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Studies on Diversity of Soil Micro Fungi from Nashik Tehsil, Maharashtra, India

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A B S T R A C T

Soil microorganisms such as bacteria and fungi play an important role in soil fertility and promoting plant health. Soil harbours most of our planet's undiscovered biodiversity. 10 soil samples of two ecosystems viz. Agricultural field and barren lands from 5 villages of Nashik tehsil were investigated for diversity among fungi. A total of 35 species belonging to 18 genera were isolated from both the agriculture fields and barren lands. The mycoflora were isolated by using soil dilution plate count method on Czapek's Dox Agar medium supplemented with antibiotic Streptomycin. Identification and characterization of mycoflora were done with the help of manuals of fungi. The dominant genera in both the ecosystems were *Aspergillus, Fusarium, Trichoderma* species.

Keywords: Diversity, Nashik Tehsil, Fungi

A R T I C L E I N F O

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1. Introduction

Biodiversity refers to the variability of life on Earth, all the living species of animals, plants and microorganisms. The soil is one of the most important habitats for microorganisms like bacteria, fungi, yeasts, nematodes, etc. The filamentous fungi are the major contributors to the soil biomass. They play important role in decay and decomposition of dead bodies of plants and animals and their wastes by secreting enzymes. These enzymes convert the carbohydrates, fatty acid and nitrogenous constituents into simpler compounds such as carbon dioxide, water, ammonia, hydrogen etc. They release nutrients in a form available to green plants. They are important in industrial fermentation as well as in the preparation of various enzymes and organic acids. Fungi are important as

pathogens. They have role in medicine as source of many antibiotics Alone the genus *Aspergillus* produces about 20 enzymes which are industrially important. The aim of present investigation is to isolate mycoflora from different ecosystems viz. Agriculture fields and Barren lands. The study involves isolation, identification and enumeration of fungal species from agriculture fields and barren lands of Samangaon, Vinchur Gavali, Devlali, Lahvit and Lohashing we villages of Nashik tehsil of Nashik District.

2. Materials and Methods

Study area:

Nashik is one of the tehsil in Nashik district of Maharashtra which lies on the banks of river Godavari. The study area lies on 20.00ºN latitude and 73.78ºE longitude which has an average elevation of 700 meters. The temperature ranges from 11ºC to 37ºC and the annual rainfall is 812 mm. Type of soil found in the district are red soils and black cotton soils. Grapes, sugarcane, onion, tomato, wheat, etc. are the crops cultivated.

Collection of Soil Samples

Soil samples were collected from the agriculture fields and barren lands of Samangaon (1), Vinchur Gavali (2), Devlali (3), Lahvit (4) and Lohashingwe (5) villages of Nashik tehsil (Table 1). In each locality 50 gm of soil sample was collected from a depth of about 10-15 cms. The collected soil samples were brought to the laboratory in sterile polythene bags and stored at 4ºC until further analysis.

Isolation and Enumeration of Fungi from the soil samples:

The soil micro fungi were enumerated by soil dilution plate count method (Subba Rao, 2004) on Czapek's Dox Agar.1 gm of soil sample was suspended in 200 ml of sterile autoclaved water. 1 ml of microbial suspension was added to sterile Petri dishes upon which sterile Czapek's Dox Agar is added by pour plate technique. One percent Streptomycin solution was added to the medium before pouring into petri plates for preventing bacterial growth. The petridishes were then incubated at 28ºC for 5 – 7 days. The plates were observed everyday up to 7 days. The colony forming units (CFU) of the fungal isolates were calculated. All the results were calculated and statistical analysis was performed.

Identification of Soil Fungi

Fungal morphology was studied macroscopically by observing colony features (Texture and colour) and microscopically by staining with lacto phenol, cotton blue and observed under compound microscope for Conidiophores, Conidia and arrangement of spores. The fungi were identified with the help of literature (Nagmani *et.al*, 2006, Gilman, 1956).

Statistical Analysis

The number of colonies per plate in 1 gm of soil was calculated. The percentage contribution of each isolate was calculated by using the following formula:

$$\text{\% contribution of an individual species} = \frac{\text{Total no. of CFU of an individual species}}{\text{Total no. of CFU of all species}} \times 100$$

*****CFU – Colony forming Unit

3. Results and Discussion

Diversity refers to the variability of life which can be among plants, animals and microorganisms. Fungi are important components of biodiversity which has major role in various biological processes. In the present study 201 fungal colonies of 35 fungal species were isolated from agriculture fields and barren land ecosystems of five villages viz. Samangaon, Vinchur Gavali, Devlali, Lahvit and Lohashingwe of Nashik tehsil (Table 3). The maximum fungi isolated belonged to the Ascomycotina (178 colonies); and 3 genera each of Basidiomycotina and Zygomycotina (8&15 colonies respectively). *Aspergillus*, *Fusarium* and *Trichoderma* were the dominant fungal species among the isolates (Table 3) in both the ecosystem types studied. The soil microflora of two ecosystem types of 5 villages was observed. The most common among them like *Curvularia* (2.56 %), *Alternaria* (2.56 %), *Rhizoctonia* (2.56 %), *Helminthosporium* (2.56 %), *Penicillium* (4.27 %), *Mucor* (3.41 %), *Rhizopus* (1.7 %), *Chaetomium* (1.7 %) were isolated from agriculture fields and *Alternaria* (1.1 %), *Helminthosporium* (1.1 %), *Chaetomium* (1.1 %), *Mucor* (5.95 %), *Penicillium* (4.76 %), *Rhizopus* (3.57 %) were isolated from barren lands. Diversity was found to be higher in agricultural fields as compared to barren lands. The percentage contribution of each fungal species in different ecosystems of all 5 villages under study was statistically analyzed (Table 2). *Aspergillus fumigatus*, *Aspergillus nidulans*, *Aspergillus niger*, *Fusarium oxysporum*, *Trichoderma viride* were dominant in agriculture field.

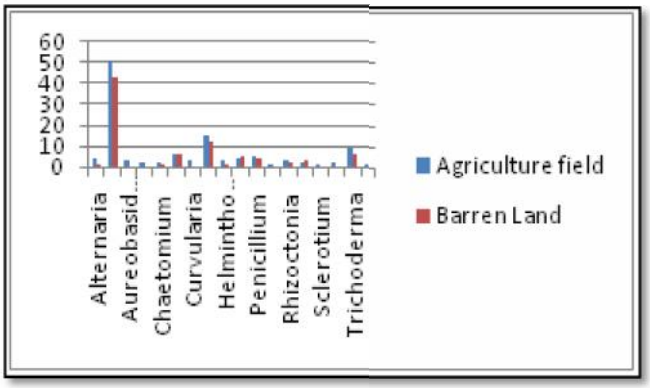

Figure 1: Frequency of Fungal species

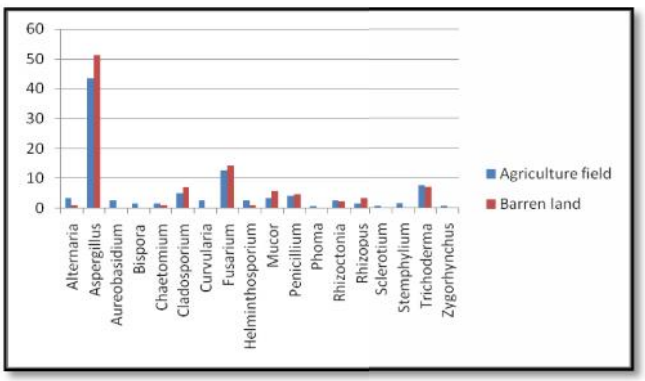

Figure 2: Percent contribution of fungal species in two ecosystems

Table 1: Soil samples collected from different villages of Nashik Tehsil

Sample No.	Sampling location	No. of samples collected	Type of Ecosystem
1	Samangaon	2	Agriculture field and Barren Land
2	Vinchur Gavali	2	Agriculture field and Barren Land
3	Devlali	2	Agriculture field and Barren Land
4	Lahvit	2	Agriculture field and Barren Land
5	Lohashingwe	2	Agriculture field and Barren Land

Table 2: Percent contribution of fungal species in different ecosystems of 5 villages in Nashik Tehsil

S. No.	Name of Fungal species	% Contribution									
		Agriculture field					Barren Land				
		1	2	3	4	5	1	2	3	4	5
1	*Alternaria alternata*	2.5	-	5.26	-	15.38	3.12	-	-	-	-
2	*Aspergillus carbonarius*	5	8.69	10.52	9.09	-	9.37	12.5	18.2	6.66	-
3	*Aspergillus flavus*	2.5	-	-	4.54	7.69	6.25	-	-	6.66	-
4	*Aspergillus fumigatus*	-	4.34	10.52	4.54	-	-	6.25	9.09	-	10
5	*Aspergillus nidulans*	5	4.34	-	-	15.38	3.12	6.25	-	-	10
6	*Aspergillus niger*	7.5	13	15.78	9.09	7.69	9.37	12.5	18.2	6.66	10
7	*Aspergillus petrakii*	5	8.69	5.26	-	-	9.37	6.25	9.09	-	-
8	*Aspergillus repens*	2.5	4.34	-	-	-	-	-	-	6.66	-
9	*Aspergillus sclerotium*	-	8.69	5.26	9.09	7.69	-	6.25	-	-	-
10	*Aspergillus sulphureus*	2.5	-	-	4.54	-	6.25	-	-	-	10
11	*Aspergillus terreus*	-	4.34	-	4.54	-	-	6.25	-	6.66	-
12	*Aspergillus ustus*	2.5	-	-	4.54	-	3.12	-	-	13.3	-
13	*Aspergillus versicolor*	2.5	-	-	-	-	6.25	-	-	-	-
14	*Aureobasidium pullulans*	5	-	-	4.54	-	-	-	-	-	-
15	*Bispora sp.*	2.5	4.34	-	-	-	-	-	-	-	-
16	*Chaetomium globosum*	-	-	5.26	-	7.69	-	-	-	-	10
17	*Cladosporium herbarum*	2.5	4.34	5.26	9.09	7.69	6.25	6.25	9.09	6.66	10
18	*Curvularia lunata*	5	-	-	4.54	-	-	-	-	-	-
19	*Fusarium moniliformae*	5	-	5.26	4.54	7.69	3.12	6.25	-	13.3	-
20	*Fusarium oxysporum*	7.5	4.34	5.26	4.54	-	6.25	6.25	18.2	-	10
21	*Fusarium rodlens*	5	-	-	-	-	3.12	-	-	-	-
22	*Fusarium semitectum*	-	8.69	-	-	-	-	6.25	-	-	-
23	*Helminthosporium tetramera*	5	-	-	4.54	-	3.12	-	-	-	-
24	*Mucor plumbeus*	2.5	4.34	-	4.54	7.69	3.12	6.25	-	13.3	10
25	*Penicillium funiculosum*	-	-	5.26	-	-	-	-	9.09	-	-
-26	*Penicillium varians*	-	-	5.26	-	-	-	-	-	-	-
27	*Penicillium verrucosum*	5	-	-	4.54	-	6.25	-	-	6.66	-
28	*Phoma eupyrena*	2.5	-	-	-	-	-	-	-	-	-
29	*Rhizoctonia bataticola*	2.5	-	5.26	-	-	3.12	-	-	6.66	-
30	*Rhizoctonia solani*	2.5	-	-	-	-	-	-	-	-	-
31	*Rhizopus stolonifer*	-	4.34	-	-	7.69	6.25	6.25	-	-	-
32	*Sclerotium rolfsii*	2.5	-	-	-	-	-	-	-	-	-
33	*Stemphylium sp.*	2.5	4.34	-	-	-	-	-	-	-	-
34	*Trichoderma viride*	5	8.69	10.52	9.09	7.69	3.12	6.25	9.09	6.66	20
35	*Zygorhynchus moelleri*	2.5	-	-	-	-	-	-	-	-	-

Samangaon (1), Vinchur Gavali (2), Devlali (3), Lahvit (4) and Lohashingwe (5)

Table 3: Frequency of Mycoflora in different Ecosystem in Nashik Tehsil

No.	Name of Fungal species	Agriculture field						% Contri-bution	Barren Land						% Contri-bution
		1	2	3	4	5	Total		1	2	3	4	5	Total	
1	*Alternaria*	1	-	1	-	2	**4**	**3.41**	1	-	-	-	-	**1**	**1.1**
2	*Aspergillus*	13	13	9	11	5	**51**	**43.58**	17	9	6	7	4	**43**	**51.19**
3	*Aureobasidium*	2	-	-	1	-	**3**	**2.56**	-	-	-	-	-	-	-
4	*Bispora*	1	1	-	-	-	**2**	**1.7**	-	-	-	-	-	-	-

5	*Chaetomium*	-	-	1	-	**1**	**2**	**1.7**	-	-	-	-	1	**1**	**1.1**
6	*Cladosporium*	1	1	1	2	1	**6**	**5.12**	2	1	1	1	1	**6**	**7.14**
7	*Curvularia*	2	-	-	1	-	**3**	**2.56**	-	-	-	-	-	**-**	**-**
8	*Fusarium*	7	3	2	2	1	**15**	**12.82**	4	3	2	2	1	**12**	**14.28**
9	*Helminthosporium*	2	-	-	**1**	-	**3**	**2.56**	1	-	-	-	-	**1**	**1.1**
10	*Mucor*	1	1	-	1	1	**4**	**3.41**	1	1	-	2	1	**5**	**5.95**
11	*Penicillium*	2	-	2	1	-	**5**	**4.27**	2	-	1	1	-	**4**	**4.76**
12	*Phoma*	1	-	-	-	-	**1**	**0.85**	-	-	-	-	-	**-**	**-**
13	*Rhizoctonia*	2	-	1	-	-	**3**	**2.56**	1	-	-	1	-	**2**	**2.38**
14	*Rhizopus*	-	1	-	-	1	**2**	**1.7**	2	1	-	-	-	**3**	**3.57**
15	*Sclerotium*	1	-	-	-	-	**1**	**0.85**	-	-	-	-	-	**-**	**-**
16	*Stemphylium*	1	1	-	-	-	**2**	**1.7**	-	-	-	-	-	**-**	**-**
17	*Trichoderma*	2	2	2	2	1	**9**	**7.69**	1	1	1	1	2	**6**	**7.14**
18	*Zygorhynchus*	1	-	-	-	-	**1**	**0.85**	-	-	-	-	-	**-**	**-**
	TOTAL	**40**	**23**	**19**	**22**	**13**	**117**		**32**	**16**	**11**	**15**	**10**	**84**	

*The numbers highlighted with red colour are to be added in the table.

4. Acknowledgement

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