

## Species Diversity of Keratinophilic Fungi in Various Soil Type of Babol Medical University's Hospitals' Yard

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### Abstract

**Back ground and Objective:** Dermatophytosis are caused by attacking keratinophilic fungi to the human's or animals' in keratinic layers. In this study the resources of fungal infection pollutions of dermatophytes existing in the soil of Babol Medical University's Hospitals have been investigated. **Materials and Methods:** This descriptive cross-sectional study was performed on the soil of Hospital yard during 3 months. Fifteen plates of soil from each hospital were collected for culture on Sabouraud dextrose agar supplemented with chloramphenicol and cycloheximide media. **Results:** In the soil of Beheshti Hospital and Marzi Kola Hospital, *Cunninghamella* sp., in Yahya nejad Hospital, Amir Kola Hospital and Fatemeh Zahra Hospital *M. gypseum* and in Shahid Rajaii Hospital, *Aspergillus niger* were the most species. **Conclusion:** In this research, the most detected species in the soil was *Cunninghamella*, *M. gypseum* and *A. niger* can cause human ringworm, mucormycosis, aspergillosis and so on.

**Keywords:** Dermatophytes, Soil, *Cunninghamella* sp., Keratinophilic fungi, Aspergillosis, Mucormycosis.

### 1. Introduction

Soil is potential sources of fungal infection agent for humans and animals and well known to support the transient of keratinophilic fungi (1,2). These fungi are prevalent in soil, if it is in reached by human and animal derbies (3). Keratinophilic fungi (KPF) are a highly specialized group of fungi that have evolved an ability to degrade native keratin. Some species of keratinophilic fungi are cause of dermatophytosis and them parasites of keratinized tissues in humans and animal's skin and its appendix (4). These fungi are classified into three genera: *Microsporum* sp., *Trichophyton* sp. and *Epidermophyton* sp. include many species. The geophilic dermatophytes can invasive to human by direct or indirect soil contact, and then cause ringworm or dermatophytosis (5,6).

Other keratinophilic fungi such as *Geomyces*, *Keratinophyton*, *Acremonium*, *Aspergillus*, which participate in the recycling of carbon, nitrogen and sulfur of native keratin in the soil and other keratin-containing environments, can cause other various form of mycosis (7,8). Etiological agents of these diseases attack to the skin keratin layer and its appendix and cause infections with moderated or severe clinical symptoms (9). Merkantin et al. detected keratinophilic fungi such as *Chrysosporium* sp., different species of *Microsporum*, *Trichophyton* and *Epidermophyton floccosum* from soil of kinder gardens and schools (10). The best method for isolation of keratinophilic fungi is hair baiting method (11,12).

Other keratin source such as chicken feather, wool and horns were used for growth of this fungi, of course some non keratinophilic fungi have potential for use of keratin (8,13).

According to some fungi have potential for diseases, thus in this study we decided to recognize keratinophilic fungi of soil of hospitals yard to suggest scientific and practical ways to prevent various mycotic diseases caused by these fungi in hospitalized patients' with immunocompromised and to recommend for improving of environment .

## 2. Materials and Methods

This descriptive cross-sectional study was performed during 3 months on the soil of Babol medical University's Hospitals' yard at 2011. Soil samples (15 plates for each hospital) were collected from 5cm depth of soil, in non-rainy weather. These samples were delivered to the laboratory and were maintained in room temperature until examination. For isolation of keratinophilic fungi from soil sample used hair baiting method (11,12). Put about 50 g of soil samples in a laboratory plate then covered its surface with sterilized scalp hair of baby under 5 years old and wetted by about 10 ml of sterile distilled water. These samples incubated at ambient temperature in laboratory for growing of keratinophilic fungi. After observing fungal growth around the hair performed subculture of these fungi on Sabouraud(S) and Sabouraud dextrose agar supplemented with Chloramphenicol and Cycloheximide (Scc) media, immediately. Fungi were identified by macroscopic and microscopic examination. Some of keratinophilic fungi were identified by using specific method such as slide culture and hair perforation. All data were collected and analyzed by SPSS and descriptive statistics.

## 3. Results

The most keratinophilic fungi species were isolated from the soil of Shahid Beheshti Hospital's yard were *Cunninghamella* in 15 cases (100%), *M. gypseum* (86%) and *Fusarium* (33%). *Mucor*, *Drechslera* and *Gliocladium* had the lowest frequency in soil (6%). In soil of Shahid Yahya Nejad Hospital, the growth of *M. gypseum*, and *Cunninghamella* sp. were seen in 100% and 93%, respectively. *Mucor* sp., *Alternaria* sp. and *Rhizopus* sp. were observed in 6% cases. *M. gypseum* were observed in 100% of soil samples were collected from Fatemeh Zahra Hospital's yard and followed by *Cunninghamella* sp., (53%). The lowest isolated fungi were *Trichothecium* sp. and *Penicillium* sp. (6%).

In Amir Kola Hospital, the most common of fungi in soil were *M. gypseum* (93%) and *Fusarium* (80%); *Yeast* and *Rhizopus* sp. were observed in 6% of samples. The growth of *Aspergillus niger* (53%) and *Cunninghamella* sp. (46%) were more than other fungi in Shahid Rajaii Hospital, Babolsar. *Yeast* were observed only in 6%. *Cunninghamella* sp. (86%) and *A-niger* (73%) were the most fungi that isolated from soil of Marzi Kola Hospital. *Trichothecium* sp and *Alternaria* sp. were seen in 6% of soil samples. Different species of growth fungi in soil of each Hospital are showed separately in table 1.

Overall growth of fungi in 90 plates of soil samples were isolated from 6 Hospitals' yards are showed in table 2. *Cunninghamella* sp. and *M. gypseum* were the most common fungi and three fungi such as *Trichothecium* sp. was the lowest fungi were grown in soil samples, totally.

**Table 1: Different Species of Keratinophilic Fungi Isolated from Various Hospitals, Yards, Babol**

Hospitals	Beheshti N (%)	Yahya Nejad N (%)	Fatemeh Zahra N (%)	Amirkola N (%)	Rajaii N (%)	Marzikola N (%)
<i>Cunninghamella</i> sp.	15(100)	14(93.33)	8(53.33)	13(86.67)	7(46.67)	13(86.67)
<i>Microsporium gypseum</i>	13(86.67)	15(100)	15(100)	14(93.33)	4 (26.67)	7(46.67)
<i>Aspergillus niger</i>	3(20)	7(46.67)	4(26.67)	6(40)	8(53.33)	11(73.33)
<i>Fusarium</i> sp.	5(33.33)	2(13.33)	4(26.67)	12(80)	5(33.33)	3(20)
<i>Penicillium</i> sp.	2(13.33)	1(6.67)	1(6.67)	3(20)	5(33.33)	2(13.33)
<i>Mucor</i> sp.	1(6.67)	1(6.67)	4(26.67)	2(13.33)	2(13.33)	-----
<i>Drechselera</i> sp.	1(6.67)	-----	3(20)	-----	-----	-----
<i>Gliocladium</i> sp.	1(6.67)	-----	-----	2(13.33)	-----	-----
<i>Aspergillus flavus</i>	-----	2(13.33)	-----	2(13.33)	-----	4(26.67)
<i>Rhizopus</i> sp.	-----	1(6.67)	-----	1(6.67)	3(20)	-----
<i>Aspergillus fumigatus</i>	-----	-----	-----	-----	4(26.67)	-----
<i>Yeast</i> sp.	-----	-----	-----	1(6.67)	1(6.67)	-----
<i>Alternaria</i> sp.	-----	1(6.67)	-----	-----	-----	1(6.67)
<i>Trichothecium</i> sp.	-----	-----	1(6.67)	-----	-----	1(6.67)

**Table 2: Frequency of Keratinophilic Fungi from Soil of Hospitals' Yard of Babol University of Medical Sciences**

Fungus name	Frequency (%) N=90
<i>Cunninghamella</i> sp.	70(77.78%)
<i>M. gypseum</i>	68(75.56%)
<i>A. niger</i>	39(43.33%)
<i>Fusarium</i> sp.	31(34.44%)
<i>Penicillium</i> sp.	14(15.56%)
<i>Mucor</i> sp.	9(10%)
<i>A. flavus</i>	8(8.89%)
<i>Rhizopus</i> sp.	5(5.56%)
<i>A. fumigatus</i>	4(4.44%)
<i>Drechselera</i> sp.	4(4.44%)
<i>Gliocladium</i> sp.	3(3.33%)
<i>Yeast</i> sp.	2(2.22%)
<i>Alternaria</i> sp.	2(2.22%)
<i>Trichothecium</i> sp.	2(2.22%)

#### 4. Discussion

In this study, the majority of identified species in soil of Babol's University training Hospitals were *Cunninghamella* sp. in 77% of cases, and the lowest species were *Alternaria* sp., *Trichothecium* sp., and *Yeast* in 2.22% of cases, each fungi. Most of the species have been isolated in this study are known as agents of human and animal infectious. The fungi observed here are discussed in relation to their global distribution as study of vidyasagar GM et al on hospital dust and soils of public places at Gulbarga, India (14).

E. Malek et al from soil of parks isolated *Microsporium gypseum* as the first but in my study we found it as the second, and *Alternaria* sp. is rare in two studies (15). Hedayati et al. in soil samples of potted plants of 4 Hospital found that *Penicillium* sp. was the most and *Alternaria* was rare (16).

In our study *Alternaria* is the same but *Penicillium* is medium frequent. Zarrin et al from soil samples of three different zone of Ahvaz city showed that *Penicillium* sp. was the most and *Alternaria* was the least (17). In our study *Alternaria* is the same but *Penicillium* is the moderate.

Saxena et al. found Hospital soils had lower keratinophilic fungi (62%) from others (80%); they showed human hairs were better than chicken feather and wool for growth of keratinophilic fungi (8). Other researches, such as Pakshir et al, from public parks soil in Shiraz (18), Singh et al. in soil of parks and agricultural fields of Uttar Pradesh, India ( 19 ). Saxena et al. in the soil of Agra (8) Shadzi et al. from elementary schools and public parks in Isfahan (20) , and Moallaei et al. In a study of forests and farm yards soil samples (1) showed that separated fungi by a little difference and same method are as same as our research. In a study the most common of keratinophilic fungi were *Arthroderma simii*, while the *Ctenomyces serratus* had the minimum frequency from dust of Hospital (21). In our study several of plants, animals and human crowding around the hospitals yard and various soil organic material can cause different various species of fungi in different hospitals.

Medical objects, instrument and hands of hospital staff may be cause of transportation of theses fungi in Hospital (22). Now a days with developing of medical knowledge and technology like kidney transplantation that need to use immunosuppressive agents and other immunocompromised diseases such as Aplastic Anemia , leukemia, cancerous patient, radiation, AIDS, diabetes and other ill patients are a good hosts for mycosis affection(23-25). So all saprophytes fungi in body or in nature can be pathogen at favorable conditions (26,27). In our study detected fungi like *Mucor* can cause Mucormycosis that is high mortality diseases and *Aspergillus* can cause Aspergillosis of lung, visceral and dermal that are dangerous diseases with high mortality, and other detected fungi are same (26). *Cunninghamella* sp. which was the most common fungi from hospital soils can be cause of mucormycosis (28).

Therefore some of these fungi such as *Mi. gypseum* that detected from soil of hospitals, yard were *dermatophytes* that can cause human ringworm and other fungi can cause various mycosis such as mucormycosis, aspergillosis and so on. So Hospitalized patients that have low immunity can be good host of these fungi. The soil fungi can be transferred to hospitalized patients straightly, by staff worker, by family visitors or by air. So observe hygiene and no contact with soil of hospitals, Yard is recommended.

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## 7. Conflict of Interest

There was no conflict of interest.

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