Isolation of Keratinophilic Fungi from Soil in Khairpur City, Sindh, Pakistan

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[Received 02 February 2007; Accepted 21 April 2007]

One hundred and twenty five soil samples were collected from five areas in the vicinity of Khairpur city, Sindh, Pakistan and screened for the presence of keratinophilic fungi by using hair bait technique. A total 253 isolates belonged to eight genera and eleven species of keratinophilic fungi were recovered. Maximum number (153/253, 60.5%) of keratinophilic fungi was recovered from farm land and poultry soils. Aspergillus niger was most prevalent species and represented 20.2% of the total number isolated. A. flavus and A. fumigatus were almost equal in their prevalence and represented 11.9 and 11.1%, respectively. Botrytis cinaria comes next constituting 9.9%; followed by Mucor spp. (9.1%) and Chochliobolus lunatus (8.3%). Other species isolated less frequently included Chrysosporum asperatum (5.9%), Fusarium spp. (5.1%), Penicillium spp. (3.1%) and A. wentii (2.4%). The distribution pattern of the different keratinophilic fungi and their significance are discussed.

Keywords: Keratinophilic fungi, Prevalence, Keratinase, Hair bait technique

Keratinophilic fungi like to grow and even reproduce on keratin materials such as skin, hair, nail, fur, feather, horn, hoof, beak of the birds etc. They utilize keratin as carbon source1. Keratin is highly insoluble protein having fibrous helical structure and numerous disulfide linkages which make it resistant to many proteases but is easily digested by keratinase enzymes2.

The keratineous materials in or on soil are attacked by these keratinophilic microbes, therefore biodegradation takes place. Keratinases also provide the virulence to certain fungi such as keratinophilic microbes, therefore biodegradation takes place. Keratin is highly insoluble protein having fibrous helical structure and numerous disulfide linkages which make it resistant to many proteases but is easily digested by keratinase enzymes2.

Keeping in view such enormous significance of keratinophilic fungi for keratinase enzymes production, the present study was undertaken to isolate these microorganisms from fertile soils, animal herds, animal slaughter houses, poultries and barbers’ shops. A total 125 soil samples were collected from five different sources including fertile lands, animal herds, animal slaughter houses, poultries and barbers’ shops in Khairpur city, Sindh, Pakistan. From each sources 25 soil samples were collected and screened for keratinophilic fungi by employing hair bait technique using human hair as keratin bait10-17. Invaded hairs were inoculated on Sabourauds dextrose agar (SDA) supplemented with chloramphenicol 0.05 mg/l for obtaining the cultural growth. Cultures were purified and maintained on potato dextrose agar (PDA) at 5ºC. The identification of isolates was made as per Dexter3 and Domesck et al.1.

The results of the isolation of keratinophilic fungi are presented in Table 1. The data revealed that of 125 samples, maximum number (85/253; 33.6%) of keratinophilic fungi was isolated from soils of fertile lands; followed by the soil samples from poultries (68/253; 26.9%). Isolation rates of keratinophilic fungi from soils of animal herd (44/253; 17.4%) and barbers’ shops (43/253; 17.0%) were almost similar. The least number of keratinophilic fungi was isolated from the slaughter house soils (13/253; 5.1%).

A total of 253 keratinophilic fungi including eight genera and eleven species were isolated, viz., Aspergillus niger (20.2%), Alternaria alternata (13.0%), Aspergillus flavus (11.9%), Aspergillus fumigatus (11.1%), Botrytis cinaria (18.2%), Chochliobolus lunatus (16.8%), Mucor spp. (16.0%), Chrysosporum asperatum (9.9%), Fusarium spp. (5.1%), Penicillium spp. (3.1%) and Apergillus wentii (2.4%) (Table 1). Aspergillus accounted for 45.6% distribution, with A. niger being the dominant species. It is interesting that some fungi isolated in this study such as Aspergillus, Alternaria, Chochliobolus, Botrytis, Fusarium and Mucor were previously thought as non-keratinophilic, but subsequent studies showed that these fungi possess keratinolytic activities when grown on keratin-rich substrates and they also occur in the environment in keratin-rich soils13,15-17. Keratinolytic enzymes have been shown to be useful for biotechnological purposes such as hydrolysis of poultry feathers19 and dehairing of bovine pelts20.

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It appears from this study that *Aspergillus niger* is the most prevalent keratinophilic fungus and also dominant species that isolated from 51 soil samples of five different regions like fertile lands, animal herds, slaughter houses, poultries and barbers' shops. Isolation rate of keratinophilic fungi including *A. niger* was higher in soil samples collected from the farm lands and poultries. Keratinases have enormous potential applications in processing waste in the poultry and leather industries. In this study, some keratinophilic fungi were isolated, which could be used for the production of adequate amounts for application in industrial processes.

### References