

Original article**Survey of keratinophilic fungi from soils in Ahvaz, Iran**

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Abstract

Introduction and objective: The soils are the major source of fungi. Some of the soil fungi can be pathogen to humans and animals. Rich keratinous materials in soil are the most reason for the incidence and growth of keratinophilic fungi. The purpose of this survey was isolation of keratinophilic and dermatophytic fungi from the soil samples which can be pathogen to humans and animals.

Materials and methods: Forty-five soil samples were collected from three different locations in Ahvaz, Khuzestan province, Iran. The isolated fungi were identified after slide culturing according to studies of their gross and micro-morphological features.

Results: Totally 644 colonies from soil samples collected from three different locations in Ahvaz. The dermatophytes isolated were identified as: *Microsporium gypseum* 3(0.47%) and *Trichophyton mentagrophytes* 2(0.31%). The most common non-dermatophytes fungi isolated were: *Penicillium* sp. 250(38.81%), Yeasts 115(17.86%), *Fusarium* sp. 81(12.58%), *Chrysosporium* sp. 57(8.85), *Aspergillus flavus* 34(5.28%), *Mycelia sterilia* 32(4.97%) and *A. niger* 25(3.88%).

Conclusion: Our research shows the keratinophilic fungi and related dermatophytes present in the soils of Ahvaz, Iran.

Significance and impact of the study: Survey results revealed the occurrence of keratinophilic fungi in soils of different locations in Ahvaz.

Keywords: Keratinophilic fungi; Dermatophytes; Iran

Introduction

The soils are the major source of fungi. Some of the soil fungi can be pathogen to humans and animals. Rich keratinous materials in soil are the most reason for the incidence and growth of keratinophilic fungi. The keratinophilic fungi and geophilic dermatophytes are distributed worldwide. Distribution of these fungi is related to various factors, one of essential is the presence of human and/or animal. Dermatophytes are recognized to cause superficial infection of keratinised tissues in humans and animals. Superficial mycoses are reported throughout the world, and the infections are very contagious [1]. The incidence of dermatophytes in soil was discussed for the first time by Vanbreuseghem [2] with the use of the hair bait technique. Since then investigations on keratinophilic fungi of soil were performed throughout the world [3-8].

The soil is also regarded as the reservoir of most pathogenic microorganisms including non-dermatophytic fungi. The opportunists *Aspergillus* [9], *Chrysosporium* [10] and *Fusarium* [11] largely found in soils occur following to trauma and cause fungal infection [12]. Persons obtain fungal infection during their association with soil that is an ecological place for the majority of human pathogenic fungi. In this study, the soil samples from Ahvaz city which is situated in Khuzestan province in south west of Iran were investigated for the presence of keratinophilic, dermatophytes and non-dermatophytic fungi.

This study could help us to recognize the frequency and occurrence of dermatophytes and other keratinophilic fungi and risk of dermatophytosis in those areas. The presence of fungi in soil also indicates the infection risk connected with contamination of the environment by possible fungal pathogen.

Materials and methods

Collection of samples

A total of 45 soil samples were collected from three different zones (Golestan, Kianpars and Engelab in Ahvaz, Khuzestan province, Iran during summer 2008. The soil samples were collected from the superficial layer with depth not exceeding 3-5cm in sterile polyethylene bags. The samples were transferred immediately to the laboratory for processing. Sterile healthy children hair bait technique was applied to isolate keratinophilic fungi from soil.

Processing of samples

The samples were processed rapidly after collection. For each samples, three sterile Petri dishes were half-filled with soil samples and moistened with sterile distilled water containing 0.05mg/ml of chloramphenicol. Strips of the hairs for the isolation of keratinophilic fungi were aseptically distributed on moistened soil. Petri dishes were stored at room temperature for at least one month. The hairs were examined for signs of fungal growth. After developing fungal growth, they were transferred to Sabouraud glucose agar, SDA (Merck, Germany) plates supplemented with 0.05mg/ml chloramphenicol and stored at room temperature. Pure cultures of fungi were attained with subculturing on SDA.

Identification of isolates

The isolated fungi were identified after slide culturing according to studies of their gross and micro-morphological features.

Results

Totally 640 colonies from soil samples collected from three different locations in Ahvaz, Iran (Table 1). The dermatophytes isolated were identified as: *Microsporum gypseum* 3(0.47%) and *Trichophyton mentagrophytes* 2(0.31%). The most common non-dermatophytes fungi isolated

were: *Penicillium* sp. 250(38.81%), yeasts 115(17.86%), *Fusarium* sp. 81(12.58%), *Chrysosporium* sp. 57(8.85), *Aspergillus flavus* 34(5.28%), *Mycelia sterilia* 32(4.97%) and *A. niger* 25(3.88%). Overall, of the in various areas, Golestan had the highest frequency of fungi (284 colonies, 44.10%) followed by Engelab (188, 29.19%) and Kianpars (172, 26.71%).

Table 1: Distribution of fungi isolated from 45 soil samples from Ahvaz, Iran

Fungi	No.	%
<i>Penicillium</i> sp.	250	38.81
Yeasts	115	17.86
<i>Fusarium</i> sp.	81	12.58
<i>Chrysosporium</i> sp.	57	8.85
<i>Aspergillus flavus</i>	3	5.28
<i>Mycelia sterilia</i>	32	4.97
<i>Aspergillus niger</i>	25	3.88
<i>Rhizopus</i> sp.	11	1.70
<i>Cladosporium</i> sp.	10	1.55
<i>Aspergillus</i> sp.	9	1.40
<i>Drechslera</i> sp.	5	0.77
<i>A. fumigatus</i>	3	0.47
<i>M. gypseum</i>	3	0.47
<i>T. mentagrophytes</i>	2	0.31
<i>Curvularia</i> sp.	2	0.31
<i>A. terreus</i>	2	0.31
<i>Ulocladium</i> sp.	1	0.16
<i>Cunnengomella</i> sp.	1	0.16
<i>Alternaria</i> sp.	1	0.16
Total	644	100

Discussion

The keratinolytic activity of fungi is important ecologically and has attracted the attention of researchers throughout the world. Keratinophilic fungi play an important role in the natural degradation of keratinized residues in the soil [13-14]. These fungi can probably cause human and animal infections [15-17]. The presence of these fungi in different soil has been reported from different countries [3-8]. A number of studies have been performed in different part of Iran and demonstrated that a variety of keratinophilic fungi exists in the soils of investigated region [3-5,18-20].

Our study also showed the presence of keratinophilic fungi in the soil of Ahvaz, Iran. Although the non-dermatophytic fungi isolated are more common than dermatophytes, *M. gypseum* and *T. mentagrophytes* were the main dermatophytes. *M. gypseum* is a frequent geophilic dermatophyte commonly distributed in soil worldwide. *M. gypseum* was recovered in soil samples from Isfahan [3], Ahvaz [5], Gazvin [19], and Sari [20]. *T. mentagrophytes* was also found in several investigations in soils of different parts of Iran [3,5]. Our study showed that the genus *Penicillium* was the first dominant fungus in soils of Ahvaz. Shokohi *et al.* [20] reported that *Penicillium* was the most prevalent saprophyte in Sari.

The occurrence of *Chrysosporium* sp. in different types of soil is important for pathogenic potential of fungus and was confirmed in several studies in different countries. For instance, *C. Zonatum* was showed causing systemic infection in a person with a chronic granulomatous disease [21]. Deshmukh [4] reported the incidence of several keratinophilic fungi such as *C. tropicum*, *C. indicum*, *M. gypseum*, and *T. mentagrophytes* from the salt pans and coastal soils in India. *A. flavus* is reported to make keratinase [22]. This possibly describes the recovery of fungus from the sterile hair bait. *A. flavus* had been recognised as a strong producer of extracellular keratinase in medium including porcine nail as the source of nitrogen and carbon. Some strains of *Fusarium* were also described to be active in extracellular keratinases after grown on agar including soluble keratin [22].

Conclusion

Our research shows the existence of keratinophilic fungi in the soils of Ahvaz, Iran. Therefore hygiene protocol should be taken to prevent the spread of pathogenic fungi in the environment of human.

Conflict of interest statement: All authors declare that they have no conflict of interest.

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