IMPACT OF ABIOTIC FACTORS ON BACTERIAL POPULATION OF RIVER GANGA AND YAMUNA ON SANGAM AT ALLAHABAD.

Dhirendra Kumar Singh,

Associate Professor

Department of Botany

Y.D. P. G. College, Lakhimpur Kheri

ABSTRACT

Total bacterial density as well as population of coliform in river Ganga, Yamuna and their confluence (Sangam) at Allahabad was studies. The pH, dissolved oxygen, chloride, BOD, free CO_2, and bicarbonate showed inverse relationship with bacterial population. During monsoon season turbidity, COD, phosphate, nitrates were high and revealed direct relationship with bacterial population. The seasonal variations in the bacterial population were also marked.

INTRODUCTION

Pressure on riverine ecosystems is enormously increasing due to rapid industrialization and urbanization. River Ganga is getting ecologically degraded (1-2). The water quality deterioration has been recorded at several points of river Ganga (3-7). The waterborne diseases due to deteriorated water quality have also been described in this water (7). The present paper deals the impact of abiotic factors and seasonal changes in the bacterial population of the river Ganga & Yamuna water and around its confluence.

METHODS

Physico-chemical and bacteriological analysis of Ganga and Yamuna waters at confluence is based on the sample collected from three different sites viz: Ganga upstream, Yamuna upstream and at Sangam (confluence) as shown in **fig. 1.** Water temperature, pH, dissolved oxygen, Free-CO_2, carbonates and bicarbonates were recorded at the spot while remaining parameters were analyzed in the laboratory according to NEERI, (8) and APHA (9). The total coliform and total plate counts were determined using Sirockin and Cullimore (10), Cruickshank at (11) and APHA (8).

Tabel 1:

Physico-chemical and Bacteriological characters of Water of confluence of Ganga and Yamuna at Allahabad during different seasons.

(G. Towards Ganga; Y: Towards Yamuna; C; Confluence)

Parameter	Winter season			Summer season			Rainy season		
	G	Y	C	G	Y	C	G	Y	C
Water Temp	18.1	18.1	18.5	27.7	22.2	27.7	29.0	29.0	29.0
pH	8.4	8.3	8.5	7.8	8.3	8.1	8.2	8.3	8.2
Turbidity(NTU)	64.0	2.0	59.0	54.0	320.0	45.0	140.0	240.0	140.0
Chloride (ppm)	32.2	28.8	28.3	28.7	62.1	44.3	31.4	14.9	13.9
Carbonate	15.0	6.5	10.7	30.0	26.0	28.0	8.5	5.0	12.5
Bi-Carbonate (ppm)	175.0	127.0	150.0	11.5	223.0	162.0	102.0	100.0	120.0
Nitrate (ppm)	7.6	20.7	5.7	0.3	4.4	2.5	7.5	14.5	13.0
Phosphate (ppm)	4.3	4.9	4.9	0.0	0.0	0.1	4.2	2.3	1.9
DO (ppm)	8.3	9.3	9.5	6.3	7.5	5.5	4.9	5.0	4.7
BOD (ppm)	1.2	1.6	1.4	4.4	0.7	3.9	1.3	1.3	0.6
COD (ppm)	2.6	0.3	1.6	3.2	3.0	3.1	8.4	4.5	5.3
CO_2 (ppm)	00	0 0	0 0	19.8	32.3	20.0	00	0.0	0.0
Total Coliforms(1×10^3/L)	344.5	148.8	410.0	365.4	220.1	492.4	526.0	205.0	507.2
Total Bacteria(1×10^3/L)	900.0	615.0	982.5	1066.5	953.9	1063.6	810.0	916.0	1025.0

LEGENDS TO FIGURE

Fig. 1: Map Showing the details of sampling stations (1-10) and sources of civic as well as industrial wastes (I- VIII):

1. Karelabagh
2. Kakarahaghat
3. Baluaghat
4. Gaughat
5. Siwala
6. Kilaghat
7. Sangam
8. Maniyia
9. Rasoolabad
10. Upstream: Rasoolabad.

FIG.
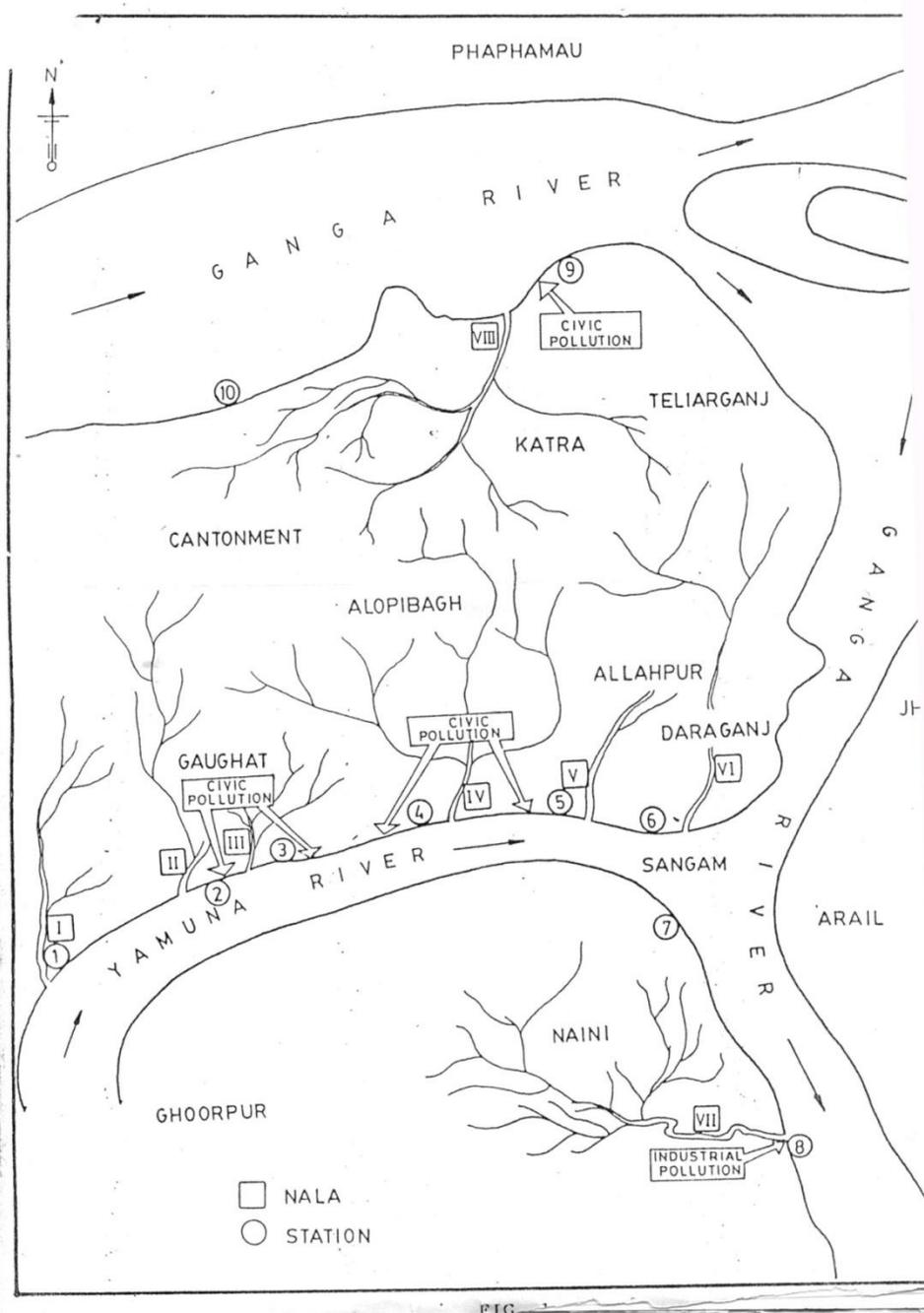
RESULTS AND DISCUSSION

The water temperature showed direct bearing on bacterial concentration which may be attributed due to decomposition rates and bacterial proliferation increased with the rise of temperature **(Table 1)** The population of bacteria and physicochemical nature of river waters varied with seasons, locations and pollution status. Maximum total coliform (556000/L) was at the confluence point during the rainy season while the corresponding water temperature was 29.00^0C The pH of Ganga-Yamuna water at confluence ranged from 7.8 to 8.4 but during the flood it was confined to 8.2 to 8.3. This seems to be the ideal pH for bacterial growth. It has been

reported that pH 6.8 to 7.4 and 6.5 to 8.2 is deemed to be fit for decomposition of organic matter by bacteria while below 6.0 and above 8.0 the degradational efficiency declined substantially (12-13). An indirect relationship between DO and total coliform has been observed. Both pH and DO were decreased during the rainy season where as the bacterial counts were maximum which may be occurred due to substantial addition on allochthonous materials in the river waters. The value of methyl orange alkalinity was low during rainy season exhibiting an indirect relation to total coliform. The chloride content decreases with the decrease of total coliform, turbidity (ranging between 2-224 NTU) increases with the increase of total coliform between 146.8×10^3/L and 526.0×10^3/L.

Other factors like nitrates, phosphate and COD has direct relationship with total coliform being maximum during rainy season. Free-CO_2 showed indirect relationship with bacteriological counts and found to be absent during rainy season.

The total bacterial density and coliform variation were maximum in the rainy season and minimum during winter season. The main origin of bacterial contamination at the confluence was from sewage discharge in Ganga, Yamuna, Air, Marginal soil, decomposing plant material, pilgrims and dead bodies throwing constituted the other source of bacterial contamination.

REFERENCES

- Bilgrami K.S. and Datta Munshi J.S. 1985 Ecology of River Ganga. Impact of Human Activities and conservation of Aquatic Biota. (Patna to Farkka) DOEn, Final technical report. Bhagalpur 103 pp.

- Singh D.K. 1988, Macrophytes and their decomposition in the riverine ecosystem at Allahabad. Thesis submitted for D.Phil. in A.U. Allahabad.

- Pahwa D.V. and Mehrotra S.N. 1986, observations on fluctuations in the abundance of plankton in relation to certain hydrological conditions of river Ganga. Proc. Natn. Acad. Sci, 36 B 157-189.

- Roy P and David A 1966. Effect of industrial work and Sewage upon the chemical and biological composition and Fisheries of river Ganga at Kanpur U.P. Indian J Env. Hlth. 8: 307-339.

- Saxena K.L., Chakrabarty R. N.; Khan A.Q. Chattopadhyaya S.N. and Harish Chandra 1966. Pollution Studies of river Ganga near Kanpur; Indian J. Eniv. Hlt. 8 270-280

- Singh N. K. Datta Munshi J.S. and Bilgrami K.S. 1983. A, quantitative study of phytoplankton of the river Ganga at Bhagalpur. India, Pol. Arch. Hydrobiol. 30: 81-87.

- Bilgrami K.S. Datta Munshi J.S. and Bhowmick B. N. 1985. Biomoni toring of the River Ganga at Polluted sites in Bihar. Proc. Symp. Bimonitoring state Environ. pp 141-145.

- NEERI 1979. A course Manual of water and waste water Analysis. (Nagpur National Env. Eng. Res. Ins.) 134.

- APHA 1985. Standard Methods for the Examination of water and waste water; 16th edn. (Washington D.C. A American Pub. Health Assoc.) 1144pp.

- Sirockin G and Cullimore S. 1959 Practical Microbiology (London Mc. Graw Hill) 159 pp.

- Cruickshank R. Duguid J.P., Marmion B.P. and Swain R.H.A. 1975. Medican Microbiology 12 end. Vol. II (London) 587pp.

+ Klein L. 1973 River Pollution I chemical Analysis London. Butterworth & Co. Ltd. 242 pp.

+ Bilgrami K.S Bhowmick B.N. and Singh A.K. 1986. Impact of Abiotic factors on bacterial population River Ganga. Proc. Indian. Natn. Sci. Acad. B. 52 No. 4 pp 509-514.