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Fungal Flora of Soils from Ashafa, Toroba, Wahat and Wehait

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Abstract. Using the adilution plate method, twenty four species belonging to nine genera were isolated from twenty soil samples from Ashafa, Toroba, wahat and Wehait (saudi Arabia). The most frequent genera were *Aspergillus* (6 species), *Alternaria, Curvularia, Fusarium* and *Penicillium* (3 species). *Rhizopus* and *Ulocladium* (2 species), *Drechslera* and *Mucor* (1 species).

Introduction

Although a great deal is known about the fungal flora of Saudi Arabia [1-10], none of these investigations have focused upon the fungal flora of soils from Ashafa, Toroba, Wahat and Wehait (Saudi Arabia).

Ali [1] isolated 47 species belonging to 24 genera from 4 soil samples collected from Wadi Hanifa (Saudi Arabia) of which *Aspergillus terreus, A. clavatus, A. flavus* and *Alternaria alternata* were the most common. Also, the fungal flora from the rhizosphere of some Saudi Arabian plants was studied [11, 12, 13]. More than 40 species, belonging to 21 genera, were isolated from different soils in the Eastern and Southern regions of Saudi Arabia, the majority belong to the Deuteromycetes [4].

According to Abou-Heilah *et al.* [3], a study was made of the mycoflora in subsurface soil samples which were collected from three different localities of cultivated land in the Riyadh region of Saudi Arabia. Fungi were isolated by the dilution plate method. The fungal counts per gram of soil varying markedly in the different soil samples from which a total of 113 species belonging to 58 genera were obtained. Khaliel [18] isolated fourteen different genera of fungi with frequency values indicating that *penicillium* was the predominant genus.

Hashem [10] isolated twenty nine fungal species belonging to eleven genera from soil samples of eight different places in Saudi Arabia and found *Aspergillus* as predominant genus. The present study was undertaken to determine the fungal flora of soil from Ashafa, Toroba, wahat and Wehait regions of Saudi Arabia.

Materials and Methods

Twenty soil samples were collected according to the method described by Johnson *et al.* [14] from the test areas (5 samples / place). The samples were sifted through a sieve with a mesh size of 60 um, to remove large soil particles, and all samples were stored at 10° C. Soil samples were oven dried at 45° C for 48 hrs [6]. Isolation of fungi was carried out by dilution plate method [15]. The medium for fungal isolation was Czapek Dox agar (Oxford Ltd. London). Rose bengal 0.033 g/L was added in the medium before autoclaving to suppress the growth of fast growing fungi. Streptomycin sulphate (0.03 g/L) was added, to inhibit the growth of bacteria [15].

For each soil sample, five replicate plates were used and incubated at 28° C. They were examined for the developing fungi which were identified and counted. The soil samples were analysed chemically for mineral and organic matter contents as described earlier by author [16]. The soil type and soil pH were determined as described by Hashem [16] and Piper [17].

Results

The results of the organic matter determination, the soil type and the pH values of the various soils on test are summarized in Table 1. The organic matter content ranged from 1.01% to 1.31% with the pH values of the soil samples revealing no appreciable differences within the range of 7.03 to 7.30.

A total number of twenty-four species belong to nine different genera of fungi were isolated from the soils examined (Table 2). The plant cover of the tested

Table 1. Characteristics of soils from the different localities

Locality	Organic matter %	Soil Type	pH value
Ashafa	1.08	Sandy	7.06
Toroba	1.1	Sandy	7.03
Wahat	1.31	Sandy	7.15
Wehait	1.01	Sandy	7.30

Table 2. Species isolated from soils of the different localities tested (isolates per gram of oven dry soil).

$$\% \text{ Frequency} = \frac{\text{No. of sites in which species found}}{\text{Total no. of sites}} \times 100$$

Species	Ashafa	Toroba	Wahat	Wehait	Frequency %
Alternaria alternata (Fr.: Fr.) Keissler	6	5	10	7	100
A. chlamydospora Mouchacca	3	—	8	11	75
A. tenuissima (Kunze: Fr.) Wiltshire	6	4	—	—	50
Aspergillus niger van Tieghem	9	5	7	11	100
A. candidus Link: Fr.	6	—	8	—	50
A. clavatus Desmazieres	9	6	—	13	75
A. flavus Link: Fr.	10	13	8	15	100
A. nidulans (Eidam) Winter					
A. terreus Thom	—	—	6	9	50
Curvularia lunata (Wakker) Boedign	3	3	—	6	75
C. siddiquii Ahmed and Qurashi	—	—	—	3	25
C. tuberculata Jain	6	3	9	2	100
Drechslera halodes (Drech.) Subram. and Jain	—	—	1	—	25
Fusarium moniliforme Scheldon	6	—	3	—	50
F. oxysporum Schlecht.	3	9	6	13	100
F. solani (Mart.) Sacc.	4	—	9	10	75
Mucor racemosus Fresenius	9	7	—	4	75
Penicillium chrysogenum Thom	11	16	9	13	100
P. citrinum Thom	—	—	—	3	25
P. notatum Westling	9	7	11	6	100
Rhizopus oryzae Went and Prinsen Geerligs.	—	—	6	—	25
R. microsporus van Tieghem	6	12	—	—	50
Ulocladium atrum Preuss	—	9	—	13	50
U. botrytis Preuss	9	—	6	11	75
Mycelia sterilia	13	10	9	8	100
Total number of genera 9	**8**	**8**	**8**	**7**	
Total number of species 24	**18**	**14**	**16**	**18**	

localities were dominated by *Alhagi maurorum, Argemene mexicana, Peganum harmala, Echinopsis spinosissmus, Zilla spinosa* and *Zygophyllum album.*

The predominant fungal genera could be placed in the following order of prevalence *Aspergillus, Alternaria, Curvularia,* and *Penicillium, Rhizopus* and *Ulocladium, Drechslera* and *Mucor.*

Discussion

The results obtained in Table 1, show that organic matter contents of tested soils were generally low and ranged between 1.01% and 1.31% which is in agreement with the values from the locations [4, 5, 6], Saudi Arabia. The pH values of the soils tested reveal no appreciable differences and all were almost neutral with pH from 7.03 – 7.3.

The predominant genus was *Aspergillus,* with six species, followed by *Alternaria, Curvularia, Fusarium* and *Penicillium* with three species each, then *Rhizopus* and *Ulocladium* with two species each, and *Drechslera* and *Mucor* each with one species. *Alternaria alternata, Aspergillus niger, Aspergillus flavus, Curvularia tuberculata, Fusarium oxysporum, Penicillium chrysogenum* and *Penicillium notatum* were the dominant species found in the samples from all the soils tested and showed 100% distribution frequency.

Alternaria chlamydospora, Aspergillus clavatus, Curvularia lunata, Fasarium solani, Mucor racemosus and *Ulocladium botrytis* were the other species which showed 75% frequency. Representatives of the Mycelia sterilia were also common and were found in soils from all the localities tested.

Table 2 indicates that *Alternaria tenuissima, Aspergillus candidus, Fusarium moniliforme, Rhizopus microsporus* and *Ulocladium atrum* showed 50% frequency while *Curvalaria siddiquii, Drechslera halodes, penicillium citrinum* and *Rhizopus oryzae* showed a distribution frequency of 25%. The highest number of fungal species was isolated from soil samples of Ashafa and Wehait (18 species) followed by Wahat (16 species) and Toroba (14 species). *Aspergillus* spp. also predominant in the Saudi Arabian soils of other localities [1, 4, 11].

Alternaria, Curvularia, Fusarium and *Penicillium* were the second most predominant genera after *Aspergillus* and this coincides with the earlier finding of Abdel-Hafez [5], who isolated five species each of *Alternaria* and *Curvularia,* two species of *Fusarium* and eight species of *Penicillium. Rhizopus* and *Ulocladium* were the third predominant genera in the present study. Abdel-Hafez [6] isolated three species of *Ulocladium* and two species of *Rhizopus.* Ali [1], Ali *et al.* [11], Ali and Abou-Heilah [4] did not find *Ulocladium* in their study. The least predominant genus in the present

study were *Derchslera* and *Mucor* and this agrees with the earlier findings of Abdel-Hafez [6]. *Alternaria alternata* was earlier isolated as a pathogen and saprophyte from almost every source tested [1,13].

In addition to *Alternaria alternata,* isolations were made of *Aspergillus niger, Curvularia lunata, Fusarium solani* and *Penicillium notatum* which are also common pathogens causing diseases to a wide range of hosts [19]. *Fusarium moniliforme* cause Al-Wijam and fruit-rot in date-palm, whilst *Mucor racemosus* causes fruit-rot in *Pyrus communis* Linn. [20]. By use of a wider range of media and techniques it may be possible to isolate a greater range of fungi from soils in these localities.

References

[1] Ali, M.I. "On the Fungal Flora of Saudi Arabia. I. Wadi Haifa." Riyadh University, *Bulletin of the Faculty of Science*, 8 (1977), 7-20.

[2] Ali, M.I., Abu-Zinadaa, A.H. and El-Mashrawi, Z. "On the Fungal Flora of Saudi Arabia. II. Seasonal Fluctuations of Fungi in the Rhizosphere of Some Plants." Riyadh University, *Bulletin of the Faculty of Science*, 1 (1977), 203-314.

[3] Abou-Heila, A.N., Kassim, M.Y., and Basahi, A.Y. "Soil Mycoflora of Saudi Arabia. I. Isolation, Identification and Distribution in Riyadh Region." *Iraqi Journal Science,* 23 (1982), 197-216.

[4] Ali, M.I., and Abou-Heila, A.N. "On the Fungal Flora of Saudi Arabia. III. Some Fungi in Soils from Eastern and Southern Regions." King Saud University, *Journal of the College of Science,* 15, No. 2 (1984), 309-320.

[5] Abdel-Hafez, S.I. "Halophilic Fungi of Desert Soils in Saudi Arabia." *Mycopathologia,* 75 (1981), 75-80.

[6] Abdel-Hafez, S.I. "Survey of the Mycoflora of Desert Soils in Saudi Arabia." *Mycopathologia,* 80 (1982), 308.

[7] Abdel-Hafez, S.I. "Survey of Airborne Fungui Spores at Taif, Saudi Arabia." *Mycopathologia,* 39 (1984), 39-44.

[8] Abdel-Hafez, S.I. *Mycotoxins,* Fungi and Mycoflora of Air-dust from Taif, Saudi Arabia. *Mycopathologia,* 92 (1985), 65-71.

[9] Bokhary, H.A. "*Seed-mycoflora* of Wheat in Saudi Arabia." *J. Tropical Plant Disease,* 4 (1986), 31-39.

[10] Hashem, A.R. "Studies on the Fungal Flora of Saudi Arabian Soil." *Cryptogamic Botany,* 2, No.3 (1990), 179-182.

[11] Ali, M.I., Abu-Zinada, A.H., and El-Masharawi, Z. "Survey of Air-borne Mould Flora at Riyadh, Saudi Arabia." Riyadh University, *Bulletin of the Faculty of Science,* (1977), 215-228.

[12] Fathi, S.M., El-Husseini, T.M., and Abu-Zinada, A.H. "Seasonal Varities of Soil Microflora and Their Activities in Riyadh Region. II. Fungi." University of Riyadh, *Bulletin of Faculty of Science,* 7 (1975), 17-30.

[13] Mostafa, M.A., and Kasem, M.Y. "Studies on the Rhizophere Fungi of *Rhazya stricta.* " University of Riyadh, *Bulletin of Faculty of Science,* 4 (1972), 170-179.

[14] Johnson, L.F., Curl, E.A., Bond, J.H., and Fribourg, H.A. *Methods for Studying Soil Microflora. Plant Disease Relationships.* Minneapolis: Burgess Pub. Co., 1959.

[15] Smith, N.R., and Dawson, V.T. "The Bacteriostatic Action of Rose Bengal in Media Used for the Plate Counts of Soil Fungi." *Soil Science,* 48 (1944), 467-471.

[16] Hashem, A.R. "Analysis of Water and Soils from Ashafa, Toroba, Wahat and Wehiat." *Journal of King Saud University, Vol. 2, Science,* No. (1990), 87-94.

[17] Piper, C.S. *Soil and Plant Analysis. A Laboratory Manual of Methods for the Examination of Soil and Determination of Inorganic Substituents of Plants.* New York: Inter. Pub. Inc., 1955.

[18] Khaliel, A.S. "Comparison of Soil fungi in Disturbed and Undisturbed Sites at Qassim Area in Saudi Arabia." *Saudi Biological Society,* 6 (1983), 325-334.

[19] Kassim, M.Y., Abou-Heilah, A.N., Sheir, H.M., and Bokhary, H.A. "Survey of Fungal Plant Diseases in Saudi Arabia, 2. Diseases of Fruit Trees and Fields Crop." *Comm. Agric. Sci. Der. Res.,* 4 (1983), 29-43.

[20] Kassim, M.Y., Bokhary, H.A., and Abou-Heilah, A.N. "General Survey of Plant Disease and Pathogenic Organisms." *Saudi Biological Society,* (1989).

الفلورا الفطرية لتربة منطقة الشفا وتربة والوهط والوهيط

عبدالوهاب رجب هاشم

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(استُلم في ١٢ جمادى الأولى ١٤١٢هـ؛ قُبل للنشر في ٤ المحرم ١٤١٣هـ)

ملخص البحث. باستخدام أطباق التخفيف تم في هذه الدراسة عزل (٩) أجناس و(٢٤) نوعًا من (٢٠) عينة تربة من منطقة الشفا وتربة والوهط والوهيط.

أثبتت نتائج هذا البحث أن الأجناس السائدة هي الجنس اسبرجليس (٦ أنواع) ثم الجنس الترناريا والجنس كيورفيلاريا والجنس فيوزاريوم والجنس بنسيليوم (٣ أنواع) ثم الجنس رايزوبس والجنس اللوكلاديوم (نوعين) ثم الجنس درشلاريا والجنس ميوكر (نوع واحد).