



Isolation And Purification Of Keratinophilic And Dermatophytic Fungi From Some Public Places Of Jaipur City, India

Soniya Bairwa* and Meenakshi Sharma

Medical Mycology and Microbiology Laboratory, Department of Botany, University of Rajasthan,
Jaipur, Rajasthan-302004, India.

Abstract: Soil is the main source for the growth and occurrence of keratinophilic fungi due to its richness in keratinous substrates. Keratinophilic fungi along with dermatophytes causes human and animal mycoses. In the present study eighty soil samples were collected from bus stands and railway stations in the vicinity of Jaipur city, Rajasthan, India and observed the prevalence of keratinophilic fungi. For this purpose, hair baiting technique was used. A total of 98 isolates belonging to seven genera were recovered. *Chrysosporium tropicum* (26.53%) was the most prevalent species followed by *Chrysosporium indicum* (12.24%), *Microsporum gypseum* (11.22%) and *Trichophyton rubrum* (8.16%), *T. terrestre* (7.14%), *A. fumigates* (6.12%) and *Fusarium oxysporum* (4.08%) etc. This study showed that soil of these places may be notable reservoirs of certain keratinophilic and dermatophytic fungi and these places explored first time in Jaipur city, India.

Keywords: Keratinophilic fungi, dermatophytes fungi, *Chrysosporium* spp., soil, hair baiting technique.

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*Corresponding Author

Soniya Bairwa, Medical Mycology and Microbiology Laboratory, Department of Botany,
University of Rajasthan, Jaipur, Rajasthan-302004, India.

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I. INTRODUCTION

Keratinophilic fungi is an important group of fungi that degrade one of the most non degradable protein on earth which is called as Keratin¹. The occurrence of keratinophilic fungi in the environment depend on several factors such as animal or and human presence because it favours to grow on keratinous substances such as hair, skin, nail etc.²⁻⁵. Keratinophilic fungi belong to Hyphomycetes and some other taxonomic groups. Hyphomycetes comprises dermatophytes and a variety of non dermatophytes. These microorganisms survive as communities together and most of them occur as saprophytes in soil. Many authors from different countries had reported its presence in soil e.g. Spain⁶⁻⁷, Korea⁸, Iran⁹, India¹⁰, Malaysia¹¹ and Kuwait¹². In India, animals such as cows, dogs, rats and bullocks are easily invaded in Public places, Parks, Bus stations, Schools and leave their organic residues that may contaminate the soil with keratinous debris and pathogenic fungi¹³. Keratinophilic and keratinolytic fungi are two groups which depend on keratin. Keratinolytic fungi are completely degrad the keratin and pathogenic to human and animal whereas keratinophilic fungi are dependent on associated material with keratin. Keratinolytic fungi have existence in communities together with keratinophilic fungi and occur profusely in the superficial soil layer to which keratin substrata are continuously delivered.

2. MATERIALS AND METHODS

2.1 Collection of soil samples

About 80 soil samples were collected from various bus stands and railway stations of Jaipur and on an average 5 samples were collected from each site. Most samples were collected from crowded places, superficial debris and other vegetative materials were removed from the soil surface before the collection of soil samples. Approximately 300-400 gm of soil was taken from each site from a depth of 2-5 cm. The soil samples were collected in a sterilized poly bags with the help of spatula and sealed on the spot. Samples were transferred to the laboratory, were used immediately or stored overnight at 4° C.

2.2 Hair Baiting of Soil Samples

Defatting of hair bait was done by soaking them in either

diethyl ether or chloroform for 24 hrs. To-Ka -Va hair baiting method¹⁴ was used for the isolation of keratinophilic fungi. In this method, sterilized Petri plates is half filled with soil samples and poured with sterilized distilled water to moist the soil. After this defatted and sterilized human hairs are kept on moistened soil. These plates were then incubated under temperature of 25° C - 30° C. The Petri plates were examined for every 5th day upto 30 days time limit using binocular microscope.

2.3 Isolation, Purification and Identification of various fungi

After observing the mycelium growth on the hair baits, cultures were transferred to Sabouraud's dextrose agar medium added with Chloramphenicol (16µg/ml) and Cycloheximide (0.5µg/ml), and incubated at 25° C - 30° C. These isolates are observed periodically for the development of mycelium. For the identification of isolates, these isolates were stained with lactophenol cotton blue and examined under the microscope. Identification of fungal culture was done on the basis of pigmentation, color and colony characters.

3. RESULTS

The present study was investigated to report the distribution and natural occurrence of keratinophilic fungi in the soils of railway station and bus stand of Jaipur. For this study, screening of 80 soil samples of different habitats (railway stations and bus stands) from different areas of Jaipur was done (Table 1 & 2). Out of 80 samples 67 samples were found positive and 13 samples were found negative for growth of fungi. All the soil samples were collected from Vidhyadhar nagar bus stand, Narayan Singh circle bus stand and Gandhi nagar railway station exhibited growth of keratinophilic fungi. Out of 67 positive samples 98 isolates belonging to seven genera were reported (Table 3). *Chrysosporium tropicum* 26.53%) was found to be most dominant fungi whereas *Chrysosporium indicum* (12.24%) was the next most common species (Figure 1) followed by *Microsporium gypseum*, *Trichophyton rubrum*, *T. terrestre*, *A. fumigates*, *Fusarium oxysporum*, *T. mentagrophytes*, *T. simii*, *T. interdigitale*, *M. canis*, *Scopulariopsis* spp. etc.

Table 1. Keratinophilic & dermatophytic fungi from bus stands

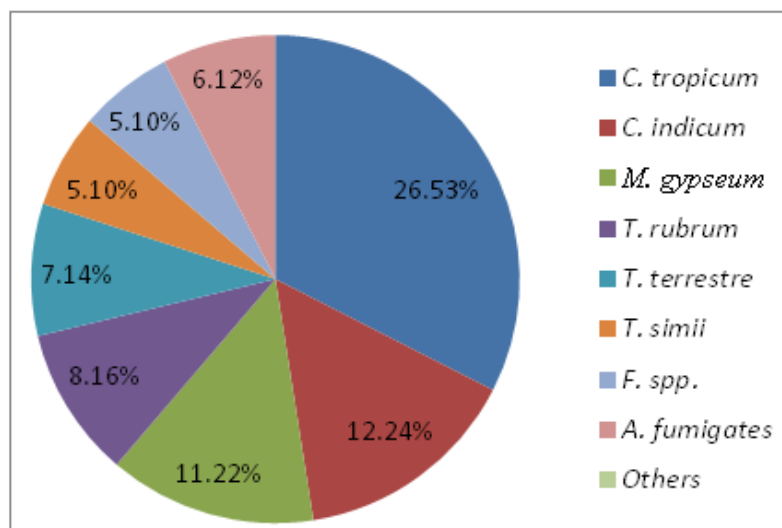
Habitats	Total no. of samples	Total no. of positive samples	% Occurrence
Sindhi camp (26.9232° N, 75.8007° E)	10	9	90
Narayan singh circle (26.8989° N, 75.8117° E)	6	6	100
Transport nagar (26.9092° N, 75.8457° E)	6	4	66.67
Vidhayadharnagar (26.9621° N, 75.7816° E)	4	4	100
Vaishalinagar (26.9048° N, 75.7489° E)	5	4	80
Jagatpura (26.8177° N, 75.8617° E)	5	4	80
Heerapura (26.8900° N, 75.7277° E)	4	2	50
Total	40	33	82.5

Table 2. Keratinophilic & dermatophytic fungi from railway stations

Habitats	Total no. of samples	Total no. of positive samples	% Occurrence
Jaipur Junction (26.9197° N, 75.7880° E)	12	11	91.67
Gandhi Nagar Station (26.8739° N, 75.7991° E)	8	8	100
Gator Jagatpura Station (26.8373° N, 75.8310° E)	5	4	80
Khatipura Station (26.8362° N, 75.8910° E)	5	3	60
Durgapura Station (26.8550° N, 75.7870° E)	6	5	83.33
Kanakpura Station (26.9292° N, 75.7032° E)	4	3	75
Total	40	34	85

Table 3: Distribution and occurrence of individual fungal species in different habitats

Fungi Isolated	Total samples	<i>C. tropicum</i>	<i>C. indicum</i>	<i>T. mentagrophytes</i>	<i>T. terrestre</i>	<i>T. simii</i>	<i>T. rubrum</i>	<i>T. interdigitale</i>	<i>M. gypseum</i>	<i>M. canis</i>	<i>Colletotrichum</i> spp.	<i>F. oxysporum</i>	<i>Fusarium</i> spp.	<i>Scopulariopsis</i> spp.	<i>A. fumigatus</i>	<i>Alternaria</i> spp.	Total Isolates
Habitats	N	n	n	n	n	n	n	n	n	N	n	n	n	n	n	n	n
Sindhi Camp	10	4	2	-	-	1	1	1	2	-	-	-	1	-	1	-	13
Narayan Singh circle	6	3	1	-	-	-	1	-	2	-	-	1	1	-	-	-	9
Transport nagar	6	2	-	1	-	-	-	-	1	-	1	-	-	1	-	-	6
Vidhayadharnagar	4	2	1	-	1	1	-	-	-	-	-	1	-	-	1	-	7
Vaishalinagar	5	-	1	-	1	-	2	-	1	-	1	-	-	-	1	1	8
Jagatpura	5	2	-	1	-	1	1	-	-	1	-	-	-	-	-	-	6
Heerapura	4	1	1	-	1	-	-	1	1	-	-	-	-	-	1	-	6
Jaipur Junction	12	4	2	-	-	-	1	-	1	-	-	1	1	-	-	1	11
Gandhi Nagar Station	8	2	-	-	1	1	2	-	1	1	-	1	-	-	1	-	10
Gator Jagatpura Station	5	2	-	-	-	1	-	-	1	-	-	-	1	-	-	-	5
Khatipura Station	5	-	2	-	1	-	-	-	-	-	1	-	-	-	-	1	5
Durgapura Station	6	3	2	-	1	-	-	-	1	-	-	-	-	-	-	-	7
Kanakpura Station	4	1	-	1	1	-	-	-	-	-	-	-	1	-	1	-	5
Total	80	26	12	3	7	5	8	2	11	2	3	4	5	1	6	3	98

**Fig 1. Prevalence of various keratinophilic and dermatophytic fungi**

4. DISCUSSION

Many investigators have reported the presence of keratinophilic fungi including dermatophytes in soil. Present study showed prevalence of keratinophilic fungi in soils of bus stand and railway stations of Jaipur, India. Our study showed that *Chrysosporium tropicum* was found to be most common fungi followed by *Chrysosporium indicum*, *M. gypseum*, *Trichophyton rubrum*. During the study, it was found that *Chrysosporium tropicum* is not only found in single form but also in the form of mix growth with *C. indicum*, *Trichophyton terrestre*. Jain and Sharma¹⁵ reported *C. tropicum* as the most predominant keratinophilic fungi during their study on animal and bird habitats. Similar results were also found by many investigators (Deshmukh¹⁶, Deshmukh et al.¹⁷, Kumar et al.¹⁸, Gora et al.¹⁹, Sharma and Sharma²⁰). Deshmukh and Verekar²¹ collected 150 soil samples from 11 districts of Vidarbha region of Maharashtra state, India. They recovered and identified 71 isolates in which *Chrysosporium indicum* was the most prominent fungi. Rekha and Krishnaveni²² examined soil and water samples from south Tamilnadu, India and reported five species of *Microsporum* viz. *M. gypseum*, *M. canis*, *M. nanum*, *M. distortum* and *M. cookei*. Gujnani et al.²³ examined 108 soil samples from St. Kitts and 55 samples from Nevis. Forty-nine (45%) of the samples from St. Kitts and Thirty-eight (69%) samples from Nevis were positive for keratinophilic fungi. *Microsporum gypseum* was the most frequently recovered species and followed by *Chrysosporium indicum*. Shrivastav et al.²⁴ reported *Trichophyton mentagrophytes* is most common (22%) followed by *T. rubrum* (16%) and *T. equinum* (13%) in the region of Gwalior, India. They collected 160 fungal samples and found eight different fungal species, specifically *T. mentagrophytes*, *T. tonsurans*, *T. equinum*, *T. rubrum*, *Microsporum gypseum*, *M. audouinii*, *M. nanum* and *Aspergillus niger* were isolated.

9. REFERENCES

- Sharma R, Rajak RC. Keratinophilic fungi: Nature's keratin degrading machines!. Resonance. 2003;8(9):28-40. Available from: <https://link.springer.com/article/10.1007/BF02837919>
- Mahmoudabadi AZ, Zarrin M. Isolation of dermatophytes and related keratinophilic fungi from the two public parks in Ahvaz. Jundishapur J Microbio. 2008;1(1):20-3.
- Haq SU, Sharma M, Gora S, Mahariya S, Jain N, Bairwa S. A Biochemical analysis on some fungal isolates against their growth and sporulation. Int J Pharma Bio Sci. 2017;8(3):155-162.
- Mahariya S, Sharma M, Tiwari M, Meena N. Antimicrobial activity of *Nigella sativa* (Kalwangi) essential oil against fungal infections of skin. Res Environ Life Sci. 2012;5(3):137-40. Available from: <http://rels.comxa.com/fullpapers/volume5paper30.pdf>
- Ali-Shtayeh MS, Arda HM, Hassouna Mand, Shaheen SF. Keratinophilic fungi on sheep hairs from the West Bank of Jordan. Mycopathologia. 1989;106(2):95-101. Available from: <https://link.springer.com/article/10.1007/BF00437087>
- Calvo A, Vidal M, Guarro J. Keratinophilic fungi from urban soils of Barcelona, Spain. Mycopathologia. 1984;85(3):145-7. Available from: <https://link.springer.com/article/10.1007/BF00440943>

5. CONCLUSION

Conclusively, *Chrysosporium tropicum*, *C. indicum* and *Microsporum gypseum* are more prevalent in the soil of railway stations and bus stands of Jaipur city, India. Soil samples collected from Vidhyadharnagar, Narayan Singh circle bus stand and Gandhi nagar railway station were most prominent for the growth of keratinophilic and dermatophytic fungi. These fungi exhibit pathogenic properties to human and animals. Therefore, studies of keratinophilic fungi in the environment are epidemiologically important.

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7. AUTHORS CONTRIBUTION STATEMENT

Mrs. Soniya collected the soil samples from various places in Jaipur city and performed the experiments with regard to this work. Prof. Meenakshi Sharma encouraged and supervised the findings of this work. All authors discussed the methodology and results and contributed to the final manuscript.

8. CONFLICT OF INTEREST

Conflict of Interest declared none.

- Ulfing K, Guarro J, Cano J, Gene J, Vidal P, Figueras MJ. General assessment of the occurrence of keratinolytic fungi in river and marine beach sediments of Catalanian waters (Spain). Water Air Soil Pollut. 1997;94(3-4):275-87. Available from: <https://link.springer.com/article/10.1007/BF02406063>
- Lee MJ, Park JS, Chung H, Jun JB, Bang YJ. Distribution of soil keratinophilic fungi isolated in summer beaches of the East Sea in Korea. Korean J Med Mycol. 2011;16(2):44-50.
- Moallaei H, Zaini F, Pihet M, Mahmoudi M, Hashemi J. Isolation of keratinophilic fungi from soil samples of forests and farm yards. Iran J Public Health. 2006;35(4):62-9. Available from: <http://ijph.tums.ac.ir/index.php/IJPH/article/view/2152>
- Deshmukh SK. Incidence of dermatophytes and other keratinophilic fungi in the glacier bank soils of the Kashmir valley, India. Mycologist. 2002;16(04):165-7. DOI: 10.1017/S0269915X0200407X
- Soon SH. Isolation of keratinophilic fungi from soil in Malaysia. Mycopathologia. 1991;113(3):155-8. Available from: <https://link.springer.com/article/10.1007/BF00436120>
- Al-Musallam, AA. Distribution of keratinophilic fungi in desert soil of Kuwait. Mycoses. 1989;32:296-302. DOI: 10.1111/j.1439-0507.1989.tb02247.x
- Jain N, Sharma M. Distribution of dermatophytes and other related fungi in Jaipur city, with particular

- reference to soil pH. *Mycoses*. 2011;54(1):52-8. DOI: 10.1111/j.1439-0507.2009.01751.x
14. Vanbreuseghem R. Keratin digestion by dermatophytes: a specific diagnostic method. *Mycologia*. 1952;44(2):176-82. DOI: 10.1080/00275514.1952.12024183
 15. Jain N, Sharma M. A descriptive study of keratinophilic fungal flora of animal and bird habitat, Jaipur, Rajasthan. *Afr J Microbiol Res*. 2012;6(42): 6973-7. Available from: http://www.academicjournals.org/app/webroot/article/article1380540686_Jain%20and%20Sharma.pdf
 16. Deshmukh SK. Keratinophilic fungi isolated from soils of Mumbai, India. *Mycopathologia*. 1999;146(3):115-6. Available from: <https://link.springer.com/article/10.1023/A:1007039014286>
 17. Deshmukh SK, Agrawal SC, Jain PC. Isolation of dermatophytes and other keratinophilic fungi from soils of Mysore (India). *Mycoses*. 2000;43(1-2):55-7. DOI: 10.1046/j.1439-0507.2000.00539.x
 18. Kumar R, Mishra R, Maurya S, Sahu HB. Isolation and identification of keratinophilic fungi from garbage waste soils of Jharkhand region of India. *Eur J Exp Biol*. 2013;3(3):600-4. Available from: <https://pdfs.semanticscholar.org/a434/1fe52856f2807ecb5639c44eb450d05d7b8d.pdf>
 19. Gora S, Gora M, Jain N, Haq SU, Sharma M, Mahariya S. Isolation and characterization of keratinophilic fungi and related dermatophytes from various public parks of Jaipur, India. *Int J Pharma Bio Sci*. 2017;8(2):100-6.
 20. Sharma M, Sharma M. Incidence of dermatophytes and other keratinophilic fungi in the schools and college playground soils of Jaipur, India. *Afr J Microbiol Res*. 2010;4(24): 2647-54. Available from: http://www.academicjournals.org/app/webroot/article/article1380538469_Sharma%20and%20Sharma.pdf
 21. Deshmukh SK, Verekar SA. Incidence of keratinophilic fungi from selected soils of Vidarbha Region of Maharashtra State, India. *J Myco*. 2014. DOI: 10.1155/2014/148970
 22. Rekha CB, Krishnaveni G. Incidence of *Microsporum* species from different soil and water samples from South Tamilnadu. *Asian Journal of Multidisciplinary Studies*. 2016;4(2):223-7. Available from: <http://www.ajms.co.in/sites/ajms2015/index.php/ajms/article/view/1656>
 23. Gughani HC, Sharma S, Gupta B, Gaddam S. Prevalence of keratinophilic fungi in soils of St. Kitts and Nevis. *J Infect Dev Ctries*. 2012; 6(04): 347-51. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/22505445>
 24. Shrivastav VK, Shukla D, Parashar D, Shrivastav A. Dermatophytes and related keratinophilic fungi isolated from the soil in Gwalior region of India and in vitro evaluation of antifungal activity of the selected plant extracts against these fungi. *J Med Plant Res*. 2013;7(28):2136-9. Available from: <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.850.2645&rep=rep1&type=pdf>