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Occurrence of Zoosporic Organisms in the Western Region of Saudi Arabia

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Thirty-eight species in addition to 2 varieties (3 unidentified) of zoosporic organisms belonging to 14 genera of Oomycetes and 3 genera of Chytridiomycetes were recovered from 50 soil samples randomly collected from different localities in the western region of Saudi Arabia. *Allomyces* and *Dictyuchus* have the highest frequency of occurrence while *Achlya*, *Aqualinderella*, *Saproleginia* and *Phytophthora* were of moderate occurrence, The remaining genera were less frequent. Seven species and two varieties were new records to Saudi Arabia, which are *Achlya oblongata*, *Allomyces javancius var. allomorphus*, Aphanomyces stellatus, Blastoccladia gracile, Dictyuchus magnusii, Olpidiopsis Saproleginia var. levis, Olpidium species, Phytophthora *megasperma*, and *Saproleginia turfosa*. Water and organic matter contents of soil samples are considered as major factors influencing the prevalence and occurrence of zoosporic organisms.

KEYWORDS: Saudi Arabian soil, Zoosporic organisms

Numerous investigations were conducted concerning the occurrence and distribution of zoosporic organisms inhabiting various types of soils and mud in many geographical regions of the world (Willoughby, 1961; Dick, 1963; Jeffrey and Willoughby, 1964; Lund, 1978; Fajola *et al.*, 1978; Sati and Khulbe, 1980; El-Nagdy, 1991; Khulbe, 1991; El-Hissy *et al.*, 1994; 1997 and Khallil *et al.*, 1995) In Saudi Arabi, many species of zoosporic organisms were isolated for the first time from the accumulated rainfall water and mud in Taif (El-Nagdy *et al.*, 1992) and Riyadh region (El-Nagdy and Nasser, unpublished). However, no information was given concerning the presence of zoosporic organisms in Saudi Arabian soils. Thus, the aim of the present investigation was to study the composition and frequency of occurrence of zoosporic organisms in western region soils.

Materials and Methods

Soil: Fifty soil samples were randomly collected from different localities in the western region of Saudi Arabia, following the method of Johnson *et al.* (1959). Most soil samples were considered as permanetly waterlogged. The soil samples were analysed for pH, total soluble salts, organic matter and water contents.

Isolation of zoosporic organisms: Five grams of each soil sample were placed into a petridish (six replicates per samples), and added 20 m*l* sterile distilled water with five sterilized sesame seeds. The dishes were then incubated at room temperature for 24~48 h. The colonized seeds were then transferred to petridishes containing sterile distilled water and incubated at 20±2°C for 4-6 weeks during which the zoosporic organisms colonizing the seeds were counted, examined, and identified. Frequency of occurrence was based on the growth on one sesame seed which was counted as one colony (Al-Saadi *et al.*, 1979).

Identification of zoosporic organisms: The following references were used for species identification: Coker, (1923); Ismail *et al.* (1979); Johnson, (1956, 1971); Rattan *et al.* (1978) Scott, (1961); Seymour, (1970); Sparrow, (1960); Muhsin *et al.* (1984) and Waterhouse (1967, 1968).

Results and Discussion

Chemical analysis of the soil samples showed pH value between 7.0 and 7.9, the water content of 3.7~40.1%, the total soluble salts of 0.65~1.21%, and organic matter content of 0.87~1.92%.

Water and organic matter contents of the soil samples could be considered as major factors affecting the prevalence, occurrence and number of zoosporic oganisms. It was found that most soil samples with relatively high water and organic matter contents yielded the widest spectra of genera and species as well as the highest counts of colonies. This is in accordance with the results obtained by Willoughby (1961), Lund (1978), Khulbe (1981), Misera (1982), El-Hissy and Abd-Elaah (1989) and El-Nagdy (1991). However, Dick (1963) and El-Hissy *et al.* (1994) mentioned that the water content of soil has a limited influence on the number of aquatic fungal genera and species, while El-Hissy and Abd-Elaah (1989) found that the soil samples richest in aquatic phycomycetes have on the average a low content organic matter.

Total soluble salts and pH values of the soil samples have no effect on the distribution and occurrence of zoosporic organisms. Dick (1963) found Saprolegniaceae (zoosporic organisms) more often in soils of pH 4.3~6.0 than in the

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Table 1. Total count (calculated per 30 seeds in every sample), and frequency of occurrence of zoosporic organisms recovered from 50 soil samples using sesame seeds as baits (20 ± °C)

Gener and species	Total count	Frequency of occurrence (%)**	O.R
A - Oomycetes			
Achlya	**316**	48	M
A. americana Humphrey	18	8	R
A. dubia Coker	102	40	M
A. flagellata Coker	19	14	L
A. oblongata *De bary	5	4	R
A. prolifera C.G.Nees	76	30	M
A. proliferoides Coker	23	12	L
Achlya species (non. Sexual)	73	26	M
Aphanomyces	**11**	12	L
A. laevis De Bary	8	10	R
A. stellstus *De Bary	3	4	R
Aqualinderella fermentans Emerson & Weston	**43**	34	M
Brevilegnia	**13**	14	L
B. bispora Couch	7	8	R
B. unisperma (Coker & Braxton) Coker	6	6	R
Calyptralegnia achlyoides (Coker et Couch) Coker	**10**	14	L
Dictyuchus	**296**	82	H
D. carpophorus Zopf	8	14	L
D. magnusii *Lindst	5	6	R
D. monosporus Leitgeb	86	42	M
D. sterilis Coker	197	80	H
Isoachlya monilifera (De Bary) Kauffman	**3**	6	R
Leptolegnia caudata De Bary	**5**	8	R
Olpidiopsis	**7**	12	L
O. achlyae Mclarty	4	6	R
O. saprolegniae var. levis *Coker	3	6	R
Pyhiopsis cymosa De Bary	**1**	2	R
Pythium	**20**	20	L
P. debaryanum Hesse	11	14	L
P. irregulare Buisman	7	8	R
P. ultimum Trow	2	4	R
Phytophthora	**23**	30	M
P. cinnamomi Rands	13	18	L
P. megasperma *Drechsler	10	14	L
Saprolegnia	**145**	46	M
S. asterospora De Bary	11	6	R
S. litoralis Coker	19	14	L
S. ferax (Gruith.) Thuret	63	40	M
S. turfosa *Minden (G umann)	2	2	R
S. unispora (Coker et Couch) Seymour	3	4	R
Saprolegnia species (non-sexual)	47	42	M
Thraustotheca clavata (De Bary) Humphery	**4**	6	R
B-Chytrids	**146**	84	H
Allomyces			
A. anomalus Emerson	36	26	M
A. arbuscula Butler	97	38	M
A. javanicus var. allomorphus *Indoph	2	4	R
A. moniliformis (Coker & Braxton)	11	145	L
Blastocladia gracile* (Waterhouse) Kanouse	**2**	4	R
Olpidium species*	**2**	4	R
Total count	1047		

O.R. = Occurrence remark. H = High occurrence; more than 25 samples. M = Moderate occurrence; between 12-25 samples. L = Low occurrence; between 6-11 samples. R = rare occurrence; less than 6 samples.

*New record to Saudi Arabia.

**Frequency of occurrence = $\frac{\text{No. of cases of isolation}}{\text{total number of samples (5O)}} \times 100$.

soils of lower or higher pH. Dayal and Tandon (1963) and Misera (1982) recorded a significant Correlation between the values of pH and fungal periodicity. Total soluble salts represented the second factor affecting the number of recovered aquatic fungal genera and species from Egyptian soils (El-Hissy *et al.*, 1994).

Thirty-eight species in addition to 2 values belonging to 14 genera of Oomycetes and 3 genera of Chytridiomycetes were recovered from 50 investigated soil samples (Table 1). Among them, seven species and two varieties were recovered for the first time in Saudi Arabia*.

Allomyces was the most prevalent genus and was represented by 3 species and one variety, of which *Allomyces arbuscula* and *A. anomalus* were the most dominant. ***Dictyuchus*** spp. were also abundant which are represented by 4 species, of which *Dictyuchus sterilis* and *D. monosporus* were the most dominant. This is in accordance with the results previously obtained in Saudi Arabian accumulated rainfall water and mud (El-Nagdy *et al.*, 1992) El-Nagdy (1991) Also recorded *Allomyces* and *Dictyuchus* in high frequency from desert soils in Egypt. Many authors isolated *Allomyces* and *Dictyushus* species from soils in various regions of the world (e.g. Alabi, 1974; Fojola *et al.*, 1978 in Nigeria; Lund, 1978 in Denmark; Willoughby, 1984 in Spain; Chowdhery and Rai, 1980; Sati and Khulbe, 1980 and Prabhuji, 1984 in India). The remaining species were encountered in low or rare frequencies.

Achlya (6 species) and *Saprolegnia* (5 species) were recovered in moderate occurrence. The most common species were *Achlya dubia*, *A. prolifera*, and *Saprolegnia ferax*. All the identified *Achlya* and *Saprdegnia* species were isolated previously from Egyptian soils (El-Hissy and Abd-Elaah, 1989; El-Nagdy, 1991; El-Hissy *et al.*, 1994). Remy (1950) and Apinis (1964) Also, found that *Soprolegnia* and most species of *Achlya* were confined to soil in moist localities.

Aqualinderella (1 species) and ***Phytophthora*** (2 species) were also of moderate occurrence. El-Nagdy and Nasser (unpublished) recovered *A. fermentans* from accumulated rainfall water for the first time in the Riyadh, Saudi Arabia. El-Hissy *et al.* (1994, 1997) also isolated *A. fermentans* from mud and soils in various regions of Egypt. *P. cinnamomi* is a common component of soil microflora in forests in Australia (West and Marks, 1974). *P.* species were also recovered from Egyptian agricultural soil (El-Hissy, 1979) and from desert soil (El-Nagdy, 1991).

Five genera wear encountered in low frequencies; *Aphanomyces*, *Brevilegnia*, *Calyptralegnia*, *Olpidiopsis* and *Pythium*, while six genera wear of rare occurrence; *Isoachlya monilifera*, *Leptolegnia caudata*, *Leptomitus lacteus*, *Pythiopsis cymosa*, *Olpidium* species and *Thraustotheca clavata*. All these genera were isolated previously from Egyption soils and mud in different regions (El-Hissy, 1979; El-Hissy and Abd-Elaah, 1989; El-Nagdy, 1991; El-Hissy *et al.*, 1994), as well as from the accumulated rainfall water and mud in Saudi Arabia (El-Nagdy *et al.*, 1992; El-Nagdy and Nasser, unpublished).

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