



Isolation and Identification of Keratinophilic Fungi from Cattle House Soil in Khartoum City, Sudan

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Authors' contributions

This work was carried out in collaboration between both authors. Author WGA designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors WGA and HO managed the analyses of the study. Author HO managed the literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

The present study was done to investigate the presence of keratinophilic fungi in soil, sixty soil samples were collected randomly from bovine farms in Khartoum state. Hair baiting technique was used for isolating the fungi. Plates which contain soil and children hair were then incubated at 28°C for one month. Ten genera and fifteen species were isolated from cattle house soils. *Aspergillus* species represent the highest occurrence of isolates.

Keywords: Keratinophilic; cattle house; hair bait technique.

1. INTRODUCTION

Keratinophilic fungi like to grow and even reproduce on keratin materials such as skin, hair,

nail, fur, feather, horn, hoof and beak of the birds. They use keratin as a carbon source [1]. Keratin has a helical structure and numerous disulfide linkages which make it highly insoluble

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protein, it has fibrous resistant to many proteases but is easily digested by keratinase enzymes [2]. Keratinophilic fungi cause animal mycoses ecologically and are present in the different distribution patterns [3].

The potentially pathogenic keratinophilic fungi and allied geophilic dermatophyte widespread worldwide. Filamentous fungi several other taxonomic groups. Hyphomycetes include dermatophytes and a great variety of nondermatophytic filamentous fungi. The main types of fungal genera with keratinolytic properties are *Alternaria*, *Aspergillus* [4,5], *Chrysosporium* [6] *Cladosporium*, *Curvularia*, *Fusarium*, *Myrothecium*, *Paecilomyces*, *Penicillium*, *Scopulariopsis*, *Sepedonium*, *Stachybotrys*, *Ulocladium* and dermatophyte fungi [7-9].

Surveys conducted in several countries in different parts of the world have demonstrated that the occurrence of a variety of keratinophilic fungi e.g. (Egypt [10], Australia [11], Palestine [12], Spain [13], India [14], Korea [15], Iran [16], Kuwait [17], Malaysia [18] and Libya [19]. to assess the Keratinophilic fungi, from cattle house in Khartoum state.

2. MATERIALS AND METHODS

2.1 Collection of Soil Samples

Sixty soil samples were collected randomly from bovine farms in Khartoum state. Samples were collected from the superficial layer with depth ranged less than 10 cm in sterile labelled sterile disposable spoon and transferred immediately to the laboratory for processing.

2.2 Baiting of Soil Samples

Sterile healthy children hair fragments were applied to isolate keratinophilic fungi from soil using bait hair technique [20,21]. 50g of soil samples was placed in a laboratory plate then the surface was covered with sterilised children hair. The baited soils were moistened with sterile distilled water and incubated at 28°C for one month.

2.3 Isolation and Identification of the Isolates

The plates of hair bait were examined for any fungal growth on the hair bait regularly. A small

part up and examined by blue wet mount preparation microscopically. Sabouraud's media containing used for isolation, identification of the fungal growth. Identification of fungal culture was done on the basis of their macroscopic and microscopic characteristics according to the microbiology manuals and atlases [22-25].

3. RESULTS

Sixty soil samples were screened for the prevalence of keratinophilic fungi. All the samples were positive for fungal growth. In the present study the following fungal strains were identified; *Aspergillus* sp (56.8%), followed by *Penicillium* sp (18.2%), *Trichophyton mentagrophytes* (6.8%), *Mucor* sp.(4.6%), *Rhizopus* sp.(3.4%), *Chrysosporium* sp.(2.3%), *Curvularia* sp.(2.3%), *Epicoccum* sp. (2.3%), *Trichophyton terrestre* (1.1%), *Alternaria* sp. (1.1%) and *Pithomyces* sp. (1.1%) as shown in (Table 1). This investigation showed the presence of several *Aspergillus* sp they were *Aspergillus niger*, *A. flavus*, *A. fumigatus*, *A. terreus*, *A. nidulans*, *A. fischeri* as shown in (Table 2).

Table 1. Different species of keratinophilic fungi isolated from cattle house soil

Fungal species	Number	Percentage
<i>Aspergillus</i> sp	50	56.8%
<i>Penicillium</i> sp	16	18.2%
<i>Trichophyton mentagrophytes</i>	6	6.8%
<i>Mucor</i> sp	4	4.6%
<i>Rhizopus</i> sp	3	3.4%
<i>Chrysosporium</i> sp	2	2.3%
<i>Epicoccum</i> sp	2	2.3%
<i>Curvularia</i> sp	2	2.3%
<i>Trichophyton terrestre</i>	1	1.1%
<i>Alternaria</i> sp	1	1.1%
<i>Pithomyces</i> sp	1	1.1%

Table 2. Different *Aspergillus* sp. Isolated from cattle house soil

<i>Aspergillus</i> species	Number	Percentage
<i>Aspergillus niger</i>	22	44%
<i>A. flavus</i>	15	30%
<i>A. terreus</i>	7	14%
<i>A. fumigatus</i>	3	6%
<i>A. nidulans</i>	2	4%
<i>A. fischeri</i>	1	2%



Fig. 1. Colony of *Alternaria* sp. on Sabouraud's dextrose agar

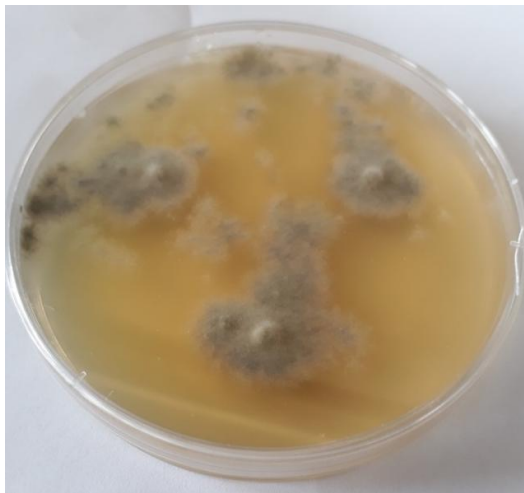


Fig. 2. Colony of *Curvalaria* sp. on Sabouraud's dextrose agar

In agreement of our findings, several reports indicated that *Aspergillus* species are the most prevalent keratinophilic fungi in the soils [27-29]. *Aspergillus niger* was the most predominant species this results in accordance with [30]. The *penicillium* sp. was the second major isolated species from soil this finding agrees with [31].

In the present study *Alternaria*, *Curvalaria* and *Trichophyton mentagrophytes* were isolated from cattle house but in low number, similarly [32] obtained the same results.



Fig. 3. Colony of *Penicillium* sp. on Sabouraud's dextrose agar

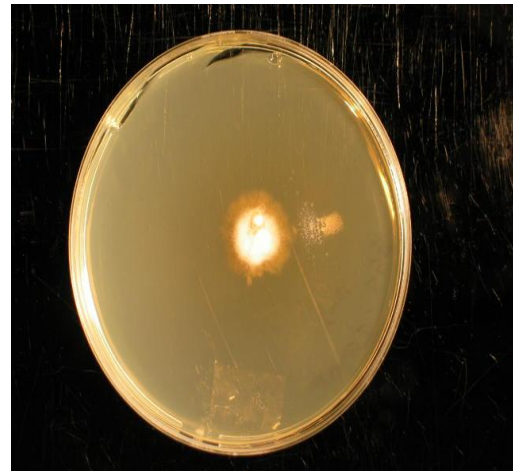


Fig. 4. Colony of *Trichophyton mentagrophytes* on Sabouraud's dextrose agar

4. DISCUSSION

Keratinophilic fungi can degrade keratin. Some keratinophilic fungi can causes mycoses in humans and animals due to their ability to parasitise keratinic tissues. Review literature reveals that keratinophilic fungi have been reported from different parts of the world. The presence of keratinophilic fungi in soils of cattle houses has serious implications because these animals can carry dermatophytes on their skin coats without showing any sign of infection [26]. Species of keratinophilic fungi can be different from country to country according to the nature of soil and environment [27].

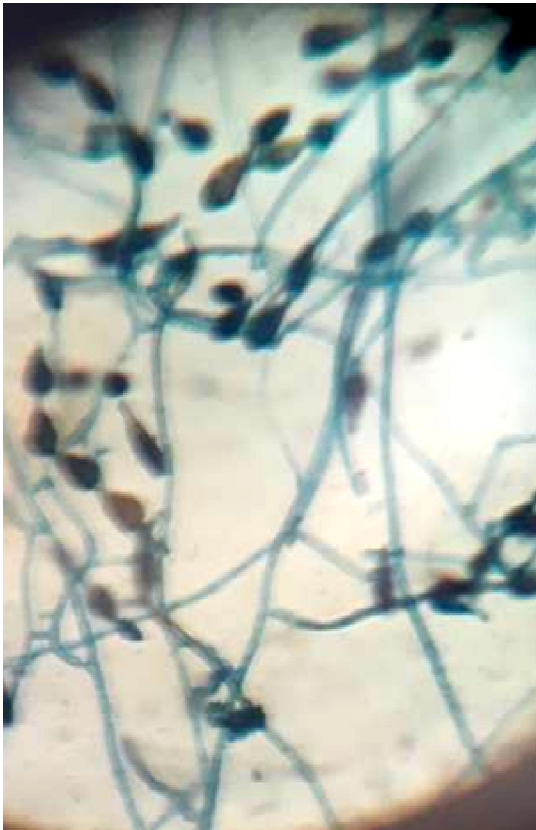


Fig. 5. Macroconidia of *Alternaria* sp. lactophenol cotton blue



Fig. 6. Macroconidia of *Curvalaria* sp. lactophenol cotton blue

Presence of *Chrysosporium* sp. in different types of soil is important for pathogenic potential of fungus and was confirmed in several studies in different countries [26,33,34].

The occurrence of *Rhizopus* and *Mucor* species in soil samples have also been reported by other workers [30,33,34]. In the current study different species of *Aspergillus* were reported *A.niger*, *A. flavus*, *A.terreus* and *A.fumigatus* the same species were previously isolated from cattle house soil by Pahare et al. [32]. *Aspergillus nidulans* has been reported by Anbu et al. [35].

Two different dermatophytes species have been isolated from soil *Trichophyton mentagrophytes* and *Trichophyton terrestre*, isolation of *Trichophyton mentagrophytes* from cattle has been reported by Pahare et al. [32] while *Trichophyton terrestre* isolated by Tuck Soon [36], Rizwana et al. [37].

5. CONCLUSION

It is clear from this study that soils of cattle houses are an ideal environment for the growth of keratinophilic fungi and dermatophytes. The presence of these fungi attributed to the high organic debris and keratinous substrates present in these soils. The major factor that affects the presence of keratinophilic fungi in soil is its organic content. These fungi which cause disease in humans and animals could be considered as bioindicators of environmental pollution with the keratinous substrate and can pose a risk of humans and animal mycoses.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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