

Isolation of Keratinophilic Fungi, Including Three Species of Dermatophytes from Soils in Makkah and Taif, Saudi Arabia

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Abstract: Thirty seven soil samples were collected from different sites in Makkah and Taif, Saudi Arabia, to determine presence of keratinophilic fungi using the hair-baiting technique. Thirty species of keratinophilic fungi belonging to seven genera were isolated and identified. The fungi included: 23 species from the genus *Chrysosporium*, three dermatophyte species (*Microsporum gypseum*, *Trichopyton mentagrophytes* and *T. tonsurans*) and one species from each of the following genera: *Amauroascus*, *Arachniotus*, *Malbranchea* and *Verticillium*.

Key Words: dermatophytes, keratinophilic fungi, saudi arabia, soil.

Introduction

In the last few decades, soil has been examined for the presence of keratinophilic fungi, as they constitute a small but important group of fungi. Some of these fungi develop topically on keratinized tissues of living animals (Ajello, 1968, Ajello and Padhye 1974, and Hyashi and Toshitani, 1983). The soil fungal flora of Saudi Arabia has

been investigated earlier (Ali, 1977; Abdel-Hafez, 1982a & b; Ali and Abu-Heilah, 1984).

Studies of keratinophilic fungi are now of considerable significance for their important role in the breakdown of keratinous debris of man and animals in nature, and they have a worldwide distribution (Al-Doory, 1967; Sur and Ghosh, 1980; Soon, and Karam El-Din *et al.*, 1996). They have been also

reported from Saudi Arabia (Baggy and Abdel-Malek, 1991).

The present study reports on the distribution of keratinophilic fungi in soils collected from Makkah and Taif, Saudi Arabia.

Materials and Methods

A total of 32 soil samples were collected from different sites in Makkah (gardens, animal enclosures, schools, university, chicken farms and markets). Also five soil samples were collected from cultivated fields in Taif. The soil samples were examined for the presence of keratinophilic fungi.

The modified hair-baiting technique (To-Ka-Va) after Benedek (1962) was employed to isolate keratinophilic fungi such as dermatophytes and other related fungi. Each soil sample was thoroughly mixed and divided into six portions. From each portion a sufficient amount was added to a sterile petri plates to a depth of 0.5 cm. Sterile water was then added to moisten the soil, and several dozen pieces of sterile human (child) hair were sprinkled on the surface. The plates were wrapped in papers, incubated at 25 °C, and examined over 8-10 weeks at periodic intervals for the development of fungal growth on the hairs. When growth occurred, baits of

hairs were removed with sterile forceps, and fungi were cultured on Sabouraud's dextrose, with chloramphenicol and cycloheximide to inhibit the growth of both the bacteria and the fast growing fungi.

The isolated keratinophilic fungi were identified by recognition of culture, microscopic and nutritional characteristics (George and Camp, 1957; Ajello, 1968; Rebell and Taplin 1974; Wolf *et al.*, 1975; Frey *et al.*, 1979; Padhye *et al.*, 1980; Van Oorschot, 1980).

Results and Discussion

During this study, 30 species of keratinophilic fungi belonging to seven genera were isolated from 37 soil samples. The most dominant species (23 species) belong to the genus *chryso sporium* (Table 1).

Chryso sporium indicum Randhawa (Sandhu and Carg) was the most prevalent species as it was recovered from six out of seven sites. This fungus has been previously reported from soil samples from India (Sanyal and Thammaya, 1971); Romania (Evalceanu and Alteras, 1966); Germany (Bojanvsky *et al.*, 1979) and Egypt (Youssef *et al.*, 1992). It was also

Table 1. List of keratinophilic fungal species isolated from soils in Makkah and Taif.

No. of fungus	Isolated fungus	No. of fungus	Isolated fungus
1.	<i>Amauroascus niger</i> Schoroot.	16.	<i>C. lucknowense</i> Carg.
2.	<i>Arachniotus citrinus</i> Masee and Salmon.	17.	<i>C. merdarium</i> (Link ex. Grev) Carmichael.
3.	<i>Chrysosporium</i> (anamorph of <i>Arthroderma cuniculi</i>). Dawson.	18.	<i>C. pannicola</i> (Corda) Van Oorschot and Stalpers.
4.	<i>Chrysosporium</i> (anamorph of <i>Arthroderma curreji</i>). Berk.	19.	<i>C. parmorum</i> (Link) Hughes (Carmichael, 1962).
5.	<i>Chrysosporium</i> (anamorph of <i>Gymnoascus demonbremii</i>). Ajello and Cheng.	20.	<i>C. pseudomerdarium</i> Van Oorschot.
6.	<i>Chrysosporium</i> (anamorph of <i>Pectinotrichum ilanense</i>). Varsavsky and Orr.	21.	<i>C. queenslandicum</i> Apinis and Rees.
7.	<i>Chrysosporium</i> (anamorph of <i>Renispora flavissina</i>). Sigler <i>et al.</i>	22.	<i>C. sulfureum</i> (Field) Van Oorschot and Samson.
8.	<i>Chrysosporium</i> (anamorph of <i>Rollandina vriesii</i>). Apinis.	23.	<i>C. synchronum</i> Van Oorschot.
9.	<i>C. carmichaelii</i> Van Oorschot.	24.	<i>C. tropicum</i> Carmichael.
10.	<i>C. evolceanii</i> Randhawa and Sandhu.	25.	<i>C. xerophilum</i> Pitt.
11.	<i>C. georgii</i> (Varsavsky and Ajello) Van Oorschot.	26.	<i>Malbranchea</i> sp Saccardo
12.	<i>C. indicum</i> (Randhawa and Sandhu) Carg.	27.	<i>Microsporum gypseum</i> (Bodin) Guiart <i>et</i> Grigoraki.
13.	<i>C. inops</i> Carmichael.	28.	<i>Trichophyton mentagrophytes</i> (Robin) Blanchard.
14.	<i>C. keratinophilum</i> D. Frey ex. Carmichael.	29.	<i>Trichophyton tonsurans</i> Malmsten.
15.	<i>C. lobatum</i> Scharapov.	30.	<i>Verticillium</i> sp Nees ex. Link-linn.

isolated by Piontelli and Carreta (1974) from mountainous localities in Italy.

Six of the isolated species of *Chrysosporium* were anamorph of the genera *Arthroderma*, *Gymnoascus*, *Pictino-trichum*, *Revispora* and *Rollandina* as described by Van Oorschot (1980).

Chrysosporium species were previously recovered from the majority of soil samples collected from different localities in many countries (Sur and Ghosh, 1908; Van Oorschot, 1980; Al-Musallam, 1989; Baggy and Abdel-Malek, 1991; Youssef *et al.* 1992).

Three species of the remaining seven keratinophilic fungi recovered in this study were dermatophytes. They were identified as *Microsporum gypseum* (Bodin) Guiart *et* Grigorak, *Trichophyton mentagrophytes* (Robin) Blanchard and *Trichophyton tonsurans* Malmsten (Table 1). These species are recognized to cause skin, hair and nails diseases in man and animals, and have worldwide distribution (Wolf *et al.*, 1975; Frey *et al.*, 1979; Rippon, 1982). Each of *Microsporum gypseum* and *Trichophyton tonsurans* was recovered from one site, while *T. mentagrophytes*

was recovered from four sites. These three species were recovered from soils by other workers (Ajello and Cheng, 1967; Verma *et al.*, 1982; Youssef *et al.*, 1992; Karam El-Din *et al.*, 1996).

The other four species recovered in our study were *Amauroascus niger* Schoroet, *Arachniotus citrinus* Masee and Salmon, *Malbranchea* sp. (Saccardo) and *Verticillium* sp. (Nees ex. Link-linn).

The distribution of these keratinophilic fungi among the different sites (Table 2) was not uniform, and this could be attributed to the difference in the organic matter content of the soil. It has been reported that the organic matter content of the soil is one of the major factors affecting the presence and distribution of the keratinophilic fungi in soils (Chmel *et al.*, 1972). Twenty seven species were recovered from garden

Table 2. Distribution of keratinophilic fungal species isolated from soils at different sites in Makkah and Taif.

Fungus Number ¹	Makkah						Taif
	Gardens (15) ²	Animal Enclosure (3)	Schools (4)	University (4)	Chicken farms (3)	Markets (3)	Cultivated fields (5)
1.	+	+					
2.	+						
3.	+						+
4.	+	+					+
5.	+						
6.	+	+					
7.	+						
8.	+						
9.							+
10.	+		+				
11.	+					+	
12.	+	+	+		+	+	+
13.	+	+	+				
14.	+				+		
15.	+			+			
16.	+						+
17.	+				+		
18.	+	+					+
19.	+					+	
20.	+	+					
21.	+		+		+		+
22.	+	+					
23.	+						
24.	+				+	+	
25.	+						+
26.	+						
27.							+
28.	+	+	+	+			
29.							+
30.							+
Total	27	9	5	3	6	3	10

¹Fungal species as listed serially in Table 1.

²Number of collected soil samples per site.

soils. This was followed by cultivated fields (10 species), animal enclosures (9 species), chicken farms (6 species), schools (5 species), and the university and markets (3 species). All of these seven sites were positive for keratinophilic fungi, but only five of these sites were positive for dermatophytes (Table 2).

Twenty three species of *Chrysosporium* were isolated from garden soils, seven from cultivated soils, seven from animal enclosures, six from chicken farms, four from schools, three from markets and only one from the university. Similar results were obtained by Chmel *et al.*, (1972) who reported that garden soils with its high organic debris are rich sources of keratinophilic fungi.

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عزل فطريات كيراتينية ، منها ثلاثة مسببة للأمراض الجلدية ، من التربة في كل من مكة المكرمة والطائف بالمملكة
العربية السعودية

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المخلص : باستخدام طريقة عجينة الشعر، تم عزل ثلاثين نوعا من الفطريات الكيراتينية تنتمي إلى سبعة أجناس ، وذلك من مجموع سبع وثلاثين عينة تربة تم جمعها من أماكن مختلفة بمدينة مكة المكرمة (٣٢ عينة) التفوق في عدد الأنواع المعزولة حيث بلغت *Chrysosporium* ٢٣ ومدينة الطائف (٥ عينات). كان لجنس نوعا مختلفا . كما تم عزل ثلاثة أنواع تنتمي لجنسين من الأجناس المسببة للأمراض الجلدية هي: *Microsporum gypseum, Trichophyton mentagrophytes and Trichophyton Tonsurons.*

كما تم عزل نوع واحد لكل من الأجناس الآتية: *Amauroascus, Arachniotus, Malbranchea and Verticillium.*