

## Incidence of keratinophilic fungi in waterlogged condition of paddy soil

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**Abstract:** Prevalence of keratinophilic fungi was observed in paddy field soil during different stages of cultivation viz., transplanting, tillering, milking and maturation. Out of total 76 soil samples, 65 soil samples were found to be positive for the keratinophilic fungi. Fourteen species belonging to a single genus *Chrysosporium* were isolated through out the cropping season. *C. keratinophilum* (17.1%) followed by *C. tropicum* (13.15%) were found to be the most dominating geophilic species. The highest percent distribution of keratinophilic fungi appeared during the milking stage (100%) of paddy cultivation, followed by the maturation stage (89.47%).

**Key words:** *Chrysosporium* species, Keratinophilic fungi, Keratin, Paddy soil  
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### Introduction

Soil serves as a natural reservoir for both pathogenic and saprophytic fungi. Throughout the world more attention have been shown by researchers towards soil mycoflora with respect to keratinophilic fungi (Al – Musallam, 1988; Al – Musallam *et al.*, 1995; Ali – Shtayah and Arda, 1989; Augt *et al.*, 1995; Garg *et al.*, 1985; Guarro *et al.*, 1981; Mercantini *et al.*, 1980; Mercantini *et al.*, 1986; Ogbonna and Pugh, 1987; Soon, 1991; Ulfig and Korcz, 1995; Caglar and Akgun, 2006). Very little information is available on the incidence of keratinophilic fungi from paddy field soil (Sunderam, 1987). Keratinophilic fungi grow on keratinous substances which is important natural material occurring in nature mainly in the form of hairs, wools, feathers, horns, hooves, nails, skin and other cornified appendages, constituting natural baits for these fungi (Khanam and Jain, 2002). Keratinophilic microbes represent a huge biodiversity of form, habitat and substrates. It is therefore, reasonable to anticipate soil as a huge reservoir of these keratinophilic fungi.

Although distribution of such fungi is influenced mostly by the amount of keratinized material available in the soil, incidence of keratinophilic fungi in paddy soil is influenced by factors like waterlogged condition, nitrogen rich environment. Therefore, the present work has been undertaken to record the distribution and natural occurrence of these keratinophilic fungi in the environment, which are unfavorable for the diffusion of keratinophilic fungi.

### Materials and Methods

Soil samples were collected from a depth not exceeding 2-3 inches, in sterilized polythene bags at the different growth stages of paddy cropping viz., transplanting, tillering, milking and maturation, from different paddy fields of Dayalbagh region of Agra (India), the region lies in the tropical environment, in an alluvial plain near the bank of major Yamuna river system. The keratin (feather) colonizing fungi were isolated by 'Hair Baiting Technique' of Benedek (1962), collected from different soil samples. Feathers used as keratin baits were sterilized and spread over the moist soil

samples in sterilized petriplates. These plates were kept undisturbed at room temperature for 15-20 days until visible fungal mycelium appeared on baits. The samples, on which no fungal growth was visualized after 8 weeks of incubation, were discarded. Fungus that appeared on baits, were transferred to sterilized petriplates containing Sabouraud's dextrose agar (SDA) medium (dextrose 40 g, peptone 10 g, agar 20 g and distilled water 1 liter). The cultures were identified on the basis of their morphological characteristic features (Van Oorschot, 1980).

### Results and Discussion

Present study shows an over all prevalence of keratinophilic fungi in paddy field with respect to different growth stages of paddy cropping. Among 76 soil samples, 65 soil samples were found to be positive for keratinophilic fungi. Total 14 species were isolated which belonged to single genera *Chrysosporium* as presented in Table 1. Total prevalence of keratinophilic fungi was observed (85.55%). Milking stage showed the highest percent prevalence of keratinophilic fungi (100%) followed by the maturation stage (89.47%), tillering (78.95%) and transplantation (73.68%) respectively. Milking stage was very rich in the distribution of keratinophilic fungi, where all 14 species were dominant.

The present study showed the occurrence of only a particular genus *Chrysosporium*, due to their mesophilic, hydrophilic and thermotolerant nature as reported by Garg *et al.* (1985). The total absence of dermatophytes and the only presence of geophilic species may result due to the waterlogged condition and limited biotic interference (Ulfig and Korcz, 1995). Al - Musallam *et al.* (1995) reported that the source of dermatophytic species is due to the presence of manure in cultivated soil, but the occurrence of several *Chrysosporium* species may reduce its chance for successful colonization in soil. Probably the use of feathers as the only keratin bait supported the presence of *Chrysosporium* sp, where as Al - Musallam *et al.* (1995) used animal wool and Sunderam (1987) used human hair, fowls feather and nail as the baiting substrate.



**Table - 1:** Percent prevalence of keratinophilic fungi during different stages of paddy cropping

	Growth stage				
	Transplantation	Tillering	Milking	Maturation	Total
Total soil samples collected	19	19	19	19	76
Soil samples positive	14	15	19	17	65
Percent prevalence	73.68%	78.95%	100%	89.47%	85.55%

**Table - 2:** Distribution of keratinophilic fungi at different growth stages of paddy cropping

Fungi (species) distribution	Transplantation	Tillering	Milking	Maturation	Total Individual sp(%)
<i>Chrysosporium</i> anamorph of <i>Arthroderma cuniculi</i>	-	-	2	1	3.94
<i>C. anamorph</i> of <i>Arthroderma curreyi</i>	2	2	1	-	6.57
<i>C. carmichaeli</i>	3	5	1	-	11.84
<i>C. georgii</i>	2	2	2	3	11.84
<i>C. gourii</i>	-	-	1	5	7.89
<i>C. indicum</i>	-	-	1	-	1.31
<i>C. Keratinophilium</i>	3	5	1	4	17.1
<i>C. lobatum</i>	-	-	1	-	1.31
<i>C. merdarium</i>	-	-	1	-	1.31
<i>C. pannicola</i>	-	-	1	-	1.31
<i>C. queenslandicum</i>	1	2	2	1	7.89
<i>C. tropicum</i>	1	1	2	6	13.15
<i>C. anamorph</i> of <i>Pectinotricum illiase</i>	-	-	1	1	2.63
<i>C. anamorph</i> of <i>Rollandina vriesii</i>	-	-	1	1	2.63

*Chrysosporium keratinophilum* were found to be the most dominant species (17.10 %) throughout the cropping season followed by *C. tropicum* (13.15 %) as compared to other fungi (Table 2). Present data supported by (Ali – Shtayeh et al., 1989; Guarro et al., 1981; Gupta and Garg, 1991; Mercantini et al., 1986; Ulfing and Korc, 1995; Ulfing et al., 1996). Saxena et al. (2004), also reported that 44 (73%) keratinophilic fungi were isolated out of total 60 soil samples from paddy crop field. They observed that among 73% keratinophilic fungi, 34% were belonged to different species of *Chrysosporium*. However, the dominance of these fungi in paddy field may be due to the presence of paddy straw as a source of cellulose.

The paddy fields of the study area are situated adjacent to the river Yamuna, soil being sandy and porous. During waterlogged condition, all the pores remain water filled, which reduce the rate of oxygen diffusion, resulting in poor aeration, hence affect the distribution of keratinophilic fungi (Nigam and Kushwaha, 1995).

Thus, on the basis of above discussion, it is concluded that occurrence of keratinophilic fungi is mainly influenced by biotic interference as well as presence of keratinous substrates in the soil. The survival and occurrence of keratinophilic fungi is also affected and controlled by other ecological factors.

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