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RESEARCH ARTICLE

Determination of various Physical and Chemical parameters in industrial Effluents and sewage of Phagwara, Tehsil of Punjab

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ABSTRACT

The study was carried out in Phagwara Tehsil of Punjab to determine various physical and chemical parameters from industrial effluents. The industrial effluents are thrown into the river Kali baian through Gandanala. Midstream samples were collected for analysis from Phagwara to Khera. The samples were analyzed for temperature, E.C, Turbidity, PH, total hardness, Dissolved Oxygen, COD and Alkalinity. Temperature was recorded to $\pm 0.10^\circ\text{C}$ accuracy, immediately after collecting the samples. The temperature varies from 6°C to 38°C during December to May. The variation in temperature was mainly related with temperature of atmosphere and weather condition. E.C was measured by digital conductivity meter which varied from 0.807 (mhos/cm) to 1.748 (mhos/cm). The higher value of E.C indicates a larger quantity of dissolved mineral salts thereby making it sour and unsuitable for use. The turbidity values of sample varied from 38.3 NTU to 58.4 NTU. The higher value of turbidity indicates the presence of suspended particles. The PH ranged from 7.1 to 7.9. The organic pollution was mild as indicated by D.O (6.4 – 7.7 mg/l) and BOD (5.3 – 6.5 mg/l). But the highest value of COD ranged between 27.0 mg/l to as high as 40.7 mg/l indicates industrial pollution. Total hardness values varied from 178 to 229 mg/l that makes the water unsuitable for domestic uses. The total solids determined ranged between 335 to 445 mg/l. It increases turbidity and electrical conductivity. Alkalinity values ranged from 167 to 217 mg/l. The higher values are due to discharge of industrial effluents upstream.

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INTRODUCTION

In all the major rivers of India, water pollution is an acute problem. In the wake of increasing urbanization and industrialization, the pollution potential of river Kali baian is gaining momentum day by day. The survey of river revealed that villages and towns which fall in way of river dump waste water and toxic waste in the river. This has caused severe pollution in the river to the extent that its water is no more palatable and is posing threat to the survival of aquatic flora and fauna. It is therefore desirable to monitor the pollution level over the stretch between Phagwara to Khera (Distt. Phagwara) by collecting and analyzing the water samples from different places with a view to study the physical, chemical and biological characteristics and to investigate the factors responsible for causing pollution.

MATERIALS AND METHODS

Midstream surface water samples were collected for analysis. The samples were collected in wide mouthed polythene bottles and stored in icebox for further analysis after determine temperature, PH and electrical conductivity. The samples were analysed for following physico- chemical and biological parameters viz. Temperature, PH, Electrical conductivity, Turbidity (Nephelometric Method), Hardness, Dissolved oxygen (Winkler Method), Alkalinity and COD (by dichromate titration method).

RESULTS AND DISCUSSIONS

Temperature: Temperature was recorded to $\pm 0.1^\circ\text{C}$ accuracy using a mercury thermometer, immediately after collecting the sample. Temperature varied from 6°C to 38°C during December to May.

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The variation was mainly related with temperature of atmosphere and weather conditions. Higher temperature during April to May was due to greater heating (3).

PH

The PH ranged from 7.1 to 7.9. In general the P.H values are higher in December and January than other months. The variation was due to exposure of river water to atmosphere, biological activities and temperature changes (2).

Electrical conductivity

In present observation the E.C. varied from 0.807 (mhos/cm) to 1.748(mhos/cm). Higher E.C. indicated a larger quantity of dissolved natural salts. Thereby making it sour and unsuitable for drinking (5, 8). Similar observations were also reported by Srivastava and Shina (4) for river Ganga at Phaphaman (Allahabad).

Turbidity

The drinking water limit for turbidity as prescribed by world Health Organization is 2.5 NTU. The turbidity values in samples varied from 38.3 NTU to 58.4 NTU. The probability of presence of pathogenic organisms is also increased in turbid water (5).

Total Hardness

The values of total hardness varied from 178 to 229 mg/l. Although hard water has no known effect on health but it is unsuitable for domestic uses. It also forms heat-insulating scales in the boilers reducing their efficiency. Therefore water of river Kali baian is unsuitable for industrial uses (7, 8). These observations are in agreement with those obtained by Bahadur and Chandra (3) and Pande and Sharma (6).

Dissolved Oxygen

Dissolved oxygen in liquid wastes is the factor which determines whether the biological changes are brought about by aerobic or anaerobic organisms. It reflects the physical and biological processes prevailing in water. The oxygen present in water can be dissolved from air or produced by photosynthetic organisms. The D.O. varied from 6.4-7.7 ml/l. These values indicate relatively mild organic pollution. As per records game fish needs at least 5mg/l dissolved oxygen therefore the water of river Kali baien can be used for fish culture. These results also agree with those of Bhargava (4), Pande and Sharma (6).

Biochemical oxygen Demand

Types of micro-organisms, PH, presence of toxins, some reduced mineral matter and nitrification process are the important factors influencing the B.O.D. tests the B.O.D varied from 5.3-6.5 mg/l. Like D.O. it also indicates presence of organic pollution.

Chemical Oxygen Demand

Chemical oxygen is the amount of oxygen consumed during the chemical oxidation of organic matter using a strong oxidizing agents like acidified potassium dichromate. This gives valuable information about the pollution potential of industrial effluents and domestic sewage (5). In present study values vary from 27.0mg/l to 40.7ml. The highest values of C.O.D indicates that most of the pollution in the study zone is caused by industrial effluents discharged by industrial units like pulp and paper mill, textile mill, sugar factory etc. upstream. Similar results were also reported by Pande and Sharma (3).

Parameter	Minimum	Maximum	Mean	StDev	SE Mean
Temperature	6	38	23.63	10.99	3.17
pH	7.1	7.9	7.3917	0.2746	0.0793
Electrical conductivity	0.807	1.748	1.138	0.386	0.111
Turbidity	38.3	58.4	43.54	6.42	1.85
Total Hardness	178	229	198.92	17.43	5.03
Dissolved Oxygen	6.4	7.7	7.150	0.373	0.108
BOD	5.3	6.5	5.942	0.427	0.123
COD	27	40.7	35.01	5.62	1.62
Alkalinity	167	217	191.08	19.09	5.51

Alkalinity

It is the quantitative capacity of water sample to neutralize a strong acid to a designated PH (5). In present study, Alkalinity values ranges from 167 to 217mg/l. The higher values are due to discharge of industrial effluents upstream.

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