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# Studies on some zoosporic fungi in soils of Upper Egypt

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In the present paper forty-five zoosporic members of the aquatic fungi as well as some unidentified species belonging to seventeen genera were recorded. *Nowakowskiella, Saprolegnia, Pythium, Rhizohlyctis* and *Achlya* were the most common genera of occurrence. Some physical and chemical properties of soil such as temperature calcium content total soluble salts and organic matter content are positively correlated with the of population zoosporic fungal.

## INTRODUCTION

Although many authors have dealt with the ecology of aquatic fungi (P e t e r - s o n, 1960, 1967; P e r r o t t, 1960; D i c k, N e w b y, 1961; W i l l o u g h b y, 1961, 1962; R o b e r t s, 1963; A l a b i, 1971 a, b) relatively little is known about the effect of temperature, pH, and many other chemical factors on the seasonal occurrence of aquatic fungi. Some information has been given by S u z u k i (1960, 1961, 1962, 1963) from Japan; by D a y a l and T a n d o n (1963) and by M i s r a (1982) from India; by E l – H i s s y (1979 a, b), E l – H i s s y et al. (1982), and by E l – H i s s y and K h a l l i l (1989) from Egypt, who have used water samples in their experiments.

In Egypt, investigations on aquatic fungi which have isolated form soil samples were carried out by E l – H i s s y, E l – N a g h y (1983), E l – H i s s y and A b d – – E l a h (1987). These studies mainly concerned the relationship between fungi and the physical and chemical properties of soil. Thus, the aim of the present work was to study the seasonal occurrance of zoosporic fungi in soil samples collected from 8 different sites of the riverbanks of the Nile River and Ibrahimaya canal from November, 1989 to May, 1990.

## MATERIALS AND METHODS

According to W i l l o u g h b y (1956) soil samples were collected from the humus layer near the banks. Four sites located at El-Minia Governorate in Upper Egypt have been studied (Fig. 1).

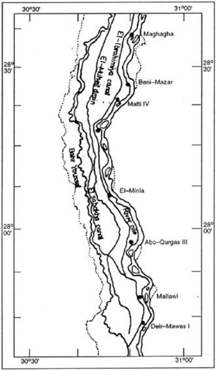


Fig. 1. Location of sites collected in Minia Governorate
● sites — main canal ....... cultivated land

Site I: the Nile River in the region of Tall-Elamana situated about 45 km to the south of the city of El-Minia. Site II: the Nile River, in the region of Samalout situated about 28 km to the north of the city El-Minia. Site III: Ibrahimya canal, in the region of Abo-Qurgas situated about 23 km to the south of El-Minia city. Site IV: Ibrahimya canal, in the region of Matti situated about 40 km to the north of the city El-Minia.

Soil samples were collected every month over a period of seven months form November, 1989 to May, 1990. The temperature of soil was recorded at each site. Subsequently the following properties were determined: hydrogen concentration, electric conduction, calcium, magnesium, sodium, potassium, phosphate, nitrate, and chloride, content total alkalinity and organic matter content. The chemical analyses were carried out in a laboratory according to the methods adopted by Mackereth et al. (1978).

Five grams of soil samples were placed in each of the five sterile 9 cm Petri dishes and just covered with 20 ml of soil extract solution. Ten parts of baiting substrata were put on the surface of each dish and then incubated at 20-30°C.

Soil extract solution was prepared (Hanson, 1945) by placing 280 gm of soil in 1 l of distilled water for 2 days, followed by filtration and autoclaving. The sterile baits used were scales of onion skin, bleached bromegrasse leaves (*Bromus cathricus*) and sesame seeds. The developing zoosporic fungi were identified according to Sparrow (1960), Batko (1975) and Karling (1977). Isolates of zoosporic fungi were subcultured on the same substrate using the induction medium which described by Mendoza and Prendas (1988). The mean value and standard deviat for all measurements were determined.

## RESULTS AND DISCUSSION

In the present studies, forty-five zoosporic fungus species and some unidentified species from seventeen genera were recorded (Table 1). Most of these zoosporic fungi were previously recorded rom the water bodies (El-Hissy, 1974; El--Hissy et al., 1982; El-Naghy et al., 1985 a, b, 1987; Hassan, 1990; Hassan, Shoulkamy, 1991) and mud and drenched cultivated soils (Khallil, 1984; El-Hissy, El-Naghy, 1983; El-Hissy, Abd-Elaah, 1987) in Upper Egypt.

Fig. 2 shows that the highest number of zoosporic fungi occured in January and February, the lowest number of fungi was recorded in May. These results are in agreement with earlier reports of Dayal, Tandon, 1963; Srivastava, 1967; Khulbe, Bhargava, 1977. The moderate apperance of fungi species was detected in November. The same results were obtained by El-Hissy and Khallil (1989), (Table 2).

The mean temperature, pH value, calcium, soluble salt and organic matter total content were positively correlated with the occurrence of the higher members of the zoosporic fungi. This is in accordance with the results reported by Booth (1971 a) and Misra (1982).

The results presented (Fig. 3) indicate that the highest number of zoosporic fungi was noted at site IV in March and November, followed by site I in January. The lowest number of fungi was reported in May in all sites. These results were in agreement with Misra (1982) and El-Hissy and Khallil's (1989) data. The temperature of soil was the same at site IV in March and November (21°C), and 17°C in site I. In March the high number of fungi at all sites connected with the physical and chemical properties of soil during the period of study (Table 2, Fig. 3).

Table 1

Total number (TC) of zoosporic fungi in soil samples (gm of dry soil), number of cases of isolation (NCI), number (NO) and relative density (RD) at four sites from November 1989 to May 1990

| Species | TC | NCI | NO | RD % | TC | | | | RD | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | I | II | III | IV | I | II | III | IV |
| *CLADOCHYTRIACEAE* | | | | | | | | | | | | |
| *Nowakowskiella* | 6375 | – | – | 25.89 | 1560 | 1695 | 1675 | 1445 | 6.33 | 6.89 | 6.80 | 5.87 |
| *N. delica* Whiffen | 195 | 9 | L | 0.79 | 60 | 95 | 30 | 10 | 0.24 | 0.39 | 0.12 | 0.04 |
| *N. elegans* (Nowak) Schröter | 370 | 10 | L | 1.50 | 50 | 110 | 155 | 55 | 0.20 | 0.45 | 0.63 | 0.22 |
| *N. elongata* Karling | 205 | 5 | R | 0.83 | – | 45 | 65 | 95 | – | 0.18 | 0.26 | 0.39 |
| *N. hemispherospora* Shanor | 2270 | 23 | H | 9.22 | 475 | 790 | 660 | 345 | 1.93 | 3.21 | 2.68 | 1.40 |
| *N. multispora* Karling | 485 | 11 | L | 1.97 | 210 | 65 | 115 | 95 | 0.85 | 0.26 | 0.47 | 0.39 |
| *N. ramosa* Butler | 2850 | 26 | H | 11.58 | 765 | 590 | 650 | 845 | 3.11 | 2.40 | 2.64 | 3.43 |
| *Cladochytrium* | 395 | – | – | 1.60 | 75 | 105 | 160 | 55 | 0.31 | 0.42 | 0.65 | 0.22 |
| *C. aurantiacum* Richards | 135 | 6 | R | 0.55 | 15 | 30 | 55 | 35 | 0.07 | 0.12 | 0.22 | 0.14 |
| *C. hyalinum* Berdan | 210 | 9 | L | 0.85 | 30 | 55 | 105 | 20 | 0.12 | 0.22 | 0.43 | 0.08 |
| *C. replicatum* Karling | 50 | 3 | R | 0.20 | 30 | 20 | – | – | 0.12 | 0.08 | – | – |
| *Septochytrium* | 1155 | – | – | 4.69 | 340 | 275 | 240 | 300 | 1038 | 1012 | 0.97 | 1.22 |
| *S. macrospourm* Karling | 135 | 6 | R | 0.55 | – | 70 | 15 | 50 | – | 0.29 | 0.06 | 0.20 |
| *S. variable* Berdan | 1020 | 11 | L | 4.14 | 340 | 205 | 225 | 250 | 1038 | 0.83 | 0.91 | 1.02 |
| *RHIZIDEACEAE* | | | | | | | | | | | | |
| *Karlingia* | 970 | – | – | 3.49 | 245 | 175 | 285 | 265 | 0.99 | 0.71 | 1.16 | 1.08 |
| *K. granulata* Karling | 160 | 8 | L | 0.65 | 30 | 30 | 30 | 70 | 0.12 | 0.1 | 0.1 | 0.12 |
| *K. hyalina* Karling | 55 | 3 | R | 0.22 | 15 | – | – | 40 | 006 | – | – | 0.16 |
| *K. rosea* (de Bary et Woronin) Johnson | 755 | 21 | H | 3.07 | 200 | 145 | 255 | 155 | 0.81 | 0.59 | 1.04 | 0.63 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Rhizophlyctis* | 305 | – | – | 1.24 | 105 | 45 | 45 | 110 | 0.43 | 0.18 | 0.18 | 0.45 |
| *R. fusca* Karling | 140 | 7 | L | 0.57 | 45 | – | 30 | 65 | 0.18 | – | 0.12 | 0.27 |
| *R. harderi* Uebelmesser | 20 | 2 | R | 0.08 | – | 10 | 10 | – | – | 0.04 | 0.04 | – |
| *R. hirsutus* Karling | 15 | 2 | R | 0.06 | – | – | 5 | 10 | – | | 0.02 | 0.04 |
| *R. petersenii* Sparrow | 130 | 7 | L | 0.53 | 60 | 35 | – | 35 | 0.25 | 0.14 | – | 0.14 |
| *Chytriomyces* | 1260 | – | – | 5.12 | 540 | 175 | 235 | 310 | 2.20 | 0.71 | 0.95 | 1.26 |
| *C. aureus* Karling | 150 | 4 | R | 0.61 | 100 | – | – | 50 | 0.41 | – | – | 0.20 |
| *Chytriomyces* sp. | 1110 | 10 | L | 4.51 | 440 | 175 | 235 | 260 | 1.79 | 0.71 | 0.95 | 1.06 |
| *Rhizidum* | 285 | – | – | 1.16 | – | – | – | 285 | – | – | – | 1.16 |
| *R. ramosum* Sparrow | 190 | 1 | R | 0.77 | – | – | – | 190 | – | – | – | 0.77 |
| *Rhizidium* sp. | 95 | 1 | R | 0.39 | – | – | – | 95 | – | – | – | 0.39 |
| *ENTOPHLYCTACEAE* | | | | | | | | | | | | |
| *Endochytrium* | 2050 | – | – | 8.33 | 405 | 625 | 655 | 365 | 1.65 | 2.54 | 2.66 | 1.48 |
| *E. pseudodistomum* Karling | 2050 | 21 | H | 8.33 | 405 | 625 | 655 | 365 | 1.65 | 2.54 | 2.66 | 1.48 |
| *Diplophlyctis* | 900 | – | – | 3.66 | 120 | 470 | 310 | – | 0.49 | 1.91 | 1.26 | – |
| *D. nephrochytriodes* Karling | 175 | 2 | R | 0.71 | – | 160 | 15 | – | – | 0.65 | 0.06 | – |
| *D. verrucosa* Kobayashi et Dokubo | 20 | 2 | R | 0.08 | 15 | 5 | – | – | 0.06 | 0.02 | – | – |
| *Diplophlyctis* sp. | 705 | 10 | L | 2.87 | 105 | 305 | 295 | – | 0.43 | 1.24 | 1.20 | – |
| *Nephrochytrium* | 45 | – | – | 0.18 | 15 | 30 | – | – | 0.06 | 0.12 | – | – |
| *N. amazonense* Karling | 45 | 3 | R | 0.18 | 15 | 30 | – | – | 0.06 | 0.12 | – | – |
| *HARPOCHYTRIACEAE* | | | | | | | | | | | | |
| *Hyphochytrium* | 640 | – | – | 2.60 | 250 | 235 | 65 | 90 | 1.02 | 0.96 | 0.26 | 0.36 |
| *H. catenoides* Karling | 640 | 8 | L | 2.60 | 250 | 235 | 65 | 90 | 1.02 | 0.96 | 0.26 | 0.36 |
| *SAPROLEGNIACEAE* | | | | | | | | | | | | |
| *Achyla* | 1785 | – | – | 7.26 | 670 | 365 | 410 | 340 | 2.72 | 1.48 | 1.67 | 1.39 |
| *A. debaryana* Humphrey | 555 | 11 | L | 2.26 | 190 | 135 | 110 | 120 | 0.77 | 0.55 | 0.45 | 0.49 |
| *A. flagellata* Coker | 340 | 9 | L | 1.75 | 130 | 100 | 90 | 110 | 0.53 | 0.41 | 0.36 | 0.45 |
| *A. megasperma* Humphrey | 135 | 3 | R | 0.55 | 40 | 40 | 55 | – | 0.16 | 0.16 | 0.23 | – |
| *A. racemosa* Hildebrand | 135 | 2 | R | 0.55 | 135 | – | – | – | 0.55 | – | – | – |
| *Achlya* sp. | 530 | 10 | L | 2.15 | 175 | 90 | 155 | 110 | 0.71 | 0.36 | 0.63 | 0.45 |

cont. Tab. 1

| Species | TC | NCI | NO | RD % | TC I | TC II | TC III | TC IV | RD I | RD II | RD III | RD IV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Aphanomyces* de Bary | 1085 | – | – | 4.41 | 280 | 2.65 | 320 | 220 | 1.14 | 1.02 | 1.30 | 0.89 |
| *A. laevis* de Bary | 285 | 6 | R | 1.16 | – | 100 | 145 | 40 | – | 0.41 | 0.59 | 0.16 |
| *A. stellatus* de Bary | 290 | 7 | L | 1.18 | 155 | 15 | 110 | 10 | 0.63 | 0.06 | 0.45 | 0.04 |
| *Aphanomyces* sp. | 510 | 11 | L | 2.07 | 125 | 150 | 65 | 170 | 0.51 | 0.61 | 0.26 | 0.69 |
| *Dictyuchus* Leitgeb | 1495 | – | – | 6.08 | 285 | 290 | 375 | 545 | 1.16 | 1.18 | 1.53 | 2.21 |
| *D. monosporus* Leitgeb | 430 | 10 | L | 1.75 | – | 30 | 210 | 190 | – | 0.12 | 0.86 | 0.77 |
| *D. polysporus* Leitgeb | 155 | 3 | R | 0.63 | 80 | 35 | – | 40 | 0.33 | 0.14 | – | 0.16 |
| *D. sterille* Coker | 910 | 16 | N | 3.70 | 205 | 225 | 165 | 315 | 0.83 | 0.92 | 0.67 | 1.28 |
| *Pythiopsis* de Bary | 750 | – | – | 3.05 | 255 | 270 | 115 | 110 | 1.04 | 1.09 | 0.47 | 0.45 |
| *P. cymosa* de Bary | 750 | 13 | L | 3.05 | 255 | 270 | 115 | 110 | 1.04 | 1.09 | 0.47 | 0.45 |
| *PYTHIACEAE* | | | | | | | | | | | | |
| *Pythium* Pringsheim | 2325 | – | – | 9.43 | 595 | 625 | 380 | 725 | 2.42 | 2.53 | 1.54 | 2.94 |
| *P. debaryanum* Hesse | 945 | 14 | M | 3.84 | 120 | 300 | 205 | 320 | 0.49 | 1.22 | 0.83 | 1.30 |
| *P. graminicola* Subramanian | 355 | 8 | L | 1.44 | 170 | 55 | 80 | 50 | 0.69 | 0.22 | 0.33 | 0.20 |
| *P. intermedium* de Bary | 75 | 6 | R | 0.30 | – | 25 | 25 | 25 | – | 0.10 | 0.10 | 0.10 |
| *P. aphanidermatum* Petersen | 15 | 1 | R | 0.06 | 15 | – | – | – | 0.06 | – | – | – |
| *P. ultimum* Trow | 705 | 12 | L | 2.86 | 250 | 245 | 70 | 140 | 1.02 | 0.99 | 0.28 | 0.57 |
| *Pythium* sp. | 230 | 3 | R | 0.93 | 40 | – | – | 190 | 0.16 | – | – | 0.77 |
| *SAPROLEGNIACEAE* | | | | | | | | | | | | |
| *Saprolegnia* Nees | 2795 | – | – | 11.36 | 690 | 665 | 605 | 835 | 2.80 | 2.70 | 2.48 | 3.38 |
| *S. eccentria* Coker | 145 | 4 | R | 0.59 | 105 | 15 | 25 | – | 0.43 | 0.06 | 0.10 | – |
| *S. diclina* Humphery | 465 | 13 | L | 1.89 | 65 | 185 | 110 | 105 | 0.26 | 0.75 | 0.45 | 0.43 |
| *S. ferax* (Gruith) Thuret | 905 | 15 | M | 3.68 | 285 | 95 | 95 | 430 | 1.16 | 0.39 | 0.39 | 1.74 |
| *S. litoralis* Coker | 820 | 17 | M | 3.33 | 180 | 225 | 235 | 180 | 0.73 | 0.91 | 0.96 | 0.73 |
| *S. parasitica* Coker | 160 | 6 | R | 0.65 | 55 | 15 | 35 | 55 | 0.22 | 0.06 | 0.15 | 0.22 |
| *Saprolegnia* sp. | 300 | 5 | R | 1.22 | – | 130 | 105 | 65 | – | 0.53 | 0.43 | 0.26 |

H – high occurrence (21-28) cases of isolation); M – moderate occurrence (14-20 cases of isolation); L – low occurrence (7-13 cases of isolation)
R – rare occurrence (less than 7 cases of isolation)

Table 2
Average monthly values of some physical and chemical properties of soil at El-Minia Governorate (XI.1989 – V.1990)

| Characters | Nov. | Dec. | Jan. | Feb. | March | April | May |
|---|---|---|---|---|---|---|---|
| temp (°C) | 20.3±0.9 | 17.3±0.3 | 16.5±0.3 | 15.3±0.6 | 21.1±0.4 | 22.8±0.3 | 26.6±0.6 |
| pH value | 8.1±0.2 | 7.7±0.2 | 7.6±0.1 | 7.9±0.1 | 7.4±0.1 | 8.0±0.1 | 7.4±0.1 |
| E.C. (a) | 1.7±0.3 | 1.3±0.1 | 1.4±0.2 | 1.4±0.1 | 1.4±0.2 | 1.7±0.1 | 1.5±0.5 |
| calcium (b) | 26.6±2.0 | 26.5±2.7 | 35.3±5.3 | 28.8±2.1 | 16.0±3.0 | 19.3±1.4 | 17.8±3.9 |
| magn. (b) | 10.5±3.0 | 16.9±4.0 | 13.5±3.0 | 21.0±7.0 | 19.4±1.9 | 16.8±2.3 | 23.5±6.0 |
| sodium (b) | 21.0±0.7 | 20.3±0.3 | 2.0±0.0 | 1.5±0.3 | 1.8±0.3 | 6.3±0.8 | 2.8±0.9 |
| potasium (b) | 7.8±0.8 | 6.8±0.3 | 1.0±0.0 | 1.0±0.0 | 1.0±0.0 | 1.0±0.0 | 6.3±1.8 |
| phos. (b) | 0.9±0.2 | 1.0±0.3 | 1.0±0.3 | 2.0±0.7 | 3.0±1.3 | 2.0±1.3 | 2.0±0.9 |
| nitrate (b) | 0.4±0.01 | 0.4±0.03 | 1.7±0.3 | 1.4±0.2 | 1.5±0.5 | 4.4±3.2 | 1.0±0.1 |
| t. alk. (b) | 1.2±0.1 | 1.3±0.2 | 1.6±0.2 | 1.2±0.1 | 1.4±0.1 | 1.4±0.1 | 1.4±0.2 |
| chloride (gm/l) | 0.9±0.2 | 0.7±0.2 | 1.5±0.3 | 1.5±0.3 | 1.1±0.2 | 1.1±0.4 | 1.5±0.4 |
| o.m. (%) | 0.01±0.01 | 0.02±0.01 | 1.9±0.7 | 1.4±0.1 | 0.5±0.02 | 0.5±0.02 | 0.7±0.1 |

(a): mhos x $10^{-4}$; (b): mg/ml; E.C.: electric conductivity; t.alk.: total alkalinity; o.m.: organic matter content

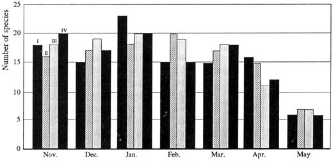


Fig. 2. Number of fungi isolated in each month
I II III IV – sites

The mean values of physical and chemical properties were studied (Table 2). Almost all the factors showed seasonal variations. Some reached maximum values during the winter (December – February), and others during spring (March – May). Temperature ranged from 14 to 28°C, with a minimum in February and maximum in May. Calcium content ranged from 11 to 37 mg/ml, with a minimum in May and maximum in January. The previous data are in accordance with M i s r a (1982) data.

It is evident that the occurrence and distribution od zoosporic fungus species at different sites may be due to the differences in their physical and chemical nature. In these studies the following species were found: *Nowakowskiella*, *Saprolegnia*, *Pythium*, *Achlya*, *Rhizophlyctis*, *Cladochytrium*, *Karlingia*, *Dictyuchus*, *Septochytrium*, *Diplophlyctis*, *Aphanomyces*, *Chytriomyces*, *Rhizidium*, *Endochytrium*, *Nephrochytrium*, *Hyphochytrium* and *Pythiopsis* (Fig. 4, Table 1).

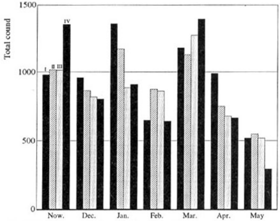


Fig. 3. Monthly mean number of species (gm. of dry soil) of fungi (XI.1989-V.1990)
I II III IV – sites

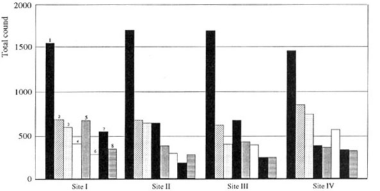


Fig. 4. Mean number of genera at fungi sites from (XI.1989-V.1990)
1 - *Nowakowskiella*; 2 - *Saprolegnia*; 3 - *Pythium*; 4 - *Endochytrium*; 5 - *Achlya*; 6 - *Dictyuchus*; 7 - *Septochytrium*; 8 - *Aphanomyces*

In the present study twenty-four species from the order *Chytidiales* were reported. However, B o o t h (1971 b) recorded fifty-five fungus species of the same order during his study on the soil of Islands. In this group E l – N a g h y et al. (1985 a, b, 1987) isolated sixteen members of chytridiaceous fungi. E l – H i s s y and K h a l - l i l (1989) reported some chytrids from Delta water samples.

*Nowakowskiella* was the most common genus in the investigated soil samples. It was noted in all samples and comprised 25.9 % of the total number of fungi. It was represented by six species, where *N. ramosa* and *N. hemisphaerospora* were the most common. The ones former was recorded in 92.8 % of the soil samples (26 out of 28) and the latter in 82 % (23 out of 28). They comprised 11.6 % and 9.2 % of the total number of fungi; 44.7 % and 35.6 % of the total number *Nowakowskiella* representively. The highest number of the two species was estimated at site IV and site I, 3.4 % and 3.2 % of total number of fungi, 13.3 % and 12.4 % of the total number of *Nowakowskiella*, respectively. At site III, the number of two species was nearly the same. S p a r r o w (1960) pointed out that both *N. ramosa* and *N. hemisphaerospora* were common in soil and water samples and widely distributed all over the world. The following four species of *Nowakowskiella* occured in small numbers: *N. multispora*, *N. elegans*, *N. elongata* and *N. delica* (of the total number of fungi 1.97 %, 1.5%, 0.88 % and 0.79 % respectively).

*Saprolegnia* was the second most common genus in the tested soil samples, comprising 11.3 % of the total number of fungi and was recorded 27 out of 28 times. It was represented by five species where *S. litoralis* and *S. ferax* were the common ones. These species were found respectively in 60.7 % (17 out of 28) and 53.6 % (15 out of 28), of the soil samples; they represented 3.33 % and 3.68 % of the total number of fungi 29.3 % and 32.4 % of the total number of *Saprolegnia*. In addition, the following three remaining species from this genus were noted: *S. diclina* – 46.4 % (13 out of 28) and *S. parasitica* and *S. eccentrica* occurred rarely, 21.4 % (6 out of 28) and 14.3 % (4 out of 28), respectively. M i s r a (1982) postulated that *S. ferax* was appeared 23 times and was the second most commonly occurring form. During their studies E l – H i s s y and K h a l l i l (1989) and G u p t a and M e h r o t r a (1989) that the genus *Saprolegnia* was one of the most commonly occurring genera.

The genus *Pythium* was represented by five species: *P. debraryanum*, *P. ultimum*, *P. graminicola*, *P. intermedium* and *P. aphanidermatum*. They occurred respectively 14, 12, 8, 6 and 1 out of 28 times; 3.84 % 2.86%, 1.44 %, 0.3 % and 0.06 % of the total number of fungi, respectively. Our results were almost in accordance with the observations of E l – H i s s y and K h a l l i l (1989).

In the present study *Achlya* was the fourth most common genus and was detected 20 times out of 28. The following species of this genus were reported: *A. debaryana*, *A. flagellata*, *A. megasperma* and *A. racemosa* which occurred respectively 11, 9, 3 times and twice (Table 1). M i s r a (1982) records that most species of the genus *Achlya* appeared from September to March, except for (*Achlya stellata* var. *multispora*) that was collected until April. These results are in ageement with our observations which indicate that lower temperature is more suitable for the occurrance of *Achlya*.

*Rhizophlyctis* was the fifth most common genus to which included the following four species: *R. fusca, R. petersenii, R. harderi* and *R. hirsuta* (7, 7, 2 and 2, out of 28 times), respectively. Most species occurred at sites with low organic matter and content neutral in pH. The results are in accordance with Booth's (1971 a) observations.

The genus *Cladochytrium* was represented by three species: *C. hyalinum* (9 specimen), *C. auratiacum* (6) and *C. replicatum* (3) respectively. The genus *Karlingia* included three species: *K. rosea, K. granulata* and *K. hyalina* which occured 21, 8 and 3 out of 28 times respectively. In this genus *K. rosea* was the most frequent species comtrising 3.07 % of the total number of fungi and 77.8 % of the total number of *Karlingia*. Thus *K. rosea* is a common and wide spread species. The findings of Sparrow (1960) and Karling (1973) were in accordance with the present results.

The genus *Dictyuchus* was represented by three species: *D. sterile, D. monosporus* and *D. polysporus* which occured respectively 16, 10 and 3 out of 28 times; they comprised 3.7 %, 1.75 % and 0.63 % of the total number of fungi 60.9 %, 28.8 % and 10.4 % of the total number of *Dictyuchus. D. sterile* was the most common and wide spread species at site IV. Temperature plays an important role in the population of *Dictyuchus*. El-Hissy and Khallil (1989) have reported that *D. sterile* occurres during the whole year; Gupta and Mehrotra (1989) also reported *D. sterile* grows in a wide range of temperature. These observations are in agreement with the present results recording the effect of temperature on the occurrence and distribution of *D. sterile*.

*Endochytrium pseudodistomum* noted 21 out of 28 times and comprised 8.33 % of the total number of fungi. The highest number of the species was recorded count at site III (655 sporangia) and comprised 32 % of the total number of *E. pseudodistomum*.

The present investigations reveals some correlations between the zoosporic fungus flora and the physical and chemical properties of soil such as temperature, calcium, soluble salt and organic matter content. These results have been by confirmed by many aquatic mycologists from different parts of the world (Perrott, 1960; Suzuki, 1960; Dayal, Tandon, 1962; Roberts, 1963; Srivastava, 1967; Alabi, 1971 a,b; Khulbe, Bhargava, 1977).

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