

DIVERSITY OF MYCOFLORA ON THE SOIL AND LEAF SURFACE OVER RICE FIELD

¹ Thakur S. M., ² Saoji A. A.

¹ Department of Botany D.B. Science college Gondia Maharashtra

Email- saritakatre28@gmail.com

² Ex-Director Institute of science Nagpur Maharashtra

Email - artiasaoji@gmail.com

Abstract: Microorganisms are introduced into the air from various sources; the important source of these microorganisms is soil and vegetation of that area. Microorganisms, which are found on the surface of plants, either as pathogens or saprophytes also, get suspended into the air. Man made action like digging or ploughing the soil may also release soil borne microbes into the air. Surrounding atmosphere plays an important role as the sources of organisms in the experimental area. The studies were carried out on rice field during June 2016 to may 2018, in both the seasons. (kharif and rabi). In the present study for sources of aeromycoflora , PDA media were used for the isolation of soil and leaf surface mycoflora located around Dhakani in Gondia district. During the present study , brown spot, blast, sheath blight, sheath rot, black kernel, and root rot were reported as plant pathological diseases, While *Alternaria*, *Fusarium*, *Bipolaris*, *Curvularia*, *Cladosporium*, *Rhizoctonia*, *Phythium*, *Mucor*, *Rhizopus*, *Aspergillus*, *Penicillium* were isolated from leaf surface (Phylosphere). And *Tricoderma*, *Phoma*, *Aurobasidium*, *Acromonium*, *Eppicoccum* and other species were isolated from the soil mycoflora.

Key Words: Mycoflora, Phylosphere, leaf surface Dhakani. Kharif, Rabi.

1. INTRODUCTION:-

Rice is one of the leading food crops of the world also is an important staple food and crop of India. Rice constitutes the diet of half of the world's population and its production is expanding even in areas which are not traditional producers of the crop. Rice as food provides a major source of calories for a large percentage of the world's population, particularly in Asia, where more than 60% of rice is grown and consumed by about 60% of the world's population. Today, rice is produced on about 10% of all cropland (144 million in hectares harvested). Again as a food crop rice provides more calories per hectare for human consumption than wheat. Rice accounts for 20% to 50% of total calories in the world.

Still rice production does not meet the required quantity to feed the growing population. [1] pointed out that grain yield are constrained by unfavorable weather, water and soil conditions, diseases and insect pest outbreak.

Generally, Fungi are ubiquitous and play significant role in our lives. They attack and destroy a variety of organic materials, cause fermentation, and are used in the production of organic acids, vitamins and medicines and also cause diseases. As saprophytes, they help to recycle a variety of complex organic materials. As pathogens, they cause a number of destructive diseases. Fungi are known to cause 55 diseases in rice, 43 of which are seed borne or seed transmittable [2]. The most important pathogens in rice are *Pyricularia oryzae*, which causes brown spot and *Xanthomonas oryzae*, which causes bacterial blight. The most notorious case of brown spot was the outbreak in Bengal, India, in the 1942-1943 when between 50 and 90% of the rice crops were destroyed thus contributing to major famine in which two million people died of starvation [3].

In the USA, the average loss caused by *Drechslera oryzae* was only approximately 0.5 percent. In Zanzibar according to survey made by [4], it was about 5 percent, whereas in Nigeria losses ranged from 12-40 percent. However North America contributes less than 2% to the world's production. In the major rice producing countries such as India, the situation is different. In India about 20% of world production and other Asian countries blast and brown spot are common and devastating *Pyricularia oryzae* often kills seedling or plants at the tillering stage and may largely destroy the panicles. *Drechslera oryzae* and *pyricularia oryzae* are two most important rice pathogens in the world of all the seed borne rice diseases, probably brown spot caused by *Drechslera oryzae* (*cochliobolus miyabeanas*), and blast (*pyricularia oryzae*) are the two most important. It has been found to induce to loss upto 30% in weight of rice grain.

The diseases may appear at any stage of the growth and development of plant, affecting the seed sown, root system, foliage, stalk, leaf sheath, inflorescence and even the developing grain. There are numerous soil-borne fungi in rice which can cause various symptoms i.e. root rot, brown spot, blast, sheath rot, and sheath blight. The soil born fungi

perpetuate from season to season on host crop to eliminate since they produce resting structures like sclerotia, chlamydia spores etc. which are well adapted to survive for long period under adverse environmental conditions. Soil born diseases are limiting factors in still crop production by small scale farmers. However, the nature of these problems is to be fully understood and little research has been conducted in the Agriculture fields.

2. MATERIALS AND METHODS:

Experiments were conducted on rice plants:

Root, foliar, and soil samples were collected from June 2016 to may 2018 at the heading stages of rice. Field was selected from Dhakani Dist Gondia. Sampling was done for the assessment of prevalence and disease intensity of soil borne diseases primarily root, foliar diseases and their associated soil borne fungi from test field. Additional information regarding planting date, previous crops, seed source, fertilizer and pesticides applications and yield were also obtained from the farmer.

Isolation of fungi from infected parts (root foliar) of rice :

Roots and foliar parts were separated and washed thoroughly under running tap water for 10 15 min. Washed roots, foliar parts were cut into pieces, immersed in 1% chlorox for 1 min and rinsed three times in sterilized distilled water. Roots and foliar pieces were dried on sterile blotting paper and placed on potato dextrose agar. The plates were incubated at 27^o c for 3 to 4 day. [5]

Isolation of fungi from soil :

Soil borne fungi were isolated from soil through soil dilution method at 10⁻³ dilution. The culture of fungi were purified and maintained on PDA slants at 27^oc. Fungi were identified on the basis of their morphological and growth characteristics using different keys for identification of fungi. [6] [7][5][8]

3. RESULT AND DISCUSSION:

Fungi are widely distributed all over the world and are affected by various environmental factors such as Temperature, moisture, wind and geographical location. During pathological study of rice plant five type of pathological disease were recorded. These diseases are Rice Blast, Brown spot of rice, Sheath blight of rice, Sheath rot and Root rot of rice.

The study was conducted at Dhakani region of Gondia District during the year June 2016 – may 2018 in both season. (i.e. Kharif and Rabi). The Fungi which are responsible for diseases caused on crops are *Alternaria solani*, *Fusarium oxysporum*, *Bipolaris oryzae*, *Curvularia lunata*, *Rhizoctonia solani*, *Phythium sp*, *Mucor hienalis*, *Rhizopus oryzae*, *Aspergillus sp*, *Phytophthora sp*, *Pyricularia sp*, *Absida sp*, were isolated from the phyllosphere, root surface and soil of the rice field. Beside the plant pathogenic fungi number of other fungal species also isolated during study period from foliage, soil and root such as *Trichoderma konilanbra*, *Phoma sp*, *Aureobasidium sp*, *Epicoccum sp*, *Cannighamella sp*.

In foliar diseases (phyllosphere) the brown spot, sheath rot and sheath blight was more prevalent (100%) in kharif season of 2016, prevalence of brown spot was 80% and sheath rot was 20%. There was no sheath blight found in Rabi season of year 2017. Prevalence of Blast 20% sheath blight 30 and black kernel 50% was observed in Kharif season of year 2017. In year 2018 (Rabi season) Brown spot and sheath rot was prevalent. Prevalence of root rot was 100% in four seasons. (Tab.1) Different types of Fungi were isolated from rice roots of test field belonging to the four distinct seasons. Frequency percentage of *Fusarium sp*, was the highest as compared to other root isolated Fungi. *Nigrospora oryzae sp*, *Curvularia sp*, *Helminthosporium sp*, *Alternaria sp*, *Aspergillus pencillium sp*, *Phythium sp* and *Trichoderma sp* were isolated from the leaves of rice. Different fungi were also isolated from the soil of rice area test field. *Aspergillus sp*, *Acremonium sp*, *Penicillium sp* *Fusarium sp* and many other Fungi were isolated from the soil.(Tab.2)

Soil borne fungi can cause various diseases of significant importance in rice crop i.e. root rot, blast, brown spot, black kernel, bacterial blight sheath rot and sheath blight, such type of research work is reported first time in this area.

According to Hafiz , Bhatti and soomro and Jiskani [9],[10],[11]. brown spot, blast, stem rot, bacterial blight and false smut are considered important diseases at various parts of rice growing areas of India. Therefore identification, management practices and some other relevant knowledge of the most important diseases of rice are very important so that the growers may protect their crops from these diseases. During 1999 survey of rice crop prevalence and disease intensity of root and foliar pathogens were estimated. Results of the twenty three key locations of Punjab districts at the heading stage show that root rot was the most prevalent disease in all four districts of Punjab. Among foliar diseases

brown spot, bacterial blight and sheath blight were more prevalent diseases in all the locations surveyed. our present results are somewhat similar to the results obtained by them..

Dodan [12] also have reported results somewhat similar to present results because in India most important diseases reported are bacterial blight, blast, black kernel, stem rot, sheath blight, brown spot and the isolated fungi were *Helminthosporium sp*, *sclerotium oryzae*, *Rhizoctonia solani*, *Fusarium sp*, *Alterneria sp*, *Curvalaria sp*. and *Nigrospora sp*. [13] in India. During current study *Rhizoctonia solani* was isolated from sheath blight affected samples. *Rhizoctonia solani* with sheath blight affected samples was isolated by Cu [14] in Philippines and Vidhyasekaran [15] in India. Similarly, Zare and Frshad [16] analyzed the rice samples and isolated nineteen species of *Fusarium*. The causal fungi of root, foliar and soil diseases of rice were *Fasarium spp*. so the present results also corroborate to Zare and Frshad because we also isolated various species of *Fasarium* from root, foliar and soil samples. Species of *Nigrospora* were also isolated from the roots, foliar and soil samples. This fungus often found on various old dead parts of rice plants throughout the world and plants are weakened by nutritional deficiency either by climatic conditions or are suffering from other diseases or from the insect attack, this fungus may affect glumes, culms, leaves or various other parts of the rice plants. In present study, rice plants were infected with root rot, brown spot, bacterial blight, sheath blight, blast, black kernel, sheath root rot and insect attack. Insect attack was commonly noticed in test field.

Table. 1 Percent contribution of fungal diseases in the year June 2016 – may 2018

Sr no	Diseases	Kharif season I	Rabi season I	Kharif season II	Rabi season II
1	Blast of rice	+++	+	++	+
2	Brown spot of rice	+++	++	+	+++
3	Sheath rot of rice	+	+	-	+++
4	Sheath blight of rice	+++	-	+	-
5	Root rot of rice	+++	+++	+++	+++
6	Black kernel of rice	++	-	++	-

(+) = Below 50%, (++) Above 50%, (+++) = Above 75%

Table. 2 Total no fungal species found in leaf surface and root surface on rice plant.

Sr.no	Fungal species isolated from	
	Leaf surface (Phylosphere)	Root surface
1	<i>Alterneria solani</i>	<i>Alterneria sp</i>
2	<i>Aspergillus sp.</i>	<i>Aspergillus sp</i>
3	<i>Bipolaris oryzae</i>	<i>Auerobasidium sp.</i>
4	<i>Cercospora sp.</i>	<i>Acromonium sp.</i>
5	<i>Curvularia lunata</i>	<i>Absida sp</i>
6	<i>Fusarium oxysporum</i>	<i>Fusarium sp.</i>
7	<i>Helminthosporium sp</i>	<i>Phoma sp</i>
8	<i>Cladosporium sp.</i>	<i>Connighamella sp</i>
9	<i>Mucor sp.</i>	<i>Epicocccum sp</i>
10	<i>Nigrospora sp.</i>	<i>Cercospora sp</i>
11	<i>Phythium sp.</i>	<i>Tricoderma sp</i>
12	<i>Phytophthora sp.</i>	<i>Rhizopus sp</i>
13	<i>Pyricularia sp.</i>	
14	<i>Penicillium sp.</i>	
15	<i>Rhizopus sp</i>	
16	<i>Rhizoctonia solani.</i>	

Fungal Disease on Rice Plant



Figure 1. Blast of rice



Figure 2. Blast of rice



Figure 3. Brown spot of rice



Figure 4. Sheath blight of rice

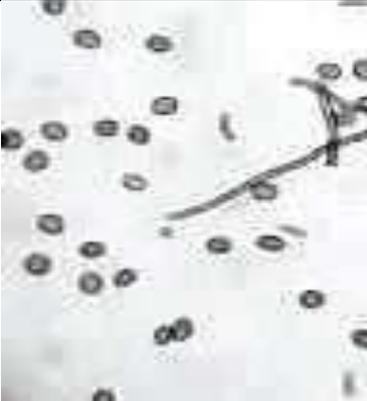
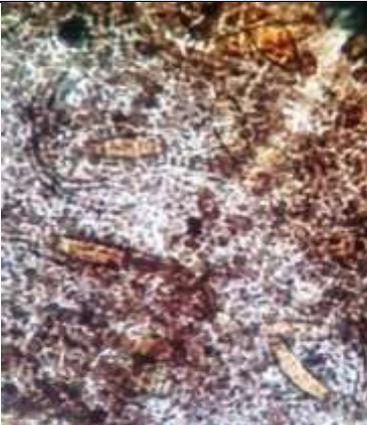
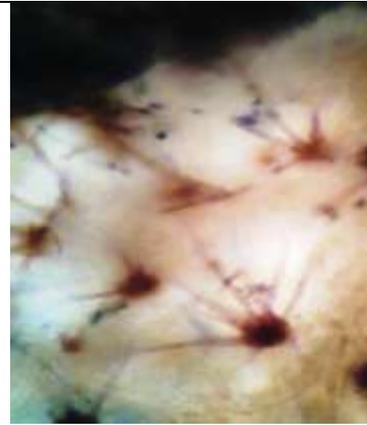


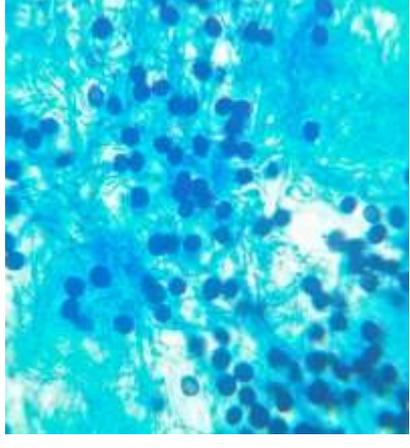
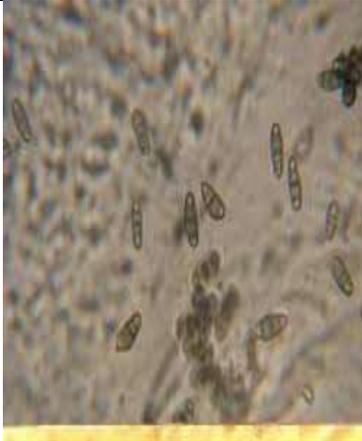
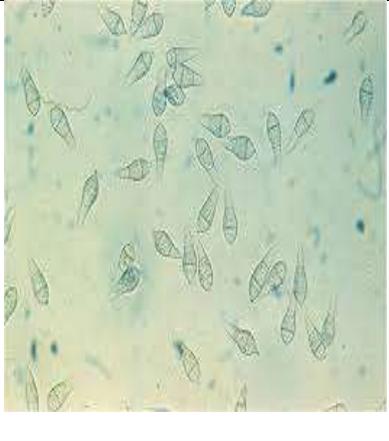
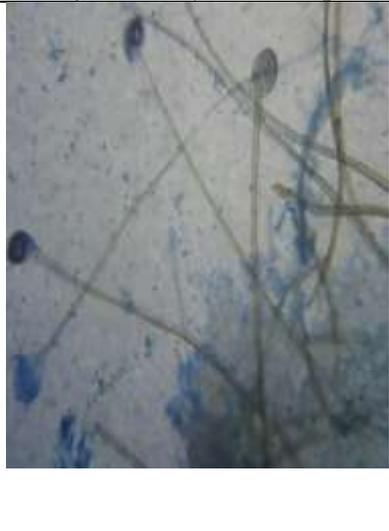
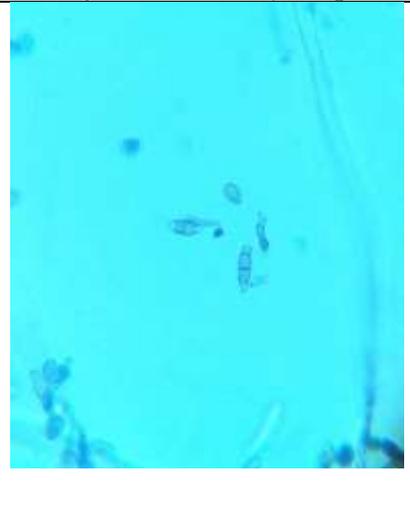
Figure 5. Black kernal disease of rice

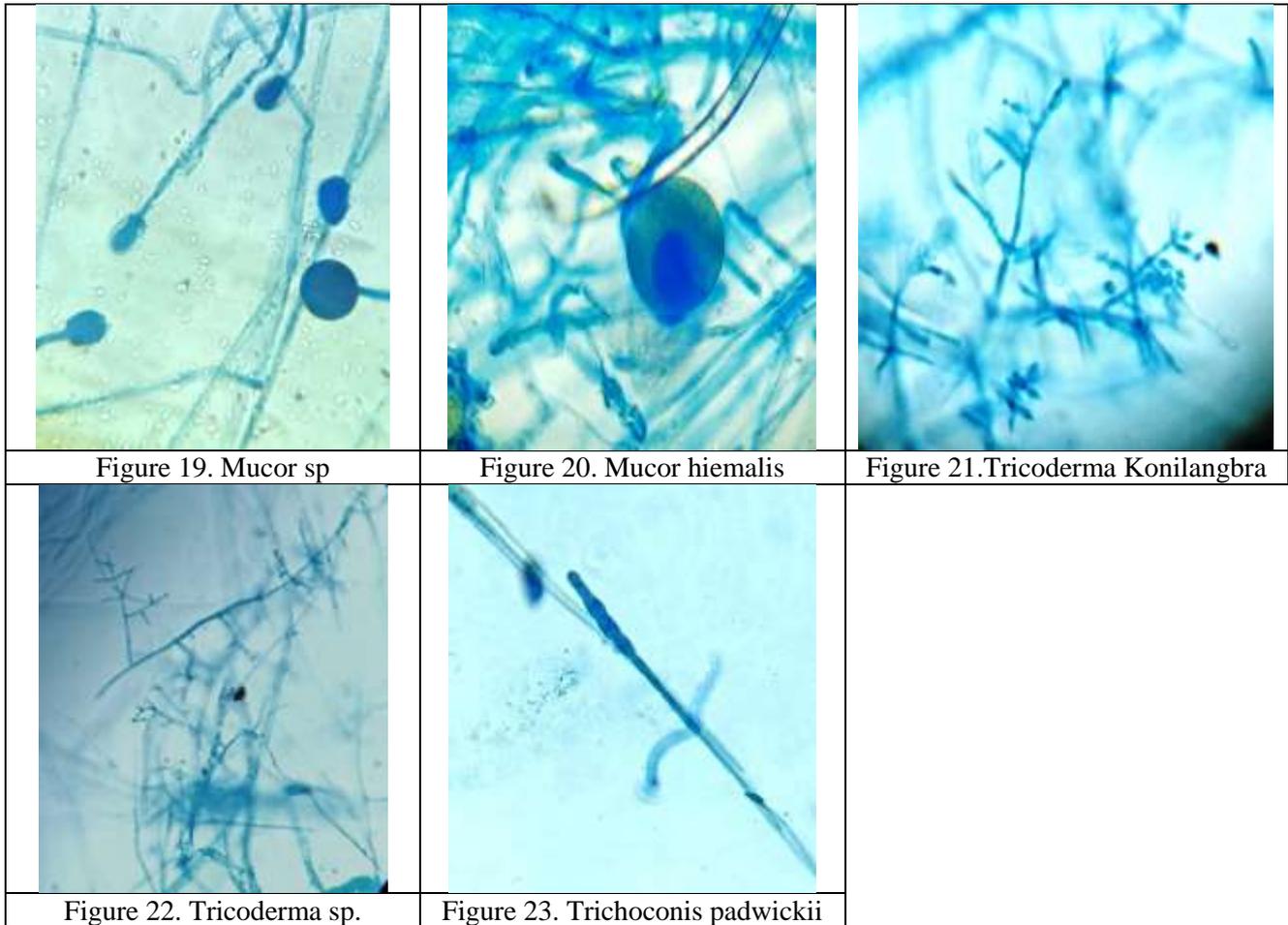


Figure 6. Sheath rot of rice

Pathological fungi

		
<p>Figure 1. <i>Absidia</i> sp</p>	<p>Figure 2. <i>Acremonium</i> sp</p>	<p>Figure3. <i>Alternaria solani</i></p>
		
<p>Figure 4. <i>Aspergillus</i> sp</p>	<p>Figure 5. <i>Bipolaris</i> sp</p>	<p>Figure 6. <i>Cercospora</i> sp</p>
		
<p>Figure 7. <i>Curvularia lunata</i></p>	<p>Figure 8. <i>Epicoccum</i> sp</p>	<p>Figure 9. <i>Fusarium</i> sp</p>

		
<p>Figure 10. <i>Fusarium</i> sp.</p>	<p>Figure 11. <i>Helminthosporium</i> sp.</p>	<p>Figure 12. <i>Nigrospora oryzae</i>.</p>
		
<p>Figure 13. <i>Pyricularia oryzae</i></p>	<p>Figure 14. <i>Pyricularia</i> sp.</p>	<p>Figure 15. <i>Pithomyces</i> sp.</p>
		
<p>Figure 16. <i>Rhizoctonia oryzae</i></p>	<p>Figure 17. <i>Rhizopus oryzae</i></p>	<p>Figure 18. <i>Magniporthya oryzae</i></p>



REFERENCES:

1. Jones, M.P., Dinggkuhn, M., Johnson, D.E., and Fagade, O.S., (1996). Interspecific hybridization: progress and prospects, Africa Rice Center, M'be, Cote d'Ivoire.
2. Ou, S.H. 1985 : *Rice diseases*. CAB International Mycological Institute.
3. Padmanabhan, S.Y. 1973 : Specialisation in pathogenicity of *Helminthosporium oryzae* *Proceedings of 40th Indian science congress III*
4. Padwick, G, W. 1956. *Losses caused by plant diseases in the colonies*. Phytopathological papers, No I. Commonwealth Mycological Institute, Kew. Surrey. 60p.
5. Nagmani, I. Kunwar K. and Manoharachary. 2009 : *Hand book of soil fungi*. I.K. International Pvt.Ltd.
6. Gilman, J.C. 1959. *A Manual of soil fungi*. Oxford and IBH Pub. Co., New Delhi.
7. Barnett, H.L. 1960; *Illustrated genera of imperfect fungi* (3rd ed.)
8. Watanabe, T. 2010 : *Pictorial Atlas of Soil and Seed Fungi*. CRC Press Taylor and Francis Group, LLC.
9. Hafiz, A., 1986 : *Plant disease* PARC. Islamabad Pakistan.
10. Bhatti, I.M. Soomro, A.H. 1996 : Agricultural impacts and field crop production in Sindh. *Agricultural research sindh*, Hyderabad, sindh, Pakistan.
11. Jiskani, M, M. 1999 : A brief outline "The fungi" (Cultivation of mushroom)
12. Dodan, D.S. Sunder S and Singh r. 1997 : *Pattern of rice disease in Haryana*. Pl. Dis Res. 12 188-191.
13. Batsa, B.K. and Manandhar H.K. 1997 : *Rice diseases in rice wheat system in the mid hills of Nepal*. Indian phytopathological society. Golden jubilee International Conference, November 10-15, 1997 New Delhi, India.
14. Cu, R.M. Mew, T.W. Cassaman K.G. and Teng P.S. 1996 : *Effect of sheath blight on yield in tropical, intensive rice production system*. Pl, Dis 80 1103-1108.
15. Vidhyasekaran P, Ponmmalar T.R., Samiyappan R, Velazhahan V. Vimala R. Ramanathan A. Paranidharan, V. Muthukrishnan, S. 1997 : *Host specific toxin production by Rhyzoctonia solani*, The rice sheath blight pathogen phytopathol 87 1258-1263.
16. Zare, R. and Frshad, D. 1997 : *Fusarium species isolated from cereals in Goregaon area*. Thranian J. DI. Pathol. 33 1-14.