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Isolation and identification of Soil Fungi from Wheat Cultivated Area of Uttar Pradesh

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Abstract

Experiments were conducted to find out different soil from wheat-cultivated area during 15 April to 10 May, 2013-2014. The soil fungi were isolated following the soil dilution plating technique. The obtained soil fungi from wheat-cultivated area were *Aspergillus* spp., *Penicillum* spp., *Geotrichum* spp., *Gloesporium* spp., *Fusarium* spp., *Mycelia sterilia, Arthrobotrys* spp., *Cladosporium herbarum* in Allahabad district. In Mirzapur district, *Aspergillus* spp., *Penicillum* spp., *Rizoctinia* spp., *Fusarium* spp., *Mucor* spp. were recorded from wheat cultivated area. In Varanasi district, *Aspergillus* spp., *Penicillum* spp., *Rizoctinia* spp., *Fusarium* spp., *Mucor* spp., *Alternaria* spp., *Helminthosporium oryzae,* and *Humicola grisea* were recorded from wheat-cultivated area. *Aspergillus* spp. and *Penicillum* spp. was common fungi presented in three different districts Allahabad, Mirzapur and Varanasi, of Uttar Pradesh.

Keywords: Soil fungi; Wheat; Uttar Pradesh

Introduction

Wheat (*Triticum aestivum* L.) is one of the most important cereals in the world and is part of a staple diet for nearly 35% of the world's population [1]. It is grown in about 102 countries of the world covering about 220.69 million hectares of land which is 32% of the total cultivated land of the world. The area and production increased to 0.83 million hectare and 1.84 million metric tons, respectively in 2000 [2].

Soil fungi play an important role as major decomposers in the soil ecosystem. There are about 75,000 species of soil fungi in the world [3]. Fungi are one of the dominant groups present in soil, which strongly influence ecosystem structure and functioning and thus plays a key role in many ecological services [4]. Therefore, there is a growing interest in assessing soil biodiversity and its biological functioning [5].

The yield was 2.8 t/ha in 2011-2012 cropping year [6] which is very low compared to those in the research farm level (3.5 t/ha to 5.1 t/ha) [2]. Coupled with many other factors, diseases also play an important role in lowering the yield [7,8].

The process of decomposition is governed by the succession of fungi at various stage of decomposition [9-12] nutrient level of soil, crop residue and prevailing environmental conditions [13-17].

The current study was aimed detection of soil fungi from wheat field. The study involved isolation, identification and screening of soil fungi of fungal species prevailed Allahabad, Varanasi, and Mirzapur districts of Uttar Pradesh in India.

Material and Methods

The present studies were carried out at Bhargava Agricultural Botany laboratory, Department of Botany, University of Allahabad, Allahabad. Soil samples were collected from wheat-cultivated areas of selected sites of Allahabad, Varanasi and Mirzapur district during 15 April to 10 May 2013-2014 for detection of soil fungi.

Study area

Three studies area were select, first district Allahabad is situated in Southern Eastern. It lies between the parallels of 24° 47' north latitude and 81° 19' east longitudes, second is Mirzapur district located at 25.15° N and 82.58° E, and third Varanasi is situated at 25.28° N and 82.96° E in Uttar Pradesh, India. Soil taken 15 cm depth and put in small sterilized polythene bags for laboratory analysis.

Isolation of soil fungi

The samples were processed for isolation using the soil dilution plate [18]. The soil fungi were isolated following the soil dilution plating technique of [19]. The moisture content of a certain amount of soil was determined and fresh soil quantities corresponding to 25 gm of oven-dried soil were calculated [20]. Each soil sample was diluted to 1×10^{-4} concentration suspension. Then, 1 ml of the soil suspension (containing 0.0001 g wet soil) was drawn by pipette into a Petri dish (90 mm). A mixture of 25 ml of warm, molten glucose-ammonium nitrate agar (GAN) added with Rose Bengal and streptomycin was poured over the soil suspension and the Petri dish was rotated gently to let the soil suspension mix well with the medium. Five replications were completed for each soil sample (0.0005 gm wet soil). All the Petri dishes were incubated at room temperature (26°C to 28°C) in darkness for 3-5 days or longer.

Identification of the soil fungi

The fungi were identified with the help of literature [21]. The colonies were counted and identified using the soil dilution plate method. The counting and identification procedure was carried out under a stereomicroscope. Then the identified colonies were transferred to Petri dishes containing agar. In the Petri dishes, different types of colonies developed. Identification of the organism was made with the help of the relevant literature [22,23]. For the identification of the isolates, Smith [24] was followed. Identification of the taxa were carried out according to Hasenekoglu [25], Subramanian [26], Ellis [27], Raper and Thom [28], Raper and Fennell [29], Zycha [30], Samson and Pitt [31,32].

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Screening of soil fungi

Screening of soil fungi after each stage the ineffective isolates were excluded from further testing. isolation of microorganisms and primary screening was done according to the method given by Vega et al. [33]. Various soil fungi recorded from different three districts *viz.* Allahabad, Mirzapur and Varanasi.

Results and Discussion

The results obtained of different three district screening of soil fungi wheat cultivated area from the analyses 10 blocks of soil through soil dilution plate methods to determine the screening of soil fungi. Different soil fungi were recorded from wheat cultivated areas *Aspergillus* spp., *Penicillum* spp., *Geotrichum* spp., *Gloesporium* spp., *Fusarium* spp., *Mycelia sterilia, Arthrobotrys* spp., *Cladosporium herbarum*. In which *Aspergillus* spp. and *Penicillum* spp. common soil fungi recorded of district Allahabad in Table 1.

S.No.	Isolated Fungi
1	**Aspergillus sp.**
	Aspergillus oryzea (Ahlburg Cohn)
	*Aspergillus flavus (*Link)
	Aspergillus variecolor (Thom and Church)
	Aspergillus ochraceus (Withelm)
	tspergillus niveus (Blotch)
2	**Penicillum sp.**
	Penicillum variabil (Sopp.)
	*Penicillum citrinum (*Thom)
	Penicillum notatum (Westling)
	Penicillum steckii (Zaleski)
	Penicillum spp.(Perithecial)
3	*Geotrichum* spp.
4	*Gloesporium* spp.
5	*Fusarium* spp. (Sterile)
6	*Mycelia sterilia* (Four)
7	*Arthrobotrys* spp.
8	*Cladosporium herbarum* (Persoon)

Table 1: Isolation and identification of soil fungi from wheat cultivated area in district Allahabad.

The five *Aspergillus species* were recorded *viz. Aspergillus oryzea, Aspergillus flavus, Aspergillus variecolor, Aspergillus ochraceus, Aspergillus niveus* whereas the five *Penicillum species* were recorded *viz. Penicillum variabil, Penicillum citrinum, Penicillum notatum, Penicillum steckii, Penicillum* sp, in Allahabad district. Saksena, et al. [34] also were recorded soil fungi in Allahabad district. In the experiment detection of soil fungi from wheat, cultivated area consists of 10 blocks in district Mirzapur. The soil fungi were recorded from wheat cultivated area are *Aspergillus* spp., *Penicillum* spp., *Rizoctinia* spp., *Fusarium* spp., *Mucor* spp**.** *Aspergillus* spp. *Penicillum* spp. and *Fusarium* spp., were common soil fungi recorded (Table 2).

The eight *Aspergillus species* were recorded *viz. Aspergillus niger, Aspergillus flavus, Aspergillus oryzea, Aspergillus luchuensis, Aspergillus terreus, Aspergillus variecolor, Aspergillus awamori, Aspergillus niveus*, whereas the five *Penicillum* species were recorded *viz. Penicillum funiculosum, Penicillum frequentans, Penicillum steckii, Penicillum* spp., *Penicillum variabil,* the two *Rizoctinia* spp. were recorded i.e. *Rizoctinia oryzae, Rizoctinia cohnii,* four *Fusarium* spp. were recorded *of Fusarium* spp., *Fusarium avenaceum, Fusarium oxysporium, Fusarium javanicum*. The two *Mucor* species were recorded i.e. *Mucor fragilis,* and *Mucor jansseni* in district Mirzapur. Saksena, et al. [35] finding these fungi in Mirzapur district.

S. No.	Isolated Fungi
1	***Aspergillus* sp.**
	Aspergillus niger (Tiegh)
	*Aspergillus flavus (*Link)
	Aspergillus oryzea (Ahlburg Cohn)
	Aspergillus luchuensis (Inui)
	Aspergillus terreus (Thom)
	Aspergillus variecolor (Thom and Church)
	Aspergillus awamori (Nakazawa)
	Aspergillus niveus (Blotch)
2	***Penicillum* sp.**
	*Penicillum funiculosum (*Thom)
	Penicillum frequentans (Westling)
	Penicillum steckii (Zaleski)
	Penicillum sp.(Perithecial)
	Penicillum variabil (Sopp.)
3	***Rizoctinia* sp.**
	Rizoctinia oryzae (Went and Geerl.)
	Rizoctinia cohnii (Berl. And de Toni*)*
4	***Fusarium* sp.**
	Fusarium sp. (Sterile)
	F,usarium avenaceum (Fr.)
	Fusarium oxysporium (Schlect. Ex Fr.*)*
	Fusarium javanicum (Koord)
5	***Mucor* sp.**
	Mucor fragilis (Bain)
	Mucor jansseni (Lendner)

Table 2: Isolation and identification of soil fungi from wheat cultivated area in district Mirzapur.

In district Varanasi, detection of soil fungi from wheat cultivated area consists of 8 blocks. The results were obtained of soil fungi from wheat cultivated area are *Aspergillus* spp., *Penicillum* spp., *Rizoctinia* spp., *Fusarium* spp., *Mucor* spp**.,** *Alternaria* spp., *Helminthosporium oryzae,* and *Humicola grisea.* In which *Aspergillus* spp., *Penicillum* spp. and *Fusarium* spp. were common soil fungi found. In Table 3 the eight *Aspergillus* spp. were recorded *viz. Aspergillus niger, Aspergillus flavus, Aspergillus luchuensis, Aspergillus terreus, Aspergillus variecolor, Aspergillus oryzea, Aspergillus luchuensis, Aspergillus terreus, Aspergillus variecolor, Aspergillus awamori, Aspergillus niveus, Aspergillus sydowi* spp., whereas the five *Penicillum* spp were recorded *viz. Penicillum funiculosum, Penicillum frequentans, Penicillum steckii, Penicillium rubrum Penicillium chrysogenum* spp., one *Rizoctinia* sp was recorded i.e. *Rizoctinia oryzae,* Three *Fusarium* sp. were recorded *viz. Fusarium semitectum, Fusarium oxysporium, Fusarium javanicum*, and one *Mucor* species i.e. *Mucor racemosus*, three *Alternaria* sp. were recorded *Alternaria alternata, Alternaria solani,* and *Alternaria claymydospora* were recorded from wheat cultivated area in Varanasi district.

Conclusion

The two common soil fungi were obtained *Aspergillus* spp. and *Penicillum* spp. in three different districts at Allahabad, Mirzapur and Varanasi, of Uttar Pradesh in India.

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S No.	Isolated Fungi
1	***Aspergillus* sp.**
	Aspergillus niger **(**Tieghem**)**
	Aspergillus flavus (Link)
	Aspergillus luchuensis (Inui)
	Aspergillus terreus (Thom)
	Aspergillus variecolor (Thom and Church)
	Aspergillus awamori (Nakazawa)
	Aspergillus niveus (Blotch)
	Aspergillus sydowi (Bainier and Sastary**)**
2	***Penicillum* sp.**
	Penicillum funiculosum (Thom)
	Penicillum frequentans **(**Westling)
	Penicillum steckii (Zaleski)
	Penicillium rubrum (Stoll)
	Penicillium chrysogenum (Stoll)
3	***Rizoctinia* sp.**
	Rizoctinia oryzae (Went and Geerl.)
4	***Fusarium* sp.**
	Fusarium semitectum (Berkeley and Revenel)
	Fusarium oxysporium (Schlechtendahl)
	Fusarium javanicum (Koord)
5	***Mucor* sp.**
	Mucor racemosus (Fresenius)
6	***Alternaria* sp.**
	Alternaria alternata (Fr.) Keissler
	Alternaria solani (Sorauer)
	Alternaria claymydospora
7	*Helminthosporium oryzae* (Sacc.)
8	*Humicola grisea* (Traaen)
9	*Pythium aphanidermatum* (Edson) Fitzpatrick

Table 3: Isolation and identification of soil fungi from wheat cultivated area in district Varanasi.

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