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Antifungal Activity of Camel Faeces with Special Reference to Dermatophytes

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Authors' contributions

This work was carried out in collaboration between all authors. Author EAS designed the study, wrote the protocol and wrote the first draft of the manuscript. Author MEYK managed the literature searches. Authors EAS and MEYK performed the experimental work. Authors SME and AME analyses the results and discuss the conclusion. All authors read and approved the final manuscript.

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Short Research Article

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ABSTRACT

Aim: The present study was conducted to evaluate the antifungal activity of camel faeces on some pathogenic fungi.
Study Design: This is a descriptive evaluation study.
Methodology: Camel faeces was extracted following Harborne method using organic solvents. Organic extracts besides, aqueous extract and ash were screened against clinical isolates using agar-well diffusion and incorporated methods. Parallel experiments were conducted with ketoconazole and nystatin, as positive control whereas; the vehicle solvents were used as negative control. Phytochemical analysis of Camel feaces was carried out following Harborne method.

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Results: Water and ethanol extracts exerted significant effect on dermatophytes followed by chloroform and hexane extracts compared to the ash which revealed no activity. *Aspergillus* and *Pencillium* species were found insensitive to all test extracts where as *Candida albicans* was found sensitive only to the hexane extract. Sterols and triterpenes were revealed on phytochemical analysis.
Discussion: The antifungal activity of camel faeces might be due to the sterols and triterpenes.
Conclusion: The study confirms efficacy of camel faeces as natural antifungal agent, and suggests the possibility of employing it for treatment of skin infections, caused by the test pathogens. The present study reveals first report on the use of camel faeces against some pathogenic fungi.
Recommendation: Identification and characterization of novel molecules are highly recommended.

Keywords: Antifungal; camel faeces extract; dermatophytes; triterpenes.

1. INTRODUCTION

Bedouin use camels for transportation in the desert and production of meat, milk, hair or hide [1]. The pharmacological effect of urine was previously investigated [2]. Camel urine was mixed with milk to treat enteric disorder [3]. It was also, found efficacious against ringworm, abscesses and burns [4]. The antibacterial and antiparasitic activity was previously screened [5,6]. Camel faeces were traditionally practiced to treat some skin infections. The stool was dried, burnt and topically applied to treat dermatitis. Furthermore, camel dung is used as fuel for fires in the winter, and sometimes for cooking food. According to available literature, there is no systematic study conducted to show its antifungal activity.

2. MATERIALS AND METHODS

2.1 Samples

Camel faeces was collected from Camel Research Station located at Tamboul city (14.92521 latitude, 33.40819 longitude), Gezira State, central of the Sudan.

Clinical isolates of *Aspergillus flavus, A. niger, A. fumigatus, Scopulariopsis brevicaulis, Candida albicans, Penicillium* and some *dermatophyte* species were obtained from mycology department (CVRL), Khartoum, Sudan.

2.2 Extraction of Camel Faeces

Organic extraction of camel faeces was carried following Harborne method [7]. 50, 100. 200 and 300 mg/ml of ethanol, hexane, butanol, chloroform and water extract of camel faeces besides ash were tested against selected fungi. Agar-well diffusion method was used to test *C. albicans* [8] and incorporated method on Sabouraud's media supplemented with chloramphenicol (0.05 mg/ml) was used for dermatophytes [9].

2.3 Inoculum Preparation

Yeast suspension was obtained from 24-h-old cultures grown on Sabouraud dextrose agar.The colonies were suspended in 5 mL of sterile saline (0.85% NaCl). The inoculum suspensions were shaken for 15 seconds and the inoculum density was adjusted to the turbidity of a 0.5 McFarland Standard (equivalent to 1–5 × 10^6 cfu/mL) with sterile saline [10].

2.4 Determination of Antifungal Activity

The *in vitro* antifungal activity of the crude extracts of camel faeces was determined by poisoned food technique [11]. 10% ethanol, chloroform hexane, butanol and water solution (w/v) of the each extract was mixed with sterilized melted Saburaud agar medium to obtain the desired concentration (100 µg/ml) and this was poured in sterilized Petridishes. At the center of each plate, 5 days old fungal mycelial block (4 mm in diameter) was inoculated and incubated at 27ºC. A control set was also maintained in each experiment with Ketoconazole, Nystatin, as positive control whereas; the vehicle solvents were used as negative control. When good growth in the control groups was observed, after 2-3 weeks, the results were read [12].

2.5 Phytochemical Screening

Screening of camel faeces was conducted following the standard procedure [13].

3. RESULTS

Aspergillus and *pencillium* species were found insensitive to all extracts tested at all concentrations used. *C. albicans* was found less sensitive to the extracts used except the hexane extract. It showed inhibition zone (15 mm) similar to the standard drug, Nystatin. Dermatophyte species showed great sensitivity to water and organic extracts (Figs. 1 and 2) compared to the ash which revealed in activity. In general, concentration 200 mg/ml, revealed reduction of growth where as 300 mg/ml showed complete inhibition of growth. All vehicle solvents showed growth of fungi except butanol which showed inhibition of growth (Figs. 3, 4). Furthermore, the phytochemical analysis of camel faeces revealed sterols and triterpene compounds (Table 1).

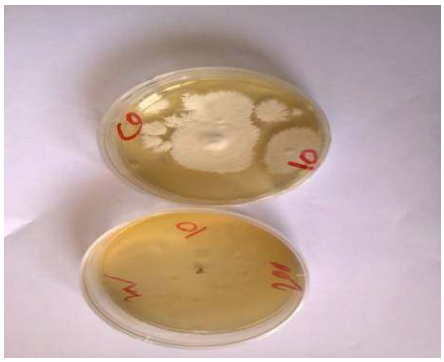

Fig. 1. *T. mentagrophytes* on water extract (lower) and control (upper) plates 21 days at 27ºC (200 mg/ml)

Fig. 2. Chloroform treated (left) and control (right) vials of *T. schoenleninii* 21 days at 27ºC (300 mg/ml)

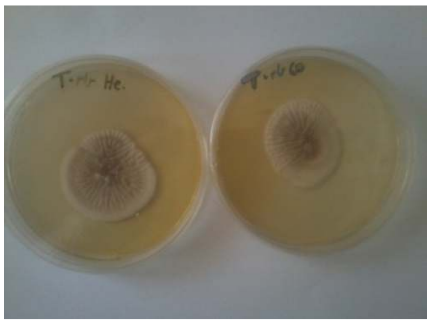

Fig. 3. Growth of *T. rubrum* on hexane treated and control plates

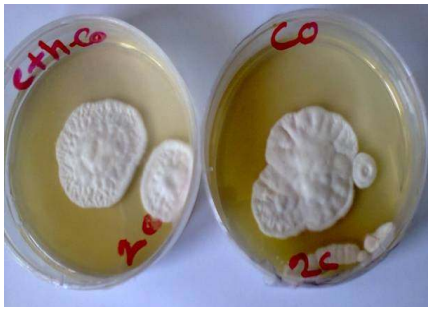

Fig. 4. Growth of *T. menta*grophyes on ethanol treated and control plates

4. DISCUSSION

Growth of *Aspergillus* and *Penicillum* species on extract- treated plates indicates inactivity of camel faeces. This might be due to endogenous resistance of such fungi. Inhibition of growth of tested dermatophytes indicated high activity of camel faeces extracts against selected species. This might be due to phenolic compounds (sterols and triterpenes) in camel faeces extract that posse's antimicrobial activity. This finding is similar to previous report [14] on screening camel urine. Although, the antifungal compounds of camel faeces are not yet determined in the present study, yet, the presence of such compounds might determine the antifungal activity by interaction with the membrane constituents and their arrangement.

All solvents used for extraction showed no activity to tested fungi except butanol. This finding indicated that, the inhibition of growth may be due to camel faeces rather than the solvent used. Thus, efficacy of camel faeces depends on the solvent used for the extraction. This result encourages the use of water, ethanol followed by hexane, chloroform for extraction of camel faeces.

Table 1. Preliminary phytochemical screening of 80% ethanolol extract of camel faeces

Secondary metabolites			
Coumarins	**Tests**	**Crude powdered**	**80%EtOH**
	KOH/U.V.		
	1%NaOH	++	++
Flavonoids	1%$ALCL_3$	++	++
	Mg /H_2SO_4	++	++
Alkaloids	Mayer's	-	-
	Dragendorffs	-	-
Saponins	Foam test	-	-
Sterols/ Triterpene	Salkowski	Not detect.	+++/++
	Liebermann	Not detect.	+++/++
Tannins	Ferric chloride	-	-
	Salts gelatin	-	-
Primary metabolites			
Sugar	Molish	+	+
	Fehling's	++	++
Amino acids	Ninhydriene	+	+
Proteins	Buiret	+++	++

+++ ≡ *High amount;* ++ ≡ *Moderate amount;* +≡ *Low amount;* ± ≡ *Trace amount;* - ≡ *Not detectable*

5. CONCLUSION

The present study reveals first report on the use of camel faeces against some pathogenic fungi. Most of the extracts revealed antifungal activity against tested dermatophytes. Water and ethanol extracts exert significant effect followed by hexane and chloroform. The study confirms efficacy of camel faeces as natural antifungal agent and suggests its use to treat dermatophyte infections.

6. RECOMMENDATION

Isolation and characterization of the novel molecules using Gc-Ms are highly recommended.

DISCLAIMER

This manuscript was presented in the conference.

Conference name: "The Regional Conference of Camel Management and Production under Open range System (RCCMPR)".

Conference link is:
"http://sustech.edu/files/workshop/20150315045140714.pdf"

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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