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Biodiversity in Rhizosphere and Non-Rhizosphere Mycoflora of *Glycine Max* (L.) *Merril* from Nashik District

Aher Shital Prabhakar^{1*} Momin Raisoddin Khudboddin²

^{1,2}Department of Botany, Milliya Arts, Science, and Management College, Beed, (Affiliated to Dr. Babasaheb Ambedkar Marathwada University), Aurangabad, Maharashtra. ***Corresponding Authors Email:** shitalpaher@gmail.com

ABSTRACT

Present study highlights the diversity of rhizosphere & non-rhizosphere mycoflora from five tehsils of Nashik District, Maharashtra, India. Total 25 species of fungi from 13 Genera were recorded. From each Field composite soil sample was taken. The collected soil samples were inoculated in Rose Bengal Agar & Potato Dextrose Agar. The mycoflora were isolated by soil dilution plate method. Identification of mycoflora was done with the help of standard protocols. The most common fungi were Aspergillus neoniger, Aspergillus ustus, Trichoderma viridae, Aspergillus versicolor, Aspergillus flavus, Trichoderma herzianum, Aspergillus fumigates, Penicillium funiculosm. These fungi were diverse due to the varying climatic conditions. The Percent contribution of the mycoflora was statistically analyzed. **Keywords:** Diversity, Mycoflora, Soybean, Rhizosphere

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INTRODUCTION

Biodiversity means the variability among living things. The soil consists of bacteria, nematodes, yeasts, fungi & actinomycetes. This is a natural habitat for microorganisms & it provides a suitable environment for the growth of microorganisms[1, 2, and 3]. Soil micro flora plays a vital role in evaluation of soil conditions & in enhancing plant growth. [4]. Fungi are non-chlorophyllus thalloid plants & major component of the soil micro biota. Fungi are helpful in decomposition of dead remains of plant & animalby secreting enzymes. They play a significant role by converting carbohydrates, nitrogenous compounds, and fatty acids into simpler ones.

Soil fungi are the major decomposers in soil & helpful in nutrient recycling. They also used in production of enzymes, Organic acids, antibiotics, pigments. In addition to that, Trichoderma are used as bio-control agent against plant pathogens. They are industrially important in fermentation & various medicines are produced from them. Some fungi are harmful, they spoil the food, causes various diseases to plants, animals & even humans also.

German Plant Physiologist Hiltner first proposed the term Rhizosphere. The narrow zone of soil adjacent to the living root system is termed as rhizosphere. The zone away from roots & not directly associated with plant roots is non-rhizosphere. The rhizosphere soil shows microbiological activities. In India, Rangaswamy & their co-workers have done extensive work on the rhizosphere of different plants. Fungi present in this region show numerous activities such as phosphate solubilization, cellulose decomposition, inhibition of plant pathogens, etc. therefore fungi in the rhizosphere region play a dominant role in biological processes beneficial to the plants [5, 6].Bohra & Sharma have reported the highest number of fungi in rhizosphere region[7].The fungal frequency changes at different growth stages and age of the plant age [8, 9]. The rhizosphere soil consists of beneficial as well as harmful fungi. Harmful fungi like *Fusarium, Alternaria*, causes different diseases to the plants while other fungi decompose plant residues antagonize plant pathogen & provide nutrients, which are useful for plant growth. So by considering above importance the rhizosphere fungi need to be studied because they might be useful for curing certain diseases or useful as a strain for various fermentation industries. The purpose of present study is to isolate mycoflora from different Soybean fields of Nashik district & to observe the percent contribution of fungal species.

MATERIAL AND METHODS

The soil samples were collected from Nashik Region. From each locality, five plants were randomly selected & rhizosphere soil was collected & mixed together to obtain a homogenous soil sample. Simultaneously area left between the plants non-rhizosphere soil samples were collected. Composite soil sample from each locality were brought to laboratory in zip lock sterile polythene bags. The soil fungi were isolated by Soil dilution plate method [10]. 1 gm of soil was suspended in 10 ml distilled water to make microbial suspensions. The dilution of 10⁻³& 10⁻⁴ were used for isolation of Fungi. 1 ml of microbial suspension were added to autoclaved Petri plates (triplicate of each dilution) containing 20 ml of sterile Rose Bengal Agar or Potato Dextrose Agar. 1% Streptomycin solution was added to culture medium before pouring into Petri plates for avoiding bacterial growth. The Petri plates were incubated at 27± 1°C&observed everyday up to six days. The slides were prepared & identified the Fungi with the help of literature [11, 12, 13, 14, 15 and 16].

Physico- chemical analysis of Soil

The soil was characterized for its physico-chemical properties. Physico-chemical parameters of soil include Soil type, Soil color, pH, Salinity, Organic carbon, Nitrogen, Potassium &Phosphorus. Color / type of soil were recorded in the field. pH of the soil sample was measured with the help of digital pH meter. The physicochemical parameters were measured by standard methods. The physical & chemical parameters of the soil samples were analyzed at R. B. Herbal Agro Laboratory Satana, Nashik.

Place	Soil Type	Soil Color	рН	Salinity	Organic Carbon%	NKg/h	P Kg/h	K Kg/h
Chandwad	Sandy clay loam	Gray	6.9	0.09	0.28	250	15	222
Malegaon	Silt clay loam	Black	6.6	0.18	0.78	190	18	425
Nandgaon	Sandy clay loam	Brown	7.5	0.10	0.46	310	19	246
Satana	Sandy clay loam	Lighy Grey	7.8	0.26	0.39	210	21	224
Yeola	Sandy loam	Brown	6.9	0.17	0.49	290	16	210

Table 1: Phycico-chemical Properties of Rhizosphere Soil samples collected from Nashik District

STATISTICAL ANALYSIS:

A total number of fungal colonies per plate were calculated. The percent contribution of each fungus was calculated by the following formula.

Total No. Of CFU of an individual Species

% Contribution = ------ X 100

Total No. Of CFU of all Species

*CFU: Colony Forming Unit

RESULT AND DISCUSSION

Fungi are important components of soil, which has major role in organic matter decomposition. In the present study rhizosphere &non-rhizosphere mycoflora of five Soybean fields of Viz. Chandwad, Malegaon, Nandgaon, Satana & Yeola studied for detecting the fungal diversity.PDA medium is mostly used culture media because its formulation is simple & potential to support wide range of fungal growth [17].Total 25 species of fungi from 13 Genera were recorded.The most common fungi among them are *Aspergillus neoniger* (13.1%),*Aspergillus ustus* (8.5%), *Trichoderma viridae* (7.6%), *Aspergillus versicolor* (6.9%), *Aspergillus flavus* (6.8%), *Trichoderma herzianum* (6.2), *Aspergillus fumigates* (5.5%), *Penicillium funiculosm* (5.5%) were isolated & characterized. The percentagecontribution of fungi was statistically analyzed (Table 3). The genus *Aspergillus* was found highest in distribution with nine species followed by *Penicillum* with three species. The antibiotics produced by the genus *Penicillium* & toxins produced by genus *Aspergillus* may be preventing the other fungal growth.

Name of Fungi	Occurrence of fungi											
		Rhizosphere					Non-rhizosphere					
	Chandwad	Malegaon	Nandgaon	Satana	Yeola	Chandwad	Malegaon	Nandgaon	Satana	Yeola		
Acrothecium Sps.	3	0	0	1	0	0	0	0	0	0		
Alternaria alternata	3	1	1	0	0	1	0	0	0	0		
Aspergillus carbonarius	0	0	0	2	0	0	0	0	0	2		
Aspergillus flavus	4	1	2	1	1	2	1	0	3	1		
Aspergillus fumigatus	3	1	0	1	1	1	2	1	0	0		
Aspergillus neoniger	0	4	3	3	2	2	3	2	3	0		
Aspergillus oryzae	5	2	0	2	0	0	0	2	0	1		
Aspergillus repens	4	3	0	0	0	0	0	0	0	2		
Aspergillus versicolor	0	0	2	1	2	1	1	1	1	2		
Aspergillus ustus	3	1	1	1	2	0	0	0	0	0		
Beauveria bassiana	2	0	0	0	0	0	0	0	0	0		
Cladosporium herbarum	2	1	0	0	0	1	1	0	2	0		
Curvularia lunata	0	0	0	0	0	2	0	0	0	0		
Fusarium oxysporum	3	0	2	0	0	0	2	2	0	0		
Fusarium roseum	2	2	0	0	0	0	0	0	0	2		
Mucor sps	1	0	0	0	0	0	1	0	0	0		
Paecilomyces lilacinus	0	0	1	1	0	0	0	2	2	0		
Penicilliumrestrictum	5	2	0	0	0	0	2	2	1	1		
Penicilliumdigitatum	0	0	2	0	0	2	0	0	0	0		
Penicillium funiculosm	3	0	2	3	0	3	3	0	0	0		
Rhizoctonia sps.	0	2	0	0	0	0	0	0	0	0		
Rhizopus nigricans	1	0	3	1	0	0	1	1	2	1		
Rhizopus stolonifer	2	1	0	0	0	0	0	0	0	0		
Trichoderma herzianum	3	2	0	2	1	1	2	0	0	2		
Trichoderma viridae	3	2	2	1	1	1	0	0	0	0		

Table 2: Frequency of Rhizosphere Mycoflora in different Soybean fields of Nashik District

Table 3: Percent contribution of Rhizosphere Mycoflora of different Soybean fields in Nashik district

		Occurrence of fungi										
	Rhizosphere						Non-rhizosphere					
Name of Fungi	Chandwad	Malegaon	Nandgaon	Satana	Yeola	Chandwad	Malegaon	Nandgaon	Satana	Yeola		
Acrothecium Sps.	8.6	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0		
Alternaria alternata	8.6	4.0	4.8	0.0	0.0	5.9	0.0	0.0	0.0	0.0		
Aspergillus carbonarius	0.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0	14.3		
Aspergillus flavus	5.7	4.0	9.5	5.0	10.0	11.8	5.3	0.0	21.4	7.1		
Aspergillus fumigatus	8.6	4.0	0.0	5.0	10.0	5.9	10.5	7.7	0.0	0.0		
Aspergillus neoniger	0.0	16.0	14.3	15.0	20.0	11.8	15.8	15.4	21.4	0.0		
Aspergillus oryzae	8.6	8.0	0.0	10.0	0.0	0.0	0.0	15.4	0.0	7.1		
Aspergillus repens	5.7	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.3		
Aspergillus versicolor	0.0	0.0	9.5	5.0	20.0	5.9	5.3	7.7	7.1	14.3		
Aspergillus ustus	8.6	4.0	4.8	5.0	20.0	0.0	0.0	0.0	0.0	0.0		
Beauveria bassiana	5.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		

Cladosporium herbarum	5.7	4.0	0.0	0.0	0.0	5.9	5.3	0.0	14.3	0.0
Curvularia lunata	0.0	0.0	0.0	0.0	0.0	11.8	0.0	0.0	0.0	0.0
Fusarium oxysporum	5.7	0.0	9.5	0.0	0.0	0.0	10.5	15.4	0.0	0.0
Fusarium roseum	2.9	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.3
Mucor sps	2.9	0.0	0.0	0.0	0.0	0.0	5.3	0.0	0.0	0.0
Paecilomyces lilacinus	0.0	0.0	4.8	5.0	0.0	0.0	0.0	15.4	14.3	0.0
Penicilliumrestrictum	14.3	8.0	0.0	0.0	0.0	0.0	10.5	15.4	7.1	7.1
Penicilliumdigitatum	0.0	0.0	9.5	0.0	0.0	11.8	0.0	0.0	0.0	0.0
Penicillium funiculosm	8.6	0.0	9.5	15.0	0.0	17.6	15.8	0.0	0.0	0.0
Rhizoctonia sps.	0.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhizopus nigricans	2.9	0.0	14.3	5.0	0.0	0.0	5.3	7.7	14.3	7.1
Rhizopus stolonifer	5.7	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Trichoderma herzianum	8.6	8.0	0.0	10.0	10.0	5.9	10.5	0.0	0.0	14.3
Trichoderma viridae	8.6	8.0	9.5	5.0	10.0	5.9	0.0	0.0	0.0	0.0



Graph: Percent frequency of rhizosphere & non-rhizosphere mycoflora

CONCLUSION

In the present study rhizosphere & non-rhizosphere soil samples from Soybean field were collected from 5 tehsils of Nashik District. The study notified that site by site the fungal species shows variation. Majority of *Aspergillus* species were found in rhizosphere & non-rhizosphere region as well. This study shows that % of occurrence of Fungi is varying in site wise It may possible due to soil & environmental factors like soil pH, Soil type, Moisture, organic content & water. The studies on soil mycoflora & percent contribution are useful for researchers, farmers, microbiologist for conservation of soil ecosystem, Soil microbial diversity & sustainable agriculture.

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