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Ecological Study of Fungi in the Mud –Flats of Tigris Edges in Baghdad

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دراسة بيئية للفطريات المتواجدة في التربة الطينية المنبسطة لحافات نهر دجلة في بغداد

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الخلاصة

في هذه الدراسة تم التحري عن الفطريات المتواجدة في التربة الطينية في حافات نهر دجلة في مدينة بغداد .استخدمت طرق العزل المعروفة والمعتمدة على مكونات مختلفة لغرض التمييز بين الاجناس الموجودة في الطور الخضري الفعال مع مثيلاتها الموجودة في الطور البوغي .
طبقا الى تكرار العزل الفطري ،الفطريات المسجلة صنفت الى اربعة مجاميع بمظاهر مختلفة .
المجموعة الاولى تحتوي على اجناس وانواع فطرية وهي الاكثر احتمالا ان تتواجد في الطور الخضري الفعال والتي هي :
Rhizopus & Fusarium ,Acremonium,Penicillium ,Mucor
الفطريات في المجموعة الثانية فقسم منها يتواجد في الطور الخضري الفعال والقسم الاخر يكون في الطور البوغي
والتي تتضمن *Ulocladium& Alternaria، Aspergillus، Penicillium* .
اما المجموعتان الثالثة والتي **تتضمن** *Aspergillus amstelodami* فقط والرابعة تتضمن انواع غير دقيقة المعالم فهما غالبا مايكونان في الطور البوغي للفطر.

Abstract

In the present study, fungal flora of the uncolonized mud of Tigris edges was investigated . Known isolation techniques ,based on different concepts were used in a trail to distinguish between genera present in the active vegetative phase and others existing in the dormant spore phase .

According to the frequency of isolation, the fungi reported are classified into 4 groups showing different existence patterns.

Group (A) fungi, comprised genera and species that most probably occur in the active vegetative phase .Genera assigned to this group are:

Fusarium ,Acremonium,Penicillium ,Mucor and Rhizopus.

Fungi of group (B) which are *Penicillium، Aspergillus، Alternaria&*

Ulocladium.

occur partly in the active vegetative phase and partly in the dormant spore phase whilst members of groups (C)which include *Aspergillus amstelodami* only and (D) accommodate species with no particular trend, most likely exist only in the spore phase.

Introduction

Several studies have been on fungi in a rid deserts and other extreme environments ,a relatively limited number of investigations have focused on fungi inhabiting river mud –flats or related environments .

As a habitat for fungi, this type of environment seems to be one of the most unsuitable because of bad aeration due to inundation from time to time (Pugh,1992). Such habitats might however be expected to accommodate fungi possessing unusual ecological characteristics of which the ability to grow under low (O2) tensions would be important.

Up to the present , very little is known a bout the biology of this group of fungi –their origin ,is even still in dispute of the few investigation which have been carried out on fungi of mud –flats and related habitats the most relevant studies are those of Sparrow(1937) on the water sediments, Siepmann (1959) on the estuarine sediments of the Weser river .The information obtained in these studies although valuable still leaves important questions to be answered concerning the origin and biology of this group of fungi .

Our present study therefore was carried out to answer a fundamental question, in what phase do fungi exist in mud as active mycelia or as dormant spore?

Habitat ,Materials and Methods

Relatively broad sandy to still muddy area are very common along the edges of Tigris river in Baghdad.

Fifty soil samples were collected from the bare-flats of Tigris edges at Baghdad during the period of March –April, 2004.This area was selected because the muddy surface is very broad and uniform in texture .The soil is typically clayed sand .The average matter content 0.6% and p^H value fluctuated between 7.9-8.2 .

Samples were taken randomly from several spots of varying distances (not over 500 cm) from the river edges .Soils were obtained from the subsurface mud (depth 5 to 15 cm) using surface sterilized trowels then transferred to the laboratory in tight sterile vials.

Fungal Isolation and Count

The fungal flora of mud was investigated by the soil plate technique (Karhoot,1986) .Six replicates were made from each soil sample making a total of 300 plates from the 50 soil samples .Soil were plated out on the day of sampling .

Two culture media namely ,Czapek-Dox agar and potato dextrose agar were used supplemented with a combination of resebengal and auromycin to suppress bacterial growth (Cooke,1994) .

There was not much differences in fungal counts on the two media although Czapek-Dox supported a growth of wider spectrum of genera and species than the latter ,hence it was used throughout this study for counting and primary isolation of fungi .For further identification and to induce sporulation in non-sporulating strains other media malt agar were used .

The identification of some genera and species was confirmed at the CBS, Baarn,Holland .

Since colony counts from isolation plates do not necessarily indicate the relative importance of a genera or species ,the results are expressed in terms of fungal potential according to which all colonies belonging to a given species ,developing on the some plate ,are estimated as one isolate and the frequency of occurrence of each species expressed as a percentage based on the total number of isolations on 300 plates.

Discrimination between active and inactive species

Two techniques were used namely ,the soil washing technique (Watson,1960) and the soil desiccation technique (McLenan ,1928) in order to differentiate between active and inactive fungi in the soil .The washing technique removes spores from the soil and gives a better chance to those species present in the vegetative phase to develop .The desiccation technique on the other hand kills hyphae in the soil and allows mainly surviving spore to produce colonies .

Growth of Fungi under limited oxygen supply

Pure cultures of some of commoner fungi were grown on liquid media in 250 ml /triplicate flasks containing 100 ml of an appropriate medium .So malt 2% ,Czapek-Dox with 0.5% yeast extract were used for these purpose. Flasks were tightly sealed by double layers of polythene and paraffin paper.After 2 weeks of incubation at 27°C ,growth was measured and compared ,on dry weight basis ,with the growth of unsealed flasks.

Results

General characteristics of Mud-Mycoflora

The mycoflora of the Tigris river edges at Baghdad revealed a considerably range of genera and species .The genera and *Penicillium* showed the widest spectrum of species among all genera isolated .However only seven *Aspergillus spp* were frequent, these were**:**
A.ochraceus,A.niger,A.fumigatus,A.sydowii,A.flavus,A.terreus and *A.oryzae.*
Only three of the *Pencillium spp* were common ,these were *P.frequentans , P.cyclopium and P.notatum* .

The genera *Fusarium ,Acremonium ,Mucor ,Rhizopus ,Alternaria* and *Ulocladium* ,also were detected with one species for each genus .

Active and inactive species

When the frequency of occurrence of each genus and species is compared by the three different isolation techniques (Table 1) .It is possible to distinguish between four groups of fungi with distinct trend:
Group (A) fungi : consisted of genera and species whose frequency of occurrence was increased by washing and decreased by desiccation .
Fungi which follow this pattern are : *Fusarium oxysporum ,Acremonium strictum, Penicillium freuentans ,Mucor circinelloides* and *Rhizopus arrhizus.*
Group (B) fungi :contained genera and species showing the opposite trend i.e. frequency of occurrence was decreased by washing and increased by desiccation .These fungi showed growth under limited oxygen supply but less than have grew well.

Group (C) fungi : *Aspergillus amstelodami* ,only belong to this group.
Group (D) fungi : accommodate species with no particular trend .All were irregularly isolated in low frequencies and therefore their growth under limited oxygen supply was not investigated .

(Table 1)Frequency of occurrence of important genera and species isolated from mud and their growth under limited oxygen supply

Group species	% Frequency of occurrence *			Growth under limited oxygen supply **
	Soil plate	Washing	Desiccation	
(A)				
Fusarium oxysporum	58	90	47	+ + +
Acremonium strictum	43	57	12	+ +
Penicillium frequentans	17	55	9	+ + +
Mucor circinelloides	8	19	2	+ + +
Rhizopus arrhizus	5	12	1	+ + +
(B)				
Penicillium cyclopium	42	18	62	+ + +
P. notatum	36	13	53	+ + +
Aspergillus ochraceus	34	11	55	+ +
A.niger	32	9	60	+ + +
A.fumigatus	30	8	54	+ + +
A.sydowii	29	13	51	+ +
A.flavus	26	15	57	+ + +
A.terreus	21	9	44	+ +
	11	4	28	+ + +

A.oryzae *Alternaria alternate* *Ulocladium consortiale*	31 26	14 10	59 51	+ + +
(C) *A.amstelodami*	0	0	6.0	+

*Frequency of occurrence see text (counts).
** Growth remarks: + + + = Heavy
+ + = intermediate
+ = weak

Discussion

Although many techniques are available for the study of fungi in soil, all have some limitations. For this reason, it is generally useful to apply a number of techniques, if possible based on different principles in order to build up a complete and accurate picture of the fungal flora of a certain habitat.

In our present study, it is most likely that fungi of group (A) exist in mud as active mycelia .Since all members are able to grow at limited oxygen supply, it is therefore to be expected that fungi of this group make a substantial contribution to the microbial activity in mud .They may be regarded as true mud inhabitants .Some of these common species included in this group, have also been reported from related habitats (Sammad,1999;Saito,1992).

Group (B) fungi on the other hand constitute different species.Although the frequency of occurrence of them decrease markedly by washing, none of them disappeared markedly after several washings. They showed good growth under limited oxygen supply suggesting that they occur partly in the vegetative and partly in the spore phase. Unlike fungi of group (A), members of group (B) contribute a smaller part to the microbial activity in mud.

Group (C) fungus showed weak growth others no growth at all under limited supply of oxygen .Recovery only after desiccation suggests that it occur only in the spore form. It existence in mud, therefore, is merely is a passive survival with no contribution to the active life in mud.

Comparison of our results with those reported elsewhere revealed that our list of fungi recovered from mud constitute an assemblage of species many of which are well known litter and leaf surface rather than soil inhabiting species.

In the present study only few species proved to occur in the active vegetative phase while the majority exist in the spore phase . This observation

might draw the attention in ecological studies of fungi living under certain environmental conditions toward stressing on the activity of the species and not merely isolation to justify their environment .It is concluded therefore, that mud do not constitute a taxonomically characteristic group of fungi ,that can be regarded as mud-flora but most are common species that probably relatively low oxygen tensions and increased salinity.

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