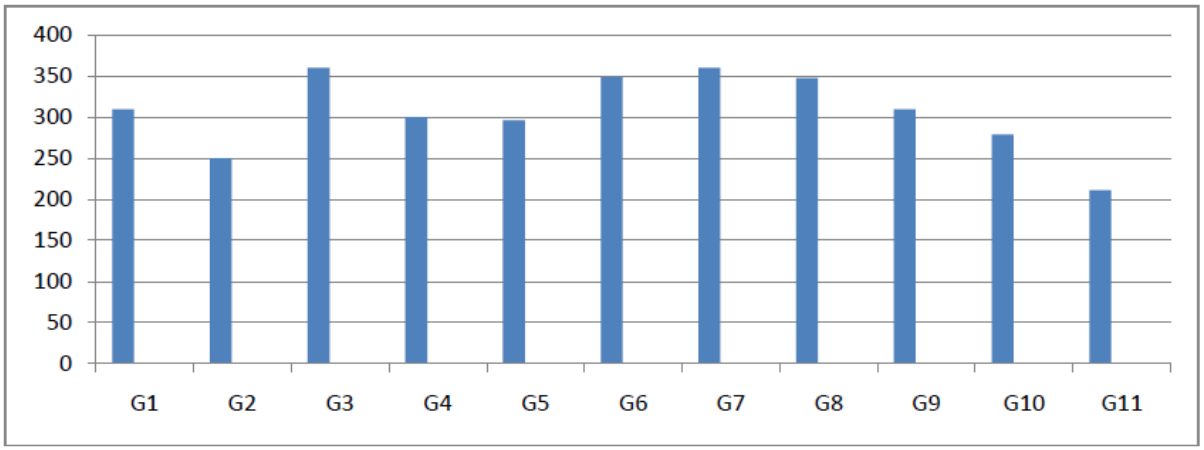

Fig11. *Graphical representation of Sulphate*

4. CONCLUSION

After analysis of physico-chemical Parameters of Ground Water samples from different location of chitrakoot region, it has been observed that some parameters are within the permissible limit while few were very higher than their maximum permissible limit. This is why; there of a better water quality management policy in corpora ting the following recommendations. Tube wells and other drinking water sources should be installed in a safety place. A proper's planning and management is required to mitigate the problem of drinking water contamination in Chitrakoot region of Satna District.

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