

## **Incidence of dermatophytes school soils of Visakhapatnam: A case study**

**Y. Avasn Maruthi, Kaizar Hossain\* and D. Apta Chaitanya**

*Dept. of Environmental Studies, Institute of Science, GITAM University, Visakhapatnam, A.P, India*

### **ABSTRACT**

*In India a number of reports have appeared concerning the distribution of dermatophytes from various habits. However, there are very few reports on the occurrence and distribution of dermatophytes in soils of India. Keeping in view the microbiological and pathological importance of dermatophytes the present study was planned to find out their distribution in selected school soils of Visakhapatnam. Dermatophytes and closely related species were represented by 12 species, *Microsporum audouinii* (43.75%) was reported all soil samples. Based on the findings it may be concluded that unhygienic soil of schools may be considered as a health risk to children. Therefore measures to enhance hygienic condition should be taken to control the diffusion of dermatophytes in these Environments.*

**Key words:** Dermatophytes, Keratinophilic fungi, School soils.

### **INTRODUCTION**

Dermatophytes grow best in warm and humid environments. Dermatophytes usually grow only in keratinized tissues such as hair, nails and the outer layer of skin; the fungus usually stops spreading where it gets in touch with living cells or areas of inflammation [1-3]. Their universal occurrence in the Environment was considered to be of epidemiological significance [4]. The majority of dermatophytes can live saprophytically and every Keratinophilic fungi can be considered as a potential pathogen [4]. Open school play grounds are often invaded by many animals such as birds, dogs, cats and rats etc. These animals leave organic residue, which probably contaminate the soil which propagules of fungal pathogens. Therefore, soil can become potential sources of infection for human beings [5]. Dermatophytes belong to a large group of Keratinophilic fungi and cause human and animal mycoses and an epidemiological study of prevalence of Keratinophilic fungi in school play grounds of west bank of Jordan revealed that twenty eight of the isolated species had been reported to be pathogenic and 63% of them belong to Keratinophilic mycoflora [6]. The chief objective of this work was to isolate and identify the dermatophytes from different school soils of Visakhapatnam.

### **MATERIALS AND METHODS**

Visakhapatnam has approximately total number of 113 schools (primary, upper primary and high schools) in and around it. Based on health data collected both from city schools and King George Hospital and some schools were selected as study areas, with respect to control. The study was conducted by collecting soil samples from different soils of sampling areas which includes playground also.

Soils samples from study areas were collected to screen for dermatophytic fungi by adopting standard method [7]. Soil samples were packed carefully and they were brought to laboratory by taking all necessary precautions. The

inoculated Petri plates were observed for the growth of the fungal colonies. Then their Cultural characteristics and Morphological characteristics of fungal colonies and identification were done by following standard mycology manuals [7].

The relative importance value (RIV) for each fungal species was calculated<sup>8</sup> and the RIV was based on the frequency of occurrence of the species both among samples and replicates [8].

## RESULTS AND DISCUSSION

Selected School soils were screened for prevalence of Dermatophytes and other fungi, were presented in (Table-1), which also outlines list of fungi isolated and their percentage of occurrence at the sampled soils. A total number of 12 Species of Keratinophilic fungi belonging to 6 genera were isolated and comprised of 61.56% of all fungal isolates recovered. Dermatophytic fungi and closely related were represented by total 7 species, in order of RIV's *Microsporium audouinii* (52.08) (Fig-1) was dominant and frequent species, followed by *Chrysosporium keratinophilum*(51.52) and *Chrysosporium tropicum* (48.75) (Table-1) in soils, where as *Microsporium nanum* (27.77) was the least prevalent species in the school soil environments (Graph -2).

The *Chrysosporium keratinophilum* was the second frequently occurring keratinophilic fungus. Other than dermatophytic fungi were also identified, studied and their pattern of distribution in sampled soils observed as follows, *Fusarium oxysporum*>*Fusarium moniliforme*> *Penicillium funiculosum* > *Aspergillus flavus*> *Absidia spinosa*. Among these fungi *Fusarium oxysporum* was predominant and common species followed by *Fusarium moniliforme* (Table-1) out of them (Graph -2).

The most common and frequent non-Keratinophilic fungi in the school soils were, in order of their RIV's (Table-1) : *Fusarium oxysporum* (103.47) , *Fusarium moniliforme* (80.97), *Penicillium funiculosum* (80.41) , *Aspergillus flavus* (65.13) and *Absidia spinosa* (37.91).

The prevalence of dermatophytes in the school soils (Table-1) indicated that periodic replacing of the soil has not been done and hence it is not a hygienic environment for children to play. An interesting feature of the present study was distinguishing rate of prevalence of potentially pathogenic fungi (Table-2) in the school soil environment. The occurrence of *Chrysosporium keratinophilum* (43.75) in the majority number of sampled soils of selected schools in Visakhapatnam was considered as worthy of attention because of its adaptability and tolerance to wide range of temperature [9]. This species was recorded in soil samples from the Antarctic region having a temperature of -4°C, further, it was isolated from the soil in many parts of Europe, Asia, America and East island , where the temperature range 10°C to 30°C<sup>10</sup>. Recurrent occurrence of *Chrysosporium tropicum*, *Chrysosporium keratinophilum*, *Microsporium gypseum* (fig-2), *Tricophyton mentagrophytes*, *Fusarium oxysporum* and *Fusarium moniliforme* in soil of school environments suggested that they may be the vital fungi involved in the biodegradation of keratinous materials in the environment. It is interesting to note that most of the species isolated are either well known agents of mycoses (*Microsporium gypseum*, *Microsporium nanum* and *Tricophyton mentagrophytes* ) or have been recovered from animals or human lesions (*Aspergillus species*, *Fusarium oxysporum*, *Fusarium moniliforme*. etc) [10-12].

Most infected children on physical examination revealed a characteristics pattern of inflammation characterized by a greater degree of redness and scaling at the edge of the lesion or occasionally blister formation as in the case of most dermatophytes identified. Mucosal involvement with an adjacent red, scaly skin rash was seen in *Chrysosporium keratinophilum*. *Chrysosporium keratinophilum*, an opportunistic pathogen, was common among female children. [13 &14].

The presence of other non-dermatophytes (particularly *Aspergillus sp* and *Penicillium* species) may be due to the ubiquitous nature of their spores in our environment, carried transiently on healthy skin. *Fusarium oxysporum* was isolated from scrapings from skin lesions. In our study this organism was recovered mixed with other pathogens and its recovery from play ground soil should be considered significant.

Table 1: Distribution of Dermatophytes and Other Fungi Identified from Sampled School Soils

Isolated Spices	Sample Site (Schools)																Tot. Colony	%	Occurrence No. (+Ve)	%	RIV
	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>	S <sub>5</sub>	S <sub>6</sub>	S <sub>7</sub>	S <sub>8</sub>	S <sub>9</sub>	S <sub>10</sub>	S <sub>11</sub>	S <sub>12</sub>	S <sub>13</sub>	S <sub>14</sub>	S <sub>15</sub>	S <sub>16</sub>					
<i>Microsporium audouinii</i>	2	-	2	-	-	-	-	2	-	-	3	-	-	-	1	2	15	8.33	7	43.75	52.08
<i>Microsporium gypseum</i>	-	2	-	-	-	-	1	-	-	-	1	-	-	2	1	2	9	5.00	6	37.75	42.75
<i>Microsprum nanum</i>	2	-	-	-	-	-	1	-	-	-	1	-	-	-	1	-	5	2.77	4	25.00	27.77
<i>Chrysosporium keratinophilum</i>	-	-	2	2	-	-	2	1	-	-	-	2	2	-	3	-	14	7.77	7	43.75	51.52
<i>Chrysosporium trophicum</i>	2	2	-	1	-	-	-	-	1	-	-	-	1	-	1	1	9	5.00	7	43.75	48.75
<i>Trycophyton mentagrophytes</i>	-	2	-	2	-	-	3	-	-	-	-	2	1	-	-	-	10	5.55	5	31.25	36.80
<i>Trycophyton terrestre</i>	-	-	-	2	-	2	-	-	-	-	1	1	-	-	-	1	7	3.88	5	31.25	35.13
Total Species per school	3	3	2	5	-	1	4	2	1	-	4	3	3	1	5	4	-	-	-	-	-
Total Isolates per School	6	6	5	9	-	2	7	3	1	-	6	5	4	2	7	6	69	38.3	-	-	-
Other fungal Species (non-Keratinophilic)																					
<i>Absidia spinosa</i>	-	2	-	3	-	2	-	-	-	-	2	-	-	3	-	-	12	6.66	5	31.25	37.91
<i>Aspergillus flavus</i>	2	1	3	-	1	-	-	-	-	1	1	4	-	1	-	2	16	8.88	9	56.25	65.13
<i>Fusarium moniliforme</i>	2	1	2	4	-	-	1	1	5	1	-	2	-	2	-	1	22	12.22	11	68.75	80.97
<i>Fusarium oxysporum</i>	2	2	2	-	5	1	2	7	2	-	3	-	5	2	1	6	40	22.22	13	81.25	103.47
<i>Penicillium funiculosum</i>	1	1	2	-	3	2	-	-	1	2	1	-	-	1	4	3	21	11.66	11	68.75	80.41
Total Species per school	4	5	4	2	3	3	2	2	3	3	4	2	1	5	2	4	-	-	-	-	-
Total Isolates per School	7	7	9	7	9	5	3	8	7	4	7	6	5	9	5	12	111	61.56	-	-	-

Table: 2 Frequency of Occurrence of Dermatophytes and closely related in School Soils

Isolated Spices	Occurrence in Schools	
	Number of positive soil samples	Percentage of positive soil samples
<i>Microsporium audouinii</i>	7	43.75
<i>Microsporium gypseum</i>	6	37.75
<i>Microsprum nanum</i>	4	25.00
<i>Chrysosporium keratinophilum</i>	7	43.75
<i>Chrysosporium tropicum</i>	7	43.75
<i>Trycophyton mentagrophytes</i>	5	31.25
<i>Trycophyton terrestre</i>	5	31.25

Figure -1: Showing the percentage of Occurrence of Dermatophytes and closely related Fungi

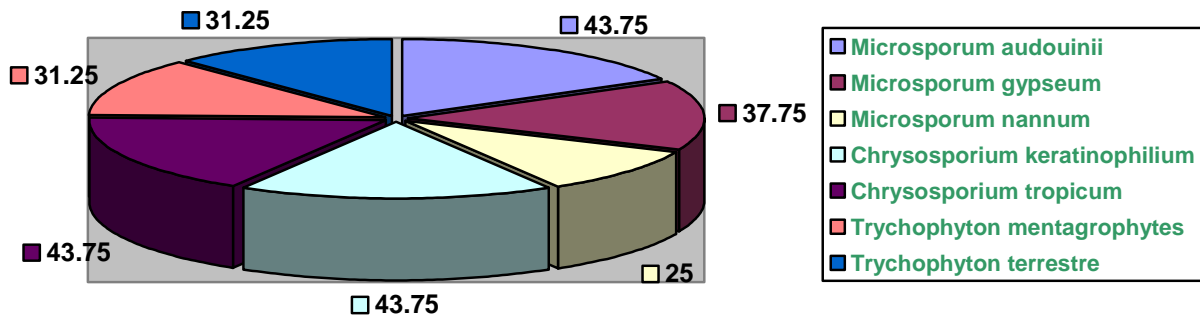
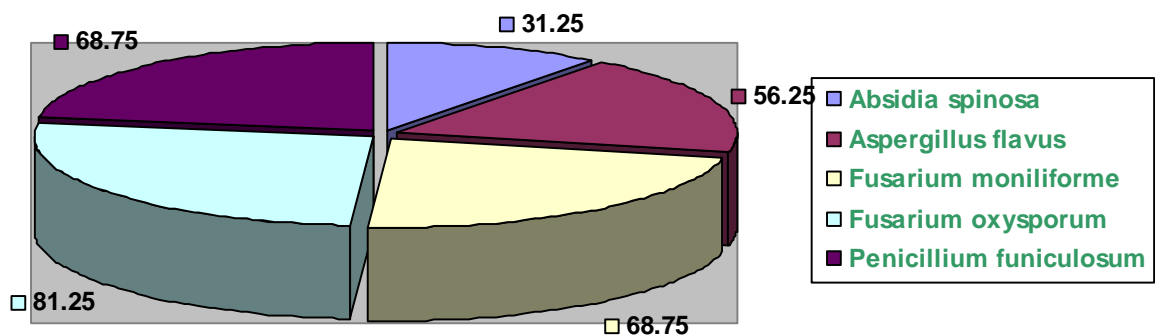


Figure -2: Showing the percentage of Occurrence of Other Fungi (Non-Keratinophilic)



### CONCLUSION

A good number of dermatophytic infections are more common in children than adults. In view of these findings it may be concluded that the unclean soil of Schools may be considered as a health risk to children. Therefore, measure to enhance hygienic condition should be taken to control the diffusion of dermatophytic fungi in these environments. The study showed that dermatophytes were the most common cause of all culture positive fungal infections involving the hair-scalp among children. However, there is a need for children who are generally at risk to be aware of the dangers of contacting dermatophytes. The government should create greater awareness of environment and personal hygiene to help to curb the incidence.

### Acknowledgment

Except first author all are grateful to management of GITAM University for providing necessary facilities. The authors are also thankful to Prof. Dr. A.Narayana, Head, Dept.of Dermatology, King George Hospital, Visakhapatnam for providing necessary facilities to collect health data with reference to incidence of Dermatophytosis. The authors are also thankful to University Grants commission for financial support.

### REFERENCES

- [1]. Otcenasek M... *Mycopathologia*. **1978**, 65:67-72
- [2]. Mercantini R, Maresella R, Caprilli F, Dovgiallo C. *Sabouraudia*. **1980**,18:123-128.
- [3]. Mercantini R, Marella R, Lambiase L ,Belardi M. *Mycopathologia*. **1986**, 94: 10-115.
- [4]. Rippon J.W., *Medical Mycology .The pathogenic fungi and the pathogenic Actinomycetes*. Philadelphia WB Saunders Company,**1982**, Pp 38.
- [5]. Mantovani, A. *Mycopathologia* **1978**, 65:61-66.
- [6]. Ali-Shtayeh M.S, Arda H.M.. *Mycopathologia*, **1989**, 106:103-108.
- [7]. Chabbase D. *Mycopathologia*,**1988**,101: 133-140.
- [8]. Ali-Shtayeh, M.S , Asa'd Alsheikh B.S. *Mycopathologia*, **1988**, 103:69-73.
- [9]. Ramesh V.M, Hilda A. *Mycopathologia*, **1999**, 143: 139-145.
- [10]. Abdel-Fattah H.M, Moubasher, A.H Maghazy, S.M. *Mycopathologia*, **1982**, 79:49-53.
- [11].Lachoria R, Jain, P.C, Agarwal, S. C. *Asian jr.of Microbiol.Biotech.Env.Sc*, **2004**, 6(2): 267-271.
- [12]. Sumana V, Singara Charya. *Asian jr.of Microbiol.Biotech.Env.Sc*, **2008**, 10(1): 157-162.
- [13]. Y. AVASN Maruthi, Kaizar Hossain, D. Hari Priya and B. Tejaswi. *Advances in Applied Science Research*, **2012**, 3 (1):605-610
- [14]. Y. AVASN Maruthi, D. Apta Chaitanya, Kaizar Hossain, A Sravani and S Jagadish (**2012**). *Euro. J. Exp. Bio.*, **2012** 2 (1):13-16