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SEDIMENT MYCOFLORA IN RIVER GANGA AT KANPUR TO ASSESS THE IMPACT OF HUMAN ACTIVITY ON THE RIVER

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Abstract

The research was carried out to study the Mycological parameters of water and sand sample in Ganga River at Kanpur. The water quality declined due to bathing and disposal of domestic, municipal and industrial waste from Jajmau ghat which directly or indirectly affects the biotic community of the river water. In Jajmau, there is a cluster of industrial units mainly tanneries, so discharge of industrial waste in water. Part of animal bodies and chemicals which are used to process leather are present in the water discharge of tanneries unit. Biological parameters have great importance for ecological point of river. All natural water contains a variety of organisms. During the study 24 genera representing various groups of mycoflora in polluted site was isolated where mostly human activities occur.
Key words: Ganga River, Mycoflora, human activity

Introduction

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).

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 by human activity (Bilgrami and Dutta Munshi, 1985). The 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 mycological effect on the quality of the Ganga water at Jajmau from Kanpur.

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 disease should not be allowed to take bath (Jaiswal, 2015). The occurrence of fungal spores and hyphae in Ganga water indicate that they are capable of utilizing the nutrients from the polluted waters.

Material and Methods

Water samples were collected aseptically in sterilized bottles from polluted site situated in near the river Ganga. Samples were baited with boiled hemp seed halves, ants, snake skins, housefly, wheat and maize grains. Baits having mycelia growth on them were taken out, washed thoroughly with sterilized distilled water and transferred to fresh Petri dishes half filled with autoclaved distilled water containing corresponding baits. Collections were also made by baiting the aquatic sites with potatoes, guava and banana (Mishra, 1983).

Micro fungal analysis was 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.

Result and Discussion

The result obtained from the observation made during the year, mycological parameters included in this study. Pollution of natural surface water is common phenomenon. Rivers occupy an important religious place in India. Rivers are of considerable significance as a source of drinking, domestic, industrial and irrigation waters. However, rapid industrialization and urbanization have induced enormous pollution and caused severe imbalances in aquatic biology (Trivedi, 1986). In Jajmau there is a cluster of industrial units mainly tanneries, so discharge of industrial water, sewage water and domestic garbage. Part of animal bodies and chemicals which are used to process leather are present in the water discharge of tanneries units (Jaiswal, 2013).

Mycoflora at Polluted site

No.	Name of Aquatic Mycoflora	No.	Name of Sediment Mycoflora
1	*Achlya Americana*	1	*Alternaria fesiculata*
2	*A. dubia*	2	*A. alternata*
3	*Aphanomyces laevis*	3	*Aspergillus nidulans*
4	*Dictyuchus monosporus*	4	*A. niger*
5	*D. sterile*	5	*A. flavus*
6	*Leptomitus lacteus*	6	*A. fumigatus*

7	*Pythiopsis intermedia*	7	*A. versicolor*
8	*Saprolegnia ecentrica*	8	*A. ustus*
9	*S. diclina*	9	*A. candidus*
10	*S. ferax*	10	*Cladosporium epiphyllum*
11	*S. rhaetica*	11	*C. cladosporoides*
12	*Thraustotheca clavata*	12	*C. sphaerospermum*
13	*Alternaria alternate*	13	*C. herbarum*
14	*Aspergillus clavatus*	14	*Fusarium moniliforme*
15	*A. nidulans*	15	*F. oxysporum*
16	*A. niger*	16	*F. semitectum*
17	*A. flavus*	17	*Penicillium funiculosum*
18	*A. fumigatus*	18	*P. citrinum*
19	*A. terreus*	19	*P. pinophilum*
20	*Penicillium funiculosum*	20	*Curvularia lunata*
21	*P. citrinum*	21	*C. geniculata*
22	*P. pinophilum*	22	*Chaetomium globosum*
23	*Cladosporium herbarum*	23	*Rhizopus cohnii*
24	*Curvularia lunata*	24	*Bipolaris tetramera*
25	*Fusarium moniliforme*	25	*Drechslera hawaiiensis*
26	*F. oxysporum*	26	*Mucor hiemalis*
27	*F. semitectum*	27	*Memnoniella echineta*
28	*Mucor hiemalis*	28	*Trichothecium roseum*
29	*Chaetomium globosum*	29	*Pythium indigoferae*
30	*Trichosphaeria pilosa*	30	*Trichoderma aueroviride*
31	*Trichoderma aueroviride*		
32	*Pythium indigoferae*		
33	*Memnoniella echineta*		

During the study 18 genera 33 species of aquatic mycoflora and 15 genera 30 species of sediment mycoflora in representing various groups of mycoflora at Jajmau ghat. Total 47 species isolated belong to 24 genera vis *Achlya, Aphanomyces, Dictyuchus, Leptomitus, Pythiopsis, Saprolegnia, Thraustotheca, Trichosphaeria, Alternaria, Aspergillus, Cladosporium, Fusarium, Penicillium, Curvularia, Chaetomium, Pullularia, Rhizopus, Bipolaris, Drechslera, Mucor, Memnoniella, Trichothecium, Pythium and Trichoderma.*

The sediments fungi of river Ganga supports 10 genera spread over 25 species. Literature supports isolation of soil fungi (Raillo, 1928; Takahashi, 1919; Mishra, 1986; Akhtar *et al.,* 1987) from different parts of the world. Species of genera *Alternaria, Aspergillus, Chaetomium, Cladosporium, Curvularia, Fusarium, Mucor, Penicillium* and *Trichoderma* comprise a group of allergenic fungi isolated during present investigation. *Aspergillus* sp. and *Penicillium* sp. cause athlete's foot. *Aspergillus sp., Penicillium sp.* and *Mucor* cause otomycosis. Disease like aspergillosis, mucormycosis and penicillosis are caused by *Aspergillus sp., Mucor sp.* and *Penicillium sp.* respectively. *Aspergillus fumigatus, A. flavus, A. niger* and *A. terreus* cause aspergillosis. *Mucor* species induce zygomycosis. Certain allergenic disease like allergenic rhinitis, bronchial asthma, hypersensitivity and pneumonitis are caused by fungal organisms like *Curvularia sp., Aspergillus sp*., *Trichoderma sp*. and *Fusarium sp*. presence of such fungi in Ganga is of pivotal significance from view point of infections in both animal and human beings, thereby posing public health problems (Shukla & Asthana, 1995).

Species of Genera *Aspergillus, Cladosporium, Fusarium, Penicillium, Alternaria, Mucor*, *Bipolaris, and Drechslera* comprise group of allergenic fungi such fungi came allergenic rhinities, Bronchial asthmas, hypersensitivity and pneumonitis. Presence of fungi in Ganga is of considerable significance as they in fact both animal and human beings passing public health problems. Biological communities perform a variety of functions with ecosystem, including regulation of climatic processes, breakdown of waste recycling of nutrients, maintenance of sediment fertility and provision of natural resources.

The study of qualitative nature of fungi associated with sand sediment of Ganga river classified into three different groups on the basis of their appearance in different times and intervals. Dominant group: the frequency of this fungi appeared more than 70% incidence and more in number. These are *Aspergillus fumigatus, A. terreus, A. niger* and *A. flavus.* Common group of fungi appeared less tha 70% and more than 50%. These are *Aspergillus fumigatus, A. terreus, Alternaria alternata, Chaetomium globosum, Cladosporium sp.*and *Drechslera sp.* Rare group of fungi appeared once or twice during isolation *Fusarium roseum, F. moniliforme* and *F. oxysporum. (*Singh, B.K. et. al., 2014*).*

The aquatic fungi observed in the river or sewage water are *Achlya, Saprolegnia, Isoachlya, Aphanomycetes, Dictyuchus and Olpidiopsis* (Singh, D.K. 2015). Ganga river in Varanasi of U.P. all fungal species were found to be dominant. *Aspergillus flavus* and *Aspergillus niger* showed highest frequency at Harishchandra ghat and Ragendra ghat while white sterile mycelium and *Trichothecium roseum* showed lowest frequency in Assi ghat (Bhupendra et al., 2014)

The fungi are also involved in self-purification of water. During investigations two fungal species including *Bipolaris sp.* and *Drechslera sp.* were recorded and involved in self-purification of water. Unfortunately, as fungi are non-green, non-photosynthetic organisms, they only consume oxygen present in water during respiration. As such they are responsible for depletion of oxygen and make water unhealthy.

Ecological importance, bio indicators are used for the assessment of the health of river ecosystems. This study explored the fungal compositions and the potential of fungal taxa as bioindicators for indicating the water quality. The River exhibited dynamic variations in both physicochemical/hydrochemical properties and fungal communities according to seasons and locations. These results thus promote the use of fungal indicators to assess the health of the river (Singh, D.K. 2015).

Ganga is known for its variance in biological fabric within short distances and totality of fungal infestation. Results of present investigations emphasize importance of fungi of Ganga waters in self-purification and public health hazards. The occurrence of fungal spores and hyphae in Ganga

waters indicates that they are capable of utilizing the nutrients from the polluted waters 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. Aquatic systems are of considerable significance as a source of drinking, domestic, industrial and irrigation waters. However rapid industrialization and urbanization have induced enormous pollution caused severe imbalances in aquatic biology (Trivedy, 1986; Trivedy *et al.*, 1990). Present study is an attempt to prepare physico-chemical and mycological profile of river Ganga. The fungal infestation in biology of river vis-à-vis self-purification, allergenic disease spread and impairing water quality are the focal hall marks for futuristic use in multiple ways. Science appears harmoniously wedded to practice. The main source of pollution in river Ganga is untreated sewage and agricultural washouts of pesticides and insecticides. The water of river Ganga is rich in heavy organic and inorganic substances(Jaiswal,H., 2021).

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