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An Account of Dermatophytes in the Soil with Special Reference to *Microsporum gypseum*

Abstract

Soil samples were collected from different habitats. Isolations were made from decomposing keratinous substances using Vanbreuseghem's technique. On analyzing the data it was found that species of keratinophilic fungi like *Chrysosporium*, *Microsporpum* and *Trichophyton* were frequent in their distribution. *M.gypseum* was mostly found in soil collected from hospitals.

Keywords: Dermatophtes, Vanbreuseghem's technique, Keratinophilic.

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Introduction

Geophilic organisms are adapted for soil habitation. The fungi sporadically infects humans and when they do the resulting disease is usually inflammatory. *Microsporum gypseum* is the most common geophilic fungus isolated from human infections. Strains isolated so far are virulent and account for epidemic spread of the infection under appropriate conditions. Infection develops on the scalp and hair and tends to affect young children worldwide.

Microsporum gypseum causes tinea capitis and tinea corporis. Lesions are usually inflammatory, impetiginous and sometimes bullous with rapid development and resolution.It is usually associated with zoophilic and geophilic genus.

Invasion of hair is of the ectothrix type and spores are sparsely arranged in chains. *Microsporum gypseum* produces suppuration, kerion and favus like crusts on the scalp. Microsporum canis and Microsporum gypseum cause infection of hands in which the palms become dry and scaly.

Microsporum gypseum is a common dermatophyte found in the soil. This fungus gains importance as the infections caused by it are common in the lower strata of the society. People living in slums, under unhygienic conditions are the main targets of this fungus. Although dermatophytes existed since ancient times and have infected animals and man from millions of years the infections were long endured before their true nature was realized. *Microsporum gypseum* was discovered and named in 1843.From the floor dust collected from the classrooms of 33 elementary schools in the west bank of Jordan *Microsporum gypseum* was found in 7.7% of the samples. In India Dey and Kakoti (1955) were the first to report this dermatophyte from a soil sample of an animal house in Dilburgh in Assam. Soil samples from twenty salt pans in their vicinity around Mumbai and Thane were screened for the occurrence of keratinophilic fungi and related dermatophytes. *Microsporum gypseum* complex was found to be 7.2% (Deshmukh 2004). Keratinophilic fungi were isolated from corridor dust of 11 hospitals and soils of twenty one public places using hair baiting technique in Gulbarga. Among the dermatophytes and related species *Microsporum gypseum* was predominant (Vidyasagar *et al.,*2005).Soils of 10 poultry farm from Namakkal Tamil Nadu and 12 feather dumping sites from Chennai were collected. Fungal species commonly found in the soil samples included *Microsporum gypseum*(64%) (Anbu *et al.,*2004).A total of one hundred and fifty soil samples were screened for the presence of keratinophilic fungi and *Microsporum gypseum* (34%)was isolated from soil of Amravati (Tambekar *et al.*,2007) In the present investigation an attempt was made to collect soil samples from various sources and study it's diversity.

Materials and Methods

A total of 100 soil samples were collected from playgrounds, hospitals, gardens and schools. Soil samples were taken from the superficial layers of the soil, the depth not exceeding 2-3inches.Soil was preferentially collected from areas which were frequently visited by humans and animals. Isolations were made from decomposing keratinous

substances like hair, nails and feathers using Vanbreuseghem's technique (1952a).

Whenever a fungal growth was observed in the petridishes for the first time, it was transferred to other dishes for purification. All the dishes were derived from single spore raised through dilution method thus ensuring the purity of cultures. Once complete purity was obtained the culture were grown on Sabourand's Dextrose Agar. Identification of the isolated fungi was confirmed with the help of available literature.

For quantitative analysis, following parameters were taken to find out the occurrence of keratinophilic fungal flora in soil.

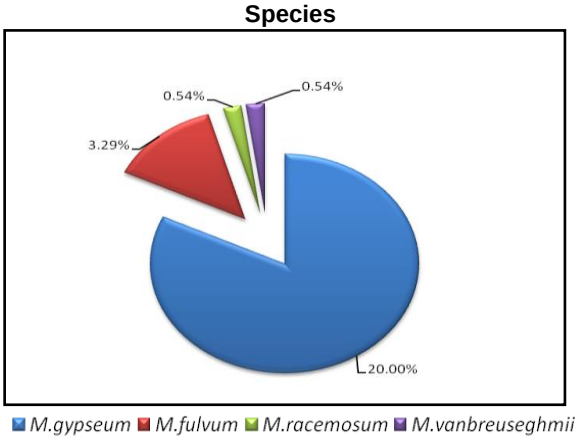
$$\text{Relative Density} = \frac{\text{No. of individual of the species}}{\text{No. of occurrence of all the species}}$$

$$\text{Distribution}(\%) = \frac{\text{Total no. of individual species occurred}}{\text{Total no. of samples examined}} \times 100$$

Results and Discussion

Overall 65% soil samples were found positive for keratinophilic fungi. The most dominating species among them was *Chrysosporium* while the next were *Microsporum* species. Among the *Microsporum* species *Microsporum gypseum* was dominating.

Fig. 1 : Percent Distribution of *Microsporum* Species



It was found to be 20.0% .*M.fulvum* was 3.29% while *M.vanbreuseghmii* and *M.racemosum* were 0.54 and 0.54% respectively.

Table 1 : Percent Distribution of Keratinophilic Fungi in Different Habitats

	Habitats				
	Garden Soil	**Hospital Soil**	**Playground Soil**	**Road-Side Soil**	**Total Distribution (%)**
Soil samples examined	25	25	25	25	100
Soil samples Positive	13	19	14	19	65
Per cent Distribution	50	76	56	76	65
Chrysosporium carmichaeli	-	4.65	-	2.32	1.64
Chrysosporium indicum	9.09	2.32	12.50	4.65	4.94
Chrysosporium lucknowese	9.09	6.66	8.33	-	2.74
Chrysosporium tropicum	13.63	7.14	5.55	25.0	10.43
Geotrichum species	-	-	4.16	2.32	1.09
Microsporum species	4.54	-	-	-	.54
Microsporum gypseum	7.14	25.0	16.66	9.30	20.0
M. fulvum	4.54	2.32	8.23	2.32	3.29
M. vanbreuseghmii	-	-	-	6.66	0.54
Naanizia gypsea	-	-	-	6.66	0.54
Naanizia fulva	-	-	-	6.66	0.54
Malbranchea pulchella	7.14	5.55	-	2.32	2.19
Trichophyton mentagrophytes	4.54	-	4.16	6.66	2.19
Trichophyton simii	-	-	4.16	-	0.54

Results were prepared after colonization on various keratin baits i.e., hair, feather and nails. Data indicated that nails least supported the growth and colonization of these fungi in comparison to feather and nails.

The ability to colonize of *Microsporum gypseum* was 28% in its occurrence on human hair and 10% on feather. Nails could not be colonized by *Microsporum gypseum* during this study. The relative density of genus *Microsporum* recorded in various habitats was as follows:-garden (14.2%), hospital waste (16.6%), play ground(0.0%), roadside(4.0%).

Table 2 : Relative Density of Keratinophilic Fungal Genera Isolated from Different Habitats

	Keratinophilic fungal genera				
Habitats	***Tricho-phyton***	***Chryso-sporium***	***Geotrichum***	***Malbranchea***	***Micro-sporum***
Garden Soil	0	42.8	14.2	0	14.2
Hospital soil	0	50.2	0	0	16.6
Playground soil	0	52.0	0	0	0
Roadside soil	4.0	40.0	4.0	4.0	4.0

Microsporum gypseum was isolated from all habitats. It was observed that the dermatophyte had maximum distribution in hospital waste. Randhawa and Sandhu (1965) also found *Microsporum gypseum* from barn yards, chicken house, dairy farm where the soil was supposedly intermixed with keratin substrates showing high probability of occurrence of *Microsporum gypseum*.

In recent years many attempts have been made to test the belief that dermatophytes have a saprophytic existence in soil. It has been confirmed through evidences that *Microsporum gypseum* has a widespread occurrence in garden and farm soil in

Britain (Stockdale, 1958). Several other reports have confirmed *Microsporum gypseum* as animal pathogen (Frey 1965; Kishimoto and Baker 1969).

Thus the data was indicative enough of the fact that *Microsporum gypseum* has a widespread occurrence. It was ascertained that its distribution was maximum in soil collected from hospitals probably because of the fact that it is a rich source of keratinous substrates. Also its availability in all habitats indicates its cosmopolitan nature. It could also be concluded that *Microsporum gypseum* could easily colonize hair and feathers while nails were not. The keratin of hair possesses a covering of oils and fats in combination with keratin protein. This determines the colonization of keratin substrates qualitatively and quantitatively. In contrast to this, feather have some easily assimilated compound other than keratin (Bolliger and Gross 1952a, b) While carrying out the study maximum growth of *M.gypseum* was found in November followed by December. Minimum growth was observed in June.

Thus, it can be concluded that *Microsporum gypseum* is widely distributed in nature. It thrives well in soils rich in keratinous sobstrates and is able to colonize human hair and bird's feathers. It's less growth in summer months can be attributed to the fact that most fungi are killed at high temperatures and their activity is hampered under dry conditions.

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