

An assessment of groundwater quality of Chaksu town in Rajasthan, India

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ABSTRACT

Assessment of underground water quality based on physico-chemical parameters at Chaksu town of Rajasthan has been taken up to evaluate its suitability for domestic's purpose. 32 ground water samples were collected from different places of Chaksu town of Jaipur district. The quality analysis has been made through the pH, EC, TDS, Dissolved Oxygen, BOD, COD, Total Hardness, Sodium, Pottassium, Calcium, Magnesium, Chloride, Sulphate, Nitrate, Fluoride and Alkanity. A systematic calculation of the correlation coffecient has also been carried out between different analysed parameters. Comparative study of samples in different seasons was conducted and it was found that Electrical Conductivity and Total Dissoved Solids (TDS) were decreased. Alkanity and Total Hardness were increased after the rainfall.

Key words: Ground Water, parameters, comparative study, Chaksu town.

INTRODUCTION

Water is one of the most vital components on earth not only essential for life but also for total well balanced of environmental system. Groundwater forms a major source of drinking water. Ground water moves through varied geological environments and during its flow many chemical compounds will be dissolved in it. The modern civilization, industrialisation, urbanisation and increase in population have lead to fast degradation of our ground water quality. As the water is the most important component of eco-system, any imbalance created either in term of amount, which is presence of impurities added to it can hard the whole eco-system¹.

The quality of public health depends to a greater extent on the quality of ground water, which should be clean and fresh. Excess of fluoride causes dental, skeletal and non skeletal fluorosis through continued use of fluoride contaminated water, air and agriculture produce². In 23 villages of Challapalli madal the quality of well water was assessed and it was found that there is a higher incidence of fluoride³. Chemical analysis of ground water samples from Nagpur showed that fluoride and nitrate concentration increses with increase in salinity⁴. It was found that alkanity and fluoride donot exhibit any significant effect on nitrate⁵. Faunistic studies in the area of Khetri Nagar was done and analysed the water from the wells⁶⁻⁷. It was found that fluoride contents from the wells from different sites to vary from 0.87 to 1.01ppm.

Water contains various types of pollutants and several other substances are dissolved in it. Concentration of which is useful for human body but in a specific limit. The study was conducted to know the physico chemical properties of ground water and in different seasons and its impact on human life.

MATERIAL AND METHODS

Polythene bottles of 2.5 litres and 2.0 litres were used to collect the water samples from different locations of the town. The samples were collected from borewells as well as from deep handpumps. The samples were also collected in different seasons. It was ensured that the concentrations of various water quality parameters do not changes in time that elapses between drawing of samples and the analysis in the laboratory. For BOD, COD separate 2 litres polythene bottles were used. The bottles were thoroughly cleaned with Hydrochloric acid and then washed with tap water rendered free of acid and then washed with distilled water twice

and again rinsed with the water sample to be collected and then filled up the bottle with the sample leaving only a small air gap at the top, stoppered and sealed the bottle with paraffin wax. Some samples which were turbid or containing suspended matter were filtered at the time of collection⁸. All the glassware, casserole and other pipettes were first cleaned with tap water thoroughly and finally with deionised distilled water. The pipettes and burette were rinsed with solution before final use.

The the chemicals and reagent were used for analysis were of analar grade. The pH meter, conductivity meter, spectrophotometer, flame photometer instruments were used to analyze these parameters. The procedure for calculating the different parameters were conducted in the laboratory.

RESULTS AND DISCUSSION

The samples collected from Chaksu town were analyzed and results presented in Table 1.

Table 1: Analyses of samples water collected from Chaksu town, Total samples - 32

Parameter and Unit	Within Maximum Permissible Limit			Out of Maximum Permissible Limit			Unit
	Value	No. of Samples	%	Value	No. of Samples	%	
pH	<=9	29	90.6	>9	3	9.4	
E.C.	<=2000	11	34.4	>2000	21	65.6	µm/cm
T.H.	<=600	31	96.9	>600	1	3.1	mg/l
T.D.S.	<=1500	16	50.0	>1500	16	50.0	mg/l
Ca ⁺²	<=200	32	100.0	>200	0	0.0	mg/l
K ⁺	<=10	28	87.5	>10	4	12.5	mg/l
Na ⁺	<=200	4	12.5	>200	28	87.5	mg/l
SO ₄ ⁻²	<=400	31	96.9	>400	1	3.1	mg/l
NO ₃ ⁻	<=24	12	37.5	>24	20	62.5	mg/l
Cl ⁻	<=1000	29	90.6	>1000	3	9.4	mg/l
F ⁻	<=1.5	16	50.0	>1.5	16	50.0	mg/l
Mg ⁺²	<=100	24	75.0	>100	8	25.0	mg/l
Alkalinity	<=600	24	75.0	>600	8	25.0	ppm
DO	<=5	15	47	>5	17	53	ppm
BOD	<=10	2	6	>10	30	94	ppm
COD	<=10	0	0.0	>10	32	100	ppm

* Maximum permissible limit or highest relaxable limit or Maximum relaxable limit are set by W.H.O., I.S.I., I.C.M.R., Govt. of India.

The value of pH was within maximum permissible limit in 29 samples out of 32. The Electrical conductivity was ranging from 648 to 8276 $\mu\text{m}/\text{cm}$ and in 65.6% samples the E.C. was out of maximum permissible limit. The Total Hardness (TH) of samples was ranging from 110 to 1500. 3.1% samples were out of maximum permissible limit. Total Dissolved Solids (T.D.S.) value were ranging from 405 to 5135 and 50% of the samples were out of maximum permissible limit. Calcium values were ranging from 16 to 180 and sulphate values were ranging from 38 to 610. In calcium (0%) and in Sulphate both only 3.1 % of the samples were out of maximum permissible limit. Value of potassium were ranging from 2 to 15 and 12.5% samples were out of maximum permissible limit. Fluoride contents were ranging from 1 to 3.64 and in 50 % samples it was more than maximum permissible limit. Nitrate value was ranging from 2 to 200 and 62.5% samples were having value more than maximum permissible limit. Alkalinity was ranging from 230 to 1488 and in 25% samples it was more than maximum permissible limit. Chlorine content was ranging from 20 to 1400 and in 9.4% samples it was more than maximum permissible limit. Magnesium was more than 100 in 8(25%) samples. Biochemical Oxygen Demand(BOD) were ranging between 9 to 20, Chemical Oxygen Demand (COD) were ranging from 65-148 and Dissolved Oxygen(DO) were ranging 2.9 to 9.10 on samples were measured. It was within the permissible limit. Pre-monsoon and post monsoon samples were collected from different locations. It was found that there are no major changes in chemical properties of the samples. It was due to the fact that the rainfall

in the state was less by 33.6% in 2000. Ground water recharge was very less. Although in summer seasonal concentration of solids were higher than rainy season and at the same time alkalinity of the samples shown down trend from summer season to rainy season.

CONCLUSION

The study carried out in the Chaksu town on ground water samples conform that the pH level of ground water was within limit except 3 samples which is less than 10% of the samples. 21 samples were having Electrical Conductivity more than Maximum Permissible Limit. It is said that these water cannot be used for drinking as well as for irrigation purposes. The value of T.D.S. were more than maximum permissible limit in 16 samples, these sample water are not suitable for drinking but samples which are having TDS more than 3000, cannot be used even for irrigation purposes, only 3 samples were found which are having TDS more than 3000. Nitrate concentration was higher in 20 samples. Higher concentration leads to cancer. It is undesirable for drinking water. Excess fluoride may lead to tooth decay and kidney disease. In 16 samples the fluoride was found more than maximum permissible limit and it is very high. The need for new institutional economics approach to deal with current and emerging problems has become very crucial. In most of the states, the problem of ground water depletion and quality deterioration has appeared in last few years. These problems have been addressed by various market based and non-market institutional approaches in different states.

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