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Physico-Chemical Assessment of Groundwater Quality of Pipar City Jodhpur Rajasthan

Sangeeta Parihar[1], Jai Singh Kachhwaha[2], Poonam Poonia[3] ,Tarun Gehlot [4], Krishan Kumar Saini[5]
1- Assistant Professor, Department of Chemistry, JNV University Jodhpur, Rajasthan (India).
2- Ph.D. Scholar, Department of Chemistry, JNV University Jodhpur, Rajasthan (India).
3- Assistant Professor, Department of Zoology, JNV University Jodhpur, Rajasthan (India).
4- Structural Engineering Department, JNV University Jodhpur, Rajasthan (India).
5- Structural Engineering Department, JNV University Jodhpur, Rajasthan (India).
Email ID: sp.ch@jnvu.edu.in, Contact Number: +91 94141 61135.

ABSTRACT
The present investigation reveals the physico chemical parameters of groundwater of pipar city, Jodhpur Rajasthan. Samples were collected to study various physico-chemical parameters from different sites of pipar city region. Where human and animal activities were elevated. Multiple samples were analyzed for dissolved oxygen (DO), biochemical oxygen demand (BOD), chemical oxygen demand (COD), pH, and Total dissolved solid (TDS) value. The total data points were used to ascertain relationships between the parameters and data were also subjected to statistical analysis. Linear regression model has been established between DO/BOD, COD/DO, BOD/COD, COD/pH, BOD/pH and DO/pH. The high to moderate correlation coefficient observed, R2 ranged from 0.987 to 0.445 between these parameters. These parameters were assessing to evaluate the quality of groundwater. This investigation shows that only 5 water samples parameters value lies within the permissible limit and rest of samples are beyond the permissible limit which indicates that groundwater of this region is highly contaminated and thus it is necessary to test the water quality at a regular and definite time interval.
Keywords: Ground Water, Physico -chemical parameter, Pipar city jodhpur, pH, TDS, etc.

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INTRODUCTION

Water is one of the abundantly available resources in nature from ground and surface area. It's also an essential ingredient of animal and plant life and forms 70% of all the matter of earth. Out of this only 0.007% water is used for drinking purpose. The importance of groundwater or the existence of human society cannot be over emphasized. Groundwater is the major source of drinking water in both urban and rural area. Besides it is an important source of water for agricultural and industrial sector [1].

Groundwater crisis is not the result of natural factor; it has been caused by human actions during the past two decades. The water level in several parts of the country has been falling rapidly due to an increase in extraction. The number of well drilled for irrigation of both food and cash crops have rapidly increased. India's rapidly rising population and changing life styles has also increased the need for water. The water requirement for the industry also shows an overall increase. Intense competition among users, agriculture, industry and domestic sector is driving the groundwater table lower [2].

The quality of groundwater is severely affected because of the wide spread pollution of surface water besides discharge of untreated waste water through bores and leaches from unscientific disposal of solid waste also contaminates groundwater, thereby reducing the quality of fresh water resources. Groundwater may contain dissolved minerals and gases that give it the tangy taste [3].

When water infected by unexpected substance, it is considered as harmful for human and aquatic lives. Heavy metals surroundings as sediments are considering as industrial effluents and these effluents affect the BOD, COD and DO of the water. BOD and COD directly or indirectly get exaggerated by the occurrence of toxic heavy metal impurity in water. India is a developing nation that moves towards the vision 2022 unfortunately, the development that had been carried all over the country gives a bad impact to the environment, particularly about water quality [4].

MATERIAL AND METHODS

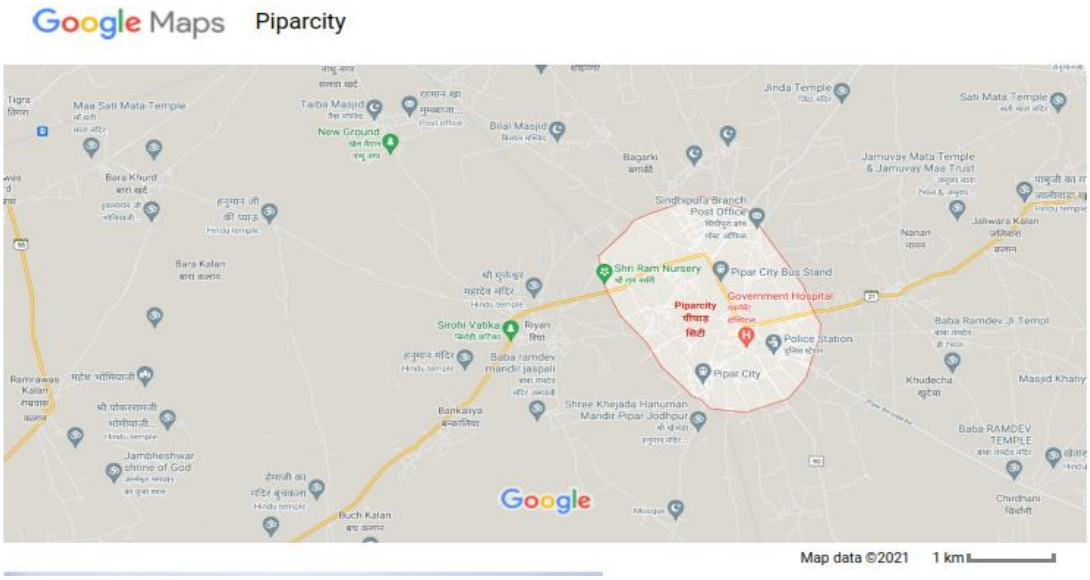
Sampling & Analysis Methods

Ten water samples were taken from various locations in Pipar city, Jodhpur area. Water samples were obtained from several locations using a composite sampling approach. All samples were collected in polypropylene vials with a high density. Plastic bottles were sanitized appropriately in all situations. Before collecting samples, bottles were cleaned with dilute nitric acid and then with double distilled water. During the investigation, Analytical Reagent (AR) grade chemicals were employed. For collection, preservation, analysis, and interpretation, proper techniques and methodologies were used. All data were examined within 6 hours of collecting the water sample, and parameters such as pH, temperature, and some parameters were assessed on site using portable meters and the results were compared to BIS standards.

DATA COLLECTIONS, TESTING & MODELING

Ten water samples from different sites were collected from different areas of pipar city Jodhpur. These water sources are extensively used for drinking and other domestic purpose. The samples were collected in high grade plastic bottles of two-liter capacity after rinsing with distilled water. The techniques and methods followed for collection, preservation, analysis and interpretation. The physico-chemical characteristics of the ground water samples were determined by standard methods.

FIGURE 1: MAP OF PIPAR CITY RAJASTHAN



LOCATION OF SAMPLING STATION

The samples were collected from ten different places of pipar city; namely, Borunda (S1), Gadsuria (S2), Javasia (S3), Bhakro ki dhani (S4) ,mahadev nagar (S5) ,Hinganiya (S6), Jatiawas (S7) , Bankaliya (S8) , Gorawat (S9) and merasiya (S10).

RESULTS AND DISCUSSIONS

The high to moderate correlation coefficient observed, R^2 ranged from 0.987 to 0.445 between BOD, COD, DO, and pH as parameters in linear regression model. Result showed that the BOD removal could be predicted by applying the correlation between BOD and COD and vice versa therefore, COD was found to be strongly correlated to BOD. TDS indicate the nature of water quality for salinity. The water samples in pipar city area fall in the range of 288-2620 mg/L According to WHO specification, TDS up to 500mg/L is highest desirable and up to 1000 mg/L is under maximum permissible category. Thus, based on the concentration of TDS, ground water can be classified as follows: up to500 mg/L as desirable for drinking, up to 1000 mg/L as permissible for drinking and up to3000 mg/L as useful for irrigation. Only 5 Samples are useful for drinking purpose only and remaining samples are not fit for drinking.

TABLE 1: AVERAGE CONCENTRATIONS OF DO (mg/L), BOD(mg/L), COD (mg/L), TDS, (mg/L) AND pH

Station no	BOD	COD	DO	pH	TDS
S1	0.20	6.1	4.0	7.5	288
S2	0.45	8.3	3.8	7.2	930
S3	0.17	3.9	5.1	6.9	1590
S4	0.20	4.5	5.2	7.1	2620
S5	0.45	8.7	4.5	8.2	590
S6	0.32	6.2	3.9	6.5	409
S7	0.25	5.9	3.8	7.2	1270
S8	0.28	6.3	6.5	7.1	1710
S9	0.25	5.8	5.3	7.1	2210
S10	0.08	1.9	4.9	7.3	492

Polynomial regression attempts to model the relationship between two variables by fitting a linear equation to experimental data .one variable is considered as descriptive variable and other is considered as dependent variable [5]

Simple linear regression follow the equation y = a + b x where x is descriptive variable and y is dependent variable slope of line is b and intercept is a. we endeavor to establish regression model between DO/BOD, COD/DO, BOD/COD, COD/pH, BOD/pH and DO/ph[6].

The regression analysis executed out to relate DO, BOD, COD and pH values. The high to moderate correlation coefficient experimental, R2 varies from 0.987 to 0.445. Significant Interrelationships were observed between COD and BOD indicators where reliable correlations were established using regression analysis Table 2 show the various linear regression models b/w water quality parameters and figure 2 to 7 show various regression equation for model between DO, BOD, COD and pH.

TABLE 2: VARIOUS LINEAR REGRESSION MODELS BETWEEN WATER QUALITY PARAMETERS.

Regression Model	Regression equation	Significant F	R Square	Adjusted R Square	Standard Error
BOD vs COD	BOD=0.365COD -0.0293	3.8E-10	0.859502	0.823364	0.03357
DO vs pH	DO=-0.3062Ph +5.8446	0.332127	0.463234	-0.019	0.86334
BOD vs pH	BOD=0.0477Ph -0.2532	0.371776	0.44538	-0.00854	0.10753
COD vs pH	COD=1.2193Ph- 4.325	0.1485	0.91043	0.042712	1.72853
BOD vs DO	BOD=- 0.0293DO+0.3566	0.167	0.98714	0.048642	0.10444

FIGURE 2: REGRESSION MODEL BETWEEN BOD AND COD

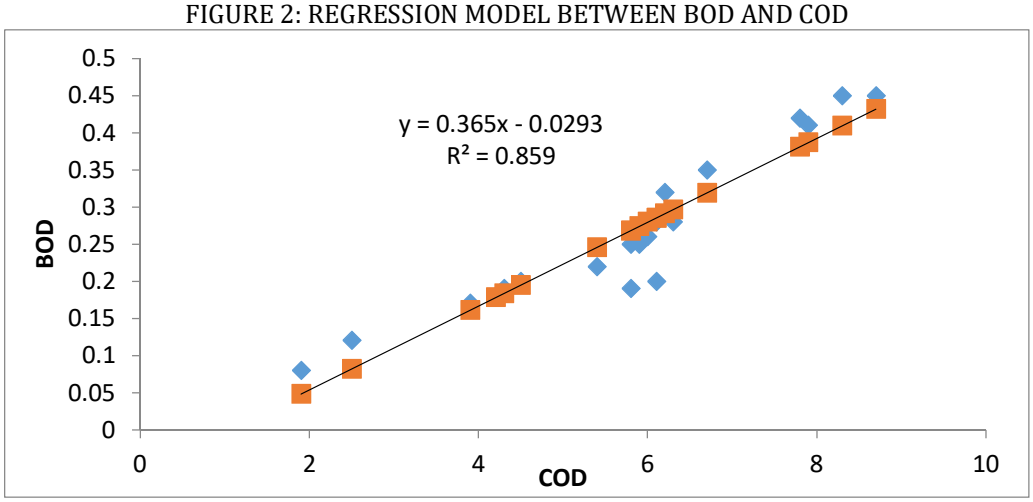


FIGURE 3: REGRESSION MODEL BETWEEN COD AND PH

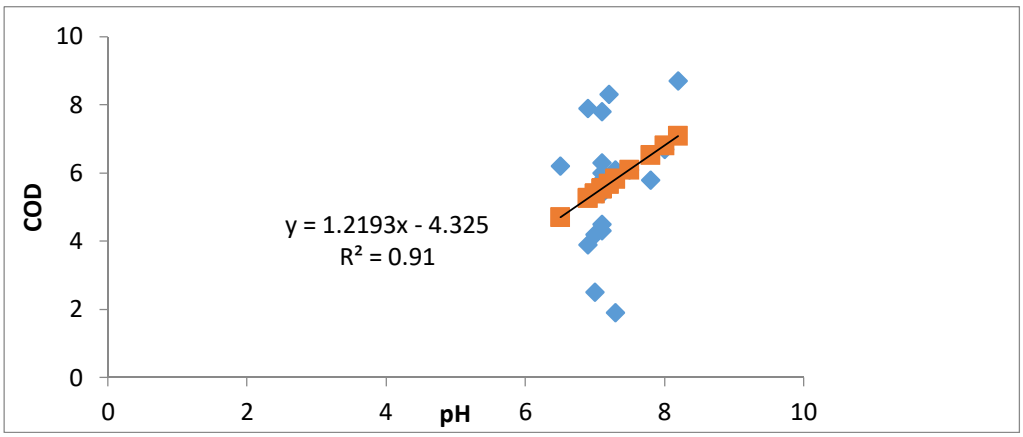


FIGURE 4: REGRESSION MODEL BETWEEN DO AND pH

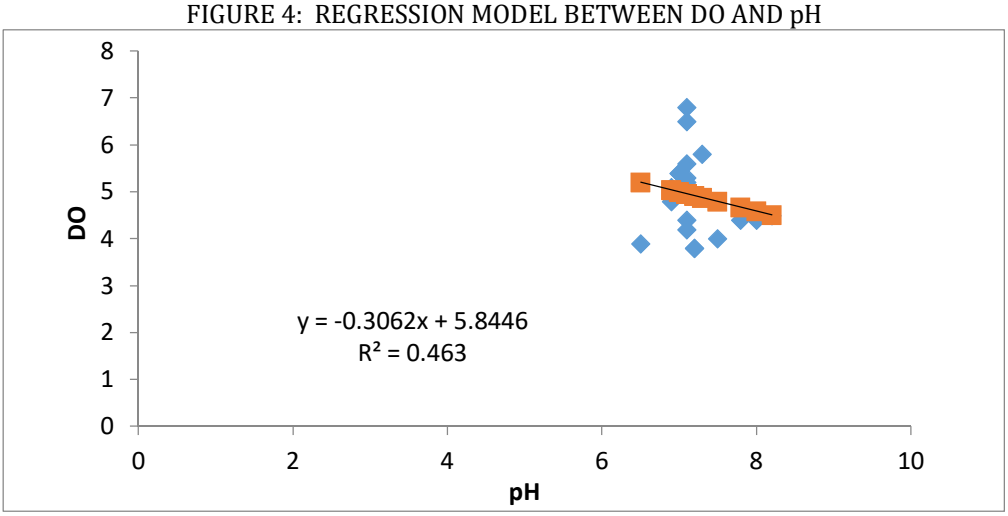


FIGURE 5: REGRESSION MODEL BETWEEN BOD AND DO

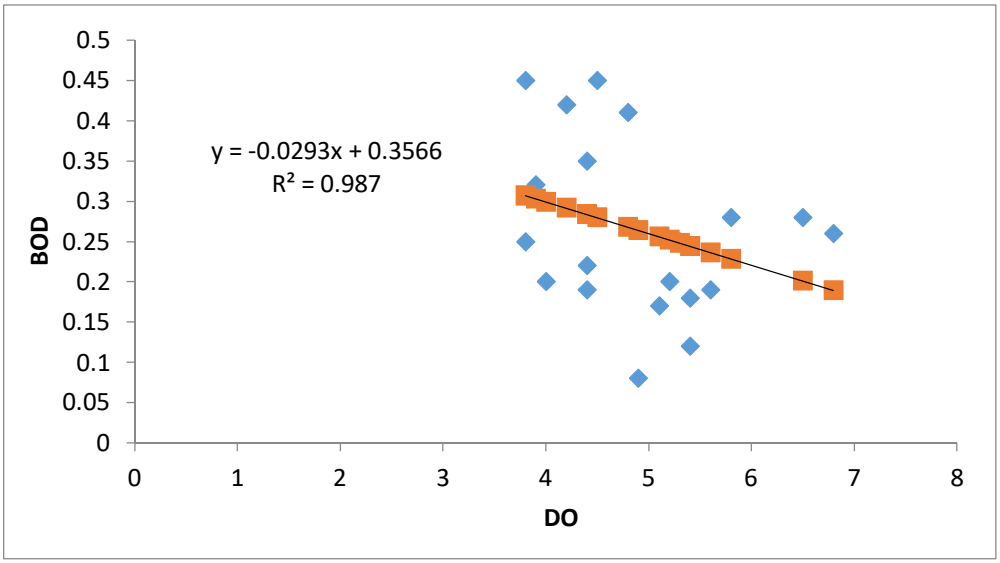
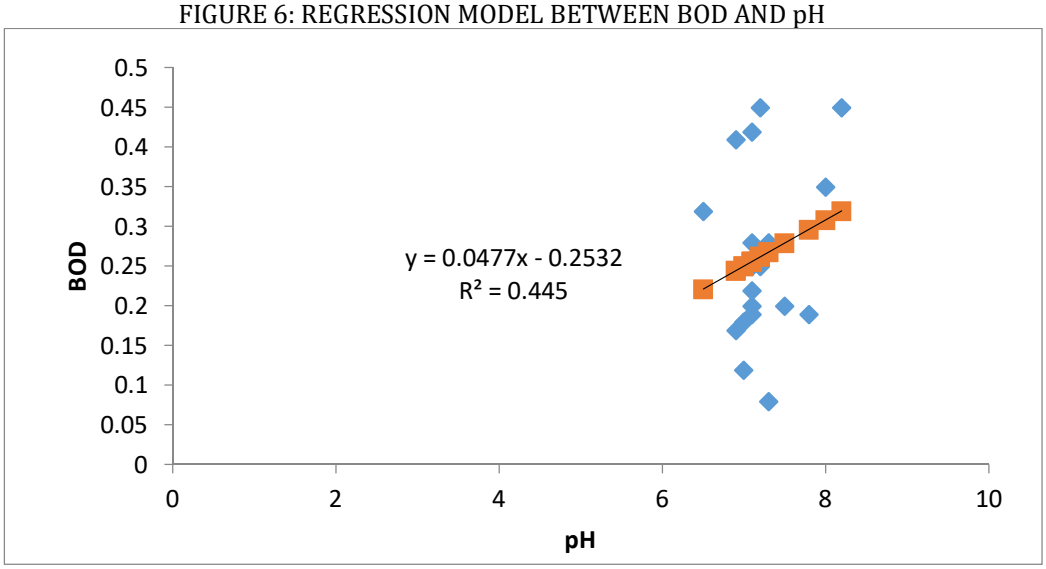


FIGURE 6: REGRESSION MODEL BETWEEN BOD AND pH



CONCLUSION

Detailed Physico-Chemical Assessment of Groundwater Quality of Pipar City in Jodhpur indicates that some of the regions under study area exceeds the permissible limits.. Thus in these areas effective water treatment technologies must be implemented to ensure good health of the community. Awareness program to educate about conservation of precious ground water resources and training on rainwater harvesting will be beneficial to check decline in water level and also it will ensure safe water for drinking and other domestic purpose. The low variation coefficient of a parameter found in various models is symptomatic of the high consistency, which can improve the precision of prediction parameter. These values indicate BOD sensitive to pH is more than COD. So, in order to access to better Prediction results we should measure pH parameter with high careful in compared to another parameter. This research suggests that the use of more participation parameters will not essentially lead to improvements of predicted results, but type of input parameters is more important than its number. The analysis of ground water shows higher values water parameters in drinking water samples of some stations sites of pipar city jodhpur in these areas, the treatment technologies must be implemented to ensure good health of the community .Good correlations established between physicochemical parameters using regression model which could be used to predict the level of contamination of pipar city jodhpur region water by different parameters. Such analysis is also economic valuable and time saving because statistical equations is being used to measure the extent of pollution hence some anticipatory action can take before the detailed study and controlled the pollution to an assured extent This statistical process would be very helpful in case of the obligation of large data set and predominantly in case of emergency when instantaneous mitigation channel is required to sustain the water quality standard.

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CONFLICT OF INTEREST

The authors declare that they have no any conflict of interest.

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