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By

Harshita Jaiswal and Vijay Tewari

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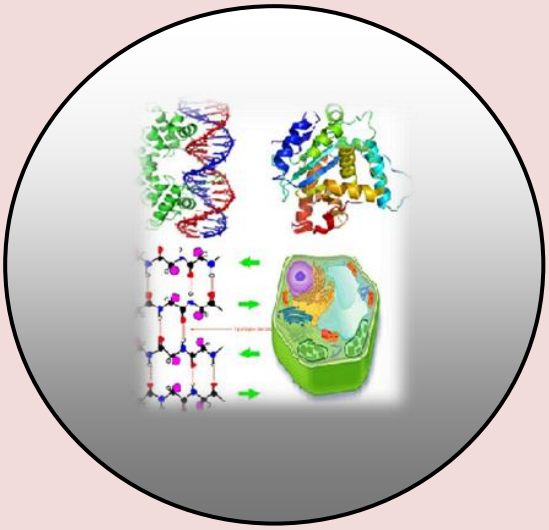

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Dr. Harshita Jaiswal
http:// www.sasjournals.com
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jbiolchemres@gmail.com

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Mycoflora in Ganga River Sand at Bithoor Ghat

Harshita Jaiswal and Vijay Tewari
Department of Botany, D.G.P.G. College, Kanpur, U.P., India

ABSTRACT

Ganga is known for its various biological fabrics even in shorter distances and totally for fungal infestation. Present investigation supports 18 genera spread over 34 species isolate from bottom sand of River Ganga (Bithoor) at Kanpur. The occurrence of fungal spores and hyphae in Ganga water indicate that they are capable of utilizing the nutrients from the polluted water. Some fungi isolated Alternaria, Aspergillus, Cladosporium, Fusarium, Penicillium, Curvularia, Chaetomium, Oospora, Pullularia, Rhizopus, Scopulariopsis, Bipolaris, Drechslera, Mucor, Memnoniella, Trichothecium, Pythium and Trichoderma.

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.

Keywords: Sediment, Mycoflora and Ganga River.

INTRODUCTION

The contamination of river Ganga is bipronged-organic and inorganic existing in the form of colloidal and dissolved matter, and biological organisms. It is well known fact that fungi are decomposers. The chlorophyll less plant constitutes one of the important components of ecosystem. Their activity is responsible for maintaining the balance of raw materials in the ecosystem because these are the organisms which are capable of decomposing the complete organic matter and releasing the simpler inorganic constituents into the system. Therefore, the study of these will give an indication of the state of the ecosystem. The viable fungal spores in water can be related to truly aquatic fungi of which only a fraction is involved in aquatic colonization.

Some terrestrial fungi have been shown to play an active role in aquatic environment. Worker stated that leaf surface acted as a trap for many fungal propagules which remain dormant. Repeated drying and wetting usually killed many fungi, only those species which could with stand such changes without losing viability could survive. Fungal activity and freshly fallen leaves in aquatic habitats is most important during initial stages of decomposition. The ubiquitous fungi coexist in various environments because of many biotic and abiotic factors favorable to their occupation of a common habitat. Their profile nature tends to obscure the more discrete occurrence of fungal groups in particular habitats. Sediments or benthic soil constitutes integral parts of riparian ecosystem and can be defined as solid materials that have settled down from a state of suspension in a liquid. It includes residual deposits, chemical precipitated, autochthonous accumulations of organic debris and material deposited through glacial and ocolian agencies.

Chaudhuri (1986) conducted extensive studies on aquatic fungi of river Ganga between Katwa and Bandi. Chaudhuri and his colleagues studied the population of fungi in the waste water environment and concluded that the population of fungi varied with the pH of the waste water. Studies on species composition in the waste water before mixing with the river and sediments of the river carried out by them revealed that species of *Aspergillus* and *Penicillium* dominated. Ecological studies on certain fungi revealed that optimum temperature for growth of the fungi isolated from waste water ranged between 27 ºC - 40 ºC on the basis of the studies carried out by them, prominent cellulose and hemicelluloses decomposers were identified as a result of studies carried out on the fungi of river Ganga between Buxer and Barh carried out under Prof. R. K. Saran at the University of Patna, fifty one species of fungi from river water and fifty four species of fungi from river sediments were isolated. Studies on the fungi of river Ganga between Barh and Sultanganj were also carried out under Prof. A. K. Srivastava (1986) at Rajendra Agriculture University, Pusa. Studied effect of pollution on fungal population of river Ganga between Katwa and Naihati reported the dominance of *Penicillium, Aspergillus* and *Curvularia.*

Fungi the decomposers of any ecosystem have been reported to degrade various compounds present in waste, polluted waters and sediments for their food requirements. It was as scavenger organisms which appear to be aiding in stream purification. The river Ganga at Kanpur receives urban sewage and effluents from industries. The load of pollutants in any ecosystem has been reported to affect the fungal flora including that of sediments and studies on fungal flora of river Ganga sediments. The topic on Ganga ecosystem vis-a-vis biological gamut has been investigated earlier by Tripathi, 1991 (Shuklaganj); Gupta, 1991 (Nanamau and Bithoor); and Kaur, 1991 (Kanpur). Biological profile of river Ganga portrays its significance. Perhaps there exists a direct co-relation between chemical constituents of organic and inorganic nature coupled with physical attributes of the water body and microbe profile. The biology of riverine system is subjected to changes in physico-chemical characteristics and complementary impacts of microbes. Involvement of microbes in self purification of water pollution and public health hazards is documented in the literature. The problem of monitoring, abatement, pollution, control of health hazards and resultant biology of river Ganga inter alia physico-chemical attributes in unison constitutes environmental priorities for exploitation, use and reuse of river water. It becomes incumbent; therefore that microbiological profile need be recorded with special reference to organisms growing luxuriantly (Jaiswal, 2014).

MATERIALS AND METHOD

Composite sand samples were aseptically collected at monthly intervals from Ganga River at (Bithoor ghat) situated in Kanpur. The samples were collected and brought to the laboratory, subjected to sand fungi analysis using with slight modification dilution plate and soil plate methods (Waksman and Fred, 1922; Warcup, 1950; 1955; and Johnson *et al.,* 1960). Czapeck's Dox agar was used as medium for plating. Culture plates were incubated at 28 ± 1 °C for 3-7 days of plating and subcultures were made in tubes having appropriate medium.

RESULTS

During the present investigation 18 genera representing various groups of sediments mycoflora in Ganga River at Kanpur in sampling station Bithoor (during two years) were isolated and have been arranged in (Table- 1, 2). The 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.

Table 1. SEDIMENTS MYCOFLORA (Ist Year).

No.	Name of Mycoflora	Month											
		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*	-	+	-	-	-	-	-	-	-	-	-	-

Table 2. SEDIMENTS MYCOFLORA (IInd Year).

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: (-)

DISCUSSION

In Present investigation of sediment mycoflora of Ganga River at Bithoor, exist a direct co-relation between chemical constituents of organic and inorganic nature coupled with physical attributes of the water body and microbe profile. The biology of riverine system is subject to changes in physico-chemical characteristics and complementary impacts of microbes. Involvements of microbes in self-purification of water pollution and public health hazards are documented in the literature (Shukla, 1989; Nigam, 1986; Tripathi and Pandey, 1990).

In water ecosystem fungi occupy the same functional status as bacteria bringing about effective degradation. Bacteria induce BOD reduction alone while fungi also set in degradation of phosphates and ammonia-N spilled through domestic waste (Heremith, 1984). Fungi posses capability of reducing BOD as well as phosphate and ammonia-N. Therefore fungi are better degraders as compared to bacteria. Presence of fungi and yeast in the waters receiving organic enrichment is of pivotal importance in self-purification of water and cannot be simply ignored as contaminants.

The sediment fungi of Bithoor Ghat in various months of the year were as seen in the table (1, 2). Most of the sediment fungal species were in table 2 then decrease the number of fungal species in table 1. Maximum fungal species are in the month of February and December and minimum fungal species are March, April, October November and December according to table 1. Maximum fungal species are in January, April and minimum fungal species in December, March, May and August in table 2.

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).

In present observation *Trichosphaeria pilosa* occur during January to June. Cladosporium species occur September, December to May. *Curvularia* species occur August, October to May. *Chaetomium* species occur during October, November to February and June. *Trichoderma* species occur during September, October and January to May. *Pythium* species occur during November to February, whereas Srivastava (1967 b) isolated it from September to March. *Memnoniella* species occur during December to August.

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 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.

CONCLUSION

Quality of water broadly depends upon the dissolved oxygen level of water on one hand and presence of toxic or poisonous substances coupled with disease spreading organisms on the other hand. Conclusively, present work 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.

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Corresponding author: Dr. Harshita Jaiswal, Department of Botany, D.G.P.G. College, Kanpur, U.P., India

Email: hjaiswal12@gmail.com