

Spectrophotometric determination of anionic detergents in the river gomti at jaunpur city

Shafqat Alauddin*, Shailendra Yadav and Tamheed Firdaus

Environmental Research Lab, Shibli National College, Azamgarh-276001, U.P., India.

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ABSTRACT

Detergents includes some surfactants like LAS (linear alkyl sulphonate), TPBS (Tetra Propylene derived alkyl Benzene Sulphonate), ABS (branched chain alkyl benzene sulphonate) etc. LAS is most widely used anionic detergents and it have biodegradable capacity, while ABS like surfactants are resistant to biodegradability. The present study specially aims to study spectrophotometrically the contamination level of water of river Gomti by the presence of anionic detergents flowing from the heart of Jaunpur city. In the river Gomti direct wastes like municipal garbage, sewage as well as industrial wastes is dumped without treatment. River Gomti is continuously been contaminated by the sewage and other types of wastes. This study revealed that there is gradual increase in the level of anionic detergents as we proceed from January to December along the years of study 2009, 2010 and 2011.

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Introduction

Jaunpur is situated southeastern part of Uttar Pradesh and lies 25.73°N latitude and 82.68°E longitude embracing an area of nearly 4,038 km² (1,559sq mile) with the total population of 4, 476,072 as per census of 2011 having density of 1,108 km² (2,870sq mile). A preliminary survey of the river Gomti at Jaunpur showed that there were several points of interest. It flows from the heart of the Jaunpur city.

Detergents are used as a cleaning agent and components of detergents are surfactant (10-30%), builder (15%) and other ingredient like sodium silicate, amines, sodium sulphate. Surfactants are largely water soluble and forms foam in the waste water. Surfactants are classified as anionic, cationic, non-ionic and amphoteric as per their nature in water. Surfactants are used in the production of synthetic detergents, which are used every day life and industries viz. textile, cosmetics, paper, pharmaceuticals. Today's sewage contains appreciable amount of detergent along with other pollutants. River which flows near the suburban as well as urban areas are most polluted with such sewage which contains appreciable amount of detergent.

People of Jaunpur city use water of river Gomti for irrigation, drinking and other day today needs. Intake of water having large quantity of detergent causes serious problems to human beings as well as to animals. It causes increase in the level of cholesterol, dilated mucous membranes, vomiting, lack of appetite, diarrhea and may cause corrosive injuries in the mouth and GI tract and may cause serious damage to aquatic life even death of fish fauna. Anionic detergents are found in shampoos, liquid detergents and utensil cleaners. They find their way to river water without treatment with other household sewage and industrial wastes. As per BIS the maximum contaminant level for anionic detergent is 1.00 mgL⁻¹ for river water.

Sampling-

This study was done in the years 2009, 2010 and 2011. Three sampling stations were earmarked which are given below in table -1

Water samples were randomly collected at the above mentioned sites from January to December during all the three study years' in the poly ethylene bottles. Samples were taken at a distance of 2 meters inside the river from the bank and depth of about 0.20 meter. The samples are taken between 15th day to 20th day of the each month.

Materials-

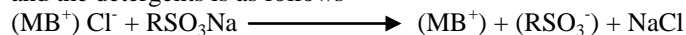
Materials used are of analytical grade provided by the Fisher Scientific. Following methods are used in the present study-

1. Methylene Blue Solution
2. 6 M HCl
3. Chloroform
4. Distilled Water

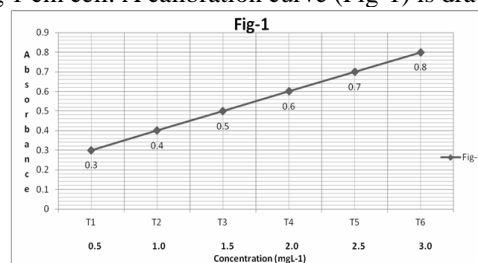
Experimental-

A series of solutions of commercially available sodium dodecyl benzene sulphonate as T₁=0.5 mgL⁻¹, T₂=1.0 mgL⁻¹, T₃=1.5 mgL⁻¹, T₄=2.0 mgL⁻¹ T₅=2.5 mgL⁻¹ and T₆=3.0 mgL⁻¹ by the dilution of stock solution.

The chemical reaction takes place between ionic dyes stuff and the detergents is as follows-



Where MB⁺ indicate the cation of methylene blue. The reaction product can be extracted by chloroform where as the original dyestuff is insoluble in this medium and the intensity of the cation in the chloroform layer is proportional to the concentration of the detergent. Absorbance is measured at 650 nm using 1 cm cell. A calibration curve (Fig-1) is drawn.



This study was done in the years 2009, 2010 and 2011. Three sampling stations were earmarked which are given below in table -1

Table-1

S.No.	Sampling Stations	Classification
1.	Kaleechabad Ghat	Entry Point
2.	Achla Devi Ghat	Mid Point
3.	Ram Ghat	Exit Point (outside the city population)

RESULTS AND DISCUSSION- The results obtained from the analysis of different parameters and for different years of study were recorded in table (2) and (3).

Table-2
Details Of Concentration Of Anionic Detergents

S.No.	Month	Years' of study								
		2009			2010			2011		
		Concentration of anionic detergents in mgL ⁻¹								
		1	2	3	1	2	3	1	2	3
		Entry Point	Mid Point	Exit Point	Entry Point	Mid Point	Exit Point	Entry Point	Mid Point	Exit Point
1.	January	0.60	0.65	0.70	0.65	0.69	0.76	0.74	0.79	0.86
2.	February	0.63	0.65	0.73	0.68	0.72	0.79	0.70	0.73	0.84
3.	March	0.72	0.88	0.93	0.76	0.90	0.98	0.80	0.92	1.05
4.	April	0.79	0.82	0.93	0.83	0.88	1.01	0.84	0.88	1.03
5.	May	0.85	0.93	1.01	0.94	1.08	1.13	1.01	1.11	1.23
6.	June	0.93	0.98	1.06	1.00	1.04	1.16	1.10	1.17	1.28
7.	July	1.03	1.10	1.18	1.06	1.12	1.23	1.18	1.23	1.37
8.	August	1.06	1.14	1.21	1.09	1.24	1.38	1.13	1.19	1.42
9.	September	0.93	0.98	1.08	1.07	1.23	1.35	1.11	1.15	1.35
10.	October	0.91	0.94	1.01	1.09	1.17	1.21	1.00	1.05	1.10
11.	November	0.83	0.87	0.93	0.84	0.88	0.95	0.86	0.91	0.97
12.	December	0.72	0.79	0.82	0.74	0.81	0.87	0.76	0.85	0.91

Table-3
Difference Of Concentration Between Entry And Exit Points

S.No.	Month	Years' of study		
		2009	2010	2011
		Concentration of anionic detergents in mgL ⁻¹		
1.	January	0.10	0.11	0.12
2.	February	0.10	0.11	0.14
3.	March	0.21	0.22	0.25
4.	April	0.14	0.18	0.19
5.	May	0.16	0.19	0.22
6.	June	0.13	0.16	0.18
7.	July	0.15	0.17	0.19
8.	August	0.15	0.29	0.29
9.	September	0.15	0.28	0.24
10.	October	0.10	0.12	0.10
11.	November	0.10	0.11	0.11
12.	December	0.10	0.13	0.15
Total Annual increase of anionic detergent		1.59	2.07	2.18

Results And Discussion

The results obtained from the analysis of different parameters and for different years of study were recorded in table (2) and (3).

From the tables it was found that there is a slight increase in the concentration of anionic detergents during summer and rainy season i.e. in the month of March, April, May, June, July and August and decrease during the winter season i.e. in the month of September, October, November and December in every year of study, and this trend continue in the month of January in the subsequent year. From February the gradual increase in the concentration of anionic detergent till the month of August.

The increase shown at the entry level every year is due to dumping of the sewage of suburban areas, because before entering in the city river Gomti merges with many small rivers flowing from the suburban areas.

Data in table (3) revealed that the cumulative concentration of anionic detergent is increasing in gradual manner, if move across the years of study.

Conclusion-

It has been observed during this study that there is gradual increase in concentrations of anionic detergent in the river Gomti during subsequent years. The total concentration of anionic detergent increasing rapidly and the level of anionic detergent crossed the MCL during the years.

The concentration of anionic detergent is increasing due to uncontrolled use of synthetic detergents containing LAS. The concentrations of anionic detergent is increasing with every passing year and it is high time to control the dumping of untreated sewage and industrial wastes containing anionic

detergent to the river water to save the river Gomti from pollution.

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