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SEDIMENT ANALYSIS OF THE UPSTREAM RIVER GANGES IN KANPUR (U.P.)

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ABSTRACT
Present investigation deals with the distribution of Physico-chemical and Mycological parameters of Upstream River Ganga (Bithoor) at Kanpur during the year of (January, 2009 – December, 2010). The water quality declined due to bathing, domestic, municipal and industrial waste from various areas of town which directly or indirectly affects the biotic community of the river. The mean values (± SD) of different physico-chemical parameters like, Temperature, pH, DO, BOD, Total Alkalinity, Chloride, EC, TDS, Total Hardness, Phosphate, Turbidity and Nitrate observed, Different types of fungi isolate from upstream river.

KEY WORDS: Ganga river, physico-chemical, sediment mycoflora.

INTRODUCTION

From the source of origin in Himalayas to point of merger in Bay of Bengal, Ganga nourishes and inspires millions of people living in its vast basin. The Ganga has largest river basin in India draining as much as 10, 60,000 km² of the country area (Bilgrami, 1991). The river Ganges has a special place in Hindu mythology. It is closely inter-woven with our culture and civilization. It is the most important significant pure and fast waste assimilative river of the Indo-Gangetic plain. Population pressure, urban and industrial growth and land development in Ganges basin have contributed significantly to pollute and toxicity of Ganges ecosystem and other rivers which are under going fast qualitative degradation. Pollutants bring about a change not only physico-chemical quality of water but also trigger a series of changes in biotic components of the ecosystem resulting in depletion of some of the valuable species (Srivastva, 2002). The main sources of water pollution are bathing agricultural washouts, human body cremation, sewage and religious material discharge. Bathing is religious in the bank of Ganga River, because Bithoor has religious and historical importance. Water pollution due to industries is negligible in Bithoor ghat. Human body cremation is regular practice in Bithoor. Burn and unburnt body ashes etc. add pollution load to the water. Boat navigation and fishing also add pollution to the water (Jaiswal & Tewari, 2013).

In nature, the quality of water is ever changing because many constituents enter into natural bodies of water through various activities of man. Man has been using them for disposal of liquid waste from industries and communities. This results in increased degradation of their quality. A large number of pathogens are discharged from partially treated or un-treated sewage that pollute this water. Their number decrease in the natural aquatic environments due to several physico-chemical and biological factors (Narayanaswamy, 1982). Water has several beneficial uses as drinking, bathing, recreational, source of public water supply, industrial and agricultural. The water has been found to be unfit even for bathing at Bithoor (Bilgrami and Dutta Munshi, 1985).The present study was conducted to observe different physico-chemical parameters (Temperature, pH, DO, BOD, Alkalinity, EC, Hardness, Chloride Nitrate and Phosphate) and biological parameters isolated and observation of different fungal colonies cultured from the Ganga water in order to find out the effect of bathing on the quality of the Ganga water at Bithoor from Kanpur.

MATERIALS & METHODS

Water samples were collected aseptically in sterilized bottles at monthly intervals from upstream river in Bithoor situated in Kanpur. The samples so collected were brought to the laboratory within a few hours. Most of the analytical techniques followed have been a routine type and conducted as the standard method for examination of water, subjected to parameters of physical and chemical (APHA, 1995). Micro fungal analysis were using with slight modification dilution plate method (Waksman & Fred, 1922; Warcup, 1950; 1955 & Johnson et al., 1960). Czapak-Dox agar was used to medium for plating culture plates are incubated at 28 ± 1 ºC for 3-7 days. Colonies were counted from 3rd -7th day of plating and sediment fungi were identified.

RESULTS & DISCUSSION

Physico-Chemical & Biological Parameter at upstream river (Bithoor)

TABLE 1: Mean value ± S. D. observation from Jan 2009- Dec 2010

No.	Parameters	Values (Mean ± SD)	
		YEAR 2009	YEAR 2010
1	Temperature	26± 4.8	24.9± 5.4
2	Electronic Conductivity (EC)	0.37±0.092	0.36±0.074
3	pH	8.2±0.22	7.8±0.35
4	Chloride	32±17.6	25.75±6.60
5	Total Alkalinity	204±58.3	132.41±53.61
6	Total Hardness	177±37.9	220.58±22.17
7	TDS	240±61.1	357±17
8	Dissolved Oxygen (DO)	10.1±3.9	7.1±1.43
9	Biological oxygen demand (BOD)	5±2.4	3.4±0.82
10	Phosphate	0.7±0.11	0.65± 0.09
11	Turbidity	42.5±9.7	76.6±8.6
12	Nitrate	1.55±0.6	2.3±0.69

TABLE 2: Sediments Mycoflora in upstream river (year-2009)

No.		Month											
	Name of Mycoflora	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
1	*Alternaria alternata*	+	+	+	-	-	-	+	-	-	-	+	-
2	*Aspergillus nidulans*	-	+	-	+	-	+	-	-	-	+	+	+
3	*A. niger*	-	+	+	-	+	+	-	+	-	+	-	+
4	*A. flavus*	+	+	-	+	+	+	+	+	+	+	+	+
5	*A. fumigatus*	+	+	-	+	+	+	+	+	-	+	-	+
6	*A. terreus*	+	+	+	+	+	-	+	+	-	+	-	+
7	*A. versicolor*	+	-	+	+	-	+	-	+	+	-	+	+
8	*A. ustus*	-	+	+	-	-	-	-	+	+	-	-	+
9	*A. candidus*	-	+	+	-	-	-	-	+	+	-	-	+
10	*Fusarium oxysporum*	+	-	+	-	+	-	+	+	-	+	+	-
11	*F. semitectum*	-	+	+	-	+	+	+	-	+	+	-	+
12	*Penicillium funiculosum*	+	+	+	+	+	+	+	-	-	-	-	+
13	*P. pinophilum*	-	+	-	-	-	+	-	-	-	-	-	-
14	*Curvularia geniculata*	+	-	+	+	-	+	+	-	+	-	-	+
15	*Chaetomium globosum*	-	+	+	-	-	-	-	-	-	-	+	-
16	*Oospora sulphurea*	-	+	-	+	-	-	-	-	+	+	-	-
17	*Rhizopus cohnii*	-	+	+	+	-	+	-	+	-	+	+	+
18	*Scopulariopsis brevicaulis*	-	+	-	-	-	-	-	-	-	-	-	-
19	*Bipolaris tetramera*	+	+	-	-	+	-	-	+	-	+	-	+
20	*Drechslera hawaiiensis*	-	+	-	+	-	+	-	+	-	-	+	-
21	*Mucor hiemalis*	+	-	+	+	+	+	+	-	-	-	+	-
22	*Memnoniella echineta*	-	+	-	+	+	+	-	-	+	-	-	-
23	*Trichothecium roseum*	-	+	-	-	-	-	-	-	-	-	-	-

Pollution of natural surface water is common phenomenon. Rivers occupy an important religious place in India. They are traditionally considered sacred and bathing in these rivers is quite common during festivals. The religious significance of holy Ganga exceeds than that of any other river in the world. It has become a stream of agricultural, industrial, urban and human filth during its long journey as it collects surface run off and domestic garbage. This is also added the burden of human activities like bathing, washing of clothes, immersion of ashes, unburnt corpses and dead animals. The mean values (± SD) of different physico-chemical parameters like, Temperature, pH, DO, BOD, Total Alkalinity, Chloride, EC, TDS, Turbidity, Total Hardness, Nitrate, Phosphate observed and different groups of fungi isolate from upstream river. Temperature of water is one of the most important factors in an aquatic environment which plays a very crucial role in physico-chemical and biological behavior of aquatic system. In the present study, temperature recorded was 26 ± 4.8 ºC in the year of 2009 and 24.9 ± 5.4 in the year of 2010. Since temperature has no direct impact on aquatic life. Solubility of oxygen in the water increased when water temperature decreases. pH is measure of the intensity of acidity or alkalinity and measures the concentration of hydrogen ions in water. In the present study, pH recorded was 8.2 ± 0.22 in the year of 2009 and 7.8 ± 0.35 in the year of 2010. In natural water, pH also changes due to variation in photosynthetic activities which increase the pH due to consumption of CO_2 in the process. The microbiological integrity of water also depends upon its pH value (Bouwer, 1978). Dissolved oxygen is one of the most important parameter in water quality assessment and reflects the physical and biological processes prevailing in the water. In the present study, DO recorded was 10.1 ± 3.9 mg/l in the year of 2009 and 7.1 ±1.43 mg/l in the year of 2010. Its deficiency directly

affects the ecosystem of river due to bioaccumulation and biomagnifications. Maintenance and distribution of biota in aquatic ecosystems depends upon the concentration of DO to a great extent. High DO content is an indication of a healthy system (Bilgrami and Dutta Munshi, 1985). BOD is the amount of oxidizable organic matter present in the solution and the BOD value can be used as a measure of waste strength. The BOD test is useful in evaluating the self-purification capacities of streams which serves as a measure to assess the quality of wastes which can be safely assimilated by the stream (Trivedi and Goel, 1984). In the present study, BOD recorded was 5.0 ± 2.4 mg/l in the year of 2009 and 3.4 ± 0.82 mg/l in the month of 2010.

TABLE 3: Sediments Mycoflora in upstream river (Year-2010)

No.	Name of Mycoflora	Month											
		Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
1	*Alternaria fesiculata*	+	-	+	-	+	+	+	-	+	-	-	-
2	*A. alternata*	+	+	-	-	+	+	+	-	+	-	-	+
3	*Aspergillus nidulans*	-	-	+	+	+	-	-	-	+	+	+	+
4	*A. niger*	-	+	-	+	-	+	-	+	+	-	+	-
5	*A. flavus*	+	+	+	+	-	+	-	+	+	-	+	-
6	*A. fumigatus*	+	+	-	-	-	-	+	+	-	-	+	+
7	*A. terreus*	-	+	-	+	+	+	-	-	+	-	+	+
8	*A. versicolor*	+	-	+	-	-	-	-	+	-	+	-	-
9	*A. ustus*	-	+	-	+	+	+	-	-	+	+	-	-
10	*A. candidus*	-	+	+	-	-	-	-	+	+	-	-	+
11	*Cladosporium epiphyllum*	-	+		-	-	-	+	-	-	+	+	-
12	*C. cladosporoides*	+	-	+	+	-	+	-	-	-	+	-	-
13	*C. sphaerospermum*	-	+	-	+	-	-	+	-	-	-	+	+
14	*C. herbarum*	+	-	-	+	-	+	+	+	+	-	+	-
15	*Fusarium moniliforme*	-	-	+	+	-	-	-	-	+	+	+	+
16	*F. oxysporum*	+	+	-	-	+	+	-	-	+	-	+	-
17	*F. semitectum*	+	+	+	-	-	-	+	-	-	+	+	-
18	*Penicillium funiculosum*	+	-	+	+	-	-	-	+	+	-	+	-
19	*P. citrinum*	-	+	-	+	-	+	+	-	+	+	+	+
20	*P. pinophilum*	+	-	+	+	-	-	+	-	+	+	+	-
21	*Curvularia lunata*	+	-	-	-	+	+	+	-	-	-	+	+
22	*C. geniculata*	+	-	-	+	+	-	-	+	+	+	-	-
23	*Chaetomium globosum*	-	+	+	+	+	-	-	-	-	+	+	-
24	*Oospora sulphurea*	+	-	-	+	-	-	+	-	-	-	-	+
25	*Pullularia pullulans*	-	+	-	-	+	-	-	-	-	+	-	-
26	*Rhizopus cohnii*	-	-	-	+	+	+	-	-	-	-	-	+
27	*Scopulariopsis brevicaulis*	+	-	+	-	-	-	-	-	+	-	-	-
28	*Bipolaris tetramera*	+	-	-	-	+	+	-	-	-	+	+	+
29	*Drechslera hawaiiensis*	+	+	-	-	-	+	+	+	+	-	+	-
30	*Mucor hiemalis*	+	+	+	-	-	+	+	+	-	+	-	+
31	*Memnoniella echineta*	-	-	+	-	+	+	-	-	+	+	-	-
32	*Trichothecium roseum*	+	+	-	+	-	-	-	-	+	-	-	-
33	*Pythium indigoferae*	+	-	+	-	-	-	+	-	-	-	+	+
34	*Trichoderma aueroviride*	-	+	-	+	-	-	-	+	-	+	-	-

Present (+), Absent (-)

Total dissolved solids in water comprise organic salts and small amount of organic matter. In the present study, TDS recorded was 240 ± 61.1 ppm in the month of 2009 and 357 ± 17 ppm in the year of 2010. Dissolved solid substances also influence the taste, hardness and corrosive property of water (Bruvold, 1969). EC and TDS measure the ability of an aqueous solution to carry an electric current. The EC as it is known, flows faster when greater amount of salts are in the water. In the present study, EC recorded was 0.37 ± 0.092 mS/cm in the month of 2009 and 0.36±0.074 in the month of 2010. Total alkalinity of water is due to present of mineral salts present in it. It primarily caused by the carbonate and bicarbonate ions. In the present study, alkalinity recorded was 204 ± 58.3 ppm in the month of 2009 and 132.41±53.61 ppm in the month of 2010. The alkalinity makes water tasteful and help in coagulation (Hussain, 1987). When, alkalinity is higher than their respective control. So it has no use any range of alkalinity for the portability of water and bathing respectively. Total hardness of water is caused by bicarbonates, carbonates, sulphate, chlorides and nitrates of calcium and magnesium. In the present study, hardness recorded was 177 ± 37.9 mg/l. in the month of 2009 and 220.58 ± 22.17 mg/l in the month of 2010 though hard water is not unfit for drinking but excessive hardness consumes more soap in laundries and forms deposits in boilers. The increase in the hardness at bathing site can be attributing to the presence of more calcium in water. Chloride occurs naturally in all types of water. Man and other animals excrete very high quantities of chloride together with nitrogenous compounds. In the present study, chloride recorded was 32 ± 17.6 mg/l in the month of 2009 and 25.75 ± 6.60 mg/l in the month of 2010. The present study were higher the value of chloride in the bathing ghat. In the present study, Phosphate was recorded 0.7± 0.11 mg/l in the month of 2009 and 0.65 ±

0.09 mg/l in the month of 2010. Phytoplankton's uses phosphorous in the phosphate form the sediments to accelerate the process of eutrophication. The phosphorous once with in a water body enter into complicated cycle involving various physical, chemical and biological processes. However some amount may be lost from water by absorption from bottom sediments in river during the study period. In the present study, Turbidity was recorded 42.5 ± 9.7 NTU in the month of 2009 and 76.6 ± 8.60 NTU in the month of 2010. Turbidity of water is directly related to aquatic life of water body, because it effects light penetration. Turbidity results from suspended matter of different sizes and is of paramount significance in water treatment plants. Turbidity in water river Ganga was found above the standard prescribed limits of ISI and Central Pollution Control Board, which is objectionable for aquatic life. In the present study, Nitrate was recorded 1.55 ± 0.6 mg/l in the month of 2009 and 2.3 ± 0.69 mg/l in the month of 2010. In the waste treatment systems, higher amount of nitrates denotes the aerobic conditions and high stability of the wastes. Nitrates are maximum during the period of rainfall. Nitrate depletion in winter and summer. Biological parameters have great importance for ecological point of river. All natural water contains a variety of organisms. Some alone were also found to be present. During the present study 18 genera representing various groups of aquatic mycoflora in upstream Ganga river (during January 2009 to December 2010) were isolated and arranged in (Table- 2.1-2.2). During the present study 18 genera representing various groups of sediments mycoflora in upstream Ganga river (during January 2009 to December 2010) were isolated and arranged in (Table- 2.1-2.2). Total 34 species isolated belong to 18 genera vis *Alternaria, Aspergillus, Cladosporium, Fusarium, Penicillium, Curvularia, Chaetomium, Oospora, Pullularia, Rhizopus, Scopulariopsis, Bipolaris, Drechslera, Mucor, Memnoniella, Trichothecium, Pythium* and *Trichoderma*. Total number of sediment fungi belongs to different groups was isolated. Out of the total number of genera isolated the member of 1 belong to Oomycetes, 3 belong to Zygomycetes, 1 belong to Ascomycetes and rest of belong to Deuteromycetes (Jaiswal, 2013). The river water after confluence with effluents, indicate the addition of organic waste. But no direct correlation could be established between different parameters and fungal population. Bathing by a large number of people in a limited space at a particular ghat may transmit diseases through water which may be already contaminated by bather themselves. Therefore, the persons suffering from contagious diseases should not be allowed to take bath.

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