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CORRELATION STUDY AMONG WATER QUALITY PARAMETERS OF GROUNDWATER SAMPLES FROM PHULAMBRI TALUQA OF AURANGABAD DISTRICT

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ABSTRACT

Physico-chemical parameters for water samples collected from 10 borewells, dugwells from different places of Phulambri Taluqa, were measured. The water samples were shown to be good computation of correlation coefficient (r) between different pairs, were carried out. Significant positive correlation was found to exist between Electrical Conductivity, pH, TDS, Turbidity, Total Hardness, Calcium, Magnesium, Sodium, Potassium, Iron, Total Alkalinity, Carbonate, Bicarbonate, Chloride, Fluoride, Nitrate and Sulphate.

Key words: Water quality parameters, Correlation coefficient, Groundwater, Aurangabad District.

INTRODUCTION

Correlation between different pairs of water quality parameters for different samples, collected at different places of a region, provides an idea about the hydrochemistry of water sources in the region[1-3]. The present work aims to establish a systematic correlation between pairs of physico-chemical parameters of dugwell and borewell samples, collected from different places of Phulambri Taluqa.

EXPERIMENTAL

Material and method

A preliminary survey was made to identify the sources and samples were systematically collected in clean sterilized polythene containers in such a way that there

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should not be any air bubble trapped inside. The water quality parameters, such as pH, EC, Turbidity, Total Solids, Total dissolved solids, Total Hardness, Chlorides, Nitrate, sulphate, Calcium, Magnesium etc. were determined as described elswere[4-6].

RESULTS AND DISCUSSION

The term correlation or (Covarian) indicates the relationship between two variables, such that the changes in the values of one variable cause the value of the other variable to change. We can establish inter-relation by statistical methods with a few sets of observations. It gives a rough but fairly useful indication of the water quality and also facilities a rapid monitoring of the status of water pollution. Ten representative borewell and dugwell samples were collected through out the year 2009-2010 from different places of Phulambri Taluqa. The results of the physico-chemical analysis of the water samples are shown in the Table 1. The correlation coefficient for different environmentally important water quality parameters are calculated using the following equation:

$$r = \frac{NEXY - EXEY}{\left[\left\{NEX^2 - (EX^2)\right\}\left\{NEY^2 - (EY^2)\right\}\right]^{\frac{1}{2}}}$$

Where X and Y are any two variables and N is the number of ground water samples taken for the study. In the present investigation N = 18. The values of correlation coefficient upto 0.5 do not show any significant correlation between the pair of parameters considered. A pair of parameters having $r \geq \pm 0.5$ bears significant linear correlation between them. The value $r \geq \pm 0.8$ indicates very strong linear correlation between the two parameters considered[7-9]. The correlation analysis helps to understand the interdependent of different water quality parameters and in the task of rapid monitoring of these parameters.

The correlation study was basically carried out to established relationship between physico-chemical parameters. In the present study the correlation coefficient between TDS and EC was found to be high i.e. 0.779, which is obvious, since electrical conductance depends on dissolved salts present in the water bodies. The another parameter, which shows good correlation i.e. Total Hardness with E.C. (0.589) it indicates that calcium or magnesium salts are present as dissolved solids in the solution. The electrical conductance does not show appreciable correlation with other parameters, which we have studied.

The correlation matrix of pH with other parameters does not show the correlation coefficient greater than 0.5 this means pH is poorly correlated. The TDS shows correlation coefficient greater than 0.5 with total hardness and with magnesium ions.

Table 1: Correlation matrix

	E. C.	pH	TDS ppm	Tur NTU	TH ppm	Ca ppm	Mg ppm	Na ppm	K ppm	Fe ppm	TA ppm	CO_3 ppm	HCO_3 ppm	Cl ppm	F ppm	NO_3 ppm	SO_4 ppm
E. C.	1																
pH	0.189	1															
TDS ppm	**0.779**	0.008	1														
Tur NTU	-0.184	-0.144	-0.14	1													
TH ppm	**0.589**	0.093	**0.564**	-0.136	1												
Ca ppm	0.015	0.048	-0.08	0.122	0.359	1											
Mg ppm	0.437	-0.002	0.524	-0.155	**0.847**	0.291	1										
Na ppm	0.077	0.103	-0.05	0.187	0.112	**0.666**	-0.036	1									
K ppm	0.389	-0.024	0.147	0.139	**0.597**	**0.748**	0.4	**0.67**	1								
Fe ppm	0.238	0.44	-0.05	0.05	0.318	0.464	0.049	**0.503**	**0.539**	1							
TA ppm	0.274	0.074	0.466	-0.43	0.431	0.123	**0.638**	-0.164	0.019	-0.073	1						
CO_3 ppm	0.302	0.095	0.306	-0.197	0.494	0.245	**0.616**	0.128	0.339	0.149	**0.705**	1					
HCO_3 ppm	0.388	0.156	0.55	-0.417	0.607	0.125	**0.616**	-0.101	0.123	-0.005	**0.857**	**0.59**	1				
Cl ppm	0.01	0.025	0.07	-0.165	0.104	**0.584**	0.166	0.408	0.337	0.149	0.235	-0.167	0.146	1			
F ppm	0.166	-0.057	-0.11	-0.075	0.364	**0.544**	0.181	0.485	**0.773**	0.269	-0.239	0.091	-0.119	0.237	1		
NO_3 ppm	-0.042	-0.155	-0.09	0.244	0.39	**0.729**	0.296	**0.685**	**0.81**	0.313	0.05	0.271	0.131	0.388	**0.582**	1	
SO_4 ppm	-0.067	-0.06	-0.08	0.218	0.291	**0.68**	0.209	**0.683**	**0.768**	0.38	0.08	0.211	0.127	**0.527**	0.489	**0.921**	1

This again confirms that the electrical conductance is due to calcium and magnesium salts. The turbidity value does not show any appreciable correlation with other parameters[10]. The total hardness shows correlation coefficient greater than 0.5 with magnesium and with potassium. The most of the cases the hardness is due to only calcium and magnesium salts. There are no references observed for potassium hardness. Calcium is correlated with sodium, potassium, Chloride, Floride, nitrite and sulphate. This means that most of the sodium is present as nitrate form. Magnesium is correlated with Total Alkalinity Carbonate and bicarbonates, which indicates that magnesium is present as magnesium carbonates and bicarbonate. Sodium correlates with sulphate and nitrate where as potassium shows good correlation with fluoride and sulphate. Iron does not show any significant correlation. The total alkalinity due to carbonate and bicarbonate salts. Since not a single parameters shows correlation coefficient above 0.9, we have not developed any regression equation.

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