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MYCOBIOTA ASSOCIATED WITH CAMEL HAIR AT TAIZ CITY, YEMEN

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ABSTRACT:

The mycobiota of 50 camel hair samples collected from different localities in Taiz city were estimated using the soil plating technique and Sabouraud's dextrose agar at 28° C. Forty-three species belonging to 15 genera were collected. The most prevalent genera were: *Chysosporium, Aspergillus* and *Scopulariopsis*. Some dermatophytic species were also recovered and these were represented by *Microsporum canis*, M. *gypseum Trichophyton rubrum* and *T. verrucosum*. Camel hair seem to represent an adequate reservoir for several pathogenic fungi.

Kew words: Animal hairs, *dermatophytes*, *keratinophilic fungi*, camel .

INTRODUCTION:

Animals are known to play an important role in the epidemiology of both animal and human mycoses. They can act as a reservoir or vectors for these diseases (Rippon, 1982; Ogbonna et al., 1986; and Ali- Shtayeh et al., 1989).

***Keratinophilic fungi* have received considerable attention in recent years. These organisms include *dermatophytes* which are able to degrade various types of keratinous substances. These substances occurr in nature mainly in the form of hairs, wools, feathers, horns, hooves, nails, skin and other cornified appendages and constitute natural baits for these *keratonophilic fungi* (Khanam and Jain, 2002; Singh et al., 2009).**

***Keratinophilic fungi* include a variety of filamentous fungi belonging mainly to hyphomycetes and several other taxonomic groups. Hyphomycetes include *dermatophytes* and a great variety of non- dermatophytic filamentous fungi (Mukesh and Sharma, 2010). *Keratinophilic fungi* can be considered as potential pathogens (Marcella and Mercantini, 1986).**

Several studies have been conducted on mycobiota associated with hair of different kinds of animals in many parts of the world (Moses and Sunday, 2001; Shukia, et al. 2003;

Periasamy et al., 2004; Dobrowolska et al., 2006; Ulfig, 2007; Maghraby et al., 2008; Mandeel et al., 2009; Nichita and Marcu, 2010; Rostami, et al., 2010; Sallam and Alkolaibe, 2010; Shokri and Khosravi, 2011; and Kraemer et al., 2012) .

In Yemen there are no records available on *dermatophytes* and *keratinopilic fungi* associated with camel hair. The aim of the present work was to survey those fungi and identify the mycobiota associated with camel hair which might be causal agents for human mycosis..

MATERIALS AND METHODS:

The areas of study:

Hair-baiting technique was used for isolation of *keratinophilic fungi* as employed by Ress (1967) with some modifications. Fifty samples of camel hair were collected from different localities at Taiz city, Yemen during the period from October 2011 to December 2012. These samples were placed in clean plastic bags and transferred immediately to the laboratory. Five hair segments were placed on dry sterile clay soil (25- 50 g) in each sterile Petri-dish (3 plates for each sample) moistened with sterilized distilled water (20-25% moisture content) and remoistened whenever necessary. The plates were incubated at 28ºC for 10-12 weeks. The moulds which appeared on hair fragments were transferred to the surface of Sabouraud's dextrose agar medium (Moss and McQuown, 1969), supplemented with chloramphenicol (0.5 mg/ml) and cyclohexamide (0.5 mg/ml). Cultures were then incubated at 28ºC for 2-3 weeks and the developing fungi were counted, identified (based on morphological and microscopic characters) following the keys of Moubasher (1993) and de Hoog et al. (2000). Fungal colonies were calculated per 15 hair fragments for each sample.

Results and Discussion :

A total of 34 species appertaining to 15 genera were recovered from camel hair samples (Table 1). These fungi included *dermatophytes* such as *Trichophyton*, and *Microsporum*, as well as true *keratinophilic* fungal species belonging to *Chrysosporium* and *Scopulariopsis*. Other *cycloheximide*- resistant were also recorded.

***Chrysosporium* was the most frequent genus being recovered from 62% of samples and representing 41% of all fungal isolates. This genus was also isolated from goat and sheep hairs in Libya by El-Said et al. (2009) who found that *Chrysosporium* was recorded in 92% and 96% of the samples and 91.2% and 87.8% of the total fungi of goat and sheep hairs, respectively.In Egypt, Bagy and Abdel-Hafez (1985) indicated also that *Chrysosporium* was the most frequent genus of the camel (98.3%) and goat (91.7%) hair samples from Al-Arish. Also, Abdel-Gawad (1997) observed that *Chrysosporium* was the most common fungus on sheep wool. In Italy, Marcella et al. (1985) found that, out of 115 animals examined, 54 presented *keratinophilic* fungi of which *Chrysosporium spp*. were the**

most common. In the current study *Chrysosporium* was represented by four species, of which *C. tropicum* was the most frequent. It was found in 46% of the samples, and comprised 23% of all isolates. The remaining *Chrysosporium species* (*C. indicum*, *C. keratinophilum*, and *C. georgii*) were isolated in low frequency of occurrence. They were identified from 38%, 32% and 28% of the samples, constituting 10.4%, 4.5% and 2.4% of the total fungi, respectively (Table1). This is in agreement with the results obtained from sheep wool in Egypt by Abdel-Gawad (1997) who reported that *C. tropicum* was the most common species occurring in 58% of the samples. Ali-Shtayeh et al. (1988a) observed that *C. keratinophilum* and *C. tropicum* were found respectively in 7.9% and 6.7% of goat hairs from West Bank of Jordan. Deshmukh (2004) reported that *C. indicum* was the most common species in feathers of pigeon and was represented in 24% of the samples. The above species and other *Chrysosporium* spp. were also isolated but with different frequencies from animal hairs (Deshmukh, 2004; Mandeell, et al. 2009 and Dokuzeylul et al. 2013) .

***Aspergillus* was the second most frequent genus on camel hair, contaminating 48% of the samples matching 24.8% of total fungi. It was represented by 7 species of which *A. flavus* and *A. niger* were the most prevalent species (22 & 32% of samples and 5.7% & 11.7 % of total fungi). A. ustus (12% of the samples), *A. terreus* (8%), *A. ochraceus* (6%), *A. fumigatus* and *A. wentii* (4% each) were isolated in rare frequency of occurrence (Table 1).In Egypt, Barakat and El-Shanawany (1998) reported that *Aspergillus* was the second most frequent genus on the hair of donkey. They noticed that *A. fumigatus*, A. sydowii, and A. versicolor were the most common species. Also, these *Aspergillus species* have been reported from hairs of camel, cow, donkey and goat in Egypt (Bagy and Abdel-Hafez, 1985; Bagy, 1986), from hair of cows, donkeys, goats, rabbits, cats and dogs in the west bank of Jordan (Ali Shtayeh et al. 1988a,b) and from hair of goats and wool of sheep inYemen (Sallam and Alkolaibe 2010)**

In the present study , *Scopulariopsis* (2 species) occupied the third place in the number of cases of isolation. It was isolated from 28% of samples comprising 8% of total fungi. From the two species isolated S. brevicaulis was the most prevalent while, S. candida was less frequent (Table 1). Several authors reported the prevalence of *Scopulariopsis species* on hairs of camel (Bagy and Abdel-Hafez, 1985, Nasser et al. 1998; Shokri and Khosravi, 2011) as well as on other animals and birds in Portugal (Bernardo et al. 2005), Bahrin (Mandeell et al. 2009), and Iran (Rostami et al. 2010).

Emericella (2 species), Penicillium (3), Acremonium (2) and Geotrichum (1) were isolated from 7 or 8 samples (out of 50) contributing 3.4%, 2.8%, 3.6% and 1.9% of total fungi, respectively. From the above

genera E. nidulans, P. chrysogenum, A. **strictum and** ***G. candidum*** **were the most common species.**

Dermatophytes **represented by two genera (*Microsporum and Trichophyton*) were recovered from 7 samples, matching 1.2% and 1.1% of total fungi, respectively. From these genera, *M. canis, M. gypseum, T. rubrum* and *T. verrucosum* were identified in rare occurrence. These species were also isolated with different frequencies from hair of different animals as reported by Prado et al. (2008); Madhavi et al. (2011); Gangil et al. (2012); Dokuzeylul et al. (2013) and Mohammed (2013).**

Alternaria (2 species), Chaetomium (2), Fusarium (3), Paecillomyces (1) and Thermoascus (1) were isolated in rare frequency of occurrence. They emerged in 8-10% of the samples, accounting collectively 8.6% of total fungi (Table1). These species were also isolated in different frequencies from various keratinous substrates as reported by several authors (Bagy, 1986: Sallam and Alkolaibe, 2010: and Mohammed, 2013).

Conclusion

The present study gives an insight on the mycobiota of camel hair in Taiz, Yemen. The prevalence of dermatophytes and non-dermatophytes emphasises that camels have a potentiality for shedding fungi in the environment and serve as reservoirs for human pathogens.

Table (1): fungi isolated from camel hair (out of 50) samples using soil- plating technique on Saubroud's dextrose agar at 28ºC.

Genera & Species	TC	NCI & OR
Acremonium	27	7 L
A. rutilum W. Gams	8	3 R
A. strichum W. Gams	19	4 R
Alternaria	18	5 R
A. alternata (Fr.) Keissler	13	4 R
A. tenuissima (Kunze) Wiltshire	5	3 R
Aspergillus	188	24 M
A. flavus link	43	11 L
A. fumigatus Fresenius	5	2 R
A. niger van Tieghem	89	16 M
A. terreus Thom	16	4 R
A. ochraceus Wilhelm	14	3 R
A. ustus (Bain.) Thom & Church	18	6 R
A. wentii Wehmer	3	2 R
Chaetomium	24	5 R
C. globosum kunze	19	4 R
C. spirale Zopf	5	3 R
Chrysosporium	311	31 H
C. indicum (Rand. & Sand.) Garg	79	19 M
C. keratinophilum D.Frey ex Carm.	34	16 M
C. tropicum Carmichael	173	23 M
C. georgii (Vars. & Ajello) Oorcshot	18	14 M
Chrysosporium sp.		6 R
Emericella	26	8 L
E. nidulans (Eidam.) Vuill.	22	6 R
E. ruglosa (Thom & Raper) Benjamin	4	2 R
Fusarium	13	6 R
F. verticillioides (Saccardo)Nirenberg	7	4 R
F. oxysporum Schlecht.	3	2 R
F. solani (Mart.) Sacc.	3	2 R
Geotrichum candidum Link	14	7 L
Microsporum	9	7 L
M. canis Bodin	6	5 R
M. gypsum (Bodin) Gulart & Grigorakis	3	2 R
Mucor hiemalis Wehmer	5	3 R
Paecillomyces lilacinus (Thom) Samson	4	4 R
Penicillium	21	8 L
P. chrysogenum Thom	16	4 R
P. funiculosum Thom	2	2 R
Penicillium sp.	3	3 R
Scopulariopsis	77	14 L
S. brevicaulis (Sacc.) Bain.	61	10 L
S. candida (Gueguen) Vuillemin	16	6 R
Thermoascus aurantiacus Miehe	6	5 R
Trichophyton	8	7 L
T. rubrum (Castellani) Sabouraud	2	2 R
T. verrucosum Bodin	6	5 R
Sterile mycelia	8	7 L
Gross total counts	**759**	
No. of genera	**15**	
No. of species	**34**	

TC= Total count; NCI= number of cases of isolation; OR= occurrence remark: H= high occurrence, 25-50 (out of 50) cases; M= moderate occurrence, 13- 24 cases; L= low occurrence, 7- 12 cases; R= rare occurrence, 1-6 cases.

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الملخص العربي

الفطريات المصاحبة لشعر الجمال بمدينة تعز- اليمن

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استهدف البحث التعرف على الأحياء الفطرية لخمسين عينة من شعر الجمال جمعت من أماكن مختلفة من مدينة تعز وذلك باستخدام طريقة مصائد التربة والوسط الغذائي سبارود اجار والتحضين عند درجة حرارة ٢٨°م وقد تم عزل٣٤ نوعاً فطرياً تنتمي إلى ١٥ جنساً وكان أكثر الأجناس شيوعاً وانتشاراً هو جنس كريزوسبورم يليه اسبرجلس ثم جنس اسكوبيولاريوبيسس كما تم أيضاً عزل أنواع من الفطريات الجلدية تنتمي إلي الميكروسبورم والتريكوفيتون ولوحظ أن العديد من الفطريات المعزولة يمكن أن تكون ممرضة للإنسان.