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Analysis of seasonal variation in river PATALGANGA with correlation regression

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ABSTRACT
The most easily accessible water is surface water which exists in lakes and rivers. Patalganga is one of the most important river in its vicinity, it is solely responsible for industrial growth in that region. This growth is showing an adverse effect on its water. In this study river water was put to the test analyzed by ten parameters and correlation was performed to gauge the relation between different parameters in three seasons. Highest dependencies of parameters were observed in rainy season lower was seen in summer. Hardness Turbidity during monsoon and BOD COD during winter and summer were most crucial as they are consequentially related. This study will illuminate those parameters which can be crucial for further studies.
Keywords: **sur**face water, patalganga, analyzed, crucial

I. INTRODUCTION

Pollution of river water is becoming a world crisis. Every now and then we here the stories of river pollution getting worst day by day. In case of India also story is not different from others. In India numbers of rivers getting polluted are increasing with every survey conducted by government. The main reason behind this is untreated sewage and industrial waste. Rivers in India are considered as sacred and treated as divine goddesses but in reality their quality is getting degraded due to various reasons. The speed with which industrialization and globalization took with the same speed efforts was not put to protect environment.

River patalganga flows near khlapur district b. As the river flows near villages it becomes major source of water for various domestic purposes as well as drinking purpose. Villages have very limited water sources such as open wells and tube wells. Hence reliance on river water is significant especially after rainy season. So measuring and assessing its potability becomes essential. Industrial cluster has developed in recent years on the banks of this river from khopoli to panvel. Many companies produce steel, chemicals, pharmaceuticals, cloth dyes etc. The raw water is used from river and waste water is directly released into the river Also there is no waste water plant in any village so untreated wastewater is directly released in river.

II. PERVIOUS RESEARCH

There were few attempts made to gauge the amount of pollution in the river.

In1984 two members scientist committee was formed to gauge the amount of pollution in river. They gave recommendation to avoid future contamination of impurities in water. But it was found that those recommendations were not followed.

Central pollution control board (CPCB) conducted a survey between 2013-2017 of 253 rivers in India and patalganga was found one of the 38 rivers which were most polluted.

In 2013 a paper was published where physic chemical and biological tests were conducted to figure out the amount of pollution. Fourteen stations were divided into 3 clusters and for each cluster results were obtained. And it was concluded that among three clusters one was in bad state and other two were medium and good.

As it can be concluded from above studies that there is obvious environmental threat. And continuous assessment requires monitoring its pollution level for protection and conservation purpose.

III.   METHODOLOGY:

Correlation regression was performed on ten parameters collected from ten stations in the selected study area. Water samples were collected in three different seasons keeping three months of gap between each collection. Method given by central pollution control board was adapted in water sampling. Testing was carried out according to IS 3025.

Sr No	Range	Level
1	0.5 to 0.65	Low
2	0.65 to 0.8	Medium
3	>0.8	High

IV.   RESULT AND DISCUSSION

The first regression matrix shows the result of rainy season in which PH do not show any significant relation with any other parameters.

In case of temperature only DO (-0.59423) is showing small relation. Turbidity is highly related to TDS (0.8318), EC (0.812737) and hardness (0.831869). Low relativity was found with COD (0.505204) it is also negatively related to DO (-0.66196). Color and DO are moderately related in negative manner (-0.73005) TDS and hardness are highly related (0.865292). TDS is moderately related to EC (0.738579) and highly related to hardness (08652). EC and hardness (09372) are the most related parameters EC shows moderate relation with COD (0.60256). COD and BOD (0.619147) are related. Hardness is also related to COD (0.727332). In all it can be seen that Hardness is the most essential parameter needs to be look after during rainy season as it is showing relation with most of the parameters. Turbidity, TDS and EC are needs to be monitor as well.

TABLE NO: 2 Correlation Matrix for Physico-chemical and Bacteriological Parameters of the Patalganga River Water during Rainy Season July (2018)

	PH	TEMP	TURBIDITY	COLOUR	TDS	EC	DO	COD	BOD	HARD
PH	1									
TEMP	0.293871	1								
TURBIDITY	0.328165	-0.022284	1							
COLOUR	-0.059904	0.214421	0.475784	1						
TDS	-0.247379	0.09159	0.84626	0.605142	1					
EC	0.1218	0.091093	0.812737	0.324856	0.738578	1				
DO	-0.46946	-0.16188	-0.66196	-0.73005	-0.52383	-0.42616	1			
COD	-0.234552	-0.32097	0.505204	0.073616	0.602563	0.636156	0.030475	1		
BOD	0.061139	0.59423	0.40931	0.409422	0.469998	0.199639	0.14046	0.619147	1	
HARDNESS	-0.043432	-0.16731	0.831863	0.434116	0.865292	0.937233	-0.36286	0.727332	0.37637	1

Second correlation matrix shows regression matrix during summer season. In this case TDS, Temperature, EC and DO shows no significance with any other parameter. However, PH shows moderate relations with TDS (-0.58) and turbidity (-0.58003). in case of turbidity it is related to color (0.77) and DO (-0.53). In this season color is the most vital parameter as it is related to maximum parameters such as EC (0.5), DO (-0.69), COD (0.578769) and BOD (0.563014). Among all the highly related parameters are COD and BOD (0.982933) it certainly indicates high biological activities.

TABLE NO: 3 Correlation Matrix for Physico-chemical and Bacteriological Parameters of the Patalganga River Water during Summer Season March (2018)

	PH	TEMP	TURBIDITY	COLOUR	TDS	EC	DO	COD	BOD	HARD
PH	1									
TEMP	0.398641	1								
TURBIDITY	-0.58013	0.370806	1							
COLOUR	-0.42894	0.314613	0.772784	1						
TDS	-0.58936	-0.15575	0.44066	-0.057655	1					
EC	-0.39737	0.106047	0.454778	0.504768	0.223886	1				
DO	0.498154	-0.1001	-0.53815	-0.69194	0.026623	0.022527	1			
COD	-0.21335	0.236001	0.428237	0.578769	0.003006	0.413675	-0.0685	1		
BOD	-0.22116	0.320334	0.451478	0.563014	0.091557	0.467032	0.05474	0.982933	1	
HARDNESS	-0.17884	0.002394	0.007729	0.14358	-0.47206	0.12717	-0.150292	0.31708	-0.21265	1

It can be observed in third correlation matrix that PH and temperature are not related to any parameters in significant manner. Turbidity and color are most related parameters in all. Turbidity is related to EC (0.555383), DO (-0.79408), COD (0.702145), BOD (0.655427) and Hardness in moderate way. It is highly related to color (0.87658). Similarly, color is also a parameter which is significant in relation with TDS (0.663939), DO (-0.68411), COD (0.703054), BOD (0.72122) and Hardness (0.763085). It indicates highest relation to EC (0.800977). TDS is moderately related to BOD (0.690226) and Hardness (0.715833) and highly related to EC (0.875733). Highest relation was found between COD and BOD (0.898642). EC is highly related to hardness (0.82503) and moderately related to BOD (0.694962). In the very last observation BOD is found moderately related to Hardness (0.746105).

TABLE NO: 4 Correlation Matrix for Physico-chemical and Bacteriological Parameters of the Patalganga River Water during Winter Season November(2017)

	PH	TEMP	TURBIDITY	COLOUR	TDS	EC	DO	COD	BOD	HARD
PH	1									
TEMP	0.173368	1								
TURBIDITY	-0.315	0.093011	1							
COLOUR	0.00113	0.092153	0.87658	1						
TDS	0.144003	-0.34188	0.475425	0.663939	1					
EC	0.24458	-0.00072	0.555383	0.800977	0.875733	1				
DO	0.497314	0.34294	-0.79408	-0.68411	-0.2612	0.33658	1			
COD	0.128191	0.01318	0.702145	0.703054	0.434343	0.499065	-0.50017	1		
BOD	0.316284	0.12402	0.655427	0.722122	0.690226	0.694962	-0.31732	0.898642	1	
HARDNESS	-0.428	0.03711	0.511684	0.763085	0.715833	0.820503	-0.124909	0.542533	0.746105	1

V.   CONCLUSION

Highest dependencies of parameters were observed in rainy season lower was seen in summer. Many parameters shown interdependency. Hardness and turbidity were the major once among all of them. Also DO showed negative relation with almost all parameters. Highest number of parameters interrelated were observed in the month of July that is rainy season. Four parameters are crucial here TDS turbidity hardness and EC. This could be the result of high discharge of rain water from surrounding catchment. In summer BOD COD showed highest dependency which indicates higher biological pollutants and activities. Other parameters remain less related. This could be the result of sluggish water velocities during this season. Though patalganaga is Perennial River it shows reduction in flow of water during summer. Hardness and color are two most crucial parameters during winter they are showing signs of greater significance. Apart from these once again like summer season all microbiological parameters are active. It can be noted that except rainy season micro parameters are becoming crucial parameters. Finally, it can be concluded that Hardness Turbidity during monsoon and BOD COD during winter and summer and in summer particularly color was showing relativity with various parameters. Hence for further analysis and modeling these parameters should be given more preference.

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