



## RESEARCH ARTICLE

### BIODIVERSITY OF FUNGAL POPULATION IN FOUR DISTINCT REGIONS OF SHIVNATH RIVER.

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#### Abstract

Shivnath river water was assessed at three sampling stations with study period of April 2013. The present investigation was carried out on diversity of aquatic fungi from Mehmara Station, Chhattagarh Station, Kotni Station, Pulgaon Chowk (Rajanandgaon Road) Station. The soil samples were examined for fungi by plating method culturing in Potato Dextrose Agar (PDA) medium and Czapek's (dox) Agar (CZA) medium. The isolated fungal strains were identified by Lactophenol Cotton Blue staining. During the study, a total of 44 fungal isolated and identified. The higher fungal taxa that occurred in station-II was observed may be due to unpolluted nature of water and less anthropogenic activities was encountered at this station. Station I, III and IV less number of fungal taxa occurred. This was may be due to the polluted nature of the water and increased anthropogenic activities at this station.

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#### Introduction:-

Biological diversity refers the variability among living organisms from all sources including terrestrial, marine and other aquatic ecosystems. This includes diversity within the species, between the species and of ecosystems. Soil factors are known to exert effect on the fungal population of microbes. Moisture, pH, porosity, mineral and organic matter contents and their chemical nature, temperature and volatile metabolites produced by accompanying microbes. Soil fungi may occur as free-living organisms or in mycorrhizal association with plant roots. The incidence of the soil fungi vary according to geographic, environmental or bioclimatic factors such as collection site, time of the years relative air, humidity, rainfall, wind speed and proximity to the source where they were produced Oliveira *et al.*, 1993. These factors determine the quality and quantity of the mycobiota existing in terrestrial ecosystems. Fungi are found primarily in the top 10 cm of the soil. They grow and carry out active metabolism when conditions are favorable which implies adequate moisture, adequate aeration and relatively high concentrations of utilizable substrates. The fungal biodiversity constitute a very large group of organisms virtually found in every ecological niche. Hawksworth (1991) puts that the soil is the typical reservoir of anemophilous fungi and estimated that on a worldwide basis there are about 1.5 million species of fungi.

#### Material and Methods:-

**Study site Shivnath River** is the biggest tributary of Mahanadi river, which it joins in Khargahni in Bilaspur district in Chhattisgarh, India. It has a total course of 290 km. The Latitude of Shivnath River is 21.2859 and The Longitude is 81.2883. Shivnath is main river of District Durg. It originates from Mountain at height of 625 meter at

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Panabaras situated in south western parts of Rajnandgaon and flows towards north east direction. Shivnath River measures length about 345 Km. City Durg is situated on east bank of Shivnath River. Climate of the district is of tropical type. Summer is a little bit hotter in the month of April. Rise of temperature begins from the month of March to May. May is hottest amongst other, **Maximum Temperature:** 39.49°C, **Minimum Temperature:** 29°C humidity is 27%.

#### **Culture media preparation:-**

##### **Potato Dextrose Agar medium (PDA) (Aneja, 1996):**

Peeled potato:	200gm
Dextrose:	20gm
Agar Agar:	20gm
Distilled water:	1000ml

The PDA medium was poured into five conical flasks each of 200 ml capacity. The flasks were plugged with cotton and wrapped with aluminum foil. Conical flasks with culture media were sterilized at 121°C at 15 psi pressure in an autoclave for about 20 minutes.

##### **Czapek's (dox) Agar medium (CZA) (Dhingra and Sinclair, 1985)**

NaNO <sub>3</sub> :	2.0gm
KH <sub>2</sub> PO <sub>4</sub> :	1.0gm
KClO <sub>3</sub> :	0.5gm
MgSO <sub>4</sub> .7H <sub>2</sub> O:	0.5gm
FeSO <sub>4</sub> :	0.01gm
Sucrose:	30.0gm
Agar-Agar :	20.0gm
Distilled water:	1000ml

Agar-agar was melted in 500 ml of distilled water. All the ingredients were mixed thoroughly. The volume was made up to 1000 ml and sterilized in the previously mentioned fashion.

#### **Isolation of potent microorganisms:-**

The innate fungal strains were isolated from soil samples by serial dilution, pour-plate technique and direct plate method. The mixed cultures were obtained by pour-plating respective diluted samples on potato dextrose agar (PDA) and Czapek Dox agar (CZA) plates amended with sefixime (50 mg/100ml) under sterile conditions at 30 ± 1°C for 7 days. The isolates were stored at 4 ± 1°C until further use. All isolated fungi were identified as per Alexopoulos and Mims<sup>10</sup> and Watanabe<sup>11</sup> based on macro and microscopic characteristics. For macro-morphological observations, fungi were pure cultured on CZA and PDA for 7 days at 30 °C in the dark to appraise growth on media with low aw. Identification based on colony morphological study includes form, pattern, quantity of aerial hyphae, diameter, colony colour and texture, margin, elevation, colo-r of colony reverse, presence of exudates, organs formed and soluble pigment.

**Result and Discussion:-****Table 1:-** Fungi Isolated From Four Sampling Stations.

S.N.	Fungi Isolated	S1	S2	S3	S4
<b>Ascomycetes</b>					
1.	<i>Acremonium byssoides</i>	-	-	+	-
2.	<i>Alternaria alternata</i>	+	+	-	+
3.	<i>Alternaria brassicola</i>	+	+	-	+
4.	<i>Aspergillus candidus</i>	-	+	-	+
5.	<i>Aspergillus flavus</i>	-	-	+	+
6.	<i>Aspergillus fumigates</i>	+	-	+	+
7.	<i>Aspergillus nidulans</i>	+	-	+	+
8.	<i>Aspergillus niger</i>	+	+	-	-
9.	<i>Aspergillus ochraceus</i>	+	+	-	-
10.	<i>Aspergillus oryzae</i>	-	+	+	-
11.	<i>Aspergillus parasiticus</i>	-	+	+	-
12.	<i>Aspergillus terreus</i>	+	+	+	-
13.	<i>Chaetomium funicola</i>	-	-	-	+
14.	<i>Chaetomium globosum</i>	-	-	-	+
15.	<i>Chaetomium indicum</i>	+	+	+	+
16.	<i>Cladosporium cladosporioides</i>	+	+	+	+
17.	<i>Cladosporium oxysporum</i>	+	+	+	+
18.	<i>Curvularia pallescens</i>	+	+	-	-
19.	<i>Drechslera hawaiiensis</i>	-	-	+	-
20.	<i>Drechslera rostrata</i>	-	+	+	-
21.	<i>Drechslera specifer</i>	-	+	-	+
22.	<i>Epicoccum purpurascens</i>	+	+	+	+
23.	<i>Eurotium amestaldomi</i>	+	-	+	+
24.	<i>Fusarium equiseti</i>	+	+	-	+
25.	<i>Fusarium moniliforme</i>	+	-	-	+
26.	<i>Fusarium oxysporum</i>	-	+	+	-
27.	<i>Fusarium pallidoroseum</i>	-	-	+	-
28.	<i>Fusarium solani</i>	-	+	+	-
29.	<i>Neosartoria fischeri</i>	+	+	+	+
30.	<i>Nocosmospora vasinfecta</i>	+	+	+	+
31.	<i>Paecilomyces variotii</i>	+	-	-	+
32.	<i>Penicillium chrysogenum</i>	-	+	-	+
33.	<i>Penicillium citrinum</i>	-	+	+	+
34.	<i>Penicillium oxalicum</i>	+	+	-	-
35.	<i>Phoma glomerata</i>	+	-	+	-
36.	<i>Trichoderma virens</i>	+	+	+	+
37.	<i>Trichoderma viride</i>	-	+	-	+
38.	<i>Verticillium albo-atrum</i>	-	+	-	-
<b>Zygomycetes</b>					
39.	<i>Absidia cylindrospora</i>	+	+	+	+
40.	<i>Gongronella butleri</i>	+	+	+	-
41.	<i>Mucor hiemalis</i>	-	+	-	-
42.	<i>Mucor racemosus</i>	+	+	+	+
43.	<i>Rhizopus stolonifer</i>	-	+	-	+
<b>Basidiomycetes</b>					
44.	<i>Rhizoctonia bataticola</i>	-	+	-	+

(+) = Present, (-) = Absent, S1- Mehmara Station, S2- Chhattagarh Station, S3- Kotni Station, S4- Pulgaon Chowk (Rajanandgaon Road) Station

In the study, totally 44 species of fungi were isolated by dilution plating technique (Table-1). Out of 44 species recorded, the maximum number of organisms recorded belonged to Ascomycetes. The 38 fungi that were more frequently isolated for these studies were *Acremonium byssoides*, *Alternaria alternata*, *Alternaria brassicola*,

*Aspergillus candidus*, *Aspergillus flavus*, *Aspergillus fumigates*, *Aspergillus nidulans*, *Aspergillus niger*, *Aspergillus ochraceus*, *Aspergillus oryzae*, *Aspergillus parasiticus*, *Aspergillus terreus*, *Chaetomium funicola*, *Chaetomium globosum*, *Chaetomium indicum*, *Cladosporium cladosporioides*, *Cladosporium oxysporum*, *Curvularia pallescens*, *Drechslera hawaiiensis*, *Drechslera rostrata*, *Drechslera specifer*, *Epicoccum purpurascens*, *Eurotium amestaldomii*, *Fusarium equiseti*, *Fusarium moniliforme*, *Fusarium oxysporum*, *Fusarium pallidoroseum*, *Fusarium solani*, *Neosartoria fischeri*, *Nocosmospora vasinfecta*, *Paecilomyces variotii*, *Penicillium chrysogenum*, *Penicillium citrinum*, *Penicillium oxalicum*, *Phoma glomerata*, *Trichoderma virens*, *Trichoderma viride*, *Verticillium albo-atrum*. Besides these, 5 fungal forms *Absidia cylindrospora*, *Gongronella butleri*, *Mucor hiemalis*, *Mucor racemosus*, *Rhizopus stolonifer* were isolated and recorded from Zygomycetes. Only 1 fungus was isolated from Basidiomycetes; *Rhizoctonia bataticola*. Fungi are ubiquitous achlorophyllous and heterotrophic organisms, which are directly influenced by environmental factors. They are cosmopolitan in occurrence and are found in rivers, and occur commonly on decomposing organic matter. Excessive levels of nutrients and other chemicals lead to changes in aquatic life (D. Dudgeon, et.al., 2006).

In which Ascomycetes is a dominant order. The Ascomycota are represented in all land ecosystems worldwide, occurring on all continents including Antarctica. Spores and hyphal fragments are dispersed through the atmosphere and freshwater environments, as well as ocean beaches and tidal zones. (Laybourn & Parry J., J 2009).

In the present study the most common fungi obtained in four distinct stations were Ascomycetes; *Chaetomium indicum*, *Cladosporium cladosporioides*, *Cladosporium oxysporum*, *Epicoccum purpurascens*, *Neosartoria fischeri*, *Trichoderma virens* and Zygomycetes; *Absidia cylindrospora*, *Mucor hiemalis*, *Mucor racemosus*. *Acremonium byssoides*, *Drechslera hawaiiensis*, *Fusarium pallidoroseum*, was present only in kotni station, *Chaetomium globosum* was found in pulgaon chowk and, *Verticillium albo-atrum* was obtained in chhatgarh station.

Physicochemical characteristics greatly influence the diversity of fungi. Station - II had a higher diversity of fungi than station - I. It may be due to the unpolluted nature of water was encountered at this station (Ayodhya D Kshirsagar and Venkat R Gunale, 2013). The species richness and conidial production was higher in the unpolluted station. Similar results were reported from (Au et al. 1992) in Hong Kong. However the lowest distribution of fungi was recorded in the station - I, III and IV, this may be due to the polluted nature of the water. Similar observation recorded by Tan and Lim, 1983.

### Conclusion:-

A total of 44 fungal taxa belonging to class Ascomycetes, basidiomycetes and Zygomycetes were isolated and identified from Shrivnath River at Durg district of Chhattisgarh. The study of biodiversity on the edge elucidates the relationships between organism and environment, and unravels the mechanisms of adaptation to extreme environment condition.

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