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Glycophilic and Cellulose-decomposing Fungi from Soils of Sinai Peninsula, Egypt

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ABSTRACT. 122 species belonging to 36 genera were collected from 100 soil samples on glucose-Czapek's agar at 28°C. The most frequent species were *Aspergillus niger*, *A. fumigatus* and *A. terreus* followed by *A. flavus*, *A. nidulans*, *Penicillium chrysogenum* and *Fusarium solani*.

On cellulose-Czapek's agar at 28°C, 30 genera and 102 species were isolated. The most frequent species were *A. fumigatus*, *A. terreus* and *A. niger* followed by *A. nidulans*, *A. flavus* var. *columnaris*, *A. flavus*, *P. chrysogenum*, *F. solani*, *Chaetomium globosum*, *Stachybotrys atra* and *Botryotrichum atrogriseum*.

In Egypt, there have been many surveys of soil fungi, but most of them were focused on glycophilic fungi from agricultural soils from the Delta area and Upper Egypt (Sabet 1935, Moubasher and El-Dohlob 1970, Moubasher and Moustafa 1970, Moubasher and Mazen 1972 and Moubasher and Abdel-Hafez 1978), as well as from sand dunes of the coastal areas of the Mediterranean sea (Salma *et al.* 1971) and from soils of Wadi-Hof (Ali *et al.* 1975) and Wadi Bir-El-Ain (Moubasher *et al.* 1985). Survey of cellulose-decomposing fungi from soils or other sources were made in this laboratory (Abdel-Hafez *et al.* 1978, Abdel-Hafez and Abdel-Kader 1980 and Moubasher *et al.* 1985), but none of these studies were focused on Sinai Peninsula soils. Hence, the present investigation was conducted to study the composition, numbers and frequency of occurrence of both glycophilic and cellulose-decomposing fungi in the soils of Sinai Peninsula.

Materials and Methods

100 soil samples were collected from different localities of Sinai Peninsula (Fig. 1) according to the method described by Johnson *et al.* (1959).

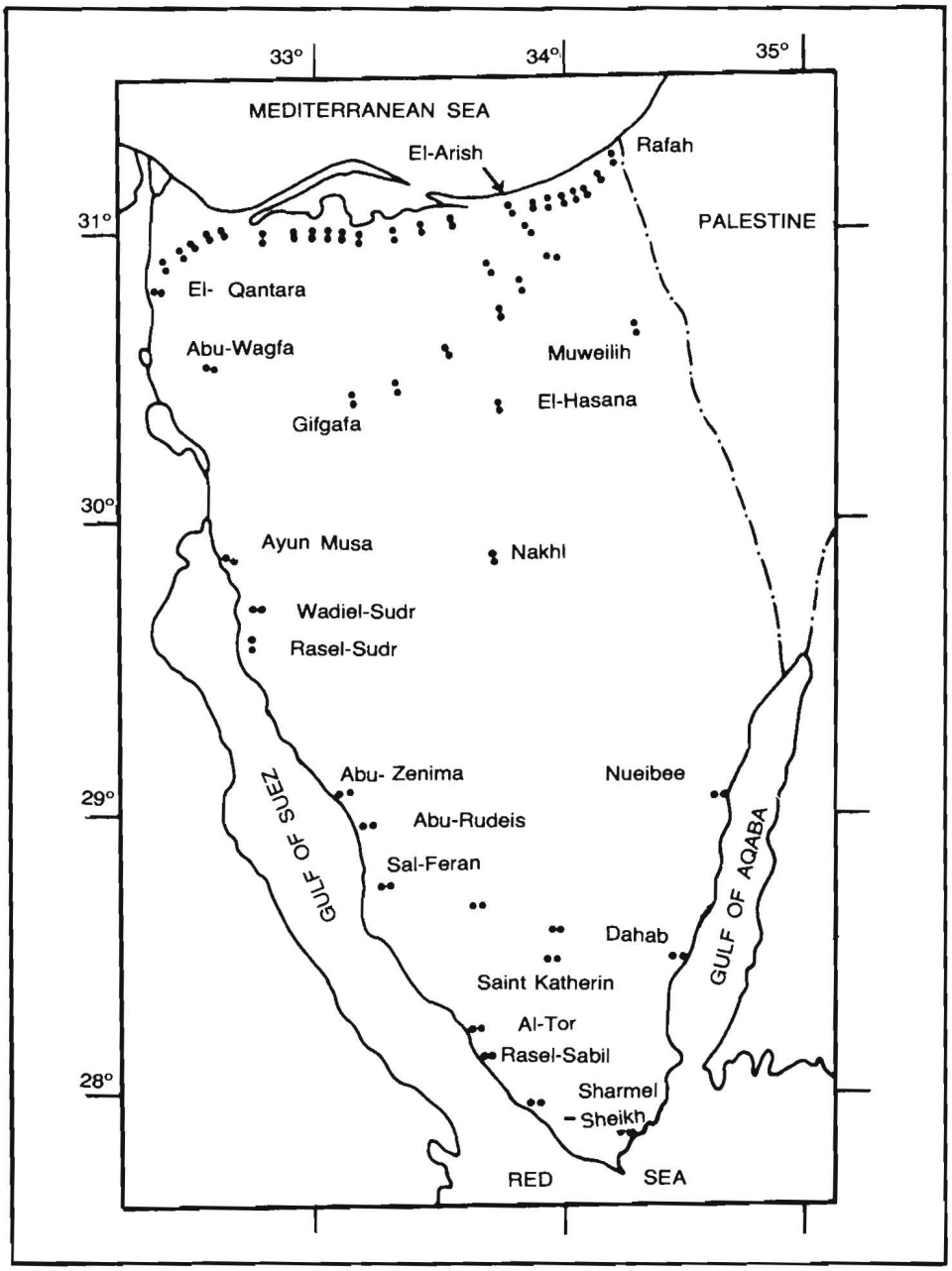

Fig. 1. A map showing the different places of Sinai Peninsula from which the soil samples were collected.

Chemical analysis of soil samples

1. Total soluble salts

For the estimation of total soluble salts, a known weight of soil was shaken in a known volume of distilled water for about 30 minutes and the mixture was left overnight settle. The soil extract was then filtered and a known volume was evaporated in an oven at 105°C. The dry residue was then weighed and the amount of total soluble salts per one g oven-dry soil was calculated (Jackson 1958).

2. Organic matter content

It was determined by Walkely and Black method (Jackson 1958). A certain amount of soil was digested by chromic acid (for oxidation of organic matter to carbon dioxide) and the excess chromic acid was bak-titrated against standard ferrous sulphate solution using diphenylamine as an indicator.

3. Determination of elements

a) Calcium (Ca^{+2}) and magnesium (Mg^{+2}) determination

The versene (disodium dihydrogen ethylenediamine tetra-acetic acid) titration method (Schwarzenbech and Biederman 1948) was employed for Ca and Ca + Mg determination.

b) Sodium (Na^{+}) and potassium (K^{+}) determination

Since the flame emission technique is a rapid and sensitive method for the determination of cations such as sodium and potassium, flame photometer method (Williams and Twine 1960) using Carl Zeiss flame photometer was used.

4. pH value

A pH-meter was used for the determination of soil pH. The electrodes were immersed in the soil paste with a ratio 1:1 to avoid the error arising through higher dilutions (Jackson 1958).

5. Determination of soil type

The soil type was determined by the hydrometer method as described by Piper (1955).

Estimation of soil fungi

The dilution-plate method as described by Johnson *et al.* (1959) was used for estimation of soil fungi. Modified Czapek Dox agar medium (g/litre; glucose 10.0

or powder cellulose 20.0, sodium nitrate 3.0, magnesium sulfate 0.5, potassium chloride 0.5, iron (11) sulfate 0.01, di-potassium hydrogen phosphate 1.0, agar-agar 15) in which glucose or powder cellulose replaced sucrose (30 g/L) were used for the isolation of glycophilic and cellulose-decomposing fungi, respectively (Abdel-Hafez *et al.* 1978, Moubasher and Abdel-Hafez 1978). To these media rose bengal (1/30000) and streptomycin (0.04 mg/ml) were applied to suppress bacterial growth. Before adding to the medium, rose bengal and streptomycin were dissolved separately in sterile distilled water and saline solution aspectically, respectively. Ten plates (five plates for each medium) were used for each soil sample. The plates were incubated at 28°C for 5-7 days during which the developing fungi were counted, identified (purely morphological, based on macro- and microscopic characters) and calculated per mg dry soil.

For thhe identification of fungal species the following references were used: Morton and Smith (1963), Raper and Fennell (1965), Simmons (1967), Booth (1971), Ellis (1971), Pitt (1979), Domsch *et al.* (1980), Ramirez (1982), Sivanesan (1984) and several others.

Results and Discussion

The chemical analysis of the soil samples tested revealed that they were generally poor in organic matter ranging between 0.08-2.14% and their total soluble salt content ranged widely between 0.1-18.1%, in Ca: 0.01-2.15 mg, Mg: 0.01-0.63 mg, K: 0.01-0.49 mg, and Na: 0.01-2.19 mg/g dry soil. Moubasher and Abdel-Hafez (1978) found that the amount of organic matter and total soluble salts in cultivated soils collected from Upper Egypt and the Delta area were 0.2-3.4% and 0.05-1.7%, respectively. The pH values of Sinai soils were slightly alkaline ranging between 7.1-8.7. This is almost in agreement with the results obtained previously from various soil samples which were collected from the coastal area of the Mediterranean, Red Sea shore, Oases, Delta area and Upper Egypt (Abdel-Fattah *et al.* 1977, El-Batanouny and Abo-Sitta 1977, Moubasher and Abdel-Hafez 1978, Abol-Nasr 1981). Soil sample textures were tested as follows: 67 sandy, 17 loamy-sand and 16 sandy-loam.

Glycophilic fungi (recovered on glucose-Czapek's agar at 28°C)

One hundred and twenty-two species and 8 varieties which belong to 36 genera were collected on glucose-Czapek's agar at 28°C (Table 1). The most frequent genera were *Aspergillus* (31 species + 8 varieties) and *Penicillium* (23 species) followed by *Fusarium* (6 species) and *Ulocladium* (7 species). They were encountered in 100%, 72%, 39% and 35% of the samples comprising 71.1%,

18%, 1.99% and 1.8% of total fungi, respectively. These three genera (*A.*, *P.* + *F.*) were also common in previous studies on Egyptian soils (Moubasher and El-Dohlob 1970, Moubasher and Moustafa 1970, Abdel-Fattah *et al.* 1977, Moubasher and Abdel-Hafez 1978 and Moubasher *et al.* 1985). Five genera were isolated in low frequency of occurrence and these were *Scopulariopsis* (5 species), *Mucor* (4 species), *Botryotrichum* (2 species), *Alternaria* (3 species) and *Torula* (2 species). They emerged in 13-20% of the samples comprising 0.5-1.1% of total fungi. The remaining genera were of rare frequency (Table 1).

Three species were commonly encountered: *Aspergillus niger* Van Tieghem, *Aspergillus fumigatus* Fresenius and *Aspergillus terreus* Thom. They occurred in 63-68% of the samples constituting 12.8-15.5% of total fungi. These species were also prevalent in cultivated, desert and saline soils collected from many parts of Egypt (Moubasher and Moustafa 1970, Ali *et al.* 1975, Abdel-Fattah *et al.* 1977, Moubasher and Abdel-Hafez 1978, and Moubasher *et al.* 1985). Four species were isolated less frequently; *Aspergillus flavus* Link, *Aspergillus nidulans* (Eidam) Wint., *Pinicillium chrysogenum* Thom and *Fusarium solani* (Mart.) Sacc. These species were also reported, but less frequently in Egyptian soils (Moubasher and Abdel-Hafez 1978, Moubasher *et al.* 1985). *Ulocladium atrum* Preuss, *Penicillium oxalicum* Currie & Thom, *Penicillium citrinum* Thom, *Penicillium funiculosum* Thom, *Aspergillus sydowii* (Bain. & Sart.) Thom & Church and *Botryotrichum atrogriseum* Van Beyma were recovered infrequently. The remaining 109 species and 8 varieties (Table 1) were isolated rarely (less than 13 cases out of 100).

Cellulose-decomposing fungi (recovered on cellulose-Czapek's agar at 28°C)

One hundred and 2 species belonging to 30 genera and 3 varieties of *Aspergillus nidulans* (Eidam) Wint. and 1 variety of each of *A. flavus* Link, *A. terreus* Thom and *Stachybotrys atra* Corda were isolated from 100 soil samples tested on cellulose-Czapek's agar at 28°C (Table 1).

The results obtained on cellulose agar plates were basically similar to those on glucose agar and the most frequent genera were *Aspergillus*, *Penicillium* and *Fusarium* followed by *Chaetomium*, *Stachybotrys* and *Ulocladium*. They were found in 100%, 72%, 53%, 38%, 37% and 30% of the samples comprising 61.6%, 13.8%, 6.04%, 7.9%, 3.3% and 2.1% of total cellulose-decomposing fungi, respectively. From the above genera the most common species were *Aspergillus fumigatus*, *A. terreus*, *A. niger*, *A. nidulans*, *A. flavus*, *Penicillium chrysogenum*, *P. citrinum*, *Fusarium solani*, *F. oxysporum* Schlecht, *Chaetomium globosum* Kunze, *Stachybotrys atra* Corda, *Ulocladium atrum* Preuss and *U. tuberculatum* E. Simmons. These species were also isolated from soils and other substrata in Egypt and some Arab countries (Abdel-Hafez *et al.* 1978, Abdel-Hafez 1982,

Mazen *et al.* 1980, Abdel-Kader *et al.* 1983, Moubasher *et al.* 1985, Moubasher and Al-Sobahi 1986, Abdel-Hafez and Shoreit 1986). The remaining genera and species were less numerous (Table 1).

Comparison between the results obtained on the two media reveal the following aspects:

1. A narrower spectrum of genera and species were collected on cellulose-Czapek's agar (30 gener and 102 species +6 varieties) than with glucose agar (36 genera and 122 species + 8 varieties). This is reasonable since glucose is a more easily utilizable carbohydrates by fungi.

2. Thirty-nine species and 4 varieties of those recovered on glucose agar plates were not encountered on cellulose agar. Eighteen species and one variety of those recovered on cellulose were not isolated on glucose agar (Table 1), due to some fungal species were isolated only on cellulose agar plates and this in agreement with the results obtained by Abdel-Hafez *et al.* (1978).

3. Several fungi increased their frequency of occurrence on cellulose than on glucose agar such as *Chaetomium globosum* (from 4 to 38 samples), *Stachybotrys atra* (3 to 31), *A. flavus* var. *columnaris* (10 to 30), *Chaetomium globosum* (4 to 38), *A. versicolor* (9 to 20), *Fusarium oxysporum* (12 to 22), *P. chrysogenum* (25 to 33), *Ulocladium tuberculatum* (2 to 9) and *Humicola grisea* (3 to 8). This is almost in agreement with the results obtained by Abdel-Hafez *et al.* (1978), Mazen *et al.* (1980) and Moubasher *et al.* (1985).

On the other hand, most fungal species recovered on cellulose-Czapek's agar were reported to be cellulose-decomposing (Warcup 1951, Pugh *et al.* 1963, Flannigan 1970, Malik and Eggins 1970, Walsh and Stewart 1971, Stewart and Walsh 1972, Mazen 1973). It is worthmentioning that Mazen (1973) made an extensive survey of cellulolytic activity among Egyptian soil fungi (based on the percentage increase in the proteinic nitrogen of fungal mycelium of tested fungi grown in the cellulose-containing medium over the control value (in absence of cellulose) and classified them into five groups:

A) High cellulolytic activity; more than 200% increase of proteinic nitrogen of fungal mycelium over the control value, demonstrated by 17 species. The highest activity was demonstrated by *Aspergillus niger, Botryotrichum piluliferum, Fusarium solani, Gliocladium catenulatum, Humicola fuscoatra, Myrothecium roridum, Penicillium aurantiogriseum (=P. cyclopium), P. janthinellum, P. oxalicum, Stachybotrys atra* var. *microspora* and *Trichothecium roseum.*

B) Moderate cellulolytic activity; between 100-199% increase, demonstrated by 23 species including *Acremonium rutilum, Aspergillus fumigatus, A. nidulans, A. quadrilineatus, A. sydowii, A. terreus, Chaetomium globosum, Curvularia tuberculata, Macrophomina phaseolina, Monodictys castaneae, P. funiculosum, P. purpurogenum* and *Trichoderma viride.*

C) Low cellulolytic activity; between 50-99% increase, demonstrated by 19 species including *Alternaria alternata, Aspergillus flavus, A. ustus, A. versicolor, Cladosporium herbarum, Cochliobolus lunatus (=C. lunata), C. spicifer (=C. spicifera), Epicoccum nigrum (=E. purpurascens), Humicola grisea* and *Setosphaeria rostrata (=Drechslera halodes).*

D) Weak cellulolytic activity; less than 50% increase, demonstrated by 25 species including *Aspergillus carneus, A. egyptiacus, A. nidulans* var. *latus, A. tamarii, Fusarium moniliforme, Mucor hiemalis, Penicillium chrysogenum, P. citrinum, P. janczewskii (=P. nigricans)* and *Pleospora herbarum (=Stemphylium botryosum).*

E) No cellulolytic activity; which did not show any growth on cellulose, shown by 11 species of which *Aspergillus asperscens, A. caesiellus, A. clavato-nanica, A. candidus, A. rugulosus* and *Penicillium jensenii.*

Most of the species recovered in cellulose-Czapek's plates are among the cellulolytic fungi tested by Mazen (1973).

In conclusion, comparison between the lists of fungi recovered from Sinai soils with Delta area and River Nile Valley reveal that there is no fungal flora characteristic of Sinai Peninsula soils. But, the lists may differ in the order of frequency of some of the component fungi.

Table 1. Total counts (calculated per mg dry soil), number of cases of isolation (out of 100) and occurrence remarks of fungal genera and species recovered on glucose- and cellulose-Czapek's agar at 28°C

Genera and species	Glucose		Cellulose	
	TC	NCI & OR	TC	NCI & OR
Total count	442.2		390.8	
Aspergillus	314.4	100 H	240.6	100 H
A. niger Van Tieghem	56.7	68 H	15.4	52 H
A. fumigatus Fresenius	63.3	64 H	102.6	75 H
A. terreus Thom	68.6	63 H	36.6	55 H
A. flavus Link	38.0	35 M	13.0	26 M
A. nidulans (Eidam) Wint.	20.9	29 M	16.0	31 M
A. sydowii (Bain. & Sart.) Thom & Church	12.3	14 L	3.8	10 R
A. flavus var. *columnaris* Raper & Fennell	7.3	10 R	8.4	30 M
A. versicolor (Vuill.) Tirab.	7.3	9 R	9.9	20 L
A. melleus Yukawa	10.6	8 R	0.5	4 R
A. candidus Link	4.1	8 R	1.2	4 R
A. nidulans var. *dentatus* Sandhue & Sandhue	3.5	7 R	0.4	3 R
A. oryzae (Ahlb.) Cohn	1.6	7 R	0.3	1 R
A. parasiticus Speare	1.6	7 R	0.5	1 R
A. carneus (V. Tiegh.) Bloch.	1.2	7 R	2.1	5 R
A. ochraceus Wilhelm	1.1	7 R	3.6	8 R
A. nidulans var. *latus* Thom & Raper	0.9	7 R	1.2	7 R
A. flavipes (Bain. & Sart.) Thom & Church	2.0	6 R	2.7	7 R
A. ustus (Bain.) Thom & Church	0.7	5 R	0.8	4 R
A. terreus var. *aureus* Thom & Raper	0.6	5 R	1.6	6 R
A. tamarii Kita	1.0	4 R	1.6	6 R
A. niveus Blochwitz	2.2	3 R	0.8	3 R
A. amstelodami Thom & Church	1.4	3 R	0.5	2 R
A. chevalieri Thom & Church	1.3	3 R	1.2	2 R
A. clavatus Desmazieres	1.0	3 R	8.1	6 R
A. fumigatus var. *albus* Rai, Tewari & Agrawl	1.0	3 R	–	–
A. nidulans var. *acristatus* Fennell & Raper	1.0	3 R	0.8	3 R
A. quadrilineatus Thom & Raper	0.5	3 R	1.2	3 R
A. zonatus Kwon & Fennell	0.4	3 R	–	–
A. nidulans var. *echinulatus* Fennell & Raper	0.3	2 R	–	–
A. deflectus Fennell & Raper	0.2	2 R	–	–
A. terreus var. *africanus* Fennell & Raper	0.2	2 R	–	–
A. avenaceus Smith	0.6	1 R	0.4	2 R
A. egyptiacus Moub. & Mous.	0.3	1 R	0.3	1 R
A. repens (De Bary) Fischer	0.2	1 R	2.1	2 R
**A. alliaceus* Thom & Church	0.1	1 R	–	–

Table 1. (Contd.)

Genera and species	Glucose		Cellulose	
	TC	NCI & OR	TC	NCI & OR
A. sulphureus (Fres.) Thom & Church	0.1	1 R	0.1	1 R
A. terricola Marchal	0.1	1 R	–	–
A. violaceus Fennell & Raper	0.1	1 R	–	–
A. wentii Wehmer	0.1	1 R	0.3	2 R
A. ruber Thom & Church	–	–	0.9	6 R
A. rugulosus Thom & Raper	–	–	1.1	2 R
A. janus Raper & Thom	–	–	0.6	1 R
Penicillium	79.6	72 H	54.1	72 H
P. chrysogenum Thom	26.4	25 M	27.2	33 M
P. oxalicum Currie & Thom	12.6	16 L	1.4	8 R
P. citrinum Thom	18.4	15 L	12.0	19 L
P. funiculosum Thom	4.4	14 L	1.7	11 R
P. janczewskii Zaleski	4.0	9 R	2.7	10 R
P. glabrum (Wehmer) Westling	1.0	5 R	0.7	6 R
P. variabile Sopp	1.0	5 R	1.1	10 R
P. purpurogenum Stoll	1.1	4 R	0.3	3 R
P. rugulosum Thom	0.9	4 R	1.1	7 R
P. jensenii Zaleski	2.7	3 R	0.8	3 R
P. aurantiogriseum Dierckx	1.5	3 R	0.8	4 R
P. albidum Sopp	0.9	3 R	0.5	2 R
P. brevi-compactum Dierckx	0.8	3 R	–	–
P. corylophilum Dierckx	0.5	3 R	–	–
P. puberulum Bainier	0.9	3 R	0.4	3 R
P. janthinellum Biourge	0.3	2 R	1.0	5 R
P. roquefortii Thom	1.2	1 R	–	–
P. verruculosum Peyronel	0.3	1 R	1.3	4 R
P. thomii Maire	0.2	1 R	0.1	1 R
P. waksmanii Zaleski	0.2	1 R	0.1	1 R
P. asperum Shear	0.1	1 R	0.1	1 R
P. purpurescens Sopp	0.1	1 R	–	–
P. simplicissimum (Oud.) Thom	0.1	1 R	–	–
P. duclauxii Delacroix	–	–	0.8	2 R
Fusarium	8.8	39 M	23.6	53 H
F. solani (Mart.) Sacc.	4.6	25 M	11.9	31 M
F. oxysporum Schlecht	2.5	12 R	5.2	22 L
F. moniliforme Sheldon	0.9	7 R	4.0	8 R
F. equiseti (Corda) Sacc.	0.6	5 R	1.1	4 R
F. acuminatum Ellis & Everhart	0.1	1 R	–	–
F. tricinctum (Corda) Sacc.	0.1	1 R	0.2	1 R

Table 1. (Contd.)

Genera and species	Glucose		Cellulose	
	TC	NCI & OR	TC	NCI & OR
F. paltidoroseum (Cooke) Sacc.	–	–	1.0	3 R
F. culmorum (w.g. Sm.) Sacc.	–	–	0.2	2 R
Ulocladium	8.1	35 M	8.2	30 M
U. atrum Preuss	3.7	19 L	4.0	16 L
U. botrytis Preuss	1.8	10 R	–	–
U. alternariae (Cke) E. Simmons	1.5	6 R	0.3	3 R
U. consortiale (Thum) E. Simmons	0.4	4 R	1.3	4 R
U. chartarum (Preuss) E. Simmons	0.3	3 R	0.5	2 R
U. tuberculatum E. Simmons	0.3	2 R	2.0	9 R
U. oudemansii E. Simmons	0.1	1 R	–	–
U. septosporum (Preuss) E. Simmons	–	–	0.1	1 R
Mucors	4.7	28 M	0.3	2 R
M. hiemalis Wehmer	1.2	11 R	0.3	2 R
M. circinelloides Van Tieghem	0.4	3 R	–	–
M. racemosus Fresenius	0.2	2 R	–	–
M. globosus Fischer	0.1	1 R	–	–
Cunninghamella echinulata Thaxter	0.5	4 R	–	–
C. elegans Lendner	0.2	1 R	–	–
Rhizopus oryzae Went & Prinsen Geerlings	0.2	2 R	–	–
R. stolonifer Ehrenb. Lindt	0.2	2 R	–	–
Circinella simplex Van Tieghem	0.8	3 R	–	–
Syncephalastrum racemosum (Cohn) Schroeter	0.7	3 R	–	–
Absidia corymbifera (Cohn) Sacc. & A. Trott.	0.2	2 R	–	–
Scopulariopsis	4.0	20 L	1.7	6 R
S. candida (Gueg.) Vuillemin	1.9	11 R	1.1	3 R
S. brevicaulis (Sacc.) Bainier	1.0	4 R	0.4	2 R
**S. flava* (Sopp) Morton & g. Sm.	0.7	4 R	–	–
S. koningii (Oud.) Vuillemin	0.3	2 R	0.2	1 R
S. brumptii Salvanet-Duval	0.1	1 R	–	–
Botryotrichum	3.1	16 L	3.5	18 L
B. atrogriseum Van Beyma	2.8	14 L	2.9	15 L
B. piluliferum Saccardo & March.	0.3	2 R	0.6	4 R
Alternaria	2.2	14 L	2.1	14 L
A. alternata (Fries) Keissler	1.5	10 R	1.7	11 R
A. raphani Groves & Skolko	0.5	2 R	0.3	3 R
A. chlamydospora Mouchacca	0.2	2 R	0.1	1 R
Torula	2.8	13 L	0.3	3 R
T. graminis Desm.	2.2	11 R	0.2	2 R
T. herbarum (Pers.) Link ex Gray	0.6	4 R	0.1	1 R

Table 1. (Contd.)

Genera and species	Glucose		Cellulose	
	TC	NCI & OR	TC	NCI & OR
Cladosporium	1.7	10 R	0.1	1 R
C. cladosporioides (Fres.) de Vries	0.7	7 R	–	–
C. herbarum (Pers.) Link	0.4	4 R	0.1	1 R
**C. oxysporum* Berk. & M.A. Curt.	0.6	2 R	–	–
Paecilomyces	2.0	6 R	–	–
P. variotii Bainier	1.5	5 R	–	–
P. lilacinus (Thom) Samson	0.5	1 R	–	–
Humicola	0.8	5 R	3.1	11 R
H. grisea Traaen	0.6	3 R	2.3	8 R
H. brevis (Gilman & Abbott) Gilman	0.1	1 R	–	–
H. fuscoatra Traaen	0.1	1 R	0.8	4 R
Myrothecium	0.6	5 R	0.6	3 R
M. verrucaria (Alb. & Sch.) Dit.	0.5	4 R	0.1	1 R
M. roridum Tode	0.1	1 R	0.5	2 R
Acremonium	0.5	5 R	0.4	4 R
**A. rutilum* W. Gams	0.4	4 R	0.2	2 R
A. strictum W. Gams	0.1	1 R	0.1	1 R
**A. butyri* (Van Beyma) W. Gams	–	–	0.1	1 R
Chaetomium globosum Kunze	1.6	4 R	30.8	38 M
Stachybotrys	0.4	3 R	12.9	37 M
S. atra Corda	0.4	3 R	11.4	31 M
S. atra var. *microspora* Mathur & Sankhla	–	–	1.0	4 R
S. albipes (Berk. & Br.) Jong & Davis	–	–	0.3	2 R
S. kampalensis Mathur & Sankhla	–	–	0.1	1 R
S. state of *Melanopsamma pomiformis* (Pers) Sacc.	–	–	0.1	1 R
Phoma	1.4	4 R	0.6	2 R
P. glomerata (Corda) Wollen. & Hochap.	1.2	2 R	–	–
P. humicola Gilman & Abbott	0.2	2 R	0.6	2 R
Cochliobolus	0.3	2 R	0.5	4 R
C. spicifer Nelson	0.3	2 R	0.1	1 R
C. lunatus Nelson & Haasis	–	–	0.4	3 R
Curvularia tuberculata Jain	0.2	2 R	0.1	1 R
Monodictys	0.9	3 R	1.2	3 R
M. castaneae (Wallr.) S. Hughes	0.7	1 R	1.1	2 R
M. glauca (Cooke & Harkn.) Hughes	0.1	1 R	–	–
**M. paradoxa* (Corda) Hughes	0.1	1 R	0.1	1 R
Sporotrichum	0.9	3 R	–	–
S. roseulum Oudemans & Beijerinck	0.8	2 R	–	–
S. olivaceum Fries	0.1	1 R	–	–

Table 1. (Contd.)

Genera and species	Glucose		Cellulose	
	TC	NCI & OR	TC	NCI & OR
Pleospora herbarum (Pers.) Rabenh. exces. & de Not.	0.8	2 R	0.3	2 R
Setosphaeria rostrata Leonard	0.5	2 R	0.3	2 R
Drechslera australiensis (Bug.) Subram. & Jain	0.5	2 R	–	–
Macrophomina phaseolina (Tassi) Goid.	–	–	2.8	8 R
Trichoderma viride Pers.	0.3	2 R	0.7	3 R
Trichothecium roseum (Pers.) Link	0.2	2 R	0.1	1 R
Gliocladium catenulatum Gilman & Abbott	0.1	1 R	0.7	3 R
**Acrodictys bambusicola* M.B. Ellis	0.1	1 R	–	–
**Diplococcum* state of *Helianthosphaeria clavarium* (Tul.) Fuckel	0.1	1 R	–	–
**Pestalotia pezizoides* de Not.	0.1	1 R	–	–
Apicoria chrysosperma (Tul.) Syd.	–	–	0.2	2 R
Verticillium puniceum Cooke & Ellis	–	–	0.2	2 R
Epicoccum nigrum Link	–	–	0.2	1 R
Geotrichum candidum Link	–	–	0.2	1 R
Cylindrocarpon lichenicola (G. Mass.) Hawksw.	–	–	0.1	1 R
Mycelia sterilia (White & dark colour)	0.5	3 R	0.3	3 R

* New records to Mycological Laboratory, Botany Department, University of Assiut, Assiut.
TC = Total count (per mg dry soil).
NCI = Number of cases of isolation (out of 100).
OR = Occurrence remarks:
H = High occurrence, more than 49 cases (out of 100).
M = Moderate occurrence, between 25-49 cases.
L = Low occurrence, between 13-24 cases.
R = Rare occurrence, less than 13 cases.

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الفطريات الجليكوفيلية والمحللة للسيليلوز من تربة شبه جزيرة سيناء في مصر

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يهدف هذا البحث إلى التعرف على الفطريات الجليكوفيلية والمحللة للسيليلوز في ١٠٠ عينة تربة جمعت من مناطق مختلفة من شبه جزيرة سيناء بمصر. وبالتحليل الكيميائي للتربة وجد أنها فقيرة بمحتواها من المادة العضوية (٠,٠٨ ـ ٢,١٤٪ من الوزن الجاف للتربة)، بينما محتواها من الأملاح تفاوتت بدرجات كبيرة (٠,١ ـ ١٨,١٪). ووجد أن الرقم الهيدروجيني لعينات التربة يتراوح بين ٧,١ ـ ٨,٧.

تم جمع ١٢٢ نوعاً فطرياً تنتمي إلى ٣٦ جنساً من عينات التربة المختبرة وذلك على الوسط الغذائي جلوكوز شابكس آجار والتحضين عند ٢٨°م. وكانت أكثر الأجناس الفطرية تعداداً وانتشاراً هي فطر اسبيرجيلس (٣١ نوعاً + ٨ أصناف)، بنيسيليوم (٢٣ نوعاً)، فيوزاريوم (٦ أنواع) ويولوكليديم (٧ أنواع). وكانت أكثر الأنواع الفطرية انتشاراً وشيوعاً هي فطر اسبيرجيلس نيجر، أسبيرجيلس فيوميجاتس وأسبيرجيلس تيريس يليها فطر أسبيرجيلس فلافس، أسبيرجيلس نيديولانز، بنيسيليوم كريزوجينم، فيوزاريوم سولانى ويولوكليديم أترم.

تم عزل ٣٠ جنساً و١٠٣ نوعاً فطرياً على الوسط الغذائي سيليلوز شابكس آجار والتحضين عند ٢٨°م. وكانت أكثر الأنواع الفطرية شيوعاً هي أسبيرجيلس فيوميجاتس، أسبيرجيلس تيريس وأسبيرجيلس نيجر متبوعة بأسبيرجيلس

نيـديـولانـز، أسبـيرجيلس فـلافس صنف كـولنـارس، أسبـيرجيلس فـلافس، بنيسيليوم كريزوجينم، فيوزاريوم سولانى، كيتوميم جلوبوزم، ستاكيبوتـرس أترا وبوتريوتريكم أتروجريزيم.

وقد وجد أن الجلوكوز كمصدر كربوني أكثر ملائمة لنمو وعزل أنواع عـديدة من الفطريات مقارنة بالسيليلوز. كـما ثبت أيضاً أن السيليلوز كمصـدر كربـوني يكون مناسباً لعزل العديد من الفطريات كأنواع جنس الكيتوميم وأستاكيبوترس. ووجد أن ٣٩ نوعاً فطرياً بالاضافة إلى ٤ أصنـاف تم عزلهـا على الـوسط الغذائي جلوكوز شابكس آجار، بينما تم عزل ١٨ نوعاً فطرياً بالاضـافة إلى صنف واحـد على الوسط الغذائي سيليلوز شابكس آجار.

وبمقارنة النتائج التي تم الحصول عليها من تربة شبه جزيـرة سيناء بـدراسات أخرى على تربة منطقة الدلتا وصعيد مصر، وأيضاً بعدد من الدراسات على تـربة بعض الـدول العربيـة (المملكة العـربية السعـودية، المملكـة الأردنية الهـاشمية، سوريا وقطر) ثبت أنه لا يوجد فلورا فطرية خاصة بتربة شبه جزيـرة سيناء بمصر، الا أن بعض الأنواع الفطرية قد يزداد أو يقل عدد مرات عزلها وتعدادها.