

Ecological Studies of Soil Fungi in Mehmara, Chhatagr, Kotani, and Rajnandgaon Road in Shivrath River, Durg Chhattisgarh

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ABSTRACT: Shivrath River is the biggest tributary of Mahanadi River. It is main river of Durg district. In the present study four distinct region of Shivrath River was selected Mahamara, Chhatagr, Kotani and Rajnandgaon Road. Soil sample were collected aseptically, from the surface layer (top 5 cm) of river bank in the month of April. Rise of temperature begins from the month of April, is hot amongst. Temperature ranges between 27°C to 40°C during this month. The soil samples were examined for fungi by plating method culturing in Potato Dextrose Agar (PDA) medium and Sabouraud's Dextrose Agar (SDA) medium. The isolated fungal strains were identified by Lactophenol Cotton Blue staining. During the study, a total of 52 fungal isolated and identified. During the present investigation **17 Genera, 24 fungal species, 21 Genera 49 Species, 18 Genera 32 Species, 16 Genera 32 species** were found in the four stations. The percentage frequency and percentage contribution was observed that maximum frequency of the river fungi shown by 100% of *Chaetomium indicum*, and 4.62 of percentage contribution, followed by 50% of *Phoma sorghina* and 0.38 of percentage contribution. This was may be due to the human and animal activity occurs in river frequently and fungi, *Phoma sorghina* present in only one of the four stations that indicates the minimum agricultural activities because they probably found in cereals.

KEYWORDS: Shivrath River, percentage contribution, percentage frequency, *Chaetomium indicum*, *Phoma sorghina*, Genera, species.

I. 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 (Gambale *et al.*, 1983; Meyer *et al.*, 1983; Oliveira *et al.*, 1993; Tan *et al.*, 1992). 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 favourable which implies adequate moisture, adequate aeration and relatively high concentrations of utilizable substrates (Miyanoto *et al.*, 2002). 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.

II. MATERIALS AND METHODS

Study Area: The study area was selected from four distinct region of Shivnath River in durg district region; the first one is mahamara, chhatagarh, kotani and rajnandgaon road. Soil sample collected from nearby bank of river. Soil and Sediment from the surface layer (top 5 cm) were collected aseptically, transferred into sterile polythene bags and were brought to the laboratory, stored in refrigerated conditions for further mycological analysis Rise of temperature begins from the month of April, it is hot amongst. Temperature ranges between 27°C to 40°C during these months. Average temperature of Durg in summers remains around 38°C which is low as compared to summer temperatures in other parts of this state. The maximum rise of temperature one can experience is 40°C.

(ii) Culture Media Preparation: The following media were prepared and used in these studies.

- I. Sabouraud's Dextrose Agar medium (SDA)
 - Dextrose (C₆H₁₂O₆) : 20gm
 - Peptone : 10gm
 - Agar-Agar : 20gm
 - Distilled Water : 1000ml
- II. Potato Dextrose Agar medium (PDA) (Aneja, 2001):
 - Peeled Potato: 200gm
 - Dextrose: 20gm
 - Agar Agar : 20gm
 - Distilled water: 1000ml

(iii) Identification. Fungi were identified with the help of various monographs, reviews and other relevant research papers [1,2&6]. Help regarding the identification of these fungi were also taken from mycologist P.N. Chowdhary of National for Central Fungal Identification, New Delhi.

(iv) Percentage Frequency and Contribution:

The following formula for the calculation, (Sharma P.D.,2004):

$$\text{Percentage frequency} = \frac{\text{No.Of Observation In Which A Species Appeared}}{\text{Total No Of Observation}} \times 100$$

$$\text{Percentage Contribution} = \frac{\text{Total No Colonies Of Species In All Observation Taken Together}}{\text{Total No Of Colonies Of All Species}} \times 100$$

Table 2: Comparison of Soil Fungi According to Fungal Isolates The table comprises presence and absence of various numbers of fungal populations in mehmara , chhatagarh Kotani, rajnandgao road region of Shivnath river

S.N.	Fungi Isolated	Mehmara Station	Chhattagarh Station	Kotni Station	Rajnandgaon Road
1.	Absidia cylindrospora	+	+	+	+
2.	Acremonium byssoides	+	+	+	-
3.	Acremonium strictum	+	+	-	-
4.	Alternaria alternata	+	-	-	-
5.	Alternaria brassicola	+	-	-	+
6.	Aspergillus candidus	+	+	-	+
7.	Aspergillus flavus	+	-	+	+
8.	Aspergillus fumigates	+	-	+	+
9.	Aspergillus nidulanse	+	-	+	+
10.	Aspergillus niger	+	+	-	-

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11.	Aspergillus ochraceus	+	+	-	-
12.	Aspergillus oryzae	+	+	+	-
13.	Aspergillus parasiticus	+	+	+	-
14.	Aspergillus terreus	+	+	+	-
15.	Chaetomium globosum	+	-	-	+
16.	Chaetomium funicola	+	-	-	+
17.	Chaetomium indicum	+	+	+	+
18.	Cladosporium cladosporioides	+	+	+	+
19.	Cladosporium oxysporum	+	+	+	+
20.	Collectotrichum gloeosporioides	-	-	-	-
21.	Curvularia pallescens	+	+	+	-
22.	Drechslera australiensis	-	-	-	-
23.	Drechslera hawaiiensis	+	-	+	-
24.	Drechslera specifer	+	+	+	-
25.	Drechslera rostrata	+	+	+	+
26.	Epicoccum purpurascens	+	+	+	+
27.	Eurotium amestaldomi	+	-	+	+
28.	Fusarium equiseti	+	+	-	+
29.	Fusarium moniliforme	+	-	-	+
30.	Fusarium oxysporum	+	+	+	-
31.	Fusarium pallidoroseum	+	-	+	-
32.	Fusarium solani	+	+	+	-
33.	Gongronella butieri	+	+	+	-
34.	Mucor hiemalis	+	+	-	-
35.	Mucor circinelloides	+	-	-	-
36.	Mucor racemosus	+	+	+	+
37.	Nocosmospora vasinfecta	+	+	+	+
38.	Neosartoria fischeri	+	+	+	+
39.	Paecilomyces variotii	+	-	-	+
40.	Penicillium chrysogenum	+	+	-	+
41.	Penicillium citrinum	+	+	+	+
42.	Penicillium digitatum	+	+	+	+
43.	Penicillium oxalicum	+	+	+	+
44.	Phoma glomerata	+	-	+	-
45.	Phoma sorghina	+	-	-	-
46.	Rhizoctonia bataticola	+	+	-	+
47.	Rhizopus stolonifer	+	+	-	+
48.	Trichoderma viride	+	+	-	+
49.	Trichoderma harzianum	+	+	-	+
50.	Trichoderma virens	+	-	-	-
51.	Trichothecium roseum	-	-	-	-
52.	Verticillium albo-atrum	+	+	-	-

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Table 2: Total Number of Common Fungal Isolates found among fifty two species of fungi in Mehmara, Chhatagarh ,kotani,rajnandgaon road of shivnath river.

S.No.	Name Of Fungi	Kotani	Mehmera	Chhatagarh	Rajnandgaon	Total CFU	% Frequency	% Contribution
1	Absidia cylindrospora	5	5	5	5	20	100	3.85
2	Acremonium byssoides	4	4	5	0	13	75	2.50
3	Acremonium strictum	0	7	3	0	10	50	1.92
4	Alternaria alternata	0	5	0	5	10	20	1.92
5	Alternaria brassicola	0	3	0	3	6	50	1.15
6	Aspergillus candidus	0	4	4	4	12	75	2.31
7	Aspergillus flavus	6	6	0	6	18	75	3.46
8	Aspergillus fumigates	7	7	0	7	21	75	4.04
9	Aspergillus nidulanse	2	2	0	2	6	75	1.15
10	Aspergillus niger	0	7	7	0	14	50	2.69
11	Aspergillus ochraceus	0	5	5	0	10	50	1.92
12	Aspergillus oryzae	4	4	4	0	12	75	2.31
13	Aspergillus parasiticus	6	6	6	0	18	75	3.46
14	Aspergillus terreus	2	2	2	0	6	75	1.15
15	Chaetomium globosum	0	1	0	1	2	50	0.38
16	Chaetomium funicola	0	4	0	4	8	50	1.54
17	Chaetomium indicum	6	6	6	6	24	100	4.62
18	Cladosporium cladosporioides	1	1	1	1	4	100	0.77
19	Cladosporium oxysporum	3	3	3	3	9	100	1.73
20	Collectotrichum gloeosporioides	0	0	0	0	0	00	00
21	Curvularia pallescens	0	6	6	0	12	50	2.31
22	Drechslera australiensis	0	0	0	0	0	00	00
23	Drechslera hawaiiensis	4	4	0	0	8	50	1.54
24	Drechslera specifer	4	5	5	4	18	100	3.46
25	Drechslera rostrata	5	4	4	0	13	75	2.50
26	Epicoccum purpurascens	1	2	1	1	5	100	0.96
27	Eurotium amestaldomi	6	6	0	6	18	75	3.46
28	Fusarium equiseti	0	5	6	6	17	75	3.27
29	Fusarium moniliforme	0	3	0	6	9	50	1.73
30	Fusarium oxysporum	1	2	1	0	4	75	0.77
31	Fusarium pallidoroseum	3	6	0	0	9	50	1.73
32	Fusarium solani	5	7	6	0	18	75	3.46
33	Gongronella butieri	4	4	4	0	12	75	2.31
34	Mucor hiemalis	0	2	2	0	4	50	0.77
35	Mucor circinelloides	0	4	0	0	4	25	0.77
36	Mucor racemosus	1	4	2	1	8	100	1.54
37	Nocosmospora vasinfecta	1	3	2	1	7	100	1.34
38	Neosartoria fischeri	4	3	4	4	15	100	2.89
39	Paecilomyces variotii	0	5	0	5	10	50	1.92
40	Penicillium chrysogenum	0	5	4	7	16	75	3.08
41	Penicillium citrinum	2	5	2	2	11	100	2.11
42	Penicillium digitatum	0	6	0	0	6	50	1.15
43	Penicillium oxalicum	0	4	2	0	6	50	1.15
44	Phoma glomerata	2	4	0	0	6	50	1.15

45	Phoma sorghina	0	2	0	0	2	50	0.38
46	Rhizoctonia bataticola	0	4	2	2	8	75	1.54
47	Rhizopus stolonifer	0	5	2	2	9	75	1.73
48	Trichoderma viride	0	4	4	5	13	75	2.50
49	Trichoderma harzianum	0	2	0	0	2	25	0.38
50	Trichoderma virens	7	4	4	7	22	100	4.23
51	Trichothecium roseum	0	0	0	0	00	00	00
52	Verticillium albo-atrum	0	2	2	0	4	50	0.77
			127	116	55	519		

III. RESULT AND DISCUSSION

During the present investigation **17 Genera, 24 fungal species, 21 Genera 49 Species, 18 Genera 32 Species, 16 Genera 32 species** were found in the four stations of shivnath river kotani, mehmera, chatagarh, rajnandgaon respectively. In the previous study maximum number of fungal species isolated from coastal area of Tuticorin (17species) followed by Punnakayal (16species) and Palayakayal (15 species).

The total number of fungal isolates was obtained **49, 32, 25 and 27** in station Mehmera, chhatagarh, kotani, pulgaon chowk rajnandgaon respectively. The highest fungal population obtained in mehmera station and lowest was in kotani; this may be indicating more polluted water in kotani station. Similarly, (Ayodhya D Kshirsagar., et al 2013) was isolated lowest no of fungal population in **station II, 31 & III, 28** comparatively than **station I, 41**.

The frequency classes of different species of fungi recorded at four stations of Shivnath river was obtained in various categories i.e. (R) Rare (0-25%) 02, O Occasional (26-50%) 18, F Frequent (51-75%) 18, C Common (76-100%) 11. in the previous study according to **K. Sharma and Shaista Parveen et.al frequency class recorded in** water mycoflora of Dudhawa dam **Dhamtari, Chhattisgarh was** R Rare (0-25%) 29, O Occasional (26-50%)03, F Frequent (51-75%) 02, C Common (76-100%) 01.

In the present study, the percentage frequency and contribution of river fungi was observed during the month of April. It was observed that maximum percentage frequency, 100% and contribution 4.62% of *Chaetomium indicum* another highest percentage frequency and contribution was 100% and 4.23% of *Trichoderma virens*. Similar results were reported by **K. Sharma et. al, (2011)** that *Aspergillus niger* was most frequent throughout year with 91.67% of percentage frequency and maximum percentage contribution was observed for *Aspergillus fumigates* (19.68%).

The minimum percentage frequency and contribution was followed by *Phoma sorghina* 50% and 0.38%. Whereas *Aspergillus versicolor* and *Cladosporium sphaerospermum* were minimum species with 41.67% frequency and minimum contribution was followed by *Aspergillus niger* with (18.65%) contribution, **K. Sharma et. al, (2011)**.

Chaetomium indicum is widely distributed in different biotopes, such as soils, marine, animal dung, hair, textiles, plant seeds and some other substrates rich in cellulose. Chivers, A. H .et.al 1915. Whereas *Phoma sorghina* is mainly associated with plants in the Gramineae group e.g. sorghum, millet, rice and sugarcane Kirk PM, 2008. Therefore *Chaetomium indicum* abundantly present in four stations. It may be indicated that the human and animal activity occurs in river frequently but the lowest number of fungi, *Phoma sorghina* present in only one of the four stations that indicates the minimum agricultural activities because they probably found in cereals.

IV. CONCLUSION

Shivnath river is the largest river of Chhattisgarh, in Durg region comprises Mahamara Aniket, Chhatagarh, kotani, and rajnandgaon road. It contains various fungal populations in distinct location. Total fungal isolates were obtained was **49, 32, 25 and 27** in station Mehmera, chhatagarh, kotani, pulgao chowck rajnandgaon road respectively, while the highest fungal population obtained in mehmera station and lowest was in kotani. Therefore *Chaetomium indicum* abundantly present in four stations. It may be indicated that the human and animal activity occurs in river frequently but the lowest

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