

## DETECTION OF SOIL FUNGI FROM WHEAT CULTIVATED AREA

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### Abstract

Experiments were conducted to find out different soil fungi from wheat cultivated area during 15 April to 10 May, 2013-2014. The obtained soil fungi from wheat cultivated area were *Aspergillus spp.*, *Penicillium spp.*, *Geotrichum spp.*, *Gloesporium spp.*, *Fusarium spp.*, *Mycelia sterilia*, *Arthrotrichum spp.*, *Cladosporium herbarum* in district Allahabad, Various soil fungi from wheat cultivated area from Mirzapur district were which *Aspergillus spp.*, *Penicillium spp.*, *Rizoctinia spp.*, *Fusarium spp.*, *Mucor spp.* and In Varanasi district, various soil fungi were obtained also from wheat cultivated area which are *Aspergillus spp.*, *Penicillium spp.*, *Rizoctinia spp.*, *Fusarium spp.*, *Mucor spp.*, *Alternaria spp.*, *Helminthosporium oryzae*, and *Humicola grisea*. *Aspergillus spp.* and *Penicillium spp.* was common fungi presented in three different districts Allahabad, Mirzapur and Varanasi, of Uttar Pradesh.

Keyword: 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 (Behl *et al.*, 2006). 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 (Hasan, 2006).

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 (Finlay *et al.*, 2007). 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 (Orgiazzi *et al.*, 2012). Therefore, there is a growing interest in assessing soil biodiversity and its biological functioning (Barrios, 2007).

The yield was 2.8 t/ha in 2011-12 cropping year (BBS, 2012) which is very low compared to those in the research farm level (3.5 to 5.1 t/ha) (Hasan, 2006). Coupled with many other factors, diseases also play an important role in lowering the yield (Saunders, 1990, Badaruddin *et al.*, 1994).

The process of decomposition is governed by the succession of fungi at various stage of decomposition (Beare, 1993; Valenzuela *et al.*, 2001; Rai. *et al.*, 2001; Santro *et al.*, 2002) nutrient level of soil, crop residue and prevailing

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environmental conditions (Nikhra, 1981; Cooxson *et al.*, 1998; Cruz, *et al.*, 2002; Simoes *et al.*, 2002; Mc Tiernan, *et al.*, 2003).

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.

### **Materials 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 (Waksman, 1922). The soil fungi were isolated following the soil dilution plating technique of (Jonhson *et al.*, 1960). 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 (Öner, 1973).  $1 \times 10^{-4}$  then dilutions of the samples were prepared (Warcup, 1955). Each soil sample was diluted to  $1 \times 10^{-4}$  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 (26-28°C) in darkness for 3-5 days or longer.

### **Identification of the soil fungi:**

Fungal morphology was studied by observing colony features such as (Colour and Texture) and by staining with lacto-phenol, cotton blue and observe under compound microscope for the conidia, conidiophores and their arrangement. The

fungi were identified with the help of literature (Nagamani and Manoharachary 2006). 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 (Thom and Raper 1945, Gilman 1957). For the identification of the isolates, Smith (1971) was followed. Identification of the taxa were carried out according to Hasenekoglu (1991), Subramanian (1983), Ellis (1971), Raper and Thom (1949), Raper and Fennell (1965), Zycha (1969), Samson and Pitt (1985, 2000)

### 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.* (2012). 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.*, *Penicillium spp.*, *Geotrichum spp.*, *Gloesporium spp.*, *Fusarium spp.*, *Mycelia sterilia*, *Arthrotrichum spp.*, *Cladosporium herbarum*. In which *Aspergillus spp.* and *Penicillium spp.* common soil fungi recorded of district Allahabad in (Table: 1)

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

S.No.	Blocks	Isolated Fungi
1.	Bahadurpur	<b><i>Aspergillus sp.</i></b>
	Holagarh, Pratappur, Phulpur, Saidabad, Handia, Meja, Manda, Koroan Saidabad	<i>Aspergillus oryzae</i> (Ahlburg Cohn) <i>Aspergillus flavus</i> (Link) <i>Aspergillus variegatus</i> (Thom and Church) <i>Aspergillus ochraceus</i> (Withelm) <i>Aspergillus niveus</i> (Blotch)
2.		<b><i>Penicillium Sp.</i></b>
		<i>Penicillium variabil</i> (Sopp.) <i>Penicillium citrinum</i> (Thom) <i>Penicillium notatum</i> (Westling) <i>Penicillium steckii</i> (Zaleski) <i>Penicillium Spp.</i> (Perithecial)

S.No.	Blocks	Isolated Fungi
3.		<i>Geotrichum spp.</i>
4.		<i>Gloesporium spp.</i>
5.		<i>Fusarium spp.</i> (Sterile)
6.		<i>Mycelia sterilia</i> (Four)
7.		<i>Arthrotrys spp.</i>
8.		<i>Cladosporium herbarum</i> (Persoon)

The five *Aspergillus species* were recorded viz. *Aspergillus oryzae*, *Aspergillus flavus*, *Aspergillus varicolor*, *Aspergillus ochraceus*, *Aspergillus niveus* where as the five *Penicillium speciese* were recorded viz. *Penicillium variabil*, *Penicillium citrinum*, *Penicillium notatum*, *Penicillium steckii*, *Penicillium Sp*, in Allahabad district. Saksena, and Sarbhoy *et al.* (1962) 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.*, *Penicillium spp.*, *Rizoctinia spp.*, *Fusarium spp.*, *Mucor spp.* *Aspergillus spp.* *Penicillium spp.* and *Fusarium spp.*, were common soil fungi recorded. (Table 2).

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

S. No.	Blocks	Isolated Fungi
1	Chhanvey Haliya Jamalpur Kon Lalganj Madihaon Majhawan Narainpur Rajgarh Skhdi	<i>Aspergillus sp.</i>
		<i>Aspergillus niger</i> (Tiegh) <i>Aspergillus flavus</i> (Link) <i>Aspergillus oryzae</i> (Ahlburg Cohn) <i>Aspergillus luchuensis</i> (Inui) <i>Aspergillus terreus</i> (Thom) <i>Aspergillus varicolor</i> (Thom and Church) <i>Aspergillus awamori</i> (Nakazawa) <i>Aspergillus niveus</i> (Blotch)
2		<i>Penicillium Sp.</i>
		<i>Penicillium funiculosum</i> (Thom) <i>Penicillium frequentans</i> (Westling) <i>Penicillium steckii</i> (Zaleski) <i>Penicillium Sp.</i> (Perithecial) <i>Penicillium variabil</i> (Sopp.)
3		<i>Rizoctinia Sp.</i>
		<i>Rizoctinia oryzae</i> (Went and Geerl.)

S. No.	Blocks	Isolated Fungi
		<i>Rizoctinia cohnii</i> (Berl. And de Toni)
4		<b><i>Fusarium sp.</i></b>
		<i>Fusarium sp.</i> (Sterile) <i>Fusarium avenaceum</i> (Fr.) <i>Fusarium oxysporium</i> (Schlect. Ex Fr.) <i>Fusarium javanicum</i> (Koord)
5		<b><i>Mucor sp.</i></b>
		<i>Mucor fragilis</i> (Bain) <i>Mucor jansseni</i> (Lendner)

The eight *Aspergillus speciose* were recorded viz. *Aspergillus niger*, *Aspergillus flavus*, *Aspergillus oryzae*, *Aspergillus luchuensis*, *Aspergillus terreus*, *Aspergillus varicolor*, *Aspergillus awamori*, *Aspergillus niveus*, where as the five *Penicillium speciose* were recorded viz. *Penicillium funiculosum*, *Penicillium frequentans*, *Penicillium steckii*, *Penicillium Spp*, *Penicillium 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 speciose* were recorded i.e. *Mucor fragilis*, and *Mucor jansseni* in district Mirzapur. Saksena, and Sarbhoy *et al.* (1966) also finding these fungi in Mirzapur district.

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.*, *Penicillium spp.*, *Rizoctinia spp.*, *Fusarium spp.*, *Mucor spp.*, *Alternaria spp.*, *Helminthosporium oryzae*, and *Humicola grisea*, In which *Aspergillus spp.*, *Penicillium spp.* and *Fusarium spp.* were common soil fungi found. in (Table: 3).

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

S No.	Blocks	Isolated Fungi
1	Arajiline	<b><i>Aspergillus sp.</i></b>
	Baragavon	<i>Aspergillus niger</i> (Tieghem)
	Chiraigaon	<i>Aspergillus flavus</i> (Link)
	Cholapur	<i>Aspergillus luchuensis</i> (Inui)
	Harhua	<i>Aspergillus terreus</i> (Thom)
	Kashi Vidya Peeth	<i>Aspergillus varicolor</i> (Thom and Church)
	Pindra	<i>Aspergillus awamori</i> (Nakazawa)
	Sewapuri	<i>Aspergillus niveus</i> (Blotch)
		<i>Aspergillus sydowi</i> (Bainier & Sastary)

S No.	Blocks	Isolated Fungi
2		<b><i>Penicillium Sp.</i></b>
		<i>Penicillium funiculosum</i> (Thom) <i>Penicillium frequentans</i> (Westling) <i>Penicillium steckii</i> (Zaleski) <i>Penicillium rubrum</i> (Stoll) <i>Penicillium chrysogenum</i> (Stoll)
3		<b><i>Rizoctinia sp.</i></b>
		<i>Rizoctinia oryzae</i> (Went and Geerl.)
4		<b><i>Fusarium sp.</i></b>
		<i>Fusarium semitectum</i> (Berkeley & Revenel) <i>Fusarium oxysporium</i> (Schlechtendahl) <i>Fusarium javanicum</i> (Koord)
5		<b><i>Mucor sp.</i></b>
		<i>Mucor racemosus</i> (Fresenius)
6		<b><i>Alternaria sp.</i></b>
		<i>Alternaria alternata</i> (Fr.) Keissler <i>Alternaria solani</i> (Sorauer) <i>Alternaria claymydospora</i>
7		<i>Helminthosporium oryzae</i> (Sacc.)
8		<i>Humicola grisea</i> (Traaen)
9		<i>Pythium aphanidermatum</i> (Edson) Fitzpatrick

The eight *Aspergillus spp.* were recorded viz. *Aspergillus niger*, *Aspergillus flavus*, *Aspergillus luchuensis*, *Aspergillus terreus*, *Aspergillus variegator*, *Aspergillus oryzae*, *Aspergillus luchuensis*, *Aspergillus terreus*, *Aspergillus variegator*, *Aspergillus awamori*, *Aspergillus niveus*, *Aspergillus sydowi spp.*, where as the five *Penicillium spp.* were recorded viz. *Penicillium funiculosum*, *Penicillium frequentans*, *Penicillium 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 speciese* 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 *Penicillium spp.* in three different districts at Allahabad, Mirzapur and Varanasi, of Uttar Pradesh in India.

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