

INCIDENCE OF KERATINOPHYLIC FUNGI AND OTHER RELATED FUNGI FROM SELECTED SOIL SAMPLES OF PAOTA, RAJASTHAN

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One hundred ten soil sample were collected from various area of paota, Jaipur district of Rajasthan and screened for prevalence of keratinophilic fungi and related dermatophytes. From the positive samples (62.72%), a total of seven genera with eighteen species were isolated. Among the dermatophytes and other related species, *Chrysosporium indicum* was predominant followed by *Microsporium gypseum*, *Trichophyton rubrum*, *T. mentagrophyte*, *C. tropicum*, *T. tonsurans*, *Epidermophyton floccosum*, *M. fulvum*, and *T. schoenleinii*. Other species were *Aspergillus flavus*, *A. niger*, *A. terreus*, *A. fumigatus*, *Fusarium oxysporum*, *F. chlamydosporum*, *F. verticillioides*, *F. solani* and *Penicillium sp.* Most of the species isolated are known to be the agents of human and animal infections.

Keywords: Dermatophytes; Keratin; Keratinophilic fungi; Soil fungi.

Introduction

Throughout the world, great interest is shown by research workers in soil mycoflora that can degrade keratinized residue. This is due to two factors, the extreme resistance of keratin to biological attack and the pathogenic potential of every keratinolytic saprophytic species¹. Soils that are rich in keratinous material are most conducive for the growth and occurrence of keratinophilic fungi². Despite that the majority of dermatophytes can live saprophytically, most keratinophilic fungi have pathogenic potential³. In India, open school play grounds, public parks, public places are often invaded by animals such as cow, bullock, bird, dog, pig, cat and rat. These transient animals leave organic residues, which may contaminate the soil with keratinaceous debris and possibly propagules of keratinophilic fungi including fungal pathogens. Therefore, soil can become a potential source of infection for human beings⁴. Keratinophilic fungi are likely to be important ecologically, especially in regions where human and animal populations are high. Filipello⁵ reported that soils rich in keratinous residue constitute a permanent or occasional reservoir for dermatophytes as well as keratinolytic and keratinophilic fungi. These fungi are potential agents of infection in human beings and animals.

Material and Methods

Soil samples were collected from various area of Paota, Jaipur district and screened for prevalence of keratinophilic fungi and other related fungi. The samples

were placed in sterile polyethylene bags, brought to the laboratory and used immediately or stored overnight at 4°C. Twenty grams of soil from each sample were placed in sterilized 9 cm diameter Petri dishes. Five replicate samples were processed. Autoclaved human hairs were used to bait keratinophilic fungi by scattering of the hairs on the soil surface. The plates were then moistened with an antibiotic solution containing cycloheximide (0.5 mg/ml), chloramphenicol (0.05 mg/ml) and streptopenicillin (1000 IU/ml). The plates were then incubated at room temperature for a period of 2 months and were remoistened with sterile deionized water whenever necessary. Once every week baits were selected at random from each Petri dish, transferred to plates containing Sabouraud dextrose agar medium with cycloheximide (0.5 mg/ml) and chloramphenicol (0.05 mg/ml) then incubated at room temperature for a period of 2 weeks. The developed colonies were examined and identified by standard mycology manuals^{6,7}.

Results and Discussion

Keratinophilic fungi are important ecologically and recently have attracted the attention throughout the world. They play a significant role in the natural degradation of keratinized residues⁸, have many properties in common with dermatophytes and some can probably cause human and animal infections^{9,10}. Keratinophilic fungi are presented in the environment with variable distribution patterns that depend on different factors, such as human

Table 1. Distribution of keratinophilic fungi in different types of soil.

Source of Soil Sample	Road Side	Garden	Garbage	Poultry Farm	Cattle Farm	School Play Ground	House dust	Hospital s	School Hostel	Total	Distribution %
No. of Sample Examined	20	10	10	10	10	10	15	15	10	110	
No. of Positive Samples	12	5	6	7	7	6	9	11	6	69	
Distribution %	60%	50%	60%	70%	70%	60%	60%	73.34%	60%	62.72%	

Dermatophytes and Related Species

<i>Microsporium gypseum</i>	2	-	1	1	1	-	1	1	1	8	11.59%
<i>M. fulvum</i>	-	-	-	-	1	1	-	-	-	2	2.89%
<i>Trichophyton rubrum</i>	-	1	1	-	1	-	2	2	-	7	10.14%
<i>T. mentagrophytes</i>	1	1	-	1	1	-	1	1	1	7	10.14%
<i>T. tonsurans</i>	1	-	-	-	-	1	-	1	-	3	4.34%
<i>T. schoenleinii</i>	-	-	-	-	-	-	1	1	-	2	2.89%
<i>Epidermophyton floccosum</i>	1	-	-	-	-	-	1	1	-	3	4.34%
<i>Chrysosporium indicum</i>	1	1	-	2	1	1	1	1	1	9	13.04%
<i>C. tropicum</i>	1	-	1	1	1	1	1	1	-	7	10.14%
Other fungi											
<i>Aspergillus flavus</i>	1	-	-	-	-	1	-	-	-	2	2.89%
<i>A. niger</i>	1	-	-	-	-	1	-	-	-	2	2.89%
<i>A. terreus</i>	-	-	-	-	-	-	-	1	1	2	2.89%
<i>A. fumigatus</i>	-	-	1	1	-	-	-	-	-	3	4.34%
<i>Fusarium oxysporum</i>	1	-	1	1	1	-	-	-	-	3	4.34%
<i>F. chlamydosporum</i>	1	-	-	-	-	-	-	-	-	3	4.34%
<i>F. verticillioides</i>	1	-	-	-	-	-	-	1	1	3	4.34%
<i>F. solani</i>	-	1	-	-	-	-	-	-	1	2	2.89%
<i>Penicillium sp.</i>	-	-	1	-	-	-	-	-	-	1	1.44%

and or animal presence, which are of fundamental importance.

The result of the isolation are presented in Table 1. The data show that out of 110 samples only 69 yielded keratinophilic fungi. A total of 7 genera with 18 species were isolated. *Chrysosporum indicum* was the most frequently isolated species (13.04%) and agrees with findings of previous workers^{11,12}. Its high percentage of distribution indicate that it is adapted to the warmer condition of India. *Microsporium gypseum* was the next frequent isolate (11.59%). This species was also reported as the second most common dermatophyte from soils in Madras and Mumbai^{13,14}. *M. gypseum* is a common geophilic dermatophyte widely distributed in soil globally^{15,16}. It causes ringworm of the scalp and glabrous skin in human beings. *Microsporium fulvum* occupied last position among dermatophytes. *M. fulvum* is geophilic fungi and rarely infects man and animals. It was also found first by Singh *et al.*¹⁷. *Chrysosporium tropicum* were recovered from 10.14% of the samples. It has been also reported by Jain *et al.*¹⁸. Regarding other dermatophytes, we encountered *Trichophyton mentagrophytes* (10.14%), *Trubrum* (10.14%), *T. tonsurans* (4.34%) and *Tschoenleinii* (2.89). *Trichophyton mentagrophytes* were reported from school and public park environment in Jaipur^{19,20}. *T. mentagrophytes* is distributed throughout the world and it recovered from man and animals as an agent of *Tinea pedis* and *Tinea unguium*²¹. We also encountered the *Epidermophyton floccosum* from 4.34% soil samples.

Other than dermatophytes and related species, 9 keratinophilic fungi belonging to 3 genera were recovered from soil samples. The most frequently observed species were: *Fusarium oxysporum* > *F. chlamyosporum* > *F. verticillioides* > *Aspergillus fumigatus* > *F. solani* > *A. niger* > *A. terreus* > *A. flavus* > and *Penicillium sp.* The potential human pathogenic fungi isolated in the present study were *A. fumigatus*. Its spores are air-dispersed and may reach the upper and lower airways as well as the ear canals. Massive spore inhalation may cause acute allergic pulmonary disease²². *Aspergillus flavus* was the second dominant species in soil sample in the category of other fungi. This species has been cited as one of the fungi, which are present in atmosphere²³. The genus *Penicillium* was also isolated (1.44%) from the soil samples. The data are coincident with those reported by several authors who mention the constant presence of *Penicillium* in mycoflora from different area in the world^{24,25}. *Fusarium oxysporum* and *F. solani* was also found out by Vidyasagar *et al.* from hospital dust and soils of public places from Gulbarga²⁶. *F. solani* was also encountered from soil sample of poultry

farm in Tamilnadu²⁷. It appears from this study that a rich variety of keratinophilic fungal flora exists in Rajasthan which may be attributed to the climatic and environmental conditions such as the soil type, vegetation, fauna and human habitations.

Acknowledgement

The authors are thankful to the Head of the Botany Department, University of Rajasthan, Jaipur for facilities and encouragement during the research work.

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