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STUDY OF INDUSTRIAL EFFLUENTS OF RIVER KHANNAUT (SHAHJAHANPUR) WITH REFERENCE TO BIOCHEMICAL ALTERATIONS IN A FRESH WATER FISH *CHANNA PUNCTATUS*

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ABSTRACT

The aquatic pollution and degradation have become very serious problem. The industrial wastes, if discharged untreated into the river, can adversely affect the aquatic ecosystem. Industrial effluents from sugar and wine factories are mixing in the Khannaut river passing through the Shahjahanpur district of Uttar Pradesh. Samples of water from unpolluted and polluted sides were collected to study the impact of pollution on this river due to the presenceof effluents. The physio-chemical parameters like alkalinity, total hardness, BOD, COD, Chloride, and calcium. The result obtained showed variations in these parameters, which indicate about theintensity of water pollution. The alkalinity ranged from minimum of 108 to max 117 mg/l, total hardness from 115 to 175mg/l, BOD from 1.3 to 2.9, COD from 15 to 45mg/l, Chloride from 12 to 32mg/l and Calcium from 25 to 55mg/l. The comparison of these values for unpolluted and polluted sites indicated that there were increased in all the values of the respective parameters like Alkalinity, total hardness, BOD, COD, Chloride and Calcium due to mixing of effluents from these sugar and wine industries. Data about the catch of fish *Channa punctatus* were collected from unpolluted site. (Mishripur) and polluted sites (Roserkothi & Daniapur) and these fishes were used for theirbiochemical studies to determine the impact of industrial effluents.

Keywords: - Channa punctatus, Industrial effluents, Total Hardness, BOD, Alkalinity, COD, Chloride and Calcium

INTRODUCTION

In the modern era of industrialization, pollution is the most serious problem which every living being is facing today. Industrialization and urbanization are the main causes for the water pollution. Cooper, (1941); Morre, (1977) & Smith, (1980) have examined the alkalinity of polluted water. They pointed out the industrial wastes have already altered the physical, chemical & biological characteristics of various water bodies. The quality of water is usually determined by the Biochemical Oxygen Demand (BOD) & Chemical Oxygen Demand (COD). As a consequence, several scientists have reported changes in BOD (Burns & Marshall, 1965; Baumann, 1974 & Pitwell, 1983). Chloride is present in low quantity in fresh water (Bond & Straul, 1973), but high concentration of Chlorides may be present due to mixing of effluents of different chemicals discharges (Little, 1971). The elemental composition of Calcium is also reported in some of these effluents by Jayabalan et al. (1994).

MATERIAL & METHODS

Industrial effluents from sugar & wine factories are mixing in the Khannaut river passing through the Shahjahanpur district of Uttar Pradesh. Samples of water from unpolluted and polluted sides were collected to study the impact of pollution on this river due to the presence of effluents. The physio-chemical parameters like alkalinity, total hardness, BOD, COD, Chloride, and calcium. The result obtained showed variations in these parameters, which indicate about the intensity of water pollution.

Total Alkalinity was calculated as follows: -

Total Alkalinity (mg/l, as $CaCO_3$) = (2B-C) x N x 50,000 / ml sample

Where, B=ml titrant to first recorded pH, C= total ml titrant to reach pH 0.3 unit lower & N= normality of acid

Total Hardness was calculated as follows: -

Total Hardness (mg/l, as $CaCO_3$) = T x 100 / V

Where, T=volume of titrant (ml), V= volume of sample (ml)

BOD was calculated as follows: -

BOD (mg/l) = (D1-D2) – (B1-B2) /P

Whereas D1= DO of diluted sample before incubation, D2= DO of diluted sample after incubation, B1= DO of control before incubation, B2= DO of control after incubation & P=Decimal fraction of the sample.

COD was calculated as follows: -

COD (mg/l) = (a-b) x N x 8,000 / ml of sample

Whereas a= ml of titrant used in control, b= ml of titrant used in sample, N= normality of titrant

Calcium was calculated as follows: -

Calcium (mg/l) = X x 400.5 x 1.05 / V

Whereas X= volume of titrant (ml), V= volume of sample (ml)

Plate 9: The catching of fish at Mishripur site.

Plate 10: Khannaut river at Mishripur site.

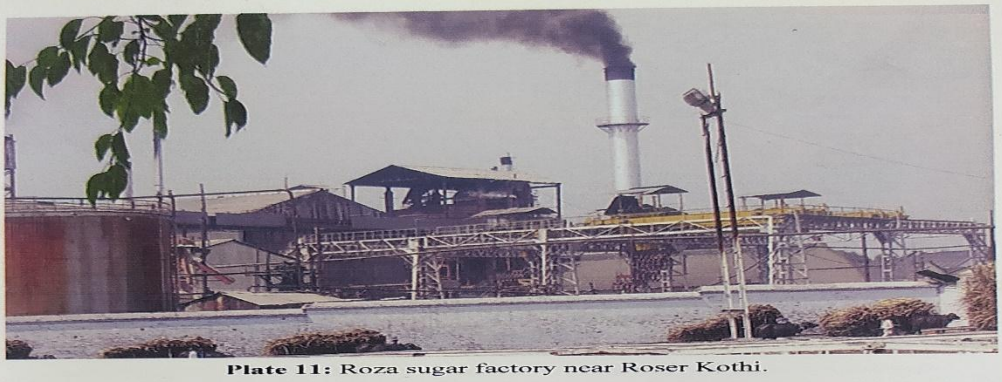

Plate 11: Roza sugar factory near Roser Kothi.

Plate 12: The untreated effluents discharged from the factory cause pollution in Khannaut river

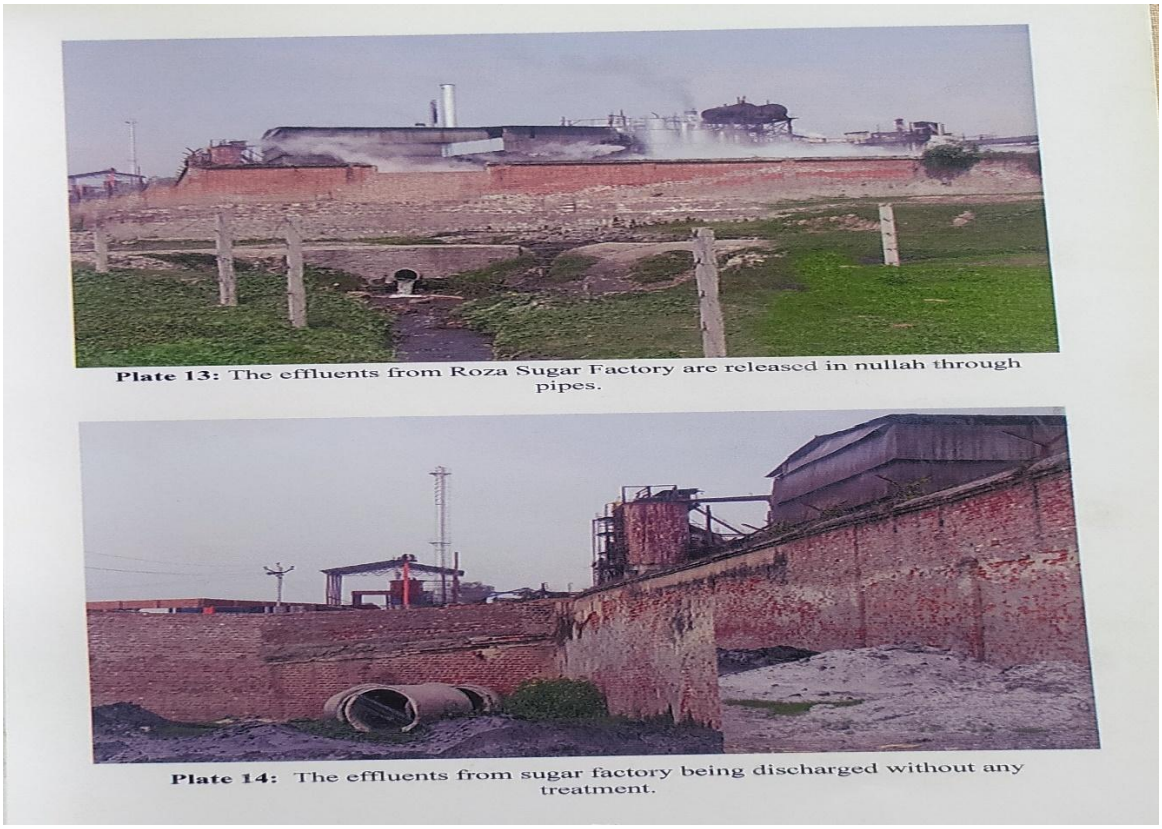

Plate 13: The effluents from Roza Sugar Factory are released in nullah through pipes.

Plate 14: The effluents from sugar factory being discharged without any treatment.

RESULT

Data obtained of water samples from present investigation is given in Table 1-3. The results show a significant impact of effluents of sugar & wine industries on water samples. Data given in all Tables (1-3) are for the months of January - September in which alkalinity ranged from minimum of 108 to maximum 170mg/l were obtained.

During January to September, the total hardness shown from 115 – 175 mg/l

BOD of water samples obtained from minimum 1.3 to maximum 2.9 mg/l

COD of water samples obtained from minimum 15 to maximum 45 mg/l

During January to September, the parameter of water samples Chloride obtained from minimum 12 to maximum 32 mg/l & Calcium obtained from minimum 25 to maximum 55 mg/l

These minimum values of water samples parameters i.e., Alkalinity, total hardness, BOD, COD, Chloride & Calcium in water are obtained from the unpolluted site of Mishripur while the maximum values of these parameters are obtained from the polluted sites i.e., Rosarkothi & Daniapur.

Tables

Table1:- Effect of Industrial effluents on chemical parameters of water collected from river Khannaut

Months	Jan-06			Feb-06			Mar-06		
Parameters	I Site	II Site	III Site	I Site	II Site	III Site	I Site	II Site	III Site
Alkalinity (mg/l)	170	125	130	130	125	150	160	130	135
Total Hardness (mg/l)	175	145	140	135	142	145	175	145	170
BOD (mg/l)	2.8	1.5	1.8	2.5	2.0	1.8	2.9	1.9	2.0
COD (mg/l)	30	20	25	32	30	25	30	25	32
Chloride (mg/l)	22	25	28	20	25	22	32	28	26
Calcium (mg/l)	45	30	35	25	30	24	55	25	66

I Site: Mishripur (Prior to mixing of industrial effluents).
II Site: Roserkothi (After mixing of effluents from Sugar industry).
III site: Daniapur (After mixing of effluents from sugar & wine industries).

Table2: - Effect of Industrial effluents on chemical parameters of water collected from river Khannaut

Months	Apr-06			May-06			Jun-06		
Parameters	I Site	II Site	III Site	I Site	II Site	III Site	I Site	II Site	III Site
Alkalinity (mg/l)	130	125	115	108	112	130	108	125	120
Total Hardness (mg/l)	135	115	130	175	120	140	126	135	130
BOD (mg/l)	1.5	2.0	1.8	2.5	1.3	1.8	1.3	1.8	1.5
COD (mg/l)	25	30	35	35	16	32	16	28	20
Chloride (mg/l)	20	25	30	20	15	27	14	32	28
Calcium (mg/l)	35	30	45	31.2	30	28	32	25	26

I Site: Mishripur (Prior to mixing of industrial effluents).
II Site: Roserkothi (After mixing of effluents from Sugar industry).
III site: Daniapur (After mixing of effluents from sugar & wine industries).

Table3:- Effect of Industrial effluents on chemical parameters of water collected from river Khannaut

Months	Jul-06			Aug-06			Sep-06		
Parameters	**I Site**	**II Site**	**III Site**	**I Site**	**II Site**	**III Site**	**I Site**	**II Site**	**III Site**
Alkalinity (mg/l)	120	112	115	122	125	130	125	145	152
Total Hardness (mg/l)	116	124	120	140	145	142	123	152	175
BOD (mg/l)	1.4	1.8	1.3	1.4	1.9	1.5	1.5	2.1	2.5
COD (mg/l)	25	28	15	17	20	23	15	30	45
Chloride (mg/l)	22	20	25	18	22	25	12	16	15
Calcium (mg/l)	34	36.18	35	32	35	38	28	26	32

I Site: Mishripur (Prior to mixing of industrial effluents).
II Site: Roserkothi (After mixing of effluents from Sugar industry).
III site: Daniapur (After mixing of effluents from sugar & wine industries).

Discussion

The alkalinity of water samples collected from Mishripur site ranged from 108 to 172 mg/l during the period of study. The changes in alkalinity were related to seasonal variation.

The total hardness of water 115 to 175 mg/l. These values indicate only minor variations in total hardness after mixing of effluents at different sites.

BOD of water samples collected from Mishripur site ranged 1.3 to 2.9 mg/l collected from polluted sites. This shows that BOD of water was slightly affected by mixing of effluents.

COD of water ranged from 15 to 45 mg/l. These fluctuations depending upon the changes in the number of effluents discharged from wine factory.

The natural water contains small quantities of Chlorides & Calcium but when water is polluted with the industrial wastes may rise their polluted level which is dangerous for aquatic life.

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