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Incidence of DermatophyticKeratinophilicFungi in soil

KEYWORDS: Soil, keratinophilic fungi, dermatophytes, nondermatophytes, dermatomycosis.

Priyanka Pathak
Senior Research Fellow, Microbiology, Central Institute of Agricultural Engineering, Nabibagh, Berasia Road, Bhopal

Ashok Shukla
Assistant Professor, Microbiology, Holy Cross Women's College, Ambikapur-497001 (C.G), India

ABSTRACT *The soil acts as a good culture medium to nurture microbial communities. There is abundance of pathogenic & non pathogenic fungi thriving in soil due to its variable organic matter availability. The soil containing keratin materials like skin, hair, feather, fur, hom, hoof and beak contributes for the growth of dematophytic& non dermatophytickeratinophilic fungi. Thesecause dermatophytosis/mycosis in humans and other animals have been divided into three ecological groups as:geophiles,zoophiles and anthrophiles. The qualitative and quantitative isolation of these fungi was performed by Surface Soil Dilution Plating (SSPD) and Hair/Feather Baiting Technique (HFBT). Colonies developed by this technique are subsequently purified on Sabouraud Dextrose Agar medium .About 30 isolates belong to 11 genera were isolated from the soil: Microsporumpulchela, Trichophytonmentagrophytes, Arthrodermagypseum, Chrysosporiumtropicum, Malbrancheaarcuata,M.pulchella, Acremonium sp., Aspergillusterreus, Cladosporiumclad osporoides,Geotricum, Humicolagriseaetc.*

Introduction

The soil constitutes one of the most complexes of microbial habitats in which many fungi complete their entire life cycle. Different soils have specific fungus floras, but the majority of species found in them are cosmopolitan [1]. Some soil fungi are potential pathogen to -both human and animals. Soils that are rich in keratinous materials are the most conducive for the growth and occurrence of keratinophilic fungi [2]. Keratinophilic fungi are involved in breakdown of keratin materials such as skin, hair, nail, fur, feather, horn, hoof, beak etc. They utilize keratin as carbon source [3]. They are prevalently occuring fungi in nature than presently recorded and there is a need to have a keen look for identifying them.These belongs to hyphomycetes and other groups. Hyphomycetes include dermatophytes and a variety of non-dermatophytickeratinophilic fungi[4]. **Dermatophytes**(name based on the Greek for 'skin plants') are a common label for a group of three types of fungus that commonly causes skin disease in animals and humans.These genera are: *Microsporum, Epidermophyton*and *Trichophyton.* There are about 40 species in these three genera. The dermatophytes have been divided into three ecological groups: geophiles, zoophiles and anthropophiles [5].They cause infections of the skin, hair and nails due to their ability to obtain nutrients from keratinized material. The organisms colonize the keratin tissues, usually nonliving cornifiedlayer of the epidermis because they are not able to penetrate viable tissue of an immunocompetent host. Invasion does elicit a host response ranging from mild to severe. Acid proteinases, elastase, keratinases, and other proteinases reportedly act as virulence factors. Some of the infections are known as ringworm or tinea.The prevalence of dermatophytes varies according to geographical location, season or living conditions[6].However, in general, they occur more commonly in countries with a hot and humid climate (Cavalcanti, 2003). So far as India is concerned, studies of this kind are very limited. Several authors have reported their occurrence in different regions of India [7-12]. **Non dermatophytickeratinophilic fungi**, including species of *Chrysoporium* and other genera of fungi, are known to occur as saprobes in soil; some of them are pathogenic to humans [4].

In the present study, two techniques have been used for the qualitative and quantitative isolation of these fungi from the soil samples collected from the various locations of Sarguja district are: surface soil dilution plating (SSPD) and Hair/ Feather Baiting technique (HFBT). The soil dilution plating method is most commonly used for quantitative isolation from soil. Colonies developed by this technique are easy to pick off for subsequent purification. Purification was made in Sabouraud Dextrose Agar medium on 32°C temperature.

Materials used

Soil samples,plastic bags, sterilized Petiplates, sterilized spoons, sterilized distilled water, human hair, and nail and bird feather, cello tape, sterilized needle, microscope, Sabouraud Agar Medium(Dextrose,40 g/L; Peptone,10 g/L; Agar, 20 g/L pH 5.6), Antibiotics- penicillin and streptomycin.

Method

• *Collection of soil samples*

Surface soil samples from different localities of Ambikapur,Sarguja (depth not exceeding 2 - 3 cm) were collected in presterilised plastic bags with the help of a sterilized spoon. These samples were then tightly closed to maintain the original moisture content and brought to laboratory and kept in refrigerator till further analysis [14].Each plastic bag was labeled indicating the date and site of collection. These samples were then tightly closed to maintain the original moisture and kept in culture room. A part of the soil sample was used for baiting and for other studies of the selected fungi.

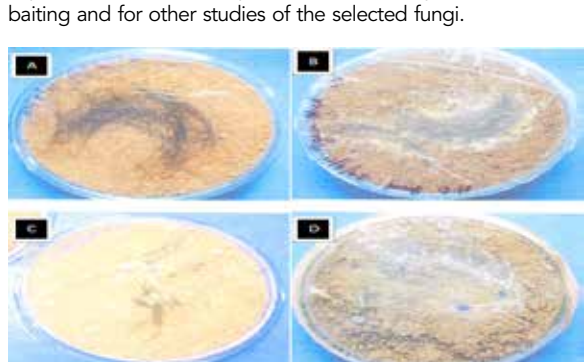

Fig.1. Soil Samples before & after baiting: Hair (A & B); Feather(C & D).

Volume : 5 | Issue : 2 | Feb 2015 | ISSN - 2249-555X

• *Baiting of soil samples*

Each soil sample was thoroughly homogenized and a sufficient amount of soil was taken in separate sterilized Petri dishes from each sample. Hair baiting technique (Vanbreuseghem, 1952) was used for isolation of fungi. Sterilized distilled water was added to provide moisture to the soil. Bits of sterilized human hair, nail and bird feather were used as baits. The hair and nail and feather were scattered uniformly only on wet soil (Figure.1A & 1C). Each Petri dish was separately labeled indicating the date, site of collection and type of bait, etc. Petri plates covered with cello tape were incubated at 32°C for 3 to 4 weeks in the culture room. Fungal growth, if any, on the baits was observed periodically.

• Isolation, identification and purification of fungi

The baited samples were examined after 3 - 4 weeks for the development of any fungal growth on the hair, feather and nail baits (Figure.1B & 1D). For fungal examination, a small portion of the fungal growth was picked up with the help of a sterilized needle, mounted on a slide under covered glass containing a drop of sterilized distilled waterand examined under the microscope with the help of fungi monographs available at Holy Cross Women's College Ambikapur.*Trichophytonmentagophytes* and other keratinophilic fungi were identified (Figure.3).After a preliminary examination of fungal growth on baits, the fungus was subsequently transferred to the Sabouraud Agar Medium supplemented with penicillin and streptomycin to prevent

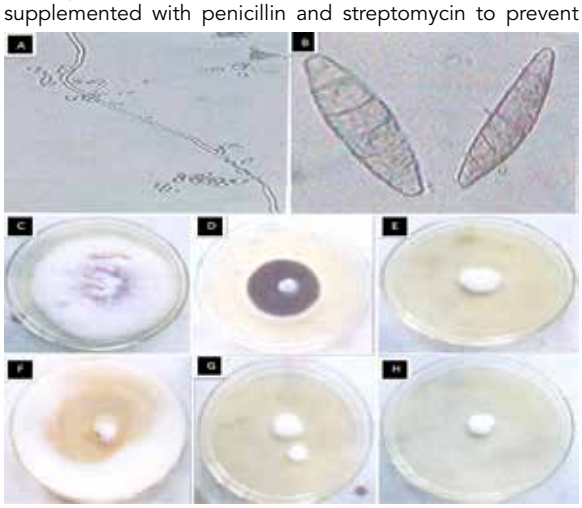

Fig.3. A)Conidia and hyphae of *T.metagrophytes*B)*Macroconidium* of *T.metagrophytes* C) *Humicolagrisea* D)*Cladosporium* sp.E)*Microsporum* sp.F)*Microsporum* sp. G) *Trichophyton* sp. H)*Microsporum* sp.

Results &Discussion

Most of the isolated fungi were grown well on hair and feather baits except *Acremonium* sp. and *Humicola* sp. On the other hand none of the fungi showed their growth on nails bait, when examined upto 30 days of their incubation at 85% relative humidity. *Microsporumpulchella*, *Trichophytonmentagrophytes* and *Malbrancheaacruata* showed their maximum growth on hair and feather baits after two weeks of incubation, while *Chrysosporium* sp. and *Aspergillus* sp. showed their lower growth efficiency to degrade nails, hairs and feather in natural condition.*Microsporumpulchella*&*Trichophytonmentagrophytes*were the most prevalent forms isolated from different soil samples analysed. They are one of the three important genera which are commomly called as Dermatophytes. Prevention and control of dermatophyte infections must take into consideration the area invaded, the etiologic agent, and the source of infection. There are about 40 species in these three genera. Species capable of reproducing sexually belong in the teleomorphic genus *Arthroderma,* of the Ascomycota were also isolated. *Chrysosporiumtropicum*was also isolated from some samples *Chrysosporium*species are the most common keratinophilic fungi isolated from soil in many parts of the world. Among the different keratinophilic species isolated were *Chrysosporiumtropicum, Malbrancheaarcuata,M pulchella, Acremonium sp. Aspergillusterreus, Cladosporiumcladosporides, Geotricum,Humicolagriseae*tc. as common saprophytes found in the soil and may be recovered as laboratory contaminants. Some of the species isolated in this study are reported to be either well known agents of mycosis or have been recovered from human and animal lesions such as *Geotricum, Aspergillus&Chrysosporium.*

Table1. Fungi isolated from soil using nail, hair & feather as baits.

FUNGUS ISOLATED	BAITS USED		
	Nails	Hair	Feather
Microsporumpulchella	-	+	+
Trichophytonmentagrophytes	-	+	+
Arthrodermagypseum	-	-	+
Chrysosporiumtropicum	-	+	+
Acremoniumsp	+	-	-
Aspergillusterreus	-	+	+
Cladosporiumcladosporides	+	+	-
Geotricum	-	+	-
Humicolagrisea	+	-	-

About 30 isolates belonging to 11genera were isolated from the soil: *Microsporumpulchella,*

Trichophytonmentagrophytes, Arthrodermagypseum, Chrysosporiumtropicum, Malbranchea

arcuata, Acremonium sp. Aspergillusterreus, Cladosporiumc ladosporides,Geotricum,Humicolagriseaetc.

Conclusion

Dermatophytes cause infections of the skin, hair and nails due to their ability to obtain nutrients from keratinized material. The organisms colonize the keratin tissues and inflammation is caused by host response to metabolic by-products. They are usually restricted to the nonliving cornified layer of the epidermis because of their inability to penetrate viable tissue of an immunocompetent host .There is a wide occurrence of fungal communities isolated from the soil some of which cause dermatomycosis which has mild to severe consequences on human and other animal tissues. Acknowledgment about population density of any area may provide a directive approach towards health concerns.

Volume : 5 | Issue : 2 | Feb 2015 | ISSN - 2249-555X

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