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Original Research Article

AN INVESTIGATION ON SOME SOIL FUNGI FROM AKOLA DISTRICT (MAHARASHTRA)

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Abstract:
Fungi are an important component of the soil microbiota, which mediate important ecological processes such as nutrient recycling; they maintain important symbiotic relationships with plants and bacteria. Many fungi are pathogenic and some may be useful in bio-exploitation. A diverse range of fungi are present in soil ecosystems, include Ascomycetes, Basidiomycetes, Deuteromycetes, some being ectomycorrhizal, anamorphic and arbuscular mycorrhizal fungi. At present, there is no clear morphological, phylogenetic or ecological definition of soil fungi. The interaction between these fungi with plant roots and other biotic or abiotic factors within the soil constitutes is a challenge to soil microbiologists. Akola is one of the northern most Districts of Vidarbha regions in Maharashtra (India). Soil mycoflora of this region is unexplored. So, the present investigation based on physico-chemical analysis, soil mycoflora and there percentage of contribution from Akola region.

Key word: Physico-chemical analysis, soil mycoflora, percentage of contribution.

Introduction:

Organisms in soil live in their own environment which undergoes much biological manifestations (Saksena 1967). Nature of the soil and different kind of flora substantially influence each other. Specificity in the flora is indicative in certain specialization in the substrate in which the organisms are surviving (Garrett, 1951, Dix NJ & Webster J. 1995).

Soil is a rich habitat for the growth of micro-organisms than other microbial habitats. Among these micro-organisms, fungi are one of the dominant groups present in soil. Fungi live, multiply and die or disintegrate in the soil & thus they provide rich organic matter, which could be recycled as plant nutrition. Thus developed humus complex is a natural fertilizer mixed with soil and plays a very important role in the composition of soil.

Nutrients for fungal growth are extremely limited for most of the time. Readily available nutrient are present for short periods in a limited zone. For most of the time, fungi are either dormant, or they metabolize & grow very slowly utilizing a range of organic molecules.

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Fungi isolated from soil or soil components are variously called such as soil borne, soil-inhabiting, or simply soil fungi which comprise saprophytes, mycorrhizal symbionts & parasites of all major categories of fungal species.

Soil fungi perform important services related to water dynamics, & disease suppression. Fungal hyphea can bind soil particles together, causing aggregation of soil particles & that helps increase water infiltration & soil holding capacity. (Watanabe, 2002) No rigid definition of soil fungi is given but fungi detected or isolated from soil, seeds & roots of plants (Watanabe, 1977 a, b, c; 1987; 1988, 1989) are tentatively termed as soil fungi. Isolated from plant residues in soil, soil borne animals, or mushrooms are also included as soil fungi.

Large quantities of readily decomposable organic matter are added to soils every year as plant or animal wastes & have a significant outcome on soil microbial composition. The plant species growing on the soil also equally influence the population & species composition of the soil fungi (Hackle *et al*, 2000).

Micro-fungi play a focal role in nutrient cycling by regulating soil biological activety (Arunachalam *et al*, 1997). However, the rate at which organic matter is decomposed by the microbes is interrelated to the chemical composition of the substrate as well as environmental conditions.

Detection exactly which fungi are present in a soil sample is not easy task, one of the major problems being the fastidious nature of the great majority of species. This is a well known phenomenon (Pugh, 1969) & indeed, estimates suggest that of the known fungi, only 17% can be readily grown in culture (Hawksworth, 1991). If this figure were applied to the 1200 species suggested by Watanabe (1994), then this would give an estimate of around 7000 species that could be considered as soil fungi.

Akola is one of the northern most Districts of Vidarbha regions in Maharashtra. Its total area is about 10,606 sq. kms. There is a considerable variation in the topography, geology & climate. It has about 812 sq. kms. area of reserve forest. The area lies between the meridians of longitudes $77\ 7^{1}\ 41^{11}$ & $77\ 12^{1}\ 36^{11}$ east & between, the parallel of latitude $19\ 22^{1}\ 4^{11}$ & $19\ 22^{1}\ 7^{11}$ north. Only two geological formations are known to occur in this division vise, the Purna alluvium & Decant trap. The soil varies from murrum to light black. The track show a considerable variation in climate especially the summer is very hot & only with maximum temperature reaching 47^{0}C. & a mean annual rainfall is about 760 mm in hilly tracks.

The aim of the present investigation is to isolate mycoflora from Akola region soil & to observe the percentage contribution of different fungal species.

Material and Method:

Collection of Material and Isolation of fungi:

The soil samples were collected from 21 selected locality of Akola district during October 2012 to Jan 2013 upto 15 cm depth. For sampling purpose specifications of localities were made on the basis of ecological & geographical variations found in a district. The soil samples were collected separately into sterilized polythene bags & brought in laboratory for further studies.

Physico-Chemical Analysis

The collected soil was characterized for its physico – chemical properties. In that soil color, type & pH were taken into consideration.

Isolation of Fungi from soil sample:

The soil micro fungi were enumerated by the plate method (Warcup 1950) on Asthanas Howkers medium 'A' (5g glucose, 3.5g $KN0_3$, 1.75g KH_2Po_4,0.75g $Mgso_4$, $7H_2O$ & 15 g (agar-agar). For that about 0.005g of soil was scattered on the bottom of a sterile petridish & molten cooled (40-45^{0}C) agar medium (Asthans & Howker's medium 'A') was added which was then rotated gently to disperse the soil

particles in the medium. The patricides were then incubated at 28^0C (+2) in dark for three days. After 2 or 3 days the mycelium will be coming out.

Table No.1: Physico-Chemical Analysis

Sample no.	Place of collection	Soil colour	Soil type	pH
1	Wagholi	Brown	Gravel	6
2	Ugwa	Brown	Gravel	8
3	Pathardi	Brown	Gravel	8
4	Malegaon	Dark Brown	Gravel	6
5	Agar	Reddish Brown	Gravel	6
6	Kasli	Brown	Loamy	6
7	Mahan	Black cotton	Granular	6
8	Nimbi	Black cotton	Granular	8
9	Amantpur	Reddish Brown	Slit clay	8
10	Batwadi	Brown	Gravel	6
11	Rohankhed	Brown	Gravel	8
12	College garden	Black cotton	Gravel	6
13	Nimbhora	Brown	Loamy	9
14	Manjari	Brown	Gravel	8
15	Babhulgaon	Brown	Sandy	8
16	Kasura	Dark Brown	Gravel	8
17	Badegaon	Brown	Gravel	8
18	Akot	Brown	Slit	8
19	Charangaon	Brown	Clay	6
20	Adoshi	Brown	Sandy clay	6
21	Valabh Nagar	Brown	Gravel	8

Identification of the soil fungi:

Fungal morphology was studied by observing mycelial colony, features (colour & texture) & microscopically by staining with lacto phenol cotton blue, conidiophores & arrangement of conidia was taken into consideration. The fungi were identified with the help of literature of H. L. Barnett, Berry B. Hunter "Illustrated Genera of Imperfect fungi" & Stock Culture of department of plant pathology, Dr.PDKV Akola.

Statistical analysis:

The number of colonies per plate in 0.005 of soil was calculated. The % contribution of each isolate was calculated by using the following formula.

$$\% \text{ contribution} = \frac{\text{Total no. of colonies forming unit of an individual species}}{\text{Total no. of colony forming unit of all species.}} \times 100$$

Results:

Table no.2:Isolation, identification and statistical analysis of fungi:

Sample no.	Place of collection	Average no. of total colony	Fungi Obtained	Average no. of individual colony	Percentage
1	Wagholi	20	*Curvularia sp.* *Rhizopus sp.* *Mucor sp.* *Fusarium sp.* *Phoma sp.* *Unknown sp.*	1 3 7 3 2 4	5% 15% 35% 15% 10% 20%
2	Ugwa	33	*Fusarium sp.* *Phoma sp.* *Mucor sp.*	20 3 10	60% 9% 30%
3	Pathardi	27	*Mucor sp.* *Fusarium sp.* *Phoma sp.* *Curvularia sp.* *Alternaria sp.*	5 6 5 6 5	18.5% 22.2% 18.51% 22.2% 18.51%
4	Malegaon	23	*Mucor sp.* *Fusarium sp.* *Unknown sp.*	6 15 2	26.0% 65.2% 8.6%
5	Agar	23	*Fusarium sp.* *Penicillium sp.* *Mucor sp.* *Aspergillus sp.*	4 6 9 4	17,3% 26.0% 39.1% 17.3%
6	Kasli	26	*Aspergillus sp.* *Mucor sp.* *Fusarium sp.* *Trichoderma sp.*	1 18 6 1	3.8% 69.2% 23.0% 3.8%
7	Mahan	23	*Mucor sp.* *Botrytis sp.* *Aspergillus sp.* *Rhizoctonia sp.*	10 4 5 4	43.7% 17.3% 21.7% 17.3%
8	Nimbi	37	*Fusarium sp.* *Cephalosporium sp.* *Cladosporium sp.* *Botrytis sp.* *Mucor sp.*	6 10 5 8 8	16.2% 27.0% 13.5% 21.6% 21.6%
9	Amantpur	27	*Fusarium sp.* *Aspergillus sp.* *Mucor sp.*	10 12 5	37% 44.4% 18.5
10	Batwadi	25	*Rhizopus sp.* *Asperigillus sp.* *Unknown sp.*	20 4 1	80% 16% 4%

11	Rohankhed	35	*Rhizopus sp.* *Mucor sp.* *Fusarium sp.*	10 20 5	28.5% 57.1 14.2%
12	College garden	26	*Mucor sp.* *Rhizopus sp.* *Unknown sp.*	20 5 1	76.9% 19.2% 3.8%
13	Nimbhora	16	*Mucor sp.* *Aspergillus sp.*	7 9	43.7% 56.2%
14	Manjari	26	*Fusarium sp.* *Rhizopus sp.* *Mucor sp.* *Aspergillus sp.*	12 5 2 7	46.1% 19.2% 7.6% 26.9%
15	Babhulgaon	48	*Fusarium sp.* *Mucor sp.* *Rhizopus sp.* *Verticillium sp.* *Trichoderma sp.*	8 10 5 15 10	16.6% 20.8% 10.4% 31.2% 20.8%
16	Kasura	41	*Rhizopus sp.* *Mucor sp.*	40 1	97.5% 2.4%
17	Badegaon	21	*Aspergillus sp.* *Mucor sp.* *Fusarium sp.* *Trichoderma sp.*	6 6 5 4	28.5% 28.5% 23.8% 19.0%
18	Akot	21	*Rhizopus sp.* *Aspergillus sp.* *Mucor sp.* *Unknown sp.*	5 4 11 1	23.8% 19.0% 52.3% 4.7%
19	Charangaon	27	*Mucor sp.* *Rhizopus sp.* *Aspergillus sp.* *Botrytis sp.* *Fusarium sp.*	5 5 5 5 7	18.5% 18.5% 18.5% 18.5% 25%
20	Adoshi	20	*Fusarium sp.* *Mucor sp.*	10 10	20.8% 20.8%
21	Vallabh Nagar	16	*Botrytis sp.* *Mucor sp.* *Aspergillus sp.*	8 7 5	40% 35% 25%

Discussion:

Soil sample were collected for the isolation of fungi which may cause plant diseases or may fertile the soil. These samples were collected from various parts of Akola district from October, 2012 to January, 2013.During the collection soil from Akola and suburban were concentrated and it was observed that most of the soil samples were manifested by fungi belonging to class Deuteromycetes. The soil samples from field as well as along the road sides were carefully screened to observe the disease development in field condition as well as along the road side plantations for sampling purpose. Distinct localities were specified on the basis of ecological and geographical

variations in Akola district. Urban areas (Akola) and rural areas (Wagholi, Ugwa etc) were selected as sampling places.

During these investigations 21 soil samples were collected, out of which 10 fungal species belonging to genera of Deuteromycetes, 2 species of Zygomycetes and 2 from Ascomycetes. These soil samples were selected for mycological investigation during the studies.

Soil sample collected from Wagholi showed high percentage of *Mucor* colonies followed by *Fusarium* and *Rhizopus*. Sample collected from Ugwa, Pathardi and Malegaon showed dominancy of *Fusarium* and *Phoma* which is followed by *Mucor*. Excellent growth of *Mucor* was found on soil sample collected from Agar, Kasli and Mahan which is followed by *Fusarium* and *Penicillium.*

Species *Cephalosporium*, *Botrytis* and *Mucor* showed dominancy on soil sample which was collected from Nimbi village. Species of *Aspergillus* and *Fusarium* showed excellent growth on soil sample collected from Amanatpur.

Sample collected from Batwadi and Rohankhed showed *Rhizopus* and *Mucor* as a dominant species, while *Aspergillus* showed high population on soil samples collected from Nimbhora.

Fusarium showed more growth on soil samples collected from Majari while *Verticillium*, *Mucor* and *Trichoderma* showed excellent growth on soil sample collected from Babulgaon.

Species of *Rhizopus* showed dominancy on soil samples collected from Kasura and Nimbi. While *Aspergillus*, *Mucor* showed good growth on soil samples collected from Badegaon, Akot, Adoshi, Vallabh Nagar and Akola.

During the investigation, there are ecological variations in the soil samples. Fungal species of *Fusarium*, *Mucor*, *Aspergillus*, *Rhizopus* are most common while *Trichoderma*, *Verticillium*, *Botrytis*, *Phoma*, *Alternaria*, *Rhizoctonia*, *Cephalosporium*, *Cladosporium*, *Curvularia* showed poor growth.

Conclusion:

Soils are highly complex systems, with many components playing diverse functions mainly due to the activity of soil organism. Soil micro flora plays a pivotal role in evaluation of soil conditions & in stimulating plant growth Microorganisms are beneficial in increasing the soil fertility & plant growth as they are involved in several biochemical transformation & mineralization activities in soils.

Fungi are fundamental for soil ecosystem functioning especially in forest & agricultural soil. They play a key role in many essential processes such as organic matter decomposition & elemental release by mineralization. Fungi are an important component of the soil microbiot.Microfungi play a focal role in nutrient cycling by regulating soil biological activity. The quantities of organic & inorganic materials present in the soil have a direct effect on the fungal population of the soil.

From the above observations & results it was concluded that many Deuteromycetes, Zygomycetes and Ascomycetes members present in the soil & it play an important role in soil fertility as well as shows harmful effect on the plants.

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