



STUDIES ON SOME INDUSTRIAL EFFLUENTS CAUSING WATER POLLUTION IN RIVER PANDU AT KANPUR

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ABSTRACT

These observations are based on the study of number of samples collected from different out falls of river Pandu. The effluents of various industries, like Thermal Power Station (TPS), Fertilizer Plant (IEL), Panki Industrial Estate (PIE), Dyes, Chemical & others Industries, Small Arms Factory (SAF), Ordnance Factory, Dada Nagar Industrial Estate (DNIE), Electro Plating, Metal finishing, Pharmaceuticals, Soaps & Detergents and domestic wastes of Govind Nagar locality, discharged about 2,00,000 gallon wastes per day. These industrial effluents contain various types of toxic heavy metals, which adversely effects the flora and fauna of river and also causes water pollution.

Key words : Water pollution, Industrial effluents, Kanpur.

INTRODUCTION

The industrial effluents contain obnoxious pollutants and drainage of water and minerals from earth has irrigation and fertilization utility too. With a view to re-examine some of the earlier findings and to workout the prospects of biological recycling of effluents for green revolution, growth, metabolism and composition of plants as influenced by these waste water. The present work has been carried out.

With an out burst in population requiring more and more food and material, green revolution and industrialization, the disturbances in ecocycle are bound to occur. Pollution and other problems associated as cause or outcome, need coordinated confrontations at all levels, in every part of the world, to keep life, happily buzzing, and longer on the planet. Among man made polluting agencies, the industries particularly, their effluents catch lime light importance in the fast modernizing world of today.

These effluents not only cause health hazards, pollute air, soils and waters but also drain out millions of tons of precious minerals, the plant food and raw material and billions of gallons of life giving water to decimal depths of oceans, for never return except, the fraction reverted by ecocycle, For conservation of water and mineral and control of pollution, recycling of these waste waters has been advocated. Effluents from certain industries have been found suitable for terrestrial recycling.

Practically very little information is available regarding the rivers in Uttar Pradesh. Physico-chemical characteristics of the river Ganga, used as a measure of water pollution level, at Kanpur were studied during the pollution studies of the rivers by Saxena et al¹, like pH, temperature, turbidity, alkalinity, hardness, chlorides, total solids, dissolved Oxygen, BOD, nitrate, nitrogen, phosphate etc.

Pollution characteristics of the waste waters discharged from the Fertilizer Factory Kanpur, (IEL) into the river Pandu have been studied by Jain², with respect to all the physico-chemical characteristics. A physico-chemical survey of heavy metal ions and different forms of nitrogen has been performed on south river Virginia by John Cairns and Dickson³. The observed that calcium, magnesium and sodium are distributed at higher concentration level, nitrate-nitrogen concentration varied from 0.14 to 0.42 ppm. A comparative study on organic constituents in polluted and non polluted aquatic environment (Takya river water, Tokyo and polluted river Brook) was made by Matsumoto⁴.

Pandey and Pandey⁵ have made an analytical study on trace concentration of arsenic in aquatic environment. Absorption and distributional studies of heavy metal in the polluted waters of river Kallado (Kerala) have been made by Nair et al⁶. Their work showed that a fraction of the total concentration of lead, zinc, cadmium, arsenic, bismuth, nickel, chromium etc. is distributed as the adsorbed species on clay-organic matter components of the river mud level in polluted river water and clay-organic matter was also made by them.

Life of plankton, plant and fishes is affected by the variation in physico-chemical conditions of the river, Reports on diurnal variation study of rivers are meagre. Basu and Ghosh⁷, have studied the diurnal variations on a selected stretch of the Hooghly estuary. In this connection, reports of river Betwa are important Sahai and Sinha⁸; Sahai and Srivastava⁹ have studied the plants of fishponds.

EXPERIMENTAL

Materials and methods

Analytical procedure mentioned in standard methods for the examination of contaminated water were used and water sample of river Pandu at Kanpur were collected at various locations. Various methods adopted for examinations are like :

- (i) pH, Electrical conductivity – pH meter, Conductivity meter
- (ii) Dissolved Oxygen (DO) – Winkler Method (Iodometric)
- (iii) Biological Oxygen Demand (BOD) – By difference in DO level before and after incubation.
- (iv) COD – Refluxing with $K_2Cr_2O_7$ and subsequent titration with ferrous ammonium sulphate.

- (v) Ammonical Nitrogen – (a) Titration (5mg/Lit.)
(b) Nesslerization (mg/Lit.)
- (vi) Nitrite and Nitrate Nitrogen – Colorimetric and ion selective electrode method.
- (vii) Total residual chlorine – Iodometric.
- (viii) Sulphide – (a) Titration method for colour less samples
(b) Ion selective electrode method for coloured samples.
- (ix) Metals – Colorimetric
- (x) Cyanide – Colorimetric
- (xi) Oil Grease – Solvent Extraction
- (xii) Total hardness – EDTA Titration
- (xiii) Phenols – Colorimetric

Table 1.

S. No.	Parameter/Organic Inorganic Substances Mg/L	Effluents of Thermal Power outfall I	Effluent of Fertilizer Plant out fall II	Effluent of Ordinance & Small Arms outfall III
1	Temperature (°C)	21.0–38.5 °C	22.06–41.6	20.0–34.0
2	pH	8.3–9.0	7.8–9.8	5.8–6.4
3	Conductivity (M mhos/cm ²)	1.75–1.95	5.96–8.34	3.90–4.30
4	Dissolved Oxygen	1.5–2.0	3.2–4.6	1.0–1.8
5	B.O.D.	48.0–62.0	48–75	80–145
6	C. O. D.	136–189	190–280	250–400
7	Total Sulphide	2.8–3.9	3.0–3.6	3.0–5.4
8	Total Ammonical N	1.1–1.25	280–375	3.0–3.5
9	Organic N	NIL	90–115	1.4–1.9
10	NO ₂ ⁻ – N	NIL	2.4–3.0	0.30–0.40
11	NO ₃ ⁻ – N	NIL	9.0–13.0	0.48–0.92
12	Oil & Grease	15–23	60–80	55–95
13	Phenolic Compounds	–	–	–
14	Iron	0.84–1.40	0.14–0.20	0.22–0.48
15	Manganese	0.40–0.50	0.18–0.36	1.28–1.42

Continued,....

Table 1. Continued....

S. No.	Parameter/Organic Inorganic Substances Mg/L	Effluents of Thermal Power outfall I	Effluent of Fertilizer Plant out fall II	Effluent of Ordinance & Small Arms outfall III
16	Nickel	0.10–0.25	0.12–0.36	1.28–1.42
17	Zinc	0.50–1.50	0.32–0.54	2.24–3.75
18	Chromimu	0.34–0.60	0.06–0.14	0.38–1.00
19	Lead	0.05–0.06	0.62–0.68	1.40–2.16
20	Cadmium	0.20–0.48	NIL	0.08–0.16
21	Arsenic	NIL	0.88–1.48	0.08–0.16
22	Copper	NIL	NIL	0.14–0.24

Experimental findings reveal that due to presence of various types of chemical substances like organic and inorganic substances, heavy metals, etc., the phytoplanktons and zooplanktons are adversely affected. The growth and metabolism of phytoplanktons are greatly influenced in various months of the year. Only the members of Algae chlorophyceae like spirogyra, Tetraspora, Protococeus, Cladophora, Zygnema, Ultothrix, Chomydomonas and Myxophyceae like spirulina, oscillotora, Anabena survived in the river Pandu. Some Aquatic Angiosperms are also reported with these. The Zooplanktons like Protozoans like Arcella, Amoeba, Euglena Paramecium and Crustaceare like Dafnea, Cyclops, Cypris, Nauplius etc. also survived.

Due to complexity of the interrelations involved in determining both; the fate and deteriorating effects of toxicants in the aqueous environment i.e. Flora and Fauna including human beings and other animals create much unfavorable conditions for life. All these parameters reported earlier show a notorious effect on life of aquatic environment. The heavy metals, which are more toxic in nature, when percolate to the main ground water and reach inside plants, animals and human being. Various types of abnormalities and diseases are caused. About 1,54,000 Kl industrial and domestic wastes have been discharged in river Pandu. The approximate pollution load in M.T.D. about BOD – 1.40; COD – 46.0; total sulphide – 0.45; total nitrogen – 11.0; oil & grease – 10.0; toxic metal – 100 and phenols – 0.20.

Thus, the experimental findings reveals clearly that there is an urgent need to control the levels of various pollutants especially ammonical nitrogen, oil and grease cyanide, phenols, sulphide and heavy metals in the effluents to keep the river Pandu, Kanpur free from water pollution. Moreover, efforts should also made to use aluminum oxide as absorbent for the effective removal of metals like Cd, Pb, Ar, Cr etc. Some aquatic flora also play very important role in uptake of heavy metals.

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