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ORIGINAL RESEARCH ARTICLE

Acremonium, Chrysosporium and Related Keratinolytic Fungi in Soil of Himachal Pradesh

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ABSTRACT

Total of 24 keratinophilic fungal genera representing 65 species were isolated from six habitats of 60 soil samples examined. Total isolates of different fungi were 257. Maximum 86 isolates were from forest soil followed by garden soil 44 and playground soil 39. *Chyrosoprium, Acremonium, Microsporum, Malbranchea and Trichophyton* were represented by 15, 8, 7, 6 and 4 species.

Key words: *Acremonium*, *Chrysosporium*, Himachal Pradesh, soil

INTRODUCTION

Keratinophilic fungi are present in the environment with variable distribution patterns that depend on different factors, one of which, of fundamental importance, is human and/or animal presence. Keratinophilic fungi play an important role in decomposing keratin. These fungi were isolated from Indian soils by various investigators from various habitats viz. public parks and soils or floor dust of primary schools [1], lake side soils [2], house dust [3], water sediments [4], a glacier bank [5], salt pans [6], and birds and their environment [7]. However, hilly areas have attracted less attention [8,9] and data on the distribution of keratinophilic fungi in such areas are therefore scanty. The present study reports the isolation of these fungi from soils in Himachal Pradesh. It is geographically diverse and the cold climate place rich in the distribution of these fungi.

MATERIALS AND METHODS

Sixty soil samples were collected at and around 50 km of Dharamshala, Himachal Pradesh. The samples were collected from the superficial layer, depth not exceeding 3–5 cm, with a plastic spoon and transferred to sterile polythene bags, brought to the laboratory, and processed.

The hair bait technique of Vanbreuseghem [10] was used to isolate keratinophilic fungi. Sterile Petri dishes were half filled with the soil samples and moistened with water and baited with sterile human hair. These dishes were incubated at room temperature (28 ±2 °C) and examined for fungal growth over a period of four weeks. After observing the growth under a binocular microscope it was cultured on Sabouraud's dextrose agar supplemented with chloramphenicol (50 mg/l) and cycloheximide (500 mg/l). These fungi were identified based on the monographs of Domschet et al [11], Oorschot [12], Sigler and Carmichael [13], Currah [14], Cano and Guarro [15], von Arx [16].

RESULTS AND DISCUSSION

Total of 24 keratinophilic fungal genera representing 65 species (**Table 1**) were isolated from six habitats of 60 soil samples examined. Total isolates of different fungi were 257 (**Table 2**). Maximum 86 isolates were from forest soil followed by garden soil 44 and playground soil 39. *Chyrosoprium, Acremonium, Microsporum, Malbranchea* and *Trichophyton* were represented by 15, 8, 7, 6 and 4 species respectively. *Chrysosporium*s pecies were also earlier reported from Indian soils [17-19]. *Chrysosporium indicum* was reported as the most dominant species [20].

These dermatophytes were also reported from Indian soils by various workers [17-19]. Also various other workers have recorded some species of this genus from Indian soils in their study while investigating keratinophilic fungi [18-20].

The parks and play-grounds in these areas are visited by tourists and occurrence of

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dermatophytes in these soils can be threat to humans. A large number of keratinophilic fungi have been isolated from public parks and play grounds [1,21]. In India, open school playgrounds, public parks and public places are often invaded by animals such as cows, bullocks, dogs, pigs, cats, and rats. These transit animals leave organic residues, which may contaminate the soil with keratinous debris and can be reservoirs for these fungi. Occurrence of these fungi in these areas may be due to the addition of feathers and keratinous material from birds and animals. The half-decomposed feathers along with plant litter which were collected showed that they can be a reservoir for these fungi.

These fungi were also isolated from water sediments from Kanpur by Katiyar and Kushwaha [4]. The occurrence of these fungi in the sediments of glaciers makes this study more interesting. These fungi were also reported from glacier banks soils of Kashmir[5] and from the Antarctic environment [22,23]. Keratinolytic nature of isolated fungi is confirmed by growing them on moist sterilized human hair and their keratinolytic profile is under process of investigation as production of extracellular keratinase of *Chrysosporium tropicum* and *Trichophyton mentagrophytes* is recently studied by Kacinova [24].

Table 1: Fungal genera and their number of species.

Name of fungi	No. of species
Acremonium	8
Alternaria	1
Auxarthron	1
Amauroascus	1
Aphanoascus	1
Apinisia	1
Arthroderma	1
Blastomyces	1
Botryotrichum	1
Chaetomium	1
Chrysosporium	15
Ctenomyces	1
Epidermophyton	1
Geomyces	1
Gymnoascus	1
Histoplasma	1
Malbranchea	6
Microsporum	7
Myceliophthora	2
Nannizzia	1
Trichophyton	4
Verticillium	2
Trichosporon	1
Unidentified	1

Table 2: Occurrence of keratinolytic fungi in Himachal Pradesh soil.

Source of soil samples	RS	FS	CF	UN	GS	PG	TOTAL
Samples examined	10	10	10	10	10	10	60
Samples positive	9	10	10	8	8	10	55
Acremonium kiliense	1	1					2
Acremonium recifei	0	1			1		2
Acremonium implicatum	1	1	1				3
Acremonium strictum	1	1			1		3
Acremonium sp.1				1		1	2
Acremonium sp.2			1	1		1	3
Acremonium sp.3	1				1		2
Acremonium sp.4		1					1
Alternaria alternata			1	1			2
Amauroascus kuehnii		2			2		4
Aphanoascus fulvescens	1	1	1	1			4
Aphanoascus keratinophilus			1	1	1	3	
Aphanoascus terreus	1	1	1	1		1	5
Apinisia queenslandica		2					2
Arthroderma simii		1			1		2
Auxarthron conjugatum		1					1
Blastomyces sp.		1				1	2
Botryotrichum piluliferum		2					2
Chaetomium globosum		2			1		3
Chrysosporium aquaticum		1			1		2
Chrysosporicum indicum	2	4	2	2	3	3	16
Chrysosporium keratinophilum	1	2	2	1	1	4	11
Chrysosporium queenslandicum	2			3		5	

Chrysosporium sulfureum		1					1
Chrysosporium tropicum	4	5	5	2	5	4	25
Chrysosporium pannicola	1	1	1		2	2	7
Chrysosporium zonatum		1					1
Chrysosporium pannorum	1	2	2	1	1	1	8
Chrysosporium mephiticum		1					1
Chrysosporium xerophylum	1					1	
Chrysosporium sp. A	1	1	1	1	1		5
Chrysosporium sp. B		1					1
Chrysosporium sp. C	1	1			1		3
Chrysosporium sp. D		1				1	2
Ctenomyces serratus	1	1	1				3
Epidermophyton floccosum	1	1	1		1		3
Geomyces pannorum		1					1
Gymnoascus reessii		1			1	1	3
Gymnoascus intermedius		1					1
Geotrichum candidum	1	1					2
Histoplasma capsulatum		1	1	1	1	1	5
Malbranchea aurantiaca		2			1		3
Malbranchea flava		2			1		3
Malbranchea gypsea	1	3	1				5
Malbranchea pulchella	2	4	2	1		2	11
Malbranchea sp. 1		1					1
Malbrancheas sp.2		2			2	4	8
Microsporum canis	1						1
Microsporum cookie	1	1					2
Microsporum equinum	1	2					3
Microsporum fulvum	1	2	2	1	1	1	8
Microsporum gypseum	2	4	2	4	4	5	21
Microsporum nanum		1					1
Microsporum vanbreuseghmi	2					2	
Myceliophthora fergusii		1			1		2
Mycelioptthora vellerea		1					1
Nannizzia gypsea	1	2	1	1	1	1	7
Trichophyton ajelloii	1	2		2	1	1	7
Trichophyton mentagrophytes	1	3	1	1		2	8
Trichophyton rubrum		1					1
Trichophyton simii	1				1	1	2
Verticillium tunipes		1			1		2
Verticillium sp.					1		1
Trichosporon aschii				1			1
Unidentified fungus			1				1
TOTAL	34	86	31	25	44	39	257

RS-Road side; FS-Forest soil; CF-cultivated field; UN-uncultivated soil; GS-Garden soil; PG-Playground soil

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