Isolation and Identification of Rhizosphere Soil Fungi from Papaya (*Carica papaya* L.) and Eggplant (*Solanum melongena* L.) at BCSIR Campus in Rajshahi , Bangladesh

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Abstract- The aim of this present study was isolation and identification of fungi from rhizosphere soil of papaya (*Carica papaya* L.) and eggplant (*Solanum melongena* L.) at BCSIR campus in Rajshahi during the months of 25 Jan-01 Nov2021.The rhizosphere soil were collected at 05 to 15 cm depth of the plants. Several fungi were isolated from the rhizosphere soil of two types of plant by using serial dilution method. *Aspergillus flavus***,** *Penicillium notatum***,** *Fusarium oxysporum, Tricoderma harzianum,Penicillium chrysogenum* were isolated from the rhizosphere soil of papaya (*Carica papaya* L.). *Fusarium oxysporum,Aspergillus flavus***,***Aspergillus niger* were isolated from the rhizosphere soil of eggplant (*Solanum melongena* L.).Petri dish containing Potato Dextrose Agar (PDA) medium was used for pure culture until pure fungal colony was found.So *Fusarium oxysporum, Aspergillus flavus* was the common fungi from the rhizosphere soil of papaya (*Carica papaya* L.) as well as eggplant (*Solanum melongena* L.) .Identification of all type of fungi were carried out by culturing on Potato Dextrose Agar (PDA) media and microscopic method.Microorganisms play an vital role in biodegradation of solid agricultural waste as well as help for increasing crop production.

Index terms:- Eggplant, Fungi, Papaya,Rhizosphere soil.

I . INTRODUCTION

Soil a strong living matrix, is a necessary part of the terrestrial ecosystem. In an affinity to plant growth,soil can be separate into two types,videlicet rhizosphere soil and non- rhizosphere soil. Rhizosphere is the shrunk region of soil incontinently surrounding the plant roots [1]. Papaya (carica *papaya* L.) is one of the most popular fruits and a soft wooded tree of the world belongs to family “caricaceae”[2] . Brinjal or eggplant (*solanum melongena* L.) is an significant solanaceous vegetable in Bangladesh. It is effective source of minerals and vitamins.It has various medicinal features and more or less available circulate the year [3].The soil work as a store-house for numerous microbial communities of plants and herbs which can be producing Co_2 and nitrogen cycle.The microorganisms plays a significant part in soil ecosystem. Functioning changes the soil quality and microbial composition through decomposition of organic matter,recycling of nutrients and natural control [4]. Soil is an oligotrophic medium for the growth of fungi because the fungal enhancement are extremely limited for all most of the time ,fungi are also dormant or they metabolize and grow very gradually utilizing a range of organic molecules.The fungi distribute organic matter apart from the roots.In general, the concentration of microbes is greatest close to the surface of roots (rhizosphere) and hyphae of arbuscular mycorrhizal fungi (mycorhizosphere),where exudates are extraordinarily main source of organic energy entering from soils. Genetic studies have exhibited that fungi are more an intimately related to animals than to plants. Fungi have 80 percent or more of the same genes as humans [5],[6],[7].Fungi are not only beautiful but play a massive role in the daily life of human beings besides their utilization industry,agriculture,medicine,food industry,textiles,bioremediation,natural cycling,as bio fertilizer and many other ways.Fungal biotechnology has become a complete part of the human welfare [8].Fungus benefits most plants by suppressing plant root diseases and fungi promote healthier plants by attacking plants pathogens with fungal

engymes.Fungi also use antagonism to reduce competition by producing antibodies,which inhibit other microorganisms from growing.They produce numerous vitamins which promote plant growth.Benificial fungi also from protective webs and nets around roots as well as leaves to save the host plants [9],[10].Fungus also save plants by supplying a protective health to supply both water and phosphorous to the plant roots during droughts [11].The present study will help us to identify which types of fungi associated with Rhizophere soil of Papaya (carica *papaya* L.) and Egg plant (*solanum melongena* L.).

Ⅱ. MATERIALS AND METHODS

A. COLLECTION OF SOIL SAMPLES

Papaya (carica *papaya* L.) and Eggplant (*solanum melongena* L.) rhizosphere soil samples (approximately 10g) were collected with a sterilized clean dry polythene bags from a depth of 05 to 15cm with the help of a sterilized cork borer pushed horizontally into the ground of those plants.The distances were measured with a plastic meter rule.The soil samples had taken to the mycology laboratory of BCSIR,Rajshahi for further processing and analysis.

B. USED OF NUTRIENT MEDIUM

A wide range of medium are used for insulation of different groups of fungi which impact the vegetative growth and colony morphology of fungi. Potato Dextrose Agar (boiled potato extract 250g and filtered,dextrose 20g, agar 15g and distilled water 1000ml) medium were used for insulation of several fungi.The pH of the medium was maintained at 6.5±1.0 being optimal for the growth of fungi.

C. ISOLATION OF FUNGI FROM THE RHIZOSPHERES

Fungi were isolated from the rhizospheres of papaya and eggplant using serial dilution techniques .From the collected rhizosphere soil samples diluted with 1g soil in 10 ml of sterile destilled water to prepare microbial suspensions .Serial dilution was done up to 10^{-5} were used to isolate fungi in order to avoid over crowding of fungal colonies.1ml of the suspention of each concentration was added to the sterile petri dishes,in triplicates of each dilution (Fig:1) .1% streptomycin solution was added to the medium for prohibiting bacterial growth, before pouring into petri plates. The PDA plates were then incubated at 28±2℃ temperature for 3-7 days in an incubator.Then see the colonies of fungi on the PDA plate [12].

D. PURIFICATION OF FUNGAL ISOLATES

Each fungal colony was obtained on sterile PDA plates for various times until a pure culture was obtained. Then pure isolates were transferred onto sterile PDA plate and seal the petri plates with the parafilm.Then stored in the refrigerator at 4 to 8℃ prior to their identification [13].

E. STAINING METHOD FOR FUNGI

For staining of fungi inoculating needles were flamed over the burning Bunsen burner.Then using the needle,a small portion of the growth on the culture plate was transferred into the drop of lactophenol cotton blue on flooding over dry slide and cover slip was placed on top.

F. THE EFFECT OF LACTOPHENOL COTTON BLUE

LPCB is a stain used for creating semi permanent microscopic preparation of fungi.The LPCB stain has three following component.Lactic acid:Preserves the structure of fungi, Phenol:kills any types of organism, Cotton blue:Stains the chitin and cellulose of the fungal cell wall intensively blue.

G. IDENTIFICATION OF THE FUNGAL ISOLATES

Standard methods were used for identifying of the fungal isolates, described by [13].This was done by matching the macroscopically by observing colony features(Colour and Texture) of each fungal insulate with those of given species and microscopically staining with lactophenol cotton blue by watching under fluorescence microscope (RaxVision - Model:N-800M) using 10X ×40X objectives for microphotograph and identification of the conidia,conidiophores and arrangement of spores .The fungi were identified with the help of relevant standard handbooks, literature and journals [14],[15],[16].

Ⅲ. RESULT AND DISCUSSION

The study aimed that the isolation of rhizosphere soil fungi from different location of BCSIR campus in Rajshahi during the period of 25Jan-01Nov2021.Isolated fungi was identified by some key with the help of standard book and the confirmation was done by Dr.Arfatun nahar Chowdhury,Principal scientific officer, Division- in- charge, Applied Botany Research Division , Rajshahi Laboratories- 6206,Bangladesh. In this investigation 5 fungal were isolated and identified from the rhizosphere soil of papaya (*Carica papaya* L.) namely *Aspergillus flavus*,*Penicillium notatum*, *Fusarium oxysporum, Tricoderma harzianum, Penicillium chrysogenum* while only 3 fungi were isolated and identified from the rhizosphere soil of eggplant(*Solanum melongena* L.) namely *Fusarium oxysporum,Aspergillus flavus*, *Aspergillus niger* on the basis of cultural,microscopic and morphological characteristics (Table & Fig- 2,3,4) . *Fusarium oxysporum, Aspergillus flavus* is the

common fungi from the rhizosphere soil of papaya and eggplant . This study provides knowledge on microorganisms of BCSIR campus in Rajshahi.

These results agreed with the result of previous studies.[17]had earlier reported that Potato Dextrose Agar was most suitable for maximum growth of fungi,[18] had earlier repoted that fungal species belonging to genera *Aspergillus,Rhizopus,Penicillum.Trichoderma,Mucor,Botrytis* spp are significant members of rhizosphere mycoflora of popular crops such as cassava,exhibiting great beneficial rhizosphere effects on their respective host plants while some of them are pathogenic.[19]studied the mycofloral of various plants including oil palm trees and isolated *Fusarium* sp.,*Geotrichum* sp.,*Verticillium* sp., *Penicillium* sp.,*Trichoderma* sp.,*Aspergillus* sp. and *Mucor* sp. from the rhizosphere of oil palm[20]also isolated *Aspergillus flavus,Rhizospus stolonifer,Saccharomyces cerevisiae,Neurospora crazza Penicillium chrysogenum, Aspergillus niger* from the rhizosphere zones of *Corchorus olitorius* (jute). *Tricoderma harzianum* is known to be capable of producing antibiotics which might have suppressed the growth of the test pathogens.These results are in agreement with the findings of [21],[22],[23]. Soil microflora not only plays an important role in decomposition and contribute to biogeochemical cycling but also are responsible for the prevalence of diseases in the crop fields.

TABLE : DISTRIBUTION OF FUNGI IN THE RHIZOSPHERE SOIL OF PAPAYA (*Carica papaya* L.)AND EGGPLANT(*Solanum melongena* L.)

SI No.	**Papaya (*Carica papaya* L.)**	**Eggplant (*Solanum melongena* L.)**
1.	*Aspergillus flavus*	*Fusarium oxysporum*
2.	*Penicillium notatum*	*Aspergillus flavus*
3.	*Fusarium oxysporum*	*Aspergillus niger*
4.	*Tricoderma harzianum*	
5.	*Penicillium chrysogenum*	

Ⅳ. CONCLUSION

The result of this study indicated that total six types of fungi were identified. *Aspergillus flavus,Penicillium notatum, Fusarium oxysporum, Tricoderma harzianum, Penicillium chrysogenum, Aspergillus niger* fungi were isolated from the rhizosphere soil of papaya(*Carica papaya* L.) and eggplant (*Solanum melongena* L.). The two common rhizosphere soil fungi *Fusarium oxysporum, Aspergillus flavus* were obtained at BCSIR campus in Rajshahi.

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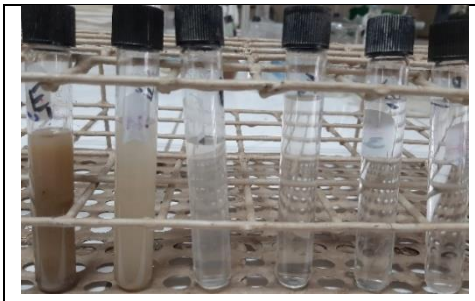


Fig 1:Serial dilution up to 10^{-5} of rhizosphere soil

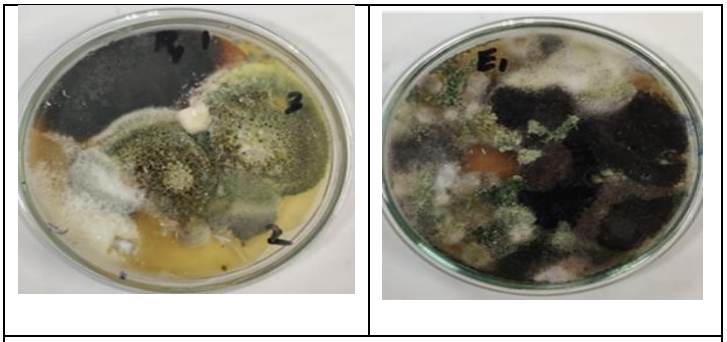
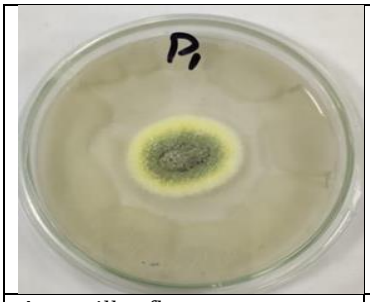


Fig 2:Fungal colonies of rhizosphere soil on PDA plate of Papaya & Eggplant



Aspergillus flavus

Aspergillus flavus

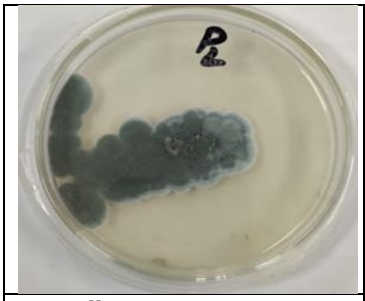
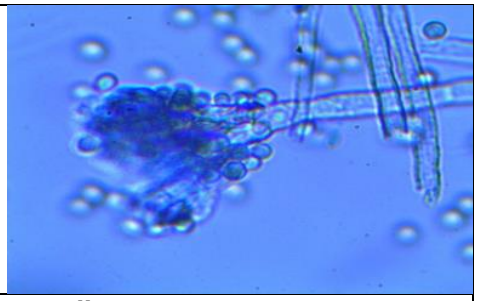
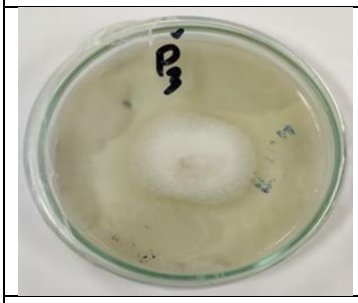
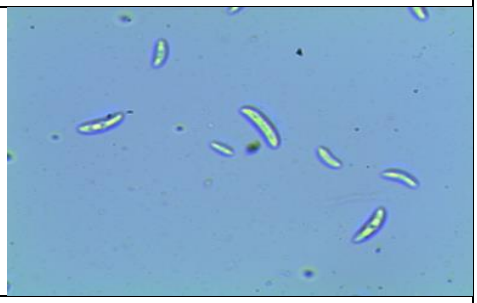
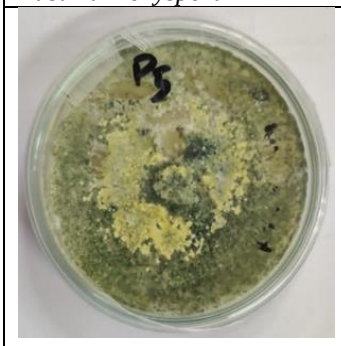
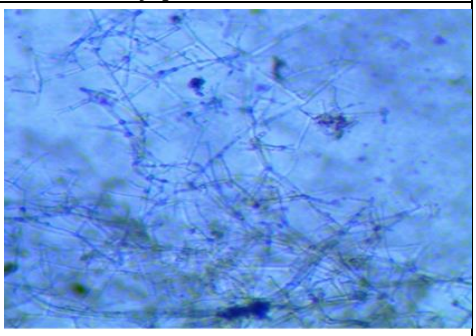
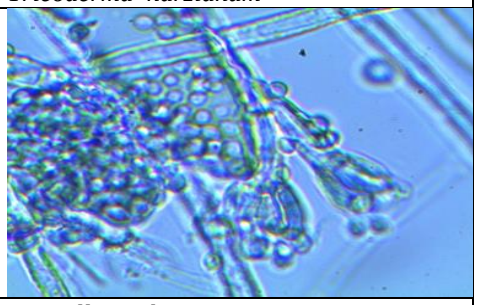
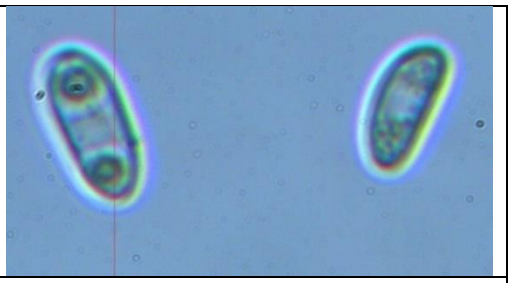
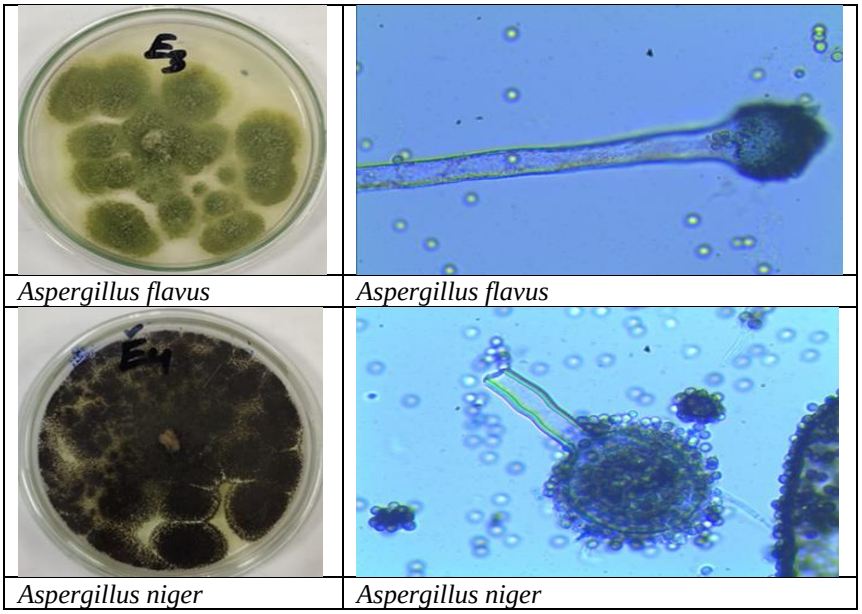
	
Penicillium notatum	*Penicillium notatum*
	
Fusarium oxysporum	*Fusarium oxysporum*
	
Tricoderma harzianum	*Tricoderma harzianum*
	
Penicillium chrysogenum	*Penicillium chrysogenum*

Fig 3:Pure fungal colonies & microscopic observation of some fungi from the rhizosphere soil of Papaya(*Carica papaya* L.)

	
Fusarium oxysporum	*Fusarium oxysporum*



Aspergillus flavus	*Aspergillus flavus*
Aspergillus niger	*Aspergillus niger*

Fig 4:Pure fungal colonies & microscopic observation of some fungi from the rhizosphere soil of Eggplant(*Solanum melongena* L.)

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