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Statistical Study of Underground Water Quality near the Bank of Ramganga River at Moradabad, UP

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ABSTRACT

Underground water characterizes a significant resource of drinking water along with its quality is presently threatened via a mixture of microbiological and chemical pollution. The current work is completed to assess underground water quality for the idea of drinking with domestic consumptions via correlation analysis on the bank of river Ramganga. The assessment was fined out in support of two continuous years (2020-2021) in rains along with winter seasons. The statistical facts expect as underground water quality is not appropriate for drinking usage in present region.

Keywords: Statistical, Underground Water, Water Quality

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INTRODUCTION

The outcome of urbanization with industrialization leads to water contamination. In rural region underground water is used for agricultural purposes, particularly wherever additional resources of water are not accessible. The speedy development of urban region has more affected underground water quality because of extra-exploitation of sources with inappropriate waste disposal process (Kumar N 2021) [1].

Unpolluted underground water does not present in environment; like it flows more or through the surface layers of the soil, it dissolves and carries with it approximately all it touches, with that dumped into it via people (Kumar N 2018) [2].

Moradabad is an industrial center for the brass ware and most vital export hub. Moradabad is situated on the bank of Ramganga River. Non organized urbanization with fast development of industrialization enlarged the water contamination problem in environmental ecosystem (Kumar N et al., 2009) [3]. This crisis is mostly because of actions like as industrial discharge, sewage waste, agricultural runoff it create ecological misbalance with cause bad health hazards. Mostly underground water is receiving gradually more contaminated because of human actions of various natures (Kumar N et al., 2010) [4]. The necessity of water in future has improved in various region of the earth. Therefore, in current analysis have been evaluated to statistical examination in underground water quality near the bank of Ramganga at Moradabad (Kumar N & Sinha 2021) [5].

MATERIALS AND METHODS

The correlation matrix is very regular and helpful statistical method. The r, correlation coefficient is asses for strength of linear relationship connecting the 2 variables. The arithmetical value of r for eight physico-chemical parameters is mentioned in Table 1 and 2 (APHA 1998 & AWWA 1992) [6,7]. The r puts on values involving +1 & -1. The Karl Pearson correlation coefficient is taken for evaluates to found the association between 2 variables X & Y. The correlation is helpful toward expected connection when it may be exploited in perform (Merch 1974 & WHO 1984) [8,9]. This is accepted for calculation of strength with statistical importance of connecting 2 or more, water quality parameters.

$$r = \frac{n \sum x y - \sum x \sum y}{\sqrt{[n \sum x^2 - (\sum x)^2][n \sum y^2 - (\sum y)^2]}}$$

Here,
n = number of data points
x = values of x–variable
y = values of y–variable

RESULTS AND DISCUSSION

The value of correlation coefficient has 0.067 for chloride and pH, 0.933 for total hardness and magnesium in summer with 0.935 total hardness and calcium in rains respectively. More positive correlation is noticed in rains for total dissolved solids and conductivity (0.942).

Conductivity represents positive correlation for all water quality parameters in both seasons such as summer and rains. This is due to strongly impacted through every part of the charged ions.

A total dissolved solid indicates positive correlation with all the parameters. More positive correlation is noticed for chloride (0.706). It is due to the majority of the ions are concerned in several reaction like as oxidation-reduction along with ion exchange in the underground water aquifer system.

Total hardness represents positive correlation with all the parameters in both seasons such as summer and rains. This is due to the most important resource of magnesium with calcium ions in underground water can be ion exchange of minerals connecting rock with groundwater.

Calcium indicates positive correlation with conductivity (0.807), total dissolved solids (0.579), total hardness (0.935), bicarbonates (0.495), chloride (0.409), pH (0.451), in summer and conductivity (0.816), total dissolved solids (0.754), total hardness (0.895), bicarbonates (0.369), chloride (0.396), pH (0.277), in rains.

Chloride represents positive correlation with conductivity (0.786), total dissolved solids (0.716), total hardness (0.394), pH (0.067), HCO_3 (0.312) for summer season and pH (0.009), EC (0. 839), total dissolved solids (0. 833), HCO_3 (0. 359), total hardness (0. 495) in rains. This is due to its ions dissolved as salts.

Table 1: The mean correlation data for summer season

	pH	EC	TDS	TH	HCO_3	Cl	Ca	Mg
pH	1							
EC	0.322*	1						
TDS	0.211	0.831**	1					
TH	0.372*	0.837**	0.627**	1				
HCO_3	0.251	0.611**	0.496**	0.523**	1			
Cl	0.067	0.786**	0.716**	0.394*	0.312	1		
Ca	0.451**	0.807**	0.579**	0.935**	0.495**	0.409**	1	
Mg	0.261	0.767**	0.557***	0.933**	0.545**	0.366*	0.769**	1

*Correlation significant level 0.05, **Correlation significant level 0.01

Table 2: The mean correlation data for Rainy season

	pH	EC	TDS	TH	HCO_3	Cl	Ca	Mg
pH	1							
EC	0.076	1						
TDS	0.046	0.942**	1					
TH	0.125	0.867**	0.812**	1				
HCO_3	-0.061	0.577**	0.583**	0.459**	1			
Cl	0.009	0.839**	0.833**	0.495*	0.359	1		
Ca	0.277	0.816**	0.754**	0.895**	0.369*	0.396*	1	
Mg	0.018	0.767**	0.702**	0.936**	0.441**	0.315*	0.315*	1

*Correlation significant level 0.05, **Correlation significant level 0.01

CONCLUSION

The correlation studies of different parameter of underground water samples denoted as the majority have more or less correlated with each others. It concludes as a quick process of water quality assessment. The importance of study is as in adding to resulting correlation along with the water quality parameters, this reveals a moderately actual plan concerning with quality of underground water. The statistical facts provides as underground water quality in the analysis region is weak like it is contaminated with major quantity of total dissolved solids, total hardness, chloride, etc. The majority of parameters are higher from permissible with extreme level. Thus, the underground water in study area is not suitable for drinking purposes. To preserve quality of underground water, the constant analysis of water quality parameters should be completed. In current analysis, it is suggested as underground water in catchment area of study should be properly treated before the use of drinking with domestic purposes.

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