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

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Original Research Article

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.
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, Scedopodium, 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 Pithyomyces sp. (1.1%) as shown in (Table 1). This investigation showed the presence of several Aspergillus sp they were Aspergillus niger, A. flavus, A. fumigates, A. terreus, A. nidulans, A. fischeri as shown in (Table 2).

| Fungal species                | Number | Percentage |
|------------------------------|--------|------------|
| Aspergillus sp               | 50     | 56.8%      |
| Penicillium sp               | 16     | 18.2%      |
| Trichophyton mentagrophytes  | 6      | 6.8%       |
| Mucor sp                     | 4      | 4.6%       |
| Rhizopus sp                  | 3      | 3.4%       |
| Chrysosporium sp             | 2      | 2.3%       |
| Epicoccum sp                 | 2      | 2.3%       |
| Curvularia sp                | 2      | 2.3%       |
| Trichophyton terrestre       | 1      | 1.1%       |
| Alternaria sp                | 1      | 1.1%       |
| Pithyomyces sp               | 1      | 1.1%       |

| Aspergillus species          | Number | Percentage |
|------------------------------|--------|------------|
| Aspergillus niger            | 22     | 44%        |
| A. flavus                    | 15     | 30%        |
| A. terreus                   | 7      | 14%        |
| A. fumigatus                 | 3      | 6%         |
| A. nidulans                  | 2      | 4%         |
| A. fischeri                  | 1      | 2%         |
4. DISCUSSION

Keratinophilic fungi can degrade keratin. Some keratinophilic fungi can cause mycoses in humans and animals due to their ability to parasitize 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].

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.

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

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

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

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