



## Occurrence of Keratinophilic Fungi from Soils of Ujjain (Holy City), India

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### Abstract

Soil is well-known as a route to fungal infection in human. Recently, human exposure to potentially pathogenic fungi is threatening the health of people. Keratinophilic fungi in the soil are diverse group that depend on different factors, such as vertebrates and human activity. These fungi plays vital task in decomposing keratinous debris of man and animals in nature. In order to study the prevalence of keratinophilic fungi present in soil of Ujjain (holy city), 128 soil samples were collected. These samples were screened using hair baiting techniques for isolation. Out of total 128 samples, 112 (87.50%) were positive for growth of keratinophilic fungi. Present results show the occurrence of keratinophilic fungi in soils of different sites in Ujjain and may have a significant role in keratin degradation in the environment.

**Keywords:** Keratinophilic fungi, degradation, hair bait technique.

### Introduction

The decomposition of keratin by keratinophilic fungi plays an important role in the natural environment. The fibrous protein keratin is found in hairs, nails, horns, skin, feathers, etc. in vertebrates and humans<sup>1</sup>, which consist of polypeptide chains joined by hydrogen bonds, salt-cross bridges and disulphide bridges.

Hair-bait technique of Vanbreuseghem<sup>2</sup> was used for isolation of keratinophilic fungi and proved that soil is natural reservoir of these fungi. Keratinophilic fungi have the distinctive capability to degrade keratinous substances. The fungi which decompose these substances entirely are known as keratinolytic. These fungi also cause dermatophytosis in humans and animals.

The keratinophilic fungi create the enzyme keratinase, which is essential in recent times in industrial application. Present study revealed the occurrence of keratinophilic fungi from soils of Ujjain (holy city), India.

### Material and Methods

**Sample collection:** In this study, 128 soil samples were collected from different places of Ujjain (M.P.) India. The soil samples were collected from the surface whose deepness did not exceed 4–6cm by using spatula. In doing so, 500 grams of soil was collected in sterile polyethylene bags. Each bag was tightly packed and labelled indicating the place and date of collection. These samples were brought to laboratory for further processing. Various baits (hairs, wool, nails, horn and feathers) were also collected from various sources and stored in plastic bags.

**Isolation of keratinophilic fungi:** For isolation, the following techniques were used:

**Hair-baiting technique:** The Vanbreuseghem<sup>2</sup> method was used for the isolation of keratinophilic fungi. For this, keratinous substances from each sample were aseptically scattered on the top of each soil sample in sterile Petri dish and provide moistened condition (in duplicates) and incubated at 28°C ±2°C for one month and examined daily for fungal growth.

The moulds which appear on the bait fragments (figure-2) were transferred to the surface of Sabouraud's dextrose agar (Himedia) with chloramphenicol (50mg/l) and cycloheximide (actidione 500 mg/l). The Petriplates were incubated at 28°C for 7-10 days. These fungi (figure-3) were identified based on the standard monographs<sup>3-8</sup>.

### Results and Discussion

128 soil samples were screened for the prevalence of keratinophilic fungi. Out of which 112 soil samples (87.50%) were positive for fungal growth. The result of prevalence of keratinophilic fungi is shown in table-1 and figure-1.

In the present investigation the fungal strains *Microsporum* sp., *Chrysosporium* sp., *Trichophyton* sp., *Penicillium* sp., *Aspergillus niger*, *A. fumigatus*, *A. flavus*, *Aspergillus* sp., *Cladosporium* sp. etc. were frequently isolated. Keratinophilic fungi and dermatophytes were also previously reported from Indian soils<sup>9-12</sup>.

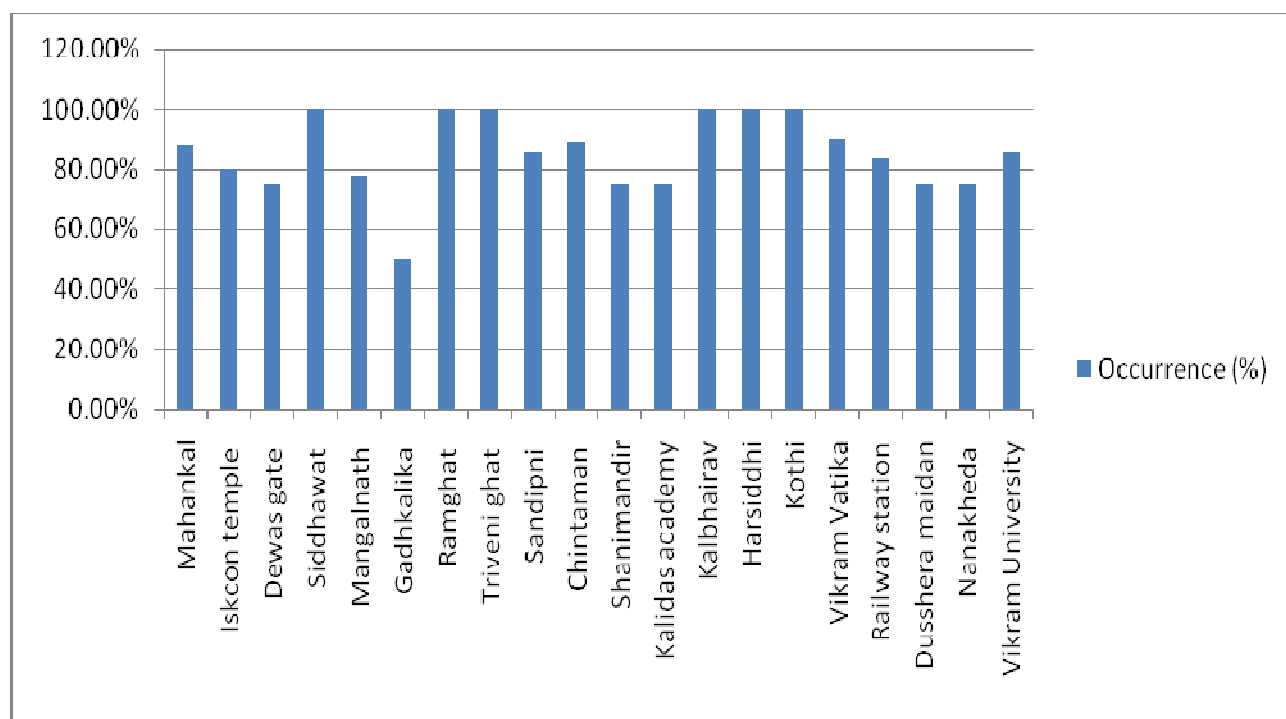
It is remarkable that the highest number of keratinophilic fungi was observed from soils of Ramghat, Siddhawati, Vikram vatika, Triveni ghat, Kalbhairav, Harsiddhi in Ujjain. The high prevalence of keratinophilic fungi from these soils explain that, hair of human/ animals and feather from birds which come to the soil either as dead or dropped off, serves as substrates and are subjected to microbial decomposition. The present study

clearly indicates the diverse existence of keratinophilic fungi in soils of Ujjain. Keratinophilic fungi are important ecologically and play major role in bioremediation in natural environment<sup>13-14</sup>. Diverse soil habitats have been screened from

different countries e.g- Brazil, Kuwait, Iran, and India indicating that these groups of fungi are distributed worldwide<sup>15-17</sup>.

**Table-1**  
**Occurrence (%) of keratinophilic fungi from soil**

Sample sites	Collected samples	Positive samples	Occurrence (%)
Mahankal	08	07	87.5%
Iskcon temple	05	04	80%
Dewas gate	04	03	75%
Siddhawath	11	11	100%
Mangalnath	09	07	77.7%
Gadhkalika	04	02	50%
Ramghat	11	11	100%
Triveni ghat	08	08	100%
Sandipni	07	06	85.7%
Chintaman	09	08	88.8%
Shanimandir	04	03	75%
Kalidas academy	04	03	75%
Kalbhairav	05	05	100%
Harsiddhi	04	04	100%
Kothi	04	04	100%
Vikram Vatika	10	09	90%
Railway station	06	05	83.3%
Dusshera maidan	04	03	75%
Nanakheda	04	03	75%
Vikram University	07	06	85.7%
<b>Total</b>	<b>128</b>	<b>112</b>	<b>87.50%</b>



**Figure-1**  
**The occurrence of keratinophilic fungi**



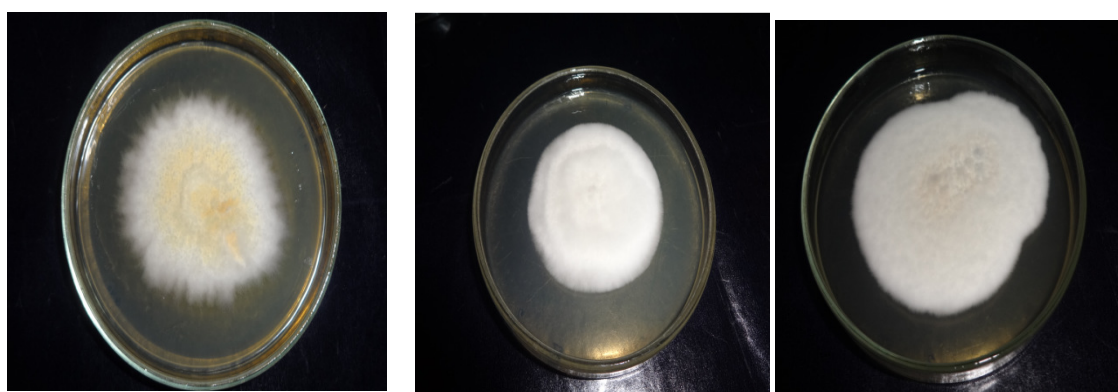
(a) On human hairs

(b) On birds feathers

(c) On human nails

Figure-2

Growth of Keratinophilic fungi on baits



a- *Microsporium* sp.

b- *Trichophyton* sp.

c- *Chrysosporium* sp.

Figure-3

Growth of keratinophilic fungi on SDA plates

## Conclusion

It is clear from present investigation that soils of Ujjain are ideal environment for the keratinophilic fungi. This could be attributed to the high organic debris and keratinous substrates present in these soils. However the isolation of fungi was not uniform as it depends on organic matter. Organic matter content of soils is one of the major factors affecting the presence of keratinophilic fungi in soils. Thus these fungi which are human/animal pathogens could be considered as bioindicators of environmental pollution with keratinous substrate and can pose risk of human and animal mycoses.

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