International Journal of Oceans and Oceanography
ISSN 0973-2667 Volume 17, Number 1 (2023), pp. 17-26

http://www.ripublication.com/ijoo.htm

Sea Water Analysis of Mypadu Coastal Area, Andhra Pradesh, India

[1]Pinki Jain and [2]Vishvajit Singh

[1,2]PDM University, Bahadurgarh, Haryana, India
Emails: [1] pinkijain47@gmail.com, [2] vishvajit73.sheoran@gmail.com
[2] Corresponding Author

Abstract:

Sea water interacts with the earthly environment, where sewage from the land will lead to the sea. Waste containing these pollutants will enter into coastal waters and marine ecosystems. The study area is based in the major portion at Mypadu of Andhra Pradesh.
The study has been performed consistently to look upon the water quality condition of the study area. A total of 10 water samples were collected and examined for physico-chemical parameters such as pH(pH), Temperature(T), Salinity(SL), Electric Conductivity(EC), Dissolved Oxygen(DO), Silica(S), Iron (Fe), Manganese (Mn), Chromium (Cr), Copper (Cu), Nickel (Ni), Lead (Pb), Zinc (Zn) and Cadmium(Cd) using standard methods. Statistical analysis like Pearson Correlation matrix and two way analysis of variance are accoutered to the data set to know the relationship among the studied parameters.

Key words: Mypadu, Bay of Bengal.

Introduction

Water is one of the important resources of earth[13]. It is very crucial for life on earth. It is the source of all living things and their comestible also. Without water survival of living being is not possible. Water quality has become a major global matter due to accumulating human activities. Sea water is contaminated due to clearance of garbage, industrial garbage, ludicrous non rural garbage discarding, extract from landfills, organic pollutants etc[2, 5].
A correlation matrix is a table showing correlation coefficients between variables. Each cell in the table shows the correlation between two variables. A correlation matrix is used to summarize data, as an input into a more advanced analysis, and as a diagnostic for advanced analyses.

In mathematics or statistics, a proximity matrix is a square matrix (two-dimensional array) containing the distances, taken pairwise between the elements of a matrix. Broadly defined; a proximity matrix measures the similarity or dissimilarity between the pairs of matrix.
Cluster analysis is a data analysis technique that explores the naturally occurring groups within a data set known as clusters. Cluster analysis doesn't need to group data points into any predefined groups, which means that it is an unsupervised learning method.

Analysis of Variance [8, p.256-258]
Analysis of variance (abbreviated as ANOVA) is an extremely useful technique concerning researches in the fields of economics, biology, education, psychology, sociology, and business/industry and in researches of several other disciplines. This technique is used when multiple sample cases are involved. As stated earlier, the significance of the difference between the means of two samples can be judged through either *z*-test or the *t*-test, but the difficulty arises when we happen to examine the significance of the difference amongst more than two sample means at the same time. The ANOVA technique enables us to perform this simultaneous test and as such is considered to be an important tool of analysis in the hands of a researcher. Using this technique, one can draw inferences about whether the samples have been drawn from populations having the same mean.

Study Area
Mypadu is located on the west coast of India. It is about 25 kilometers from Nellore, Andhra Pradesh and lies on the coast of the magnificent Bay of Bengal. One can take a long peaceful stroll across the beach or sit in the sand, contemplate about life or just absorb the beauty of the location.

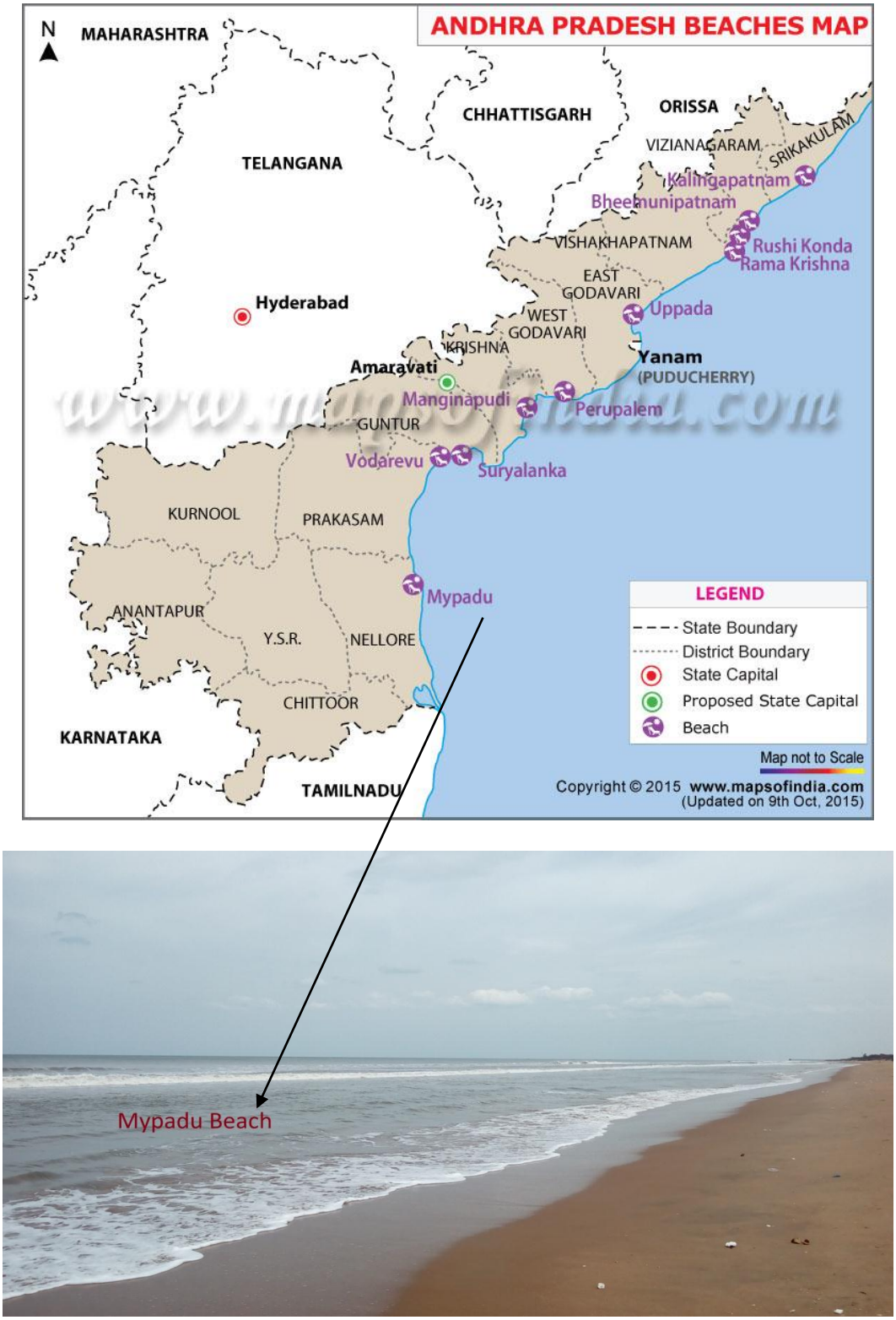

Figure 1: Location map of the study area

Sample Collection

Sampling site consists of Mypadu coast area. Samples are taken from ten (10) samples site. Samples were taken in impervious bottle to neglect dubious variegate in attributes according to canonical method (APHA) [1, 6, 7, 10, 13].

Investigation of Samples

The preserved specimen were distinctly considering such as pH(pH), Temperature(T), Salinity(SL), Electric Conductivity(EC), Dissolved Oxygen(DO), Silica(S), Iron (Fe), Manganese (Mn), Chromium (Cr), Copper (Cu), Nickel (Ni), Lead (Pb), Zinc (Zn) and Cadmium(Cd) as per the standard methods (APHA, 1998) [3.]

Results and discussion

The variations different attributes such as pH(pH), Temperature(T), Salinity(SL), Electric Conductivity(EC), Dissolved Oxygen(DO), Silica(S), Iron (Fe), Manganese (Mn), Chromium (Cr), Copper (Cu), Nickel (Ni), Lead (Pb), Zinc (Zn) and Cadmium(Cd) concentrations at the different locations along the Mypadu Coast are listed in Table 1 and shown in Fig. 2. Two way Anova has adapted using Microsoft Excel 7.0 software to determine the dependency of attributes and Sample Names and tabulated in Table 3. ANOVA helps to identify the trend with respect to different samples and its influence among the parameters. Attributes are equally important. There is no significance difference between the attributes. There is significance differences between the samples. Correlation matrix has performed within the studied attributes using Microsoft Excel 7 software and tabulated in Table 2 for determining the relationship between the physico-chemical variables.[16] The analysis yielded positive correlations among Fe, Mn, Cr, Ni, Zn, Cu and Pb. Positive correlations among heavy metals signified that metals have common sources, mutual dependence, and identical behavior . Proximity matrix is created using IBM SPSS 21 which shows the similarity and dissimilarity among the attributes. . Agglomeration Schedule has adapted using IBM SPSS 21 software and tabulated in Table 5. Cluster analysis has performed by IBM SPSS 21 software and a Dendogram is shown in Fig 2. There are two statistically significant clusters are formed. Present study reveals that there is a difference in the physico-chemical properties of cluster 2 and cluster 1.

Conclusions:

The analysis of total aggregation of heavy metals and their dispensation show that sediment from the Mypadu Coast are desecrated with heavy metals, which is an effect of comprehensive anthropogenic accentuation in the area.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this study.

Table 1. Water Quality at different locations of Mypadu Coastal area (Laboratory Analysis)

Sample Name	pH	T (^{0}C)	SL (ppt)	EC (µmho)	DO (mg/L)	S (mg/L)	Fe (mg/L)	Mn (mg/L)
MP-1	6.8	32.9	35.8	66	3.9	24	2030.26	50.86
MP-2	7.1	33.5	35.4	85	4.2	22	2041.76	25.43
MP-3	7.2	33.0	35.3	80	4.3	21	2952.73	57.88
MP-4	6.8	33.8	35.2	76	4.3	20	2560.86	40.76
MP-5	6.9	33.9	35.9	68	4.2	20	2308.68	29.72
MP-6	7.1	33.7	36.1	65	4.2	24	4810.44	166.26
MP-7	7.2	33.2	36.2	79	4.1	31	1528.76	20.42
MP-8	6.7	32.9	35.3	81	3.9	16	2072.24	44.28
MP-9	7.0	34.0	35.8	64	3.7	29	3313.59	66.88
MP-10	6.8	32.9	35.9	81	4.2	28	4043.12	90.22

Sample Name	**Cr** (mg/L)	**Cu** (mg/L)	**Ni** (mg/L)	**Pb** (mg/L)	**Zn** (mg/L)	**Cd** (mg/L)
MP-1	7.00	5.34	6.22	7.16	14.26	0.88
MP-2	7.92	4.26	4.56	4.18	14.85	0.55
MP-3	9.82	4.22	6.62	4.10	17.56	1.02
MP-4	9.20	4.16	6.54	6.44	14.32	0.59
MP-5	7.68	4.18	6.34	6.48	13.48	0.57
MP-6	18.98	5.67	9.38	7.16	24.42	0.92
MP-7	6.72	4.14	6.26	4.97	11.96	0.72
MP-8	6.74	4.00	6.98	4.57	11.78	0.58
MP-9	10.32	3.96	7.13	6.28	12.29	0.64
MP-10	10.96	4.12	8.40	5.48	13.67	0.58

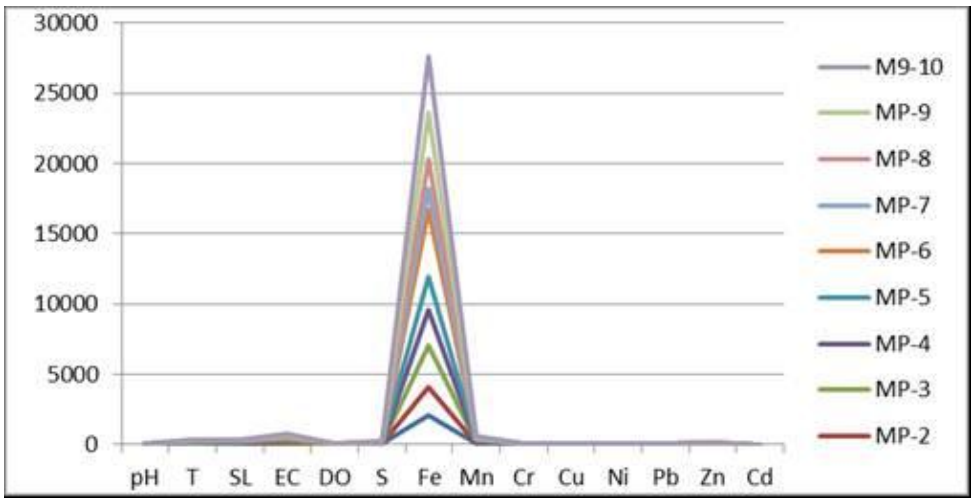

Figure 1: Graphical representation of data

Table 2: Pearson Correlation Matrix for the data

	pH	*T*	*SL*	*EC*	*DO*	*S*	*Fe*	*Mn*	*Cr*	*Cu*	*Ni*	*Pb*	*Zn*
pH	1												
T	0.1776557	1											
SL	0.2784608	0.1084406	1										
EC	0.0688247	-0.5037403	-0.4738139	1									
DO	0.2720536	4.634E-16	-0.1695642	0.4286643	1								
S	0.4140301	0.0476435	0.7224796	-0.1940069	-0.2377921	1							
Fe	0.0640063	0.1947302	0.2605077	-0.3370598	0.1500835	0.1917853	1						
Mn	0.0831668	0.0900615	0.3552316	-0.4232649	0.0660548	0.151525	0.9286963	1					
Cr	0.2628999	0.3033408	0.3175727	-0.3915199	0.2252352	0.1522858	0.9179723	0.953506	1				
Cu	0.0868084	-0.0451279	0.3762791	-0.5321781	0.0441089	0.0299264	0.3883928	0.6461729	0.5843904	1			
Ni	-0.1172318	0.0004933	0.4188805	-0.3861081	0.0034091	0.1996364	0.8573262	0.8836475	0.790432	0.3907532	1		
Pb	-0.3153182	0.4300518	0.4479912	-0.8730298	-0.1981409	0.1538685	0.361223	0.4472119	0.4064691	0.6100255	0.4414468	1	
Zn	0.3928667	0.1548964	0.1614082	-0.2865468	0.4277372	-0.0865119	0.6925229	0.8098512	0.876598	0.7478262	0.5347595	0.292919	1

Table 3: Two way Analysis of Variance

Anova: Two-Factor Without Replication						
SUMMARY	*Count*	*Sum*	*Average*	*Variance*		
MP-1	14	2291.38	163.67	289018.6		
MP-2	14	2290.71	163.6221	292700.9		
MP-3	14	3234.75	231.0536	614176.5		
MP-4	14	2818.97	201.355	461620.4		
MP-5	14	2546.03	181.8593	375056.6		
MP-6	14	5213.33	372.3807	1633467		
MP-7	14	1774.65	126.7607	163270.9		
MP-8	14	2326.97	166.2121	301449.6		
MP-9	14	3594.59	256.7564	774555.3		
M9-10	14	4365.35	311.8107	1154154		
pH	10	69.6	6.96	0.033778		
T	10	333.8	33.38	0.201778		
SL	10	356.9	35.69	0.129889		
EC	10	745	74.5	62.5		
DO	10	41	4.1	0.04		
S	10	235	23.5	21.83333		
Fe	10	27662.44	2766.244	1052735		
Mn	10	592.71	59.271	1847.814		
Cr	10	95.34	9.534	13.36223		
Cu	10	44.05	4.405	0.350428		
Ni	10	68.43	6.843	1.699601		
Pb	10	56.82	5.682	1.386773		
Zn	10	148.59	14.859	14.12857		
Cd	10	7.05	0.705	0.029694		
ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Parameters	739238.7	9	82137.64	1.097915	0.369779	1.960818
Sample Names	70020051	13	5386158	71.99551	1.95E-49	1.804692
Error	8753052	117	74812.41			
Total	79512342	139				

Table 4: Proximity Matrix

Case	Matrix File Input				
	pH	T	SL	EC	DO
pH	.000	6982.020	8255.270	46177.520	82.280
T	6982.020	.000	56.030	17505.060	8575.360
SL	8255.270	56.030	.000	15650.130	9981.030
EC	46177.520	17505.060	15650.130	.000	50112.260
DO	82.280	8575.360	9981.030	50112.260	.000
S	2926.120	1172.660	1661.730	26898.000	3964.460
Fe	85610884.371	84158462.155	84032138.075	81979252.431	85768460.159
Mn	43983.210	23304.278	22093.070	22101.180	47058.856
Cr	183.640	5799.428	6955.262	43092.232	412.940
Cu	68.568	8400.692	9790.390	49743.574	4.350
Ni	16.243	7059.231	8334.417	46424.123	90.881
Pb	30.346	7681.994	9015.028	48080.452	38.708
Zn	746.518	3554.540	4463.696	36413.416	1279.290
Cd	391.550	10679.029	12240.777	55026.978	115.816

Proximity Matrix					
Case	Matrix File Input				
	S	Fe	Mn	Cr	Cu
pH	2926.120	85610884.371	43983.210	183.640	68.568
T	1172.660	84158462.155	23304.278	5799.428	8400.692
SL	1661.730	84032138.075	22093.070	6955.262	9790.390
EC	26898.000	81979252.431	22101.180	43092.232	49743.574
DO	3964.460	85768460.159	47058.856	412.940	4.350
S	.000	84684712.031	29074.640	2220.432	3844.354
Fe	84684712.031	.000	82030993.667	85407267.099	85747922.948
Mn	29074.640	82030993.667	.000	38791.380	46440.288
Cr	2220.432	85407267.099	38791.380	.000	363.718
Cu	3844.354	85747922.948	46440.288	363.718	.000
Ni	2964.463	85596931.483	43241.212	140.168	72.461
Pb	3368.552	85673801.277	44953.125	249.625	24.288
Zn	1097.676	85127866.173	34126.388	314.172	1193.220
Cd	5391.598	85955798.999	50871.589	895.452	139.182

Proximity Matrix				
Case	Matrix File Input			
	Ni	Pb	Zn	Cd
pH	16.243	30.346	746.518	391.550
T	7059.231	7681.994	3554.540	10679.029
SL	8334.417	9015.028	4463.696	12240.777
EC	46424.123	48080.452	36413.416	55026.978
DO	90.881	38.708	1279.290	115.816
S	2964.463	3368.552	1097.676	5391.598
Fe	85596931.483	85673801.277	85127866.173	85955798.999
Mn	43241.212	44953.125	34126.388	50871.589
Cr	140.168	249.625	314.172	895.452
Cu	72.461	24.288	1193.220	139.182
Ni	.000	29.058	737.847	391.147
Pb	29.058	.000	958.473	259.992
Zn	737.847	958.473	.000	2123.365
Cd	391.147	259.992	2123.365	.000

Table 5: Agglomeration Schedule for the Samples

Agglomeration Schedule						
Stage	Cluster Combined		Coefficients	Stage Cluster First Appears		Next Stage
	Cluster 1	Cluster 2		Cluster 1	Cluster 2	
1	5	10	2.175	0	0	5
2	1	11	10.297	0	0	3
3	1	12	27.391	2	0	5
4	2	3	55.406	0	0	8
5	1	5	119.451	3	1	7
6	9	13	276.538	0	0	9
7	1	14	477.579	5	0	9
8	2	6	1413.037	4	0	11
9	1	9	2382.635	7	6	11
10	4	8	13433.225	0	0	12
11	1	2	26304.184	9	8	12
12	1	4	80688.653	11	10	13
13	1	7	78773103.097	12	0	0

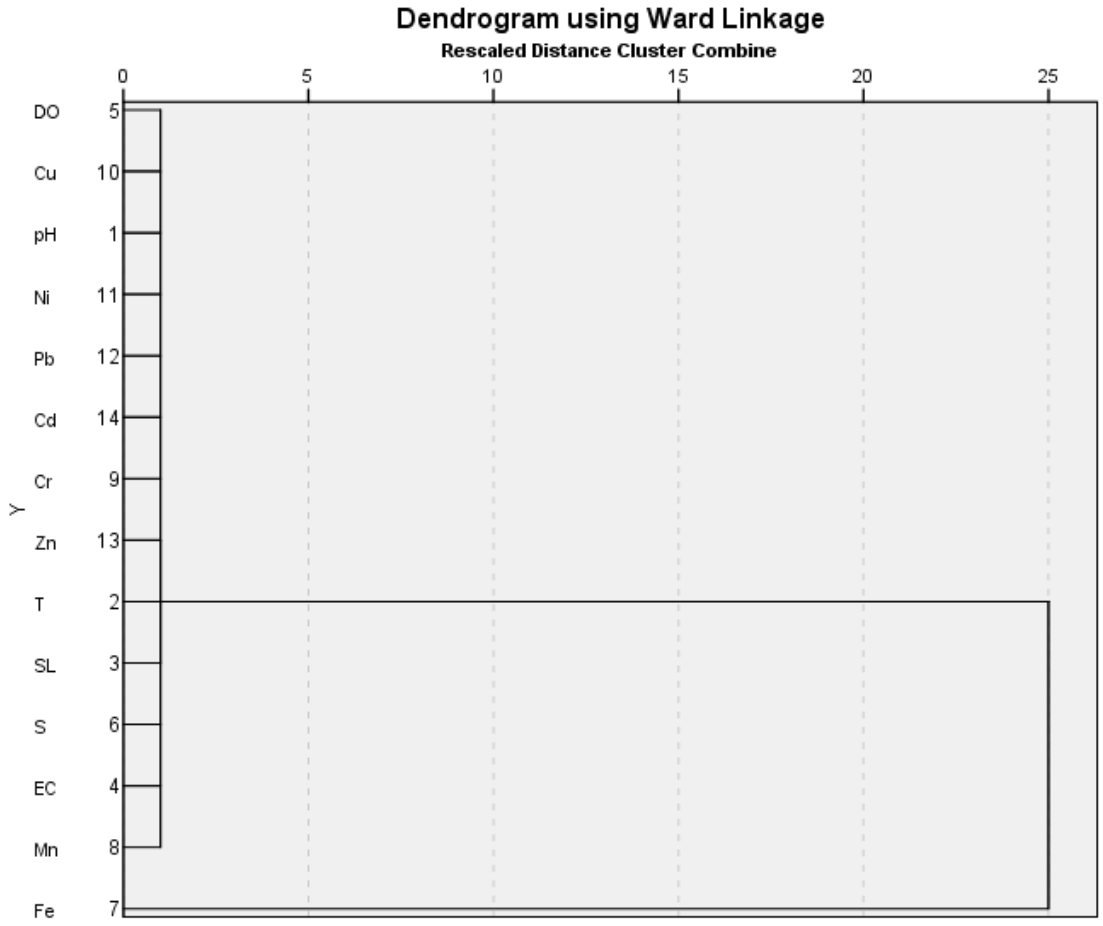

Figure 2: Dendrogram using Ward Linkage

REFERENCES

[1] Anita. and Salahuddin.(2019). Analysis of Electrical conductivity of Ground water at different locations of Phooli of U.P, India. *International Journal of Emerging Trends in Engineering and Development*, 3, 1-5.

[2] Ansari, Farid**.** and Salahuddin. (2013). Groundwater Temperature Variation Analysis of Industrial Area Nandganj, Ghazipur (India). *Australian Journal of Basic and Applied Sciences,* 7 (14),539-542.

[3] APHA. (1998). Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WPCF, Washington D.C.

[4] Babu,Y. S. and Mohan, M.R. (2018). A study on Physico-Chemical parameters of Errarajan of Bangalore Rural. *International Journal of Scientific Research*, 7(2), 401-402.

[5] Chaudhary, M. P. and Salahuddin (2014). Analysis of COD in water at different locations of upper lake in Madhya Pradesh. *European Journal of Applied Engineering and Scientific Research*, 3(2), 37-39.

[6] Chaudhary, M. P. and Salahuddin. (2015). Physico-Chemical analysis in winter season of Bhojtal water in Bhopal region of Madhya Pradesh, India. *International Journal of Mathematical Archive,* 6 (4),78-81.

[7] Khan, M. F. (2020). Physico-Chemical and Statistical Analysis of Upper Lake Water in Bhopal Region of Madhya Pradesh, India. *International Journal of Lakes and Rivers.*13(1),01-16.

[8] Kothari, C. R., *Research Methodology*, New Age International (P) Limited, Publishers, New Delhi, 2004

[9] Salahuddin. (2013). Analysis of Chloride Content in the Surface of water at different locations of Madhya Pradesh. *International Journal for Pharmaceutical Research Scholars,* 2(4), 107-109.

[10] Salahuddin.(2014). Physico-chemical analysis of upper lake water in Bhopal region of Madhya Pradesh, India. *Advances in Applied Science Research*, 5(5), 165-169.

[11] Salahuddin.(2015). Analysis of electrical conductivity of ground water at different locations of Dildar Nagar of U.P, India, *Advances in Applied Science Research*, 6(7), 137-140.

[12] Salahuddin. (2020).Analysis of Magnesium contents of Ground water at surrounding areas of Dildar Nagar of U.P. India. *International Journal of Innovative Research in Science, Engineering and Technology*, 9(4), 1607-1610.

[13] Salahuddin. and Ansari, Farid.(2013). Statistical Analysis for the Presence of pH Content of Ground Water at Different Locations of Industrial area at Ghazipur in India.*Global Journal of Science Frontier Research (F),* 13 (9),55-59.

[14] Salahuddin and Intazar Husain (2020), Analysis of Sea Water from Tupilipalem Coastal area, India, *International Journal of Oceans and Oceanography,* Vol-14, No 2, 227-283.

[15] Salahuddin. and Husain, Intazar.(2020). Analysis of Lower Lake Water in Bhopal Region of Madhya Pradesh, India. *International Journal of Lakes and Rivers.*13(1), 17-25.

[16] Salahuddin. Khola, R. K.(2014). Physico-Chemical Analysis for the Presence of Oxygen Content of Ground Water at Different Locations of Dildar Nagar of U.P, India. *Global Journal of Science Frontier Research (B),* 14 (6),01-03.

[17] Salahuddin and Khola, R. K. (2013). Analysis of Chloride Content in the Surface of water using two way Anova. *International Journal for Pharmaceutical Research Scholars,* 2(4), 51-53.

[18] Salla, S. and Ghosh, S. (2014). Assessment of water quality parameters of lower lake, Bhopal. *Advances in Applied Science Research*, 6, 8-11.

[19] Sirajudeen., Mohidheen, M. K., and Vahith, R. A.(2014). Physico-chemical contamination of groundwater in and around Tirunelveli district, Tamil Nadu. *Advances in Applied Science Research***,** 5(2), 49-54.