ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Diversity of Hyphomycetes and Zygomycetes of farmland in Egypt.

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ABSTRACT

The biodiversity of terrestrial Hyphomycetes and Zygomycetes of farmland in Egypt until now have been ignored. The aim of this work was to identify these distinguished fungal groups which isolated from farmland at Al-Sharqia governorate. Different soil samples from patches free of roots were collected from different farmland at Al-Sharqia Governorate. The results showed that the amount and species distribution of terrestrial Hyphomycetes and Zygomycetes had a close relationship. Hyphomycetes and Zygomycetes were represented by thirty-eight and forty-two isolates, respectively. *Acremonium* was the dominant genus while other genus of Hyphomycetes were represented in moderate levels as *Alternaria* and *Fusarium* while other genus of hyphomycetes group were represented in low frequency. *Mucor* and *Phycomyces* had the highest frequencies of occurrence while other genus of Zygomycetes were represented by moderate or low frequencies of occurrence. According to available data, it is the first estimation to terrestrial Zygomycetes in farmland at Egypt.

Keywords: Hyphomycetes; Zygomycetes; terrestrial fungi; farmland; biodiversity.

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ISSN: 0975-8585

INTRODUCTION

Microorganisms play an important role in soil matter transmutation, soil composition and structure, enrichment progression, amelioration, and disintegration and refining of the toxic compounds [1,2].

Thus, the study of terrestrial microbiota has the serious connect in the ecosystem. As a significant component of soil microorganisms, fungi have remarkable role in formulation and labour of the ecosystem [3,4].

Hyphomycetes is a class of subkingdom Deutromycotina and proliferate by formation conidia from superficial conidiogenous cells emerging individually from vegetative hyphae. The colonies of hyphomycetes on substrates are coloured black, brown, green, grey and white. The hyphomycetes have the ability of adaption to grow, reproduce and survive under different and extreme conditions and they are of economic importance because they are plant pathogens causing many serious diseases in all kinds of vascular plants [5].

Zygomycetes are characterized by the formation of sexual spores (zygospores), and vegetative mycelium that lack septated line. A sexual reproduction occurs by the formation unicelled or multicelled sporangia or merosporangia[6], Zygomycetes contain only about 1% of the known species of fungi. Its members are distinctive, and some of them are common, successful, fast-growing, primary colonizers of substrates containing accessible carbon sources like sugar or starch. Others are specialized parasites. The more than 900 species are primarily terrestrial. Generally, they feed on decaying plant and animal matter (substrates of starch & sugar), though this group does contain symbiotic members as well as parasitic forms. Hawksworth [7,8], estimated that approximately 1.5 million fungal species are present on Earth. Only about 7% of the world's fungi have been described to date. Records of the Egyptian fungi may be dated back to 4500 B.C., no research was carried out the terrestrial fungi of Egypt until the 1930s [9].

The number of fungi recorded in Egypt is 2281 species and about 105 taxa have been described from Egypt as new to science [9]. In Egypt, the most common fungi recorded in Egyptian soils were members of *Aspergillus*, *Penicillium*, *Fusarium*, *Mucor* and some dematiaceous Hyphomycetes [10,11]. The Nile Delta is a productive riverine triangle wedged in the middle of one of the driest deserts in the world. Located in northern Egypt, the Delta extends about 175 km from its top at Cairo to the Mediterranean Sea, and is about 260 km wide along the coast [12]. Al-Sharqia (tested area) is one of centric and East Delta governorates. It is one of the superior agricultural governorates in Egypt, where overall cultivated parts about 852.39 thousand acres. It is famed for cultivation of cotton, wheat, barley, rice, sugar beets, and fava beans.

The present study had the following objectives: 1- identification the different genera which belonging to hyphomycetes and zygomycetes in farmland, 2- determination the frequencies of occurrence and the relative abundance of those genera in tested area. So, we investigated the species, ecological distribution, diversity of the terrestrial Hyphomycetes and Zygomycetes at genus level in the farmland at Al-Sharqia governorate.

MATERIALS AND METHOD

Collection of Samples.

Different isolates of filamentous fungi were collected. These isolates were isolated from soil samples collected from four selected farmland areas at Al-Sharqia governorate during wheat harvesting at the end of April. Soil samples were collected from patches free of roots according to the method described by Johnson et al. [13]: A sample tube is used which be washed thoroughly before starting the sampling. Samples were taken to a depth of 12.7 cm and the soil was shaken directly into clean and sterilized plastic bags (at least 5 samples were collected randomly from each one of three replications). The five or more samples from each replication were brought together into composite sample, which was mixed thoroughly.

Isolation of Fungi.

The dilution-plate method was used to determine soil fungi as described by Johnson et al. [13] and can be summarized as follows: Ten grams of soil particles were placed in a graduated cylinder; sterilized distilled water was added to the soil so that a total volume of 100 ml was reached. The suspension was stirred and poured

into 1000-ml Erlenmeyer flask. The flask containing the suspension was shaken on a mechanical shaker for 30 minutes. Ten millilitres of the suspension were immediately drawn (while in motion) using sterile Menzies' dipper and transferred immediately through a known volume of sterile distilled water blank until the desired final dilution was reached (1/10000). Each suspension was shaken by hand for few minutes, and was in motion while being drawn by the dipper. One millilitre of the desired dilution was transferred directly into each of sterilized 12-cm Petri dishes then 15 ml of a Czapekˈs agar medium cooled to just above solidifying temperature were added to each dish. The dishes were rotated by hand in a broad swirling motion, so that, the dilution soil was dispersed in the agar. Five plates were used for each sample and incubated at 28 °C for seven days. The developing colonies were isolated and grown again for three times until purification; the purified colonies were identified and counted. The average number of colonies per plate was multiplied by the dilution factor to obtain the number per gram in the original soil samples. Czapekˈs agar medium was used throughout the present investigation as a selective medium for identification of fungi. This was supplemented with Rose-Bengal and chloramphenicol as bacteriostatic agents [14].

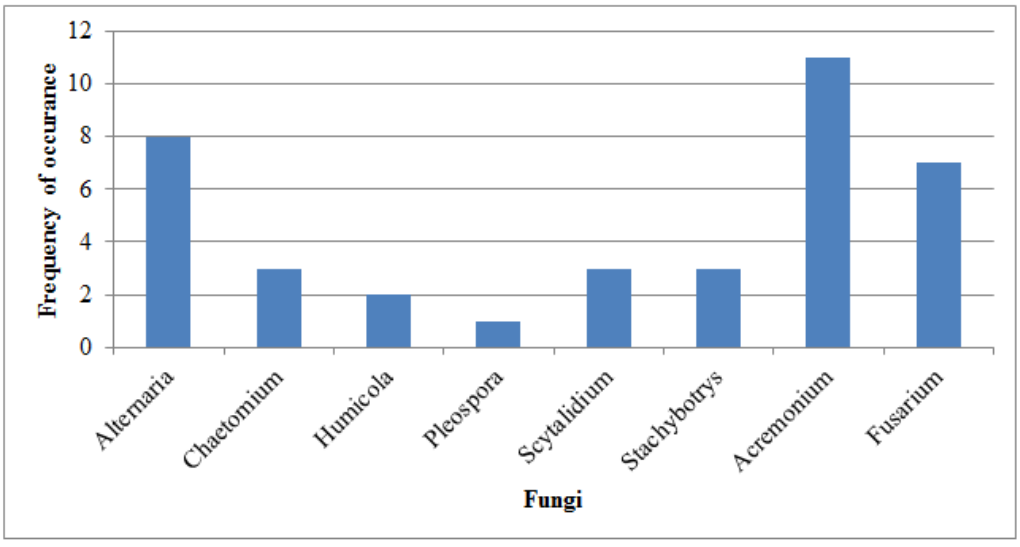
Identification of Fungi.

Identification of the isolated fungi during our investigation was carried out using the morphological characteristics as colony diameter, the colour of condia, extracellular exudates, pigmentation and the colour of reverse mycelium and microscopic features were examined also as conidial heads, fruiting bodies, degree of sporulation and the homogeneity characters of conidiogenous cells by optical light microscope (10×90) Olympus CH40 according to the following references: Ainsworth [15] and Barron [16], for the genera of Hyphomycetes; Booth [17,18], for *Fusarium* species; Ellis [19,20], for Dematiaceous Hyphomycetes; and Zycha [21], for Mucorales group. Fungal isolates were grown onto Malt extract-agar (MA) medium at 28 °C for several days (7-10). The cultures were then kept at 4 °C.

RESULTS

Eighty isolates of filamentous fungi belonging to Zygomycetes and Hyphomycetes were produced from the samples from different areas of farmland at Al-Sharqia governorate. Scientific names of fungal isolates are provided in Tables (1 & 2). Thirty-eight isolates belonging to twelve species and eight genera of three families representing Hyphomycetes were identified as follows: Dematiaceae (6 species of 6 genera), Moniliaceae (only *Acremonium strictum*) and Tuberculariaceae (5 species of one genus namely Fusarium). Forty-two isolates of Zygomycetes were represented by ten species belonging to seven genera of two families: Mucoraceae (nine species belonging to six genera) and Syncephalastraceae (only *Syncephalastrum racemosum*).

Figure 1. freauency of occurance of soil Hyphomycetes in the tested area of farmland.



ISSN: 0975-8585

Figure 2. freauency of occurance of soil Zygomycetes in the tested area of farmland.

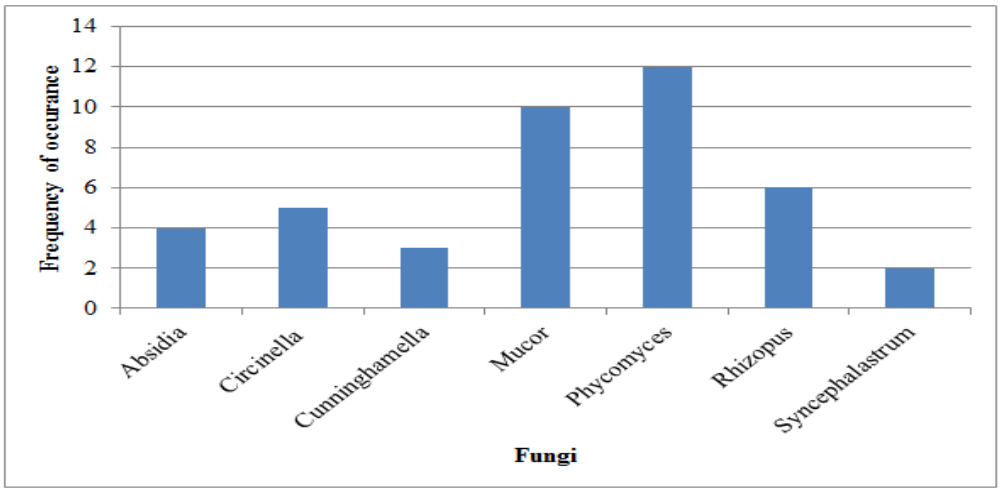


Table 1: Classification and name of tested species belonging to various genera of Hyphomycetes group.

Families	Genus	Species*
Dematiaceae	*Alternaria* Nees	*Brassicicola* (Schweinitz) Wiltshire
	Chaetomium Kunze and Schmidt	*C. globosum* Kunze
	Humicola Traaen	*H. grisea* Traaen
	Pleospora Rabenhorst. Ex Cesati and De Notaris	*P. herbarum* (Persoon) Robenhorst Ex Cesati and De Notaris
	Scytalidium Pesante	*S.thermophilium* (Cooney and Emerson) Austwick
	Stachybotrys Corda	*S.chartarum* (Ehrenberg) Hughes
Moniliaceae	*Acremonium* Link Ex Fr.	*A. strictum* W. Gams
Tuberculariaceae	*Fusarium* Link	*F.aquaeductuum* (Radlk. and Rabenh.)
		F.chlamydosporum Wollenw and Reinking
		F. moniliforme Sheldon
		F.proliferatum (Matsushima) Nirenberg
		F.solani (Martius) Saccardo

* All species belonging to order Moniliales.

Table 2: Classification, name and code numbers of tested species belonging to various genera of zygomycetes group.

Families	Genus	Species*
Mucoraceae	*Absidia*	*A. corymbifera* (Cohn) Saccardo and Trotter
	Circinella	*C. muscae* (Sorokin) Berlese and De Toni
	Cunninghamella Matruchot	*C.echinulata* (Thaxter) Thaxer Ex Blakesles
		C. elegans Lendner
	Mucor Micheli	*M.circinelloides* Van Tieghm
		M. racemosus Fresenius
	Phycomyces Kunze	*Ph. nitens* Agardh
	Rhizopus Ehrenberg	*R. oryzae* Went and Prinsen
		R. nigricans Ehrenberg
Syncephalastraceae	*Syncephalastrum* Schroter	*S. racemosum* Cohn and Schroter

* All species belonging to order Mucorales.

DISCUSSION

Diversity of terrestrial fungi and vascular plant species are positively linked, and cultivation, combustion, logging, grazing, irrigation and fruitfulness could change the fungal diversity [22,23]. The northern part of the Nile delta (Lower Egypt) composes a riparian oasis that frames the densely-inhabited farmlands of Egypt. Knowledge of Hyphomycetes in Egyptian soils is limited. Besada & Yusuf [24], reported eight species as Egyptian records including; *Botryotrichum*, *Nigrospora*, *Gilmaniella*, *Cladosporium*, *Scolecohasidum*, *Torula*, *Curvularia* and *Alternaria*. The knowledge of terrestrial zygomycetes in Egypt is rare because Zygomycetes are renowned as environmental contaminants or the cause of a clinical disease called Zygomycosis. We studied the terrestrial Hyphomycetes and Zygomycetes in farmland, the results showed that the amounts and distribution of terrestrial hyphomycetes (thirty-eight isolates) and zygomycetes (forty-two isolates) had a close related.

Acremonium was the dominant genus while the other genus in hyphomycetes was represented in moderate level as *Alternaria* and *Fusarium* and other genus of Hyphomycetes group was represented in low frequency as show in Figure (1). *Mucor* and *Phycomyces* have the high frequencies of occurrence while the other genus of Zygomycetes was represented by moderate or low frequencies of occurrence as show in Figure (2). Most of the above genus which belonging to Hyphomycetes and Zygomycetes were also general in soils formerly examined and collected from several places in Egypt [10,11,25] but the diversity index of terrestrial Hyphomycetes and Zygomycetes was much higher in farmland due to this kind of soil contains rich organic matters, and is located at the regions are covered with better vegetation and the soil environment is relatively steady than in other ecosystem types and this agreement with [2,26].

CONCLUSIONS

According to available data, it is new-fangled report of fungal biodiversity in farmland at Al-Sharqia governorate but the results of this research showed that the fungal biodiversity in farmland is similar to the fungal biodiversity in different localities of Egypt with differentiation in number and frequency of occurrence.

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