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Studies on Edaphic Factors and Fungal Diversity of Niphad Tehsil of Nashik District, Maharashtra, (India)

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Abstract
Soil micro- organisms play an important role in ecosystem functioning and are known to be influenced by biotic and abiotic factors, such as plant cover and edaphic factors. The edaphic factors are closely associated with the geographical environment of the spatial area. The edaphic factors are the soil properties that affect the diversity of organisms living in the soil environment. These factors include soil structure, temperature, pH and salinity. The soil properties are mostly independent of the human activities but sometimes may be influenced by man. These factors influence the species composition of soil fungal communities. Higher fertility and fungal diversity have a reverse interrelationship. Present study highlights the study of edaphic factors and the fungal diversity of Niphad tehsil of Nashik district, Maharashtra, India.

***Keywords*:** Edaphic factors, Soil fungi, Diversity

Introduction:
The fungal communities are highly influenced by environmental factors and the anthropogenic activities. The current scenario of climate change and changing land use pattern has a crucial role in the fungal diversity transition (Lluvia Vargas-Gastélum, 2015). It is estimated that one gram of fresh fertile soil matter can contain up to billions of bacteria and other microbes (Nannipieri, P. *et. al.*, 2003). Soil microorganisms play crucial roles in ecosystems functioning (Schulz, S. *et. al.*, 2013) such as in biogeochemical cycles, soil stability, plant growth and plant community dynamics (Tisdall, J.M., 1994). Soil microorganism communities have been shown to be influenced by abiotic and biotic factors (Fierer, N., Jackson, R.B., 2006) such as plant cover and edaphic factors. The edaphic factors are the soil properties that affect the diversity of organisms living in the soil environment. These factors include soil structure, temperature, pH and salinity. Among the edaphic parameters, pH is the factor that most strongly influences soil microbial communities (Fierer, N., Jackson, R.B., 2006). Fungi dominate in low pH or slightly acidic soils where soil tend to be undisturbed. (Lavelle & Spain, 2005). The present study highlights the edaphic factors and the status of fungal diversity of Niphad tehsil of Nashik district.

Materials and Methods

II.I. Study area:
Niphad is the southern tehsil of Nashik District and it is the part of deccan plateau which began forming around 66.25 million years ago. The parent rock of the region is basalt so the black deep soil is been found over the study area. The region is drain by river Godavari, Kadva, Banganga and their tributaries. The geographical coordinates of the study region are 20˚4'43" North latitudes to 74˚6'26" East Longitudes. Niphad is the agriculturally well-developed tehsil of the district. Location map of study region have been prepared by using Arc GIS DEM Model.

II.Collection of Soil samples

The random sampling method has been adopted for the sample collection. The soil samples were collected from 20 villages of the Niphad tehsil. These were Ahergaon, Antarveli, Chandori, Chitegaon. Kundewadi, Lasalgaon, Lonwadi, Nandurdi, Niphad, Ozar (Mig), Pachore Wani, Pimpalgaon (Baswant), Ranwad, Saikheda, Sakore (Mig), Savargaon, Shivadi, Sukene, Ugaon Khede and Vanasgaon. From each locality 50 gm of soil sample was collected from a depth of 10-15 cms. The collected soil samples were brought to the laboratory in sterile polythene bags and stored at 4˚C until further use.

II.Solation and identification of fungi

The soil fungi were isolated by using the 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 the microbial suspension was added to sterile Petri dishes upon which the Czapek's Dox Agar medium was added by pour plate method. The fungi were identified with the help of literature (Barnett, 1998, Gilman, 2001, Nagamani et. al., 2006).

II.IV. Statistical analysis

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

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

***CFU**- Colony-forming unit

Results and Discussion

Fungi are the important components of the environment that have a significant role to play in the ecological processes (Chandrashekar, 2014). In the study region agriculture is main occupation and farmers are well known with modern agricultural techniques but they are not aware about fungal biodiversity which is closely associated with soil health and productivity. Soil health means ability of the soil to sustain biological productivity, environmental quality, and provide fertile condition to living organism in the soil. (Magdalena Frac, 2018)

In the present study, a total of 484 fungal colonies were isolated from 20 villages of Niphad tehsil. A total of 50 fungal species belonging to 26 genera were recorded during the study from these villages under study. The soil microflora was observed to study the diversity of the fungi in Niphad tehsil. The most common and dominant genus recorded was *Aspergillus* with 14 species. These were *Aspergillus Aculeatus, A. carbonarius, A. chaveleri, A. flavipes, A. flavus, A. fumigatus,*

A. nidulans, A. niger, A. petrakii, A. sclerotium, A. sulphureus, A. terreus, A. ustus and *A. versicolor*. *Aspergillus niger* was the dominant species which contributed 6.4% followed by *A. carbonarius* (5.16 %). *Fusarium* and *Penicillium* were some other dominating genera with 4 species each. *Mucor globosus* and *M. plumbeus* contributed significantly in the microflora with 5.16 and 6.19 % respectively. Among others *Rhizopus stolonifer* (5.78 %), *R. nigricans* (4.13%), *Trichoderma viride* (5.99 %) were some of the major contributors. Other genera such as *Absidia* (0.41 %), *Alternaria* (1.03 %), *Bispora* (0.41 %), *Chaetomium* (1.03 %), *Cladosporium* (2.47 %), *Curvularia* (1.85 %), *Helminthosporium* (2.89 %), *Rhizoctonia bataticola* (1.03 %), *Zygorhynchus* (1.85 %) also contributed in the area [Table 1]. The diversity of fungi in Niphad tehsil was found to be significantly high. The percentage contribution of each fungal species at different localities was analysed statistically [Table 1]. The growth of other fungal species may have been prevented due to the toxins produced by *Aspergillus* species.

I. Conclusion

The result of the survey indicates that the Niphad tehsil have deep black soil and is characterised by high production potential. The man induced activities like grazing, mining, modern intensive agriculture and all anthropogenic activities influence the soil fungal community. Tehsil have very rich fungal diversity and is characterized by a larger proportion of Ascomycotina members which are among the more diverse groups of fungi and the occurrence of other groups is relatively rare. The fungal diversity of tehsil is influenced by anthropogenic activity and changing agriculture patterns.

Table 1: Occurrence and Percentage contribution of fungal species in Niphad Tehsil

Sr. No.	Name of the Fungi	Niphad	
1	Absidia corymbifera	2	0.41
2	Alternaria alternata	5	1.03
3	Aspergillus aculeatus	2	0.41
4	Aspergillus carbonarius	25	5.16
5	Aspergillus chaveleri	4	0.82
6	Aspergillus flavipes	9	1.85
7	Aspergillus flavus	16	3.3
8	Aspergillus fumigatus	12	2.47
9	Aspergillus nidulans	10	2.06
10	Aspergillus niger	31	6.4
11	Aspergillus petrakii	4	0.82
12	Aspergillus sclerotium	2	0.41
13	Aspergillus sulphureus	13	2.68
14	Aspergillus terreus	7	1.44
15	Aspergillus ustus	9	1.85
16	Aspergillus versicolor	3	0.61
17	Bispora sp.	2	0.41
18	Aureobasidium pullans	2	0.41
19	Chaetomium globosum	5	1.03
20	Cladosporium herbarum	12	2.47
21	Curvularia lunata	9	1.85
22	Cylindrocarpon sp.	1	0.2
23	Fusarium moniliformae	19	3.92
24	Fusarium oxysporum	21	4.33
25	Fusarium rodlens	11	2.27
26	Fusarium semitectum	18	3.71
27	Geotrichum candidum	1	0.2
28	Helminthosporium tertamera	14	2.89
29	Mortierella sp.	2	0.41
30	Mucor globosus	25	5.16
31	Mucor plumbeus	30	6.19
32	Myrothecium roridium	2	0.41
33	Neocosmospora vasinfecta	6	1.23
34	Penicillium brefeldianum	4	0.82

35	Penicillium funiculosum	12	2.47
36	Penicillium varians	10	2.06
37	Penicillium verrucosum	15	3.09
38	Phoma eupyrena	4	0.82
39	Phoma herbarum	3	0.61
40	Rhizoctonia bataticola	5	1.03
41	Rhizoctonia solani	3	0.61
42	Rhizopus nigricans	20	4.13
43	Rhizopus stolonifer	28	5.78
44	Sclerotium rolfsii	2	0.41
45	Stemphylium sp.	1	0.2
46	Syncyphalastrum sp.	1	0.2
47	Trichoderma lignorum	2	0.41
48	Trichoderma viride	29	5.99
49	Torula herbarum	2	0.41
50	Zygorhynchus moelleri	9	1.85
	TOTAL	**484**	

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