

## Comparison of Water Quality Parameters for Ganga and Pandu River in Kanpur

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**ABSTRACT:** Water quality of Ganga and Pandu Rivers, was studied and compared for pollution by determining various physico-chemical parameters. The pH range is 7.2 to 9.2 for the river Ganga and 7.0 to 9.4 for the Pandu river. COD in river Pandu is much more severe as varied (13.6 to 544.6) and BOD (9 to 115) than river Ganga as the values are 12 to 66 and 7 to 46.7 respectively. Overall degree of Pandu pollution is quite alarming for the human population. Pandu river is subjected to severe pollution whereas Ganga is less polluted river.

**Keywords:** Pollution level, water quality, DO, BOD, pH, sulphate

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### I. INTRODUCTION

Rivers are considered as a main source of fresh water resources. Human developmental activities mostly depend on the availability of quality water (7). Assimilating agricultural waste, manure, municipal waste in rivers are causes for river pollutions (8). Addition of these waste products changes the physiochemical characteristics of river water (1). The river pollution has direct affect on the ecology as well as variation in the biotic factors (2). Different organizations in large number of countries have involved, regular basis, to assess water quality by estimation of Physico Chemical parameters (3-6,9).

### II. MATERIAL AND METHODS

In the analysis of the physico- chemical properties of water, standard method prescribed in limnological literature were used. Temperature and pH were determined at the site while total hardness, chlorides, sulphates, BOD and T.D.S. were determined in the laboratory. The physico-chemical parameters were determined adopting methods given by APHA (2002).

Parameters	Abbreviations	Units	Analytical methods
Temperature	Water temperature	0 <sup>C</sup>	Centigrade thermometer
TH	Total hardness	mg/l	E.D.T.A
pH	Hydrogen Ion Concentration	pH unit	pH meter
DO	Dissolved Oxygen	mg /l	Winkler's Azide modification method
BOD	Bio-Chemical Oxygen Demand	mg /l	Dilution technique and seeding technique
COD	Chemical Oxygen Demand	mg /l	Open reflux method
Cl	Chloride	mg/l	Argentometric method
PO <sub>4</sub>	Phosphate	mg/l	Stannous Chloride method
NO <sub>3</sub>	Nitrate	mg/l	Phenol - di - sulphuric acid method
NH <sub>4</sub>	Ammonia	mg/l	Nesslerization method
SO <sub>4</sub>	Sulphate	mg/l	Turbidity method

### III. RESULTS AND DISCUSSION

The data revealed that there were considerable variations in estimated values of physico-chemical parameters of river water mentioned in table 1& 2. The differences in physico-chemical parameters of the studied river water samples has been studied vis – a- vis with WHO and BIS standards.

#### Temperature

Temperature has been observed as one of the most important parameters that influence all the physical, chemical and biological properties of water. It never remains constant in rivers due to changing environmental conditions. Temperature is one of the most important factors in aquatic environment. Temperature also affects

solubility of oxygen in water. The temperature varied from 18.5 to 33 and 18.5 from to 34.0 to Ganga and Pandu respectively. Comparative variation is depicted in figures for ready reference. The higher water temperature in river suggests that it has fewer amounts of insoluble pollutants.

#### **pH value**

One of the most important factors for water quality as pH indicates the intensity of acidic or basic character at a given temperature. Not significant variation observed (9.2 to 9.4) in two rivers for the study area however somewhat more pH estimated in Pandu river.

#### **Total solids (TS)**

TS had great implications in the control of biological and physical waste water treatment processes. A large amount of total solids makes river water more turbid and increase its electrical conductivity. The larger values observed as 1170 & 1200 for river Pandu in respective years as compared to 702 to 996 in Ganga river.

#### **Chloride**

Chloride is one of the major inorganic anion in water and waste water. It is stored in most fresh water algal cells. Contamination of water from domestic sewage can be monitored by chloride essays of the concerned water bodies. Chloride Values of Pandu ranged from 114 to 154 in comparison to 44 to 56 for Ganga river.

#### **Total hardness**

Water containing excess hardness is not desirable for potable water and consumes more soap during washing of clothes. In present study the higher values observed from 1292 to 1556 for the river Pandu whereas maximum values was 620 to 636 for Ganga. Much higher for Pandu water than permissible prescribed limits by WHO more over within the limits of BIS standards. Hard water is unsuitable for domestic uses. Water of Pandu river is unsuitable for industrial uses whereas the water of Ganga in milder enough.

#### **Alkalinity**

It is quantitative capacity of water sample to neutralize a strong acid to desired pH for domestic as well as other uses. In present the values varied from (120 to 115) to (258 to 432) for both rivers respectively. Higher values may be estimated due to the industrial effluents and this alkalinity level lowers in probably because of increased dilutions.

#### **Dissolve Oxygen**

DO ranged from (1.6 to 8.5) to (0 to 8.5) for both rivers respectively. The maximum variation in Pandu river owing to higher decomposition of industrial waste.

#### **Biological oxygen demand (BOD)**

The biochemical oxygen demand, abbreviated as BOD, is a test for measuring the amount of biodegradable organic material present in a sample of water. The acceptable BOD level in the raw water meant for treatment is 3 mg/lit while more than 2 mg/lit BOD indicated the non suitability of river water for domestic use as per Indian standards. The higher values in Pandu river 110 to 115 as compared to 38 to 46 values of Ganga obtained due to the release of a large amount of discharge.

#### **Chemical Oxygen Demand (COD)**

Chemical oxygen demand is a valuable water quality parameter. COD values convey the amount of dissolved oxidisable organic matter including the non-biodegradable matters present in it. COD is a measure of the oxygen equivalent of the organic matter in a water sample that is susceptible to oxidation by a strong chemical oxidant, such as dichromate. It is an index of organic content of water because the most common substance oxidized by dissolve oxygen in water is organic matter having biological origin i.e. dead plant and animal wastes (Singh,A, 2006). Higher value of COD found in the Pandu river 544 mg/l as compared to 66 mg/l i.e. more than the permissible limit prescribed by WHO.

#### **Sulphate**

The sulphate ion is usually second to carbonate as the principal anion in freshwaters. Atmospheric sources of sulphate have increased with man's industrial activities. In natural water in the concentration ranges from a few to several thousand milligrams per litre. Excess sodium sulphate cause cathartic action. High concentration of Sodium and magnesium sulphate is associated with respiratory illness. More values in Pandu river 114 to 154 in comparison to 44 to 56 for Ganga river.

#### **Nitrate Nitrogen and Ammonia Nitrogen concentration**

The different forms of nitrogen are relatively stable in most river systems with ammonia transforming nitrite that slowly transforming into nitrate in well oxygenated rivers like Ganga and Pandu. Relatively large values values were estimated in Pandu water for Nitrate and Ammonia nitrogen for studied period.

IV. CONCLUSION

The present study revealed severe pollution level river Pandu and crossed the specified levels of certain parameters for domestic use. Special attention should be paid to control pollution of Pandu to keep at suitable for survival of aquatic life and also because of its use and aesthetic value.

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Table 1: Variations in Physico-chemical parameters of Ganga river

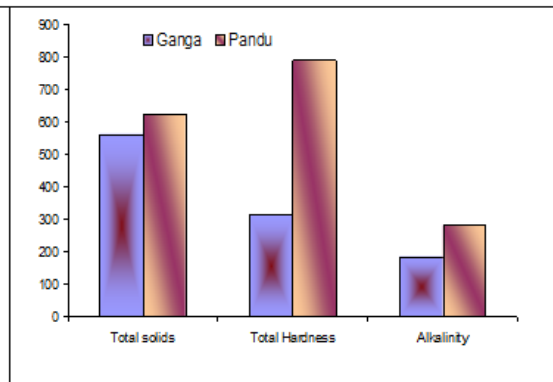
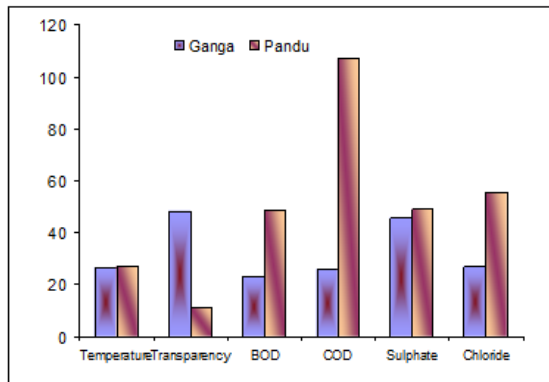
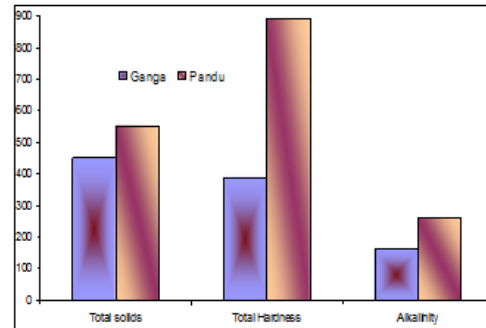
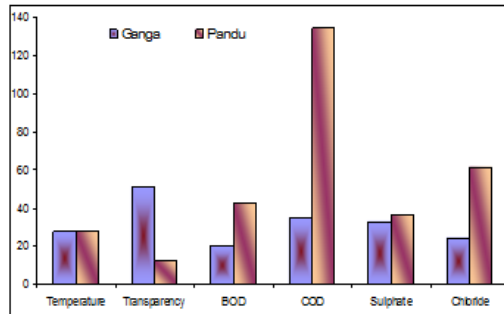
Ganga River	First year of study				Second year of study			
	Maximum	Minimum	CV	Stand Dev.	Maximum	Minimum	CV	Stand Dev.
Temperature	33	20	1.65	3.4	32.8	18.5	1.77	3.7
Total solids	702	157	4.47	147.81	996	126	7.9	228.4
pH	8.7	7.7	1.12	0.31	9.2	7.2	1.27	0.46
Alkalinity	258	114	2.26	41.12	253	120	2.1	35.4
Dissolved Oxygen	8	2.5	3.2	1.6	8.5	1.6	5.3	1.98
BOD	37.7	7	5.38	9.21	46.7	7	6.67	11.64
COD	66	12.2	5.4	18.1	52.7	12	4.39	11.67
Total Hardness	636	102	8.1	255.16	620	102	6.07	173.23
Nitrate Nitrogen	1.86	0.06	3.1	0.46	1.82	0.7	2.6	0.6
Ammonia Nitrogen	2.88	0	0.86	3.3	0	0	0.93	
Sulphate	61	10	6.1	15.3	65	23.5	2.7	9.35
Chloride	56	6.2	9.03	15.79	44	12.4	3.54	8.53

Table 2: Variations in Physico-chemical parameters of Pandu river

Pandur River	First year of study				Second year of study			
	Max	Min	CV	St. Dev.	Max	Min	CV	St. Dev.
Temperature	34	18.5	1.83	3.8	33.6	19.4	1.73	3.9
Total solids	1170	112	10.44	314.3	1200	100	12	335.08
pH	9.4	7	1.34	0.53	9.2	7.1	1.29	0.5
Alkalinity	432	150	2.84	70.54	450	115	3.91	80.62

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Dissolved Oxygen	8.5	0	2.16	8	0	2.12		
BOD	110	9	12.22	22.67	115	11	10.45	29.92
COD	544.6	13.6	40.04	107.95	539.6	15.4	35.03	92.98
Total Hardness	1556.8	444.8	3.5	264.84	1292	402	3.21	243.73
Nitrate Nitrogen	3.5			1.84	2			0.54
Ammonia Nitrogen	126.7			23.9	131.2			24.56
Sulphate	73	15	4.86	14.81	95	14	6.78	20.57
Chloride	154.4	8.1	19.06	39.86	114.7	11.2	10.24	27.55



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