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Fungi from the Tidal Zone of Khawr AL-Zubair Canal Southern Iraq

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Abstract

A survey on the filamentous microfungi inhabiting soil and mud of the tidal zone of Khawr Al-Zubair canal, Southern Iraq was conducted. A total of 144 species belonging to 61 genera were encountered from 99 soil and mud samples collected from different distances from the water edge. The isolates were assigned to 107 species of mitosporic fungi, 29 species of ascomycotina and 8 species of zygomycotina. Tidal zone of Khawr Al-Zubair supported a diverse species belonging to the genera *Alternaria* , *Aspergillus* (11 species for each),*Bipolaris* (8 species),*Chaetomium, Curvularia, Ulocladium* (7 species for each) , *Stachybotrys* (6 species)and *Exserohilum* (5 species). Eight species of marine fungi were isolated viz: *Camarosporium roumerguerii, Exserohilum rostratum, Leptosphaeria* sp., *Monodictys pelagica, Trichocladium constrictum, T. ochrasporum,Zalerion martimum* and *Z.varium*. There is apparently no characteristic fungal flora for tidal zone of Khawr Al-Zubair canal except for frequent isolation of some well known marine species.

1- Introduction

The study of mycobiota inhabiting sediments and soil in wetlands of Southern Iraq has received some attention recently (Abdullah and Abbas,1994a,b,1997,Abdullah and Hassan,1995, Abdullah et al.,2000) and revealed several novel and interesting taxa (Abdullah and Abbas,1994c; Abdullah and Al-Saadoon,1994a,b;Cannon *et al*. 1995; Sivanesan *et al.*,1993). Survey of the mycofora of similar habitats have been conducted in the area near Iraq (Moustafa,1975, Moustafa and Sharkas,1982, Moustafa *et al*.1976). The purpose of this work is to survey the mycobiota inhabiting the mud and soil of the tidal zone of Khawr Al-Zubair canal, Southern Iraq.

Key words: marine fungi, tidal zone, soil fungi, Iraq

2- Materials and Methods

Area of study: Khawr Al-Zubair is an estuarine/lagoonal environment situated at the head of the Arabian Gulf, 30 km South-Southeast of Basrah (30 12 N, 47 54 E). The total length of the canal is about 40 km from the lower boundary at the head of the Gulf to its Northern end at the connection with the artificial canal (Shatt Al-Basrah canal). The later canal was constructed at 1980 to connect directly Khawr Al-Zubair with Eastern end of Khawr Al-Hammar marsh, near its discharge into the Shatt Al-Arab River. The length of Shatt Al-Basrah canal is about 37 km. Khawr Al-Zubair receives freshwater inflow from the Shatt Al-Basrah canal. The freshwater discharge is controlled by a dam built at a distance of 1.5 km from the upper reaches of Khawr Al-Zubair (Al-Ramadhan,1987). Large area of intertidal mudflats are exposed at low tide and tidal amplitude is likely to be more than 3 m (Scott,1995). The environment of Khawr Al-Zubair canal was considered as a lagoonal or as a "negative esuary" before its connection with Shatt Al-Basrah canal. The salinity was as high as 47% in summer months (Emery and Stevenson,1957). After the opening of the Shatt Al-Basrah canal in 1983, the environment of Khawr Al-Zubair has been changed and considered as a positively esuarine environment and a longitudinal salinity gradient is well developed (Al-Ramadhan,1987). In addition, since 1992, " the Third River" canal which receives saline water from irrigated land via drainage canals and discharge this waste water into the Shatt Al-Basrah and hence into the Khawr. The impact of these developments on Khawr Al-Zubair and its wildlife is not known (Evans,1994).

Sample collection: Ninty nine soil or mud samples (500 g each) were collected during the period July 2000 –November,2001 from 33 sites in the tidal zone of Khawr Al-Zubair canal. Each site is divided into 3 sectors. Sector A: represents the area constantly flooded with water even at low tide. Sector B: represents the area covered by water during high tide. Sector C:represents the area where not reached by water even at high tide. Samples were stored in poluthene bags at 5 C and were processed within 1-2 days. The vegetation along the shoreline is dominated by *Arundo donax, Phragmitis australis, Juncus* sp., *Salicornia* sp., and *Suaeda* sp.

Isolation of fungi: Four isolation methods were applied, standared dilution plate (Johnson et al.1959), direct plating (Warcup,1950), treatment with 7% ethanol (Warcup and Baker,1963) and soil treatment with 5% acetic acid (Furuya and Naito,1979).

Five types of growth media were used for isolation of fungi viz: potato carrot agar (20 g peeled potatoes, 20 g carrot, 20 g agar, 1L distilled water), malt extract agar (Macknur, Canada), potato dextrose agar (200 g peeled potatoes, dextrose 20 g; agar 20 g ;1L distilled water). Czapecks dox agar (Difco. U.S.A) and sea-water glucose yeast extract agar (Johnson and Sparrow, 1961) (glucose 1 g; yeast extract 0.1 g; agar 18 g, IL aged sea water). Each medium was supplemented with 50 ug/ml chloramphenicol (SDI, Iraq) to suppress

bacterial growth. Plates for all methods and media (three replicates each) were incubated at 25 C in the dark. Single colonies were picked from the plates under a dissecting microscope and transferred to appropriate media to allow fungus development. The following publications were used for identification of fungi: Ahmed and Cain (1972); Arx et al.,(1986,1988); Currah(1985); Domsch et al.(1980); Ellis (1971,1976), Goos (1985); de Hoog and Guarro (1995); Horie (1980), Klich and Pitt (1980); Kohlmeyer and Kohlmeyer (1979), Kohlmeyer and Volkman-Kohlmeyer (1991), Matsushima (1975), Moustaffa and Ezz-Eldin (1989), O Donnel (1979), Pitt and Hocking (1997) and Sivanesan (1987),

3- Results

One hundred and forty seven species representing 61 genera were isolated from 99 soil and mud samples collected from different distances from the water edge in 33 sites along the shoreline of Khawr Al-Zubair canal. Their frequency of occurrence is presented in Table 1. The isolates were assigned to 107 species in 36 genera of mitosporic fungi, 29 species in 20 genera of ascomycetes and 8 species in 6 genera of zygomycetea. The highest number of fungal species (117 species) were isolated from sector B against 101 and 104 species detected from sectors A and C respectively.

Seventy two species were found common to the three sectors in each thirty three sites. *Acremonium kiliense, Aspergillus nidulans, Aurobasidium pullulans, Bipolaris clavata, Trichocladium constrictum, Trichoderma hamata, Exserohilum rostratum, Kernia nitida* were only detected from sector A, whereas, *Alternaria cheiranthi, Bipolaris indica, Chrysosporium* sp., *Curvularia lunata* var. *aria, C. pallescens, C. portuberata, C. verruculosa, Exserohilum sorgicola, Humicola grisea, Leptosphaeria* sp., *Mammaria echinobotryoides, Microascus senegalensis, Preussia nigra, Pseudoeurotium zonatum,*and *Scopulariopsis flava* were isolated from soil at sector B. Eleven species viz: *Curvularia eragrostidis, Exserohilum gedarefense, Monodictys putredinis, Neocosmospora vasinfecta, Nigrospora oryzae, Scopulariopsis asperula, S.fusca, Stemphylium botryosum, Thielavia terricola* and *Ulocladium tuberculatum* were detected from sector C.

Ten species were showed the highest frequency of occurrence (listed in decreasing order): *Aspergillus terreus, A.niger, Stachybotrys atra, Alternaria alternate, Aspergillus flavus, A. fumigatus, Penicillium glabrum, Trichoderma harzianum, Ulocladium atrum* and *U. chatarum* (Table 1).

Alternaria and *Aspergillus* were represented by 11 species for each and thus showed the widest diversity among all recovered genera. *Alternaria alternate* was the most frequent species among the genus. *Aspergillus terreus* and *A. niger* were the most frequent species within the genus with 81.81% and 78.78% frequencies of occurrence respectively.. *Bipolaris* was second in the number of species isolated and was represented Emericellopsisby 8 species, but generally with low frequency of occurrence. Four genera of dematiaceous

hyphomycetes viz: *Curvularia, , Ulocladium(7 species each) , Stachybotrys (6 species) and Exserohilum (5 species)* were showed wide diversity. Generally species of *Curvulaaria* and *Exserohilum* occurred at low frequencies. *Stachybotrys atra* was the most frequent species among the genus occurring in 72.72%. Among *Ulocladium* species, *U. atrum* and *U. chartarum* were the most common with 36.36% frequency of occurrence each (Table 1).

Zygomycetes were represented by six genera viz: *Absidia* (1 species), *Circinella* (1 speies),Cuninghamella (1 species), *Mucor* (3 species), *Rhizopus* (1 species) and *Saksenea* (1 species). *Rhizopus stolonifer* showed the highest frequency of occurrence (33.33%) among the species of the group (Table 1).

Twenty nine species of ascomycetes assigned to 20 genera were encountered in this survey (Table 1). Among these *Chaetomium globosum* and *Emericella nidulans* var. *nidulans* were the most common with 30.30% frequency of occurrence each. Most of the remaining species showed very law occurrence. *Aschotricha bosei*, *Kerenia nitida* , *Leptosphaeria* sp., *Microascus senegalensis, Myxotrichum stipitatum, Neocosmospora vasinfecta, Preussia nigra, Pseudoeurotium zonatum* were encountered in one sample.

Four species of *Fusarium* were identified. Among these, *F. oxysporum* and *F. moniliforme* were the most common with 24.24% and 18.18% frequencies of occurrence respectively.

Penicillium was represented by 3 species. *Penicillium glabrum* (=*P. frequentans*) was the most frequent of those species occurring in 39.39% of the cases (Table 1).

Eight species of marine fungi were isolated viz: *Camarosporium roumerguerii*, *Exserohilum rostratum* (= *Drechslera halodes*), *Leptosphaeria* sp., *Monodictys pelagica*, *Trichocladium ochrasporum, T. constrictum, Zalerion maritimum* and *Z. varium.*

Table 1. List of fungi isolated from tidal zone soil of Khawr Al-Zubair canal and their Percentage frequency of occurrence.

Fungi	Frequency% in sector		
	A	B	C
Absidia corymbifera (Cohn)Sacc.&Trotter	3.03	3.03	0.0
Acremonium kiliense Grutz	3.03	0.0	0.0
A. strictum W.Gams	12.12	24.24	24.24
Alternaria alternata (Fr.)Keissler	39.39	54.54	48.48
A. citri Ellis&Pierce	24.24	27.27	36.36
A. cheiranthi (Lib.)Bolle	0.0	3.03	`0.0
A. chlamydospora Mouch.	12.12	27.27	24.24
A. dianthi Sterens&Hall	15.15	12.12	15.15

Fungi	Frequency% in sector		
	A	**B**	**C**
A. longipes (Ellis&Everh.)Mason	0.0	9.09	3.03
A.phragmaspora Van Emden	6.06	9.09	6.06
A. pluriseptata (Karst.&Har)Jorstad	15.15	18.18	6.06
A. raphani Groves&Skolko	6.06	15.15	0.0
A. radicina Meier,Drechsler&Eddy	9.09	6.06	3.03
A. tenuissima (kunz)Wiltshire	12.12	3.03	3.03
Aschotricha bosei Hawks.	0.0	0.0	3.03
Aspergillus candidus Link	15.15	12.12	18.18
A. clavatus Desm.	0.0	0.0	3.03
A.flavus Link	48.48	51.51	51.51
A. fumigatus Fres.	42.42	51.51	48.48
A. nidulans (Eidam)Vuill	6.06	0.0	0.0
A. niger Van Tieghem	69.69	78.78	44.48
A. niveus Blochwitz	6.06	6.06	9.09
A. ochraceus Wilhelm	9.09	6.06	3.03
A. terreus Thom	69.69	69.69	81.81
A. versicolor (vuill.)Tiraboschi	3.03	3.03	0.0
A. wentii Wemer	0.0	15.15	3.03
Aurobasidium pullunas (De Bary)Arnaud	3.03	0.0	0.0
Bipolaris australiensis (Ellis)Tsuda&Ueyama	6.06	9.09	3.03
B. clavata Alcorn	3.03	0.0	0.0
B. ellisii (Danquah)Alcorn	0.0	0.0	3.03
B. hawaiiensis (Ellis)Uchida&Aragaki	6.06	15.15	3.03
B. indica Rai,Wadhwani&Tewari	0.0	6.06	0.0
B. neerrgaardii (Danquah)Alcorn	0.0	3.03	6.06
B. papendorfii (Van der Aa)Alcorn	3.03	3.03	0.0
B. spicifera (Bainier)Subram	12.12	12.12	12.12
Camarosporium roumeguerii Sacc.	3.03	0.0	3.03
Cephaliophora irregularis Thaxter	15.15	9.09	9.09
Chaetomium atrobrunneum Ames	21.21	12.12	12.12
C. aureum Chivers	0.0	9.09	3.03
C. bostrychodes Zopf	12.12	18.18	12.12
C. globosum Kunz	21.21	30.30	27.27

Fungi	Frequency% in sector		
	A	**B**	**C**
C. elatum Kunz	3.03	9.09	6.06
C. murorum Corda	21.21	24.24	15.15
C. pilluliferum Daniels	0.0	3.03	9.09
Chrysosporium sp.	0.0	3.03	0.0
Circinella umbellata Van Tieghem&Le Monnier	6.06	15.15	6.06
Cladosporium cladosporioides (Fresen.)de Vries	18.18	15.15	24.24
C. herbarum (Pers.)Link	6.06	3.03	9.09
Cunninghamela echinulata (Thaxter)Thaxter	6.06	9.09	6.06
Curvularia eragrostidis (henn.)Meyer	0.0	0.0	3.03
C. lunata (Walker)Boedijin	9.09	12.12	6.06
C. lunata var.*aeria*(Batista,Lima&Vasconcelos)Ellis	0.0	3.03	0.0
C. pallescens Boedijn	0.0	3.03	0.0
C. protuberata Nelson&Hodges	0.0	3.03	0.0
C. tuberculata Jain	6.06	3.03	6.06
C. verruculosa Tondon&Bilgrami	0.0	3.03	0.0
Doratomyces microsporus (Sacc)Morton&Smith	6.06	9.09	5.15
Emericella nidulans var. echinulata(Fennel&Raper)Godeas	3.03	6.06	0.0
E. nidulans var.*nidulans* (Eidam)Vuill	27.27	30.30	21.21
E. variecolor var variecolor Berk&Br.	3.03	3.03	0.0
Eupenicillium zonatum Hodge&Perry	0.0	3.03	3.03
Eurotium chevalieri Mangin	6.06	9.09	6.06
Exserohilum gedarefense (El Shafie)Alcorn	0.0	0.0	3.03
E. holmi (Luttr.)Leonard&suggs	3.03	9.03	6.06
E.pedicellatum (Henry)Leonard&Suggs	6.06	6.06	3.03
E. rostratum(Drechsler)Leonard &Suggs	3.03	15.15	6.06
E. sorghicola Sivanesan	0.0	3.03	0.0
Fusarium chlamydosprum wollenw&Reink	3.03	0.0	0.0
F. oxysporum Schlecht	9.09	12.12	24.24
F. moniliforme Sheld	3.03	18.18	15.15
F. solani (Mart.)Sacc.	0.0	3.03	12.12
Geotrichum candidum Link	12.12	12.12	3.03
G. multiporosa Moustafa&Ezz-Eldin	0.0	0.0	3.03
Graphium penicillioides Corda	6.06	3.03	3.03

Fungi	Frequency% in sector		
	A	**B**	**C**
Gymnascella dankaliensis (Castellani)Currah	3.03	6.06	3.03
Humicola fuscoatra Traaen	3.03	6.06	3.03
Gilmaniella humicola Barron	3.03	0.0	3.03
H. grisea Traaen	0.0	3.03	0.0
Kernia nitida (Sacc.)Nieuwland	3.03	0.0	0.0
Leptosphaeria sp.	0.0	3.03	0.0
Lophotrichus ampullus Benjamin	3.03	3.03	3.03
Mammaria echinobotryoides Ces	0.0	3.03	0.0
Melanospora fallax Zukal	0.0	6.03	3.03
Microascus senegalensis Von Arx	0.0	6.06	0.0
M. trigonosporus Emmons&Dodge	3.03	6.06	6.06
Monodictys fluctuata (Tandon&Bilgrami)Ellis	9.09	9.09	18.18
M. pelagica (Johnson)Jones	27.27	12.12	24.24
M. putredinis (Wallr.)Hughes	0.0	0.0	3.03
Mucor circinelloides Van Tieghem	15.15	21.21	21.21
M. hiemalis Wehmer	18.18	18.18	0.0
M. luteus Linneman	0.0	6.06	6.06
Myxotrichum stipitatum (lindfors)Orr	3.03	0.0	0.0
Neocosmospora vasinfecta Smith	0.0	0.0	3.03
Neosartorya fischeri (wehmer)Malloch&Cain	3.03	9.09	0.0
Nigrospora oryzae (Berk&Br.)Petch	0.0	0.0	3.03
Paecilomyces marquandii (Massee)Hughes	0.0	3.03	6.06
P. variotii Bainier	3.03	0.0	0.0
Papulaspora immerse Hoston	9.09	6.06	9.09
Penicillium chrysogenum Thom	6.06	12.12	12.12
P. glabrum (wehmer)Westling	30.30	12.12	39.39
P. notatum Westling	3.03	24.24	18.18
Phoma leveillei Boerrema&Bollen	6.06	15.15	9.09
P. glomerata (Corda)Wollenw&Hochepfel	6.06	12.12	21.21
Preussia nigra (Routien)Cain	0.0	3.03	0.0
Pseudoeurotium zonatum Beyma	0.0	3.03	0.0
Rhizopus stolinifer (Eghrenb)Vuillemin	33.33	30.30	15.15
Scopulariopsis acremonium (Delacr.)Vuill	9.09	0.0	3.03

Fungi	Frequency% in sector		
	A	**B**	**C**
S. asperula (Sacc.)Hughes	0.0	0.0	3.03
S. brevicaulis(Sacc.)Bainier	3.03	6.06	0.0
Saksenaea vasiformis Saksena	0.0	3.03	6.06
S. flava Zach	0.0	0.0	3.03
Scytalidium lignicola Pesante	3.03	3.03	3.03
*S.*state of *Hendersonula toruloidea* Nattrass	3.03	15.15	0.0
Sepedonium niveum Massee&Salmon	15.15	12.12	18.18
Sordaria fimicola(Rob.)Ces.&de Not.	0.0	3.03	3.03
Sporormiella minimoides Ahmed&Cain	12.12	6.06	6.06
Stachybotrys atra Corda	54.54	72.72	57.57
S. atra var.*microspora* Mathur&Sankhla	0.0	0.0	6.06
S. cylindrospora Jensen	12.12	12.12	15.15
S. dichroa Groves	3.03	12.12	0.0
S. elegans (Pidopl.)W.Gams	12.12	24.24	24.24
S. state of *Melanopsamma pomiformis* (Pers.)Sacc.	9.09	27.27	18.18
Stemphylium botryosum Wallr.	0.0	0.0	9.09
S. state of *Pleospora herbarum* (Pers.)Rabenh	6.06	0.0	6.06
S. vesicarium (Wallr.)Simmons	0.0	303	0.0
Talaramyces flavus (Klocker)Stolk&Samson	9.09	6.06	3.03
Thermomyces lanuginosus Tsiklinsky	0.0	303	0.0
Thielavia terricola (Gilman&Abbott)Emmons	0.0	0.0	303
Torula herbarum Pers.	0.0	303	0.0
Trichocladium constrictum Schmidt	12.12	0.0	0.0
T. ochrasporum (Meyers&Moore)Dixon	12.12	15.15	12.12
Trichoderma hamatum (Bond)Bain	6.06	0.0	0.0
T. harzianum Rifai	30.30	39.39	27.27
T. koningii Oudem	12.12	6.06	0.0
T. viride Pers.	12.12	24.24	6.06
Ulocladium alternaria (Cooke)Simmons	24.24	27.27	24.24
U. atrum Preuss	33.33	36.36	18.18
U. botrytis Preuss	27.27	27.27	3.03
U. chartarum (Fr.)Simmons	36.36	30.30	21.21
U. consortiale (Thum)Simmons	9.09	18.18	9.09

Fungi	Frequency% in sector		
	A	**B**	**C**
U. oudemansii Simmons	0.0	3.03	6.06
U. tuberculatum Simmons	0.0	0.0	3.03
Zalerion maritimum(Linder)Anastasiou	15.15	12.12	9.09
Z. varium Anastasiou	3.03	6.06	0.0

4- Discussion

The present study showed that about 70 percent of species are melanic i.e they possess darkly pigmented mycelia and or spores. The dematiaceous genera reported during this survey showing high species diversity were *Alternaria* (11 species), *Bipolaris* (8 species), *Curvularia* (7 species), *Exserohilum* (5 species). *Stachybotrys* (6 species), and *Ulocladium* (7 species). Steiman et al.(1997) working on soil from the Dead Sea oases of Ein Gedi and Enot Zugin reported similar high species diversity for *Alternaria* (7 species), *Bipolaris* (3 species), *Curvularia* (6 species), *Stachybotrys* (2 species) and *Ulocladium* (6 species). In Kuwait, Moustafa (1974) isolated the genera *Alternaria* (5 species), *Ulocladium* (3 species),*Bipolaris* (2 species) and *Exserohilum* (1 species) from the salt marshes soils. It was suggested that darkly pigmented species were well adapted to withstand intense light radiation (Durrrell and Shields,1960; Ranzoni,1968). In a previous study, Abdullah and Al-Bader (1990) attributed the high diversity among darkly pigmented species in the Iraqi soil due to the fact that Iraq is considered as one of the geographic area receiving the highest incidence of solar radiation in the Northern hemisphere (Thalen,1979).

The number of the recovered species of ascomycetes (29 species) from soil at Khawr Al-Zubair shoreline is more or less similar to that found in soil around the Dead Sea (31 species) (Steiman et al.1997). The detection of higher number of ascomycetes in the present study was expected, perhaps because of the methods used (acetic acid and ethanol) stimulate ascospore germination or pasteurize species with thin walled conidia (Asina and Cain,1977; Bills and Polishook,1993; Furaya and Naito,1979; Warcup and Baker,1960). However, the two sites showed differences in their generic and species composition. For example in the soil around Dead Sea, the genera *Eurotium* and *Microascus* showed higher diversity (6 and 5 species respectively) than the Khawr Al-Zubair soil (1 and 2 species respectively). The ascomycete genera *Aschotricha, Gymnascella, Kerinia, Leptosphaeria, Lophotrichus, Melanospora, Myxotrichum, Neocosmospora, Neosartorya* and *Thielavia* were common to the soil at Khawr Al-Zubair but they were not detected from soil around Dead sea. On the contrary, the genera *Chaetomidium, Coniochaeta, Gymnoascus, Nadsonia, Podospora and*

Pseudogymnoascus were isolated from soil around Dead Sea, but not from Khawr Al-Zubair soil (Steiman et al.1995,1997). This may be attributed to the differences in isolation methods or isolation media and therefore, their absence from one or the other site can not be ruled out..

Aschotricha bosei, Kernia nitida, and *Thielavia terricola* were common in soil at both from Khawr Al-Zubair and similar habitat (tidal mud-flats and salt marshes) in Kuwait(El-Wahid et al.,1982; Moustafa,1974).

Of the eleven Aspergilli found in our study, *Aspergillus terreus, A. niger, A. flavus* and *A. fumigatus* were the major species in their frequency of occurrence. These species have been reported as the major components of mycobiota of arid and desert soil (Abdullah et al.1986, Halwagy et al.1982, Steiman et al.,1997).Moreover, they predominatly isolated from tidal mud-flats and salt marshes of Kuwait (El-Wahid et al.,1982, Moustafa,1974) mangrove mud in Okinawa, Japan (Ito and Nakagiri,1997) and mangrove forest soil in Thialand (Ito et al.2001).

Among the three species of Penicilli detected in our study, *A. glabrum* (=*P. frequentans* Westling) was the only species with high frequency of isolation (39.39%). During the study of El-Wahid et al., (1982) to distinguish between species present in the active vegetative phase and other in the dormant spore phase in tidal mud-flats of Kuwait, *Penicillium glabrum* assigned to the group of fungi comprised species that most probably occur in active vegetative phase and therefore may be regarded as true mud inhabitant.

A notable result during our survey was the isolation of eight species of marine fungi. Among the isolated species, only *Exserohilum rostratum* and *Monodictys pelagica* were frequently encountered from soil or sediment in estuarine or marine habitat (Kohlmeyer and Kohlmeyer,1979). However, the majority of the rest species are mostly found colonizing halophytes along the tidal zone, salt marshe plants or drifted plant materials in the sea water. Therefore, their isolation is probably due to the disintegration of these plant materials in coastal soil. Introducing of the sea water glucose yeast extract agar (Johnson and Sparrow,1961) as a growth medium in our survey, may enhanced their propagules to grow on this medium

In a conclusion, the mycobiota of the tidal zone of khawr Al-Zubair is similar to those found in arid regions and there is appearently no characteristic fungal flora for tidal zone of Khawr Al-Zubair canal except for frequent isolation of some well known marine species.

5- References

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الفطريات الموجودة في منطقة المد في سواحل خور الزبير جنوب العراق

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الخلاصة

تم اجراء مسح للفطريات الخيطية الدقيقة الموجودة في ترب وطين منطقة المد في سواحل خور الزبير جنوب العراق. وقد تم تشخيص 144 نوع تعود الى 61 جنساً في 99 عينة جمعت من مسافات مختلفة من حافة المياه وكانت الانواع موزعة على مجاميع فطرية مختلفة منها 107 نوع من الفطريات السبورية الخيطية و 29 نوع من الفطريات الكيسية و 8 انواع من الفطريات اللاقحية. وتمتاز سواحل خور الزبير بوجود انواع مختلفة احدى عشر منها تعود لكل من الجنسين *Alternaria* و *Aspergillus* وثمانية للجنس *Bipolaris* وسبعة لكل من الاجناس *Chaetomium* و *Curvulavia* و *Ulocladium* وستة للجنس *Stachybotrys* وخمسة للجنس *Exserohilum* وقد تم عزل ثمانية انواع من الفطريات البحرية التي هي *Camarosporium roumerguerii* ، *Exserohilum rostratum* ، *Leptosphaeria* sp ، *Monodictys pelagica* ، *Trichocladium constrictum* ، *T. ochrasporum* ، *Zalerion martimum* و *Z. varium* ويبدو عدم وجود انواع مميزة من الفطريات لمنطقة المد في خور الزبير.