

ECOLOGY OF AQUATIC AND EXTRA-AQUATIC FUNGI FROM THE RIVERINE ECOSYSTEM AT ALLAHABAD

Dr. Dharendra Kumar Singh,

Associate Professor,
Department of Botany,
Y.D.P.G. College,
Lakhimpur Kheri

ABSTRACT

Seasonal fluctuations of aquatic and extra-aquatic fungi of river Ganga, Yamuna and Tons have been studied at Allahabad with reference to sewage water. Six aquatic and five extra-aquatic fungi, were isolated from rivers and sewage. Comparatively higher representation of aquatic fungi of non polluted water of Yamuna was recorded during winter season while in sewage during summer and winter seasons. Fungi as indicator of pollution are discussed.

Keywords: *Fungi, polluted and non-polluted waters, civic and industrial sewage.*

INTRODUCTION

Seasonal fluctuation of aquatic ecosystems plays an important role in the distribution, periodicity and qualitative composition of the freshwater fungi (Manoharachary 1978, 1979, Madhusudan Rao and Manoharachary 1981). Relatively few studies on extra-aquatic fungi in freshwater ponds, rivers, streams, sewage and other habitats exist (Church et al 1972, Cooke 1976, Hynes 1960, Noel 1973, Park 1972, Sladeck 1969 and Willoughby 1965). Almost all the group of fungi have been reported from aquatic environment.

Because of their special modifications for aquatic environment, lower fungi are most frequent invaders of decomposing materials. Considerable amount of information about the aquatic fungi can be had from the work of Gilman (1945). However, in India such study is very few (Bhargava, 1969, Das Gupta et al 1953, Dayal 1958 Baruah and Bora 1979, Vishwe and Umalkar 1979, Madhusudhan Rao and

Manoharachary 1981 and Singh 1989). In the present investigation an attempt has been made to study the distribution of aquatic and extra aquatic fungi in polluted and non-polluted environment.

RESEARCH SITES

Ganga forms part of the Northern Boundary of Allahabad district and then crosses it to flow west wards. Yamuna, after flowing through Southern border of the district merges into the river Ganga near the centre of the District (Sangam). In addition, approximately 40 Km. to Ganga downstream Sangam and stretch of about 2 Km. of tons was also included in the study. Fungal Analysis river waters (Ganga, Yamuna and Tons) is based on the samples collected from 13 different stations during different seasons.

On the basis of the nature of the discharges and its points of confluence in the rivers, four sites

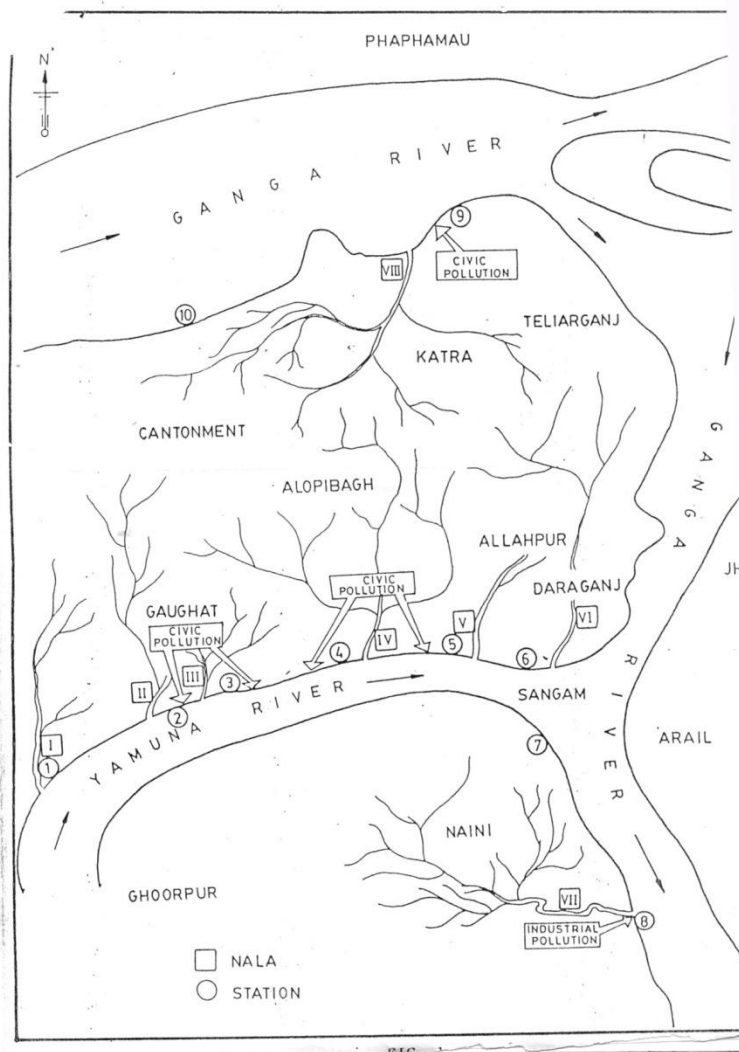
were categorized for the present study as summarized following (Fig. 1).

LEGENDS TO FIGURES

Fig.1: Map showing the details of sampling stations (1-10) and sources of civic as well as industrial wastes (I - VIII).

2. Kakarahaghat
3. Baluaghat
4. Gaughat
5. Siwala
6. Kilaghat
7. Sangam
8. Maniya
9. Rasoolabad
10. Upstream : Rasoolabad

1. Karelabagh



Site 1. Non-polluted zone i.e. free from the discharge of any activities. The places include Ganga – Kara , Sringavarepur and Sirsa, Yamuna – Sujawan and Tons – Katka.

Site 2. Polluted zones (Mixed effluent zone) i.e. the wastes carrying a mixture of civic sewage, industrial effluents, surface wastes etc.

These include Rassolabad in Ganga and Karelabagh, Baluaghat, Gaughat, Siwala and Kilaghat in Yamuna.

Site 3. Civic Sewage zone i.e. effluent containing only civic discharges. It covers Rasoolabad (Ganga),

Karelabagh, Kakarahaghat, Siwala, Gaughat and Kilaghat (Yamuna).

Site 4. Industrial sewage zone i.e. joining effluents contain only industrial discharge which is located at Maniya (Ganga).

MATERIALS AND METHODS

Method outlined by Adoni (1985) were followed for determining fungal characteristics of river / sewage water. The population of fungi in river/sewage water at different sites during different seasons is presented in Tables 1 and 2.

Table 1:

Population of aquatic fungi in the form of genera which were not represented in river or sewage water during different seasons was as follows/the total number of genera represented is also mentioned below.

Sites/Seasons	Summer	Winter	Rainy
Non-Polluted Ganga	FOUR <u>Dictyuchus</u> <u>Isoachlya</u>	FIVE <u>Dictyuchus</u> -	FOUR <u>Olpidiopsis</u> <u>Olpidiopsis</u>
Yamuna	TWO <u>Achlya</u> <u>Saprolegnia</u> <u>Dictyuchus</u> <u>Olpidiopsis</u>	FOUR <u>Achlya</u> - - - <u>Isoachlya</u>	ONE <u>Achlya</u> <u>Saprolegnia</u> <u>Dictyuchus</u> <u>Olpidiopsis</u> <u>Isoachlya</u>
Tons	ONE <u>Achlya</u> <u>Saprolegnia</u> <u>Isoachlya</u> <u>Dictyuchus</u> <u>Olpidiopsis</u>	FIVE - - - <u>Dictyuchus</u> <u>Olpidiopsis</u>	ONE <u>Achlya</u> <u>Saprolegnia</u> <u>Isoachlya</u> <u>Dictyuchus</u> <u>Olpidiopsis</u>
Polluted: Ganga	FIVE <u>Olpidiopsis</u> -	FIVE - <u>Isoachlya</u>	FIVE <u>Olpidiopsis</u> -
Civic sewage	FOUR <u>Dictyuchus</u> <u>Achlya</u> <u>Olpidiopsis</u> - - -	FIVE <u>Dictyuchus</u> <u>Achlya</u> <u>Olpidiopsis</u> - - -	ONE <u>Dictyuchus</u> <u>Achlya</u> <u>Olpidiopsis</u> - <u>Saprolegnia</u> <u>Isoachlya</u>
Industrial Sewage	THREE <u>Isoachlya</u> <u>Dictyuchus</u> <u>Olpidiopsis</u>	FOUR <u>Isoachlya</u> <u>Dictyuchus</u> -	ONE - <u>Dictyuchus</u> <u>Olpidiopsis</u>

	- ≡	- ≡	<u>Achlya</u> <u>Saprolegnia</u>
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Table 2:

Population of Extra-aquatic Fungi showing the list of genera which failed to appear in river/sewage water during the different seasons and the number of genera which appeared is also given :

Sites/Seasons	1 summer	2 Winter	3 Rainy
Non-polluted			
Ganga	THREE Ascobolus Phoma	FIVE - -	TWO Ascobolus Phoma
Yamuna	ONE Mucor Ascobolus Phoma Fusarium	TWO Mucor Ascobolus Phoma	ONE Mucor Ascobolus Phoma Fusarium
Tons	ONE Mucor Ascobolus Phoma Fusarium	THREE Mucor Ascobolus	TWO Mucor Ascobolus Phoma Fusarium
Poluted			
Ganga	FOUR Mucor -	FOUR Fusarium -	THREE Mucor Ascobolus
Yamuna	THREE Ascobolus Phoma	FIVE Ascobolus	FOUR Ascobolus Phoma
Industrial			
Sewage	ONE Mucor Ascobolus Phoma Fusarium	FOUR - - - -	ONE Mucor Ascobolus Phoma Fusarium
Civic Sewage	THREE Ascobolus -	FIVE - -	THREE Ascobolus Phoma

RESULTS AND DISCUSSION

Eleven fungal genera viz. six aquatic and five extra-aquatic ones recovered from river and sewage waters are presented in Tables 1 and 2. They belong to various groups of lower and higher fungi including Oomycetes, Zygomycetes, Pyrenomycetes, Discomycetes and Hyphomycetes. The aquatic fungi observed in the river or sewage water are Achlya, Saprolegnia, Isoachlya, Aphanomyces, Dictyuchus and Olpidiopsis. All of them were never represented in any of the rivers during any period of the river year. In the present study, a majority of them have been found to exist throughout the year in polluted and non-polluted water of Ganga and polluted waters of Yamuna and Tons, majority of them were represented only during winter. In both the sewage majority of the Ganga water were represented only during summer and winter.

The genera which were not represented in river of sewage water during different seasons was as follows and the total number of the genera represented is also mentioned.

The extra-aquatic fungi like Pythium, Mucor, Ascobolus, Phoma and Fusarium species have been represented in non-polluted waters of Ganga, polluted water of Yamuna and civic sewage during winter. Most of them existed during winter in water of industrial sewage and during summer as well as in winter in polluted water of Ganga.

Comparatively higher representative of aquatic fungi in non-polluted water of Yamuna and Tons was recorded during winter season while in sewage water during summer and winter season. These fungi were well represented throughout the year in polluted and non-polluted water of Ganga.

Achlya and Saprolegnia persists throughout the year in Ganga water while Aphanomyces in water of all the three rivers. In Dictyuchus while in sewage water only Aphanomyces was persisted throughout the year. The higher representation of extra-aquatic fungi was in polluted water. Pythium persisted in the non-polluted and sewage waters throughout the year. In addition, Fusarium_sp. In

non-polluted water of Ganga. Phoma in polluted water of Yamuna showed presence throughout the year.

Seasonal periodicity of fungi in water bodies has also been reported by a number of investigators including Perrot (1960), Dayal and Tandon (1963), Khulbe and Bhargava (1977) and Misra (1982). In most of the reports maximum representation of Fungi has been noted during colder months. A number of fungi have been shown to survive in polluted waters (Tabak and Cooks 1968, Loudon 1972, Cooke 1976, Mishra 1982, Somashekar et al 1982) has stressed upon the importance of fungi as a indicator of pollution since they play an important role in the digestion of organic matter and other pollutants.

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