



RESEARCH ARTICLE

Dermatophytosis among Ruminants in Egypt: The Infection Rate, Identification and Comparison between Microscopic, Cultural and Molecular Methods

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Abstract

Dermatophytosis is a skin disease of farm animals caused by different species of the *Microsporum* and *Trichophyton* genera. Although the disease is self-limiting, ringworm has a major public and veterinary health problem with worldwide distribution including Egypt. The objectives of this study were to estimate the infection rate of dermatophytosis in ruminants, identify the incriminated dermatophyte species and differentiate among them using conventional and molecular methods. Moreover, assessment of the role of environmental risk factors in the occurrence of the disease. Cow (n=197), sheep (n=103) and goats (n=70) of different breeds, sexes, and ages in Sharkia and Dakahalia Governorates were clinically examined during the period from June 2018 to July 2019. Out of the examined animals, 111 (30%) have skin lesions consistent with dermatophytosis. The infection rate of the disease was 30, 37.9 and 18.6% in cow, sheep and goat, respectively. The rate of infection was higher in the Holstein breed (36.6%) compared to native breed (23%). The higher rate of infection was found amongst lambs less than 6 months while in cow and goats the infection rate was higher in animals more than 6 months old. Male animals were generally more infected than females in all studied animals, and the infection was more common in winter season. *Trichophyton verrucosum* was the most commonly identified dermatophyte species (25.6%). Polymerase chain reaction (PCR) of internal transcribed spacer (ITS) along with restriction fragment length polymorphism method (RFLP) succeeded to differentiate between both isolated *Trichophyton* and *Microsporum* species. In conclusion, PCR along with culture results acted as gold standard methods for diagnosis of dermatophytosis. Restriction Fragment Length Polymorphism method was considered as a rapid approach with high specificity and sensitivity to identify and differentiate dermatophytes in ruminants.

Keywords: Dermatophytosis, Egypt, RFLP, Risk factors, Ruminants.

Introduction

Dermatophytes are considered as one of the most important skin diseases affecting all domesticated animals and human in developing and developed countries. Dermatophytosis belongs to class ascomycetes, Phylum: Ascomycota, family arthrodermataceae and genus *Arthroderma* and divided into 3 genera: *Epidermophyton*, *Trichophyton* and *Microsporum*. Different dermatophytes have zoonotic importance in

which the most species of dermatophytosis public health concern are belonging to *Trichophyton* and *Microsporum* species and its distribution has varied in different animals according to geographical location, age, sex of affected animals [1-5].

Dermatophytosis has a huge economic loss in the form of reduction of weight gain and downgrading of hide and skin that affects marketing show, premature culling and

treatment costs with dramatically increase the infection in the last few years all over the world [6, 7]. In addition to easy transmission from animals to human [8, 9]. The British leather confederation evaluated losses due to downgrading of the leather of about 35 million dollars annually, of which 5% due to dermatophytosis [10, 11].

Most of the lesions observed in the affected animals were circumscribed grayish-white area of alopecia, crusty, raised lesions. These lesions commonly appear on the head, neck, chest area, dewlap and limbs [12]. The severity of lesions varies from mild to severe attributed to many reasons as the reaction of the host to metabolic products of fungi, virulence and type of affected strain of dermatophytes along with environmental risk factors [13].

Trichophyton verrucosum, *Trichophyton mentagraphytes*, *Microsporum canis*, and *Microsporum gypseum* are considered the most incriminated dermatophytes species, causing Tinea capitis and Tinea corporis in different parts of the world. Ringworm infection is more prevalent in regions with high warmth and humidity conditions than the cold and dry ones. The direct contact with affected animals and contaminated environment are the most common means to spread the infection in presence of other predisposing factors including age, sex and environmental conditions, other diseases, parasitic infestation, and hygienic measures [14-16].

Diagnosis of dermatophytosis occurred mainly by direct microscopic examination of scales including hairs along with cultural methods. These conventional methods are time-consuming, high-priced and need skilled staffs [17]. In the early 1980s, several molecular approaches, as restriction fragment length polymorphism (RFLP), restriction enzyme analysis of mitochondrial DNA, internal transcribed spacer PCR (ITS-PCR), random amplified polymorphic DNA and DNA sequencing were practiced as new and accurate diagnostic tools of dermatophytosis [18]. ITSs regions especially ITS1-5.8s-ITS2 along with RFLP has been considered as a rapid and accurate approach to identify the

dermatophytes. Moreover, resolving relationships between close taxonomic dermatophytes and produce specific band on agarose gel electrophoresis to determine dermatophytes species within 5 h. [19-23]. This study was performed to identify and differentiate the isolated dermatophytes from naturally infected cow, sheep and goat at species level using both conventional methods and restriction fragment length polymorphism (RFLP). Moreover, assessment of the role of environmental risk factors in the occurrence of the disease was carried out.

Materials and Methods

The protocol of this study was accepted by Zagazig University Institutional Animal Care and Use Committee (ZU-IACUC/ 2/F/ 103/ 2019)

Animals and clinical examination

Clinical examination of cow, sheep and goat (n=370) of different breeds, sexes and ages brought to Veterinary Clinics in Dakahlia and Sharkia Governorates during the period from June 2018 to July 2019 was performed in line with Constable [24]. The site, shape, size, distribution and time of the appearance of skin lesions were reported.

Sampling

Fecal samples (3 g) were collected from all examined animals (197 cow, 103 sheep and 70 goat) and then macroscopically inspected for the presence of parasitic eggs and larvae. Samples were then processed for microscopical examination by a modified McMaster technique [25].

The affected lesions from 111 animals (59 cow, 39 sheep and 13 goats) with skin lesions thought to be ringworm was cleaned with a cotton swab soaked with 70% alcohol. Skin scraping was done by using a sterile scalpel blade from the margin of the lesion until oozing of the blood and hairs also included in the samples [26]. Collected scales were divided into two portions, the first one was subjected to direct microscopic examination, while, the second one was submitted in a sterile Petri dish to the laboratory of Mycology, Animal Health Research Institute, Dokki, Giza, Egypt.

Direct Microscopical examination of collected samples

A portion of collected scales was put on a clean glass slide with a drop of 10% KOH, covered with a cover slide, heated gently and let for 1 h and then examined for fungal elements (hyphae, ectothrix and endothrix spores) using low and high power of microscopical examination [27].

Isolation and identification of dermatophytes

The collected specimens from different animals were cultured on Sabouraud's dextrose agar (SDA) (Sigma) plus chloramphenicol (antibiotics) 50 mg/L (Sigma) and cycloheximide (antifungal) 0.5 g/L (Sigma). The inoculated media were incubated at 30°C for 4 weeks and examined every three days for evidence of growth.

The isolated dermatophytes were identified by macroscopical examination which comprised of growth rate, surface and reverse colour and consistency of grown colony [28, 29]. While microscopical morphology of the isolates was done by using Lactophenol cotton blue (LPCB) wet mount preparation to demonstrate the presence of hyphae, macroconidia, chlamydospores and other fungal structure [30].

DNA Extraction

DNA from the suspected 21 isolates was extracted using Qiagen Extraction Kit (Hilden Germany) as described in manufacturer's manual.

Amplification of ITS region

PCR amplification of ITS region of twenty one samples was done by using universal fungal primers ITS 1 (5' – TCC GTA GGT GAA CCT GCG G – 3') and ITS4 (5' – TCC TCC GCT TAT TGA TAT GC – 3') according to White *et al.* [31]. The total reaction mixture of 25 µl PCR master mix (Merck genei), 280 pmol of each primer (ITS-1 and ITS-4), 1 µl of template DNA and the final volume reached to 50 µl with nuclease free water. Amplification was adjusted to initial denaturation at 95°C for 5 min, followed by 35 cycles of denaturation at 95°C for 30 sec, annealing at 56°C for 30 sec, extension at 72°C for 30 sec and final extension at 72°C for 5 min. PCR products

were analyzed in a 1.5% agarose gel electrophoresis stained with ethidium bromide for the presence of suspected bands of the expected length.

Restriction Fragment length polymorphism (RFLP) analysis

RFLP procedures were performed according to Jackson *et al.* [32] as follow; Mixture had 2 µl of 10X FastDigest Green enzyme buffer, 1 µl of FastDigest enzyme (*Mva I*) and 10µl of PCR product, the volume was adjusted up to 30 µl with nuclease-free water. The reaction mixture was incubated at 37°C for 1 h. Twelve microliters of each RFLP products were loaded into 2% agarose gel with 0.5 µg/mL ethidium bromide. The bands on agarose gel were visualized using gel documentation system and photographed.

Statistical analysis

The collected data was statically analyzed using SPSS 20.0 for windows (SPSS Inc., Chicago, IL, USA 2011). Quantitative data were represented in form of mean ± SD and qualitative data were detected as absolute frequencies (number) and relative frequencies (percentage). For Non- normally distributed variables, Mann Whitney U test was preferred. Mc-Nemar Test was used to compare between two dependent categorical variables. All tests were two sided. *P*-value < 0.05 was considered statistically significant (S) while *P*-value < 0.001 was detected as highly statistically significant (HS), and *P*-value ≥ 0.05 was considered statistically insignificant (NS).

Results

Out of 370 examined cow, sheep and goats, 111 animals (30%) had skin lesions thought to be ringworm and had subjected to examination as illustrated in (Table 1). The rate of ringworm infection varied from species to another, in cow, it was 30% (59/197), while, higher infection rate of 37.9% (39/103) was recorded in sheep, however, goat was the least infected (18.6%, 13/70). The rate of infection was higher in the foreign breed (Holstein breed; 36.6%) compared to native one (23%). Ringworm lesions in cow are usually but not always circular, vary in diameter from (3-5 cm), with hair loss, crusts and scales formation, sometimes lesions may coalesce to

form larger area of alopecia. In cow, lesions mostly found on the head, necks, around-ear, eyes, lips and dewlap and less frequently in flank region, sometimes the entire bodies were affected (Figure 1A). Lesions in sheep and goat also were restricted to head, lips, ear, and neck, limbs and flank regions (Figure 1B). As mentioned in (Table 2), the higher infection rate was found amongst lambs less than 6 months (71.8%) while cow and goats had high

prevalence in the age group more than 6 months to 12 month (67.8 and 53.9%, respectively). Male animals were more infected (62.7, 53.9 and 69.2%) than females (37.3, 46.2 and 30.8%) in cow, sheep, and goat, respectively. Ringworm infection was detected all over the year but more common in winter season (35.6, 48.7 and 53.9%) in cow, sheep, and goat, respectively.

Table 1: Prevalence and comparison of isolated dermatophytes among examined animals using conventional methods in Sharkia and Dakhalia Governorates (2018-2019).

Animals species		Total numbers	Infected animals		Microscopic		culture	
			Number	%	Number	%	Number	%
Cow	Native	96	22	23	19/22	86.3	17/22	77.3
	Holstein	101	37	36.6	32/37	86.4	30/37	81.1
	All cow	197	59	30	51/59	86.4	47/59	79.7
	Sheep	103	39	37.9	33/39	84.6	29/39	74.4
	Goat	70	13	18.6	11/13	84.6	10/13	76.9
Total animals		370	111	30	95/111	85.6	86/111	77.5

McNemar test was used to establish the comparison in which there was no significant difference between microscopic and cultural methods in diagnosis of dermatophyte infection in cow, sheep and goats ($p>0.05$).

Table 2: Frequency distribution of dermatophytes' infected animals in Sharkia and Dakhalia Governorates (2018-2019) regarding to risk factors

Risk factors	Parameters	Cow		Sheep		Goat	
		No.	%	No.	%	No.	%
Age	< 6 months	19	32.2	28	71.8	6	46.2
	> 6-12months	40	67.8	11	28.2	7	53.9
Season	Winter	21	35.6	19	48.7	7	53.9
	Summer	8	13.6	3	7.7	0	.00
	Autumn	17	28.8	9	23.1	4	30.8
	Spring	13	22.0	8	20.5	2	15.4
Sex	Male	37	62.7	21	53.9	9	69.2
	Female	22	37.3	18	46.2	4	30.8
Overcrowding	With	41	69.5	31	79.5	5	38.5
	Without	18	30.5	8	20.5	8	61.5
Bad hygienic measure	Yes	39	66.1	33	84.6	9	69.2
	No	20	33.9	6	15.4	4	30.8
Bad ventilation	Yes	35	59.3	29	74.4	11	84.6
	No	24	40.7	10	25.6	2	15.4
Concurrent infection	Yes	21	35.6	19	48.7	7	53.8
	No	38	64.4	20	51.3	6	46.2
Parasitic infestation	Yes	23	39	15	38.5	4	30.8
	No	36	61	24	61.5	9	69.2
Insect control	Yes	17	28.8	19	48.7	4	30.8
	No	42	71.2	20	51.3	9	69.2



Figure 1: (A) The most common affected sites(face, around the ear and eyes) with ringworm in cow (B) ringworm in sheep.

High moisture conditions, bad ventilation, transportation, bad hygienic measures and lack of insect control increased rate of infection among ruminants. The presence of concurrent infection (diarrhea, constipation, pneumonia and cough) or other parasitic infestation were not significantly increased the rate of infection ($p > 0.05$). A non-significant difference between microscopic and cultural methods for diagnosis of dermatophytosis $P > 0.05$ was reported. The direct microscopic examination is an easy method to determine the infection with fungi without demarcating between pathogenic and saprophytic one, while, the culture methods had high accuracy level to determine causative dermatophyte but it was considered as an expensive and time-consuming method as shown in Table 1.

Validity of microscopic and culture methods to diagnosis ringworm in comparison to PCR of examined 21 samples donated that microscopic examination had sensitivity 81.3%, specificity 60%, positive predicted value 86.7%, negative predicted value 50% and accuracy 76.2% compared to PCR result while culture method had sensitivity 93.8%,

specificity 100%, positive predicted value 100%, negative predicted value 83.3% and accuracy 95.2% compared to PCR result (data not shown). The combination of both PCR and culture results acted as a gold standard for accurate diagnosis of dermatophytosis.

As depicted in Table 3, dermatophytes belong to genus *Trichophyton* and *Microsporum* were equally distributed among the examined animals (50%, each). *T. verrucosum* was the most predominantly isolated species, where, it was isolated from 25.6% of the total examined samples. From calves the isolated dermatophytes were *T. verrucosum* (31.9%), *T. mentagrophytes* (27.7%), *T. tonsurans* (10.6%), *M. ferrugineum* (12.8%) and *M. canis* (17%), while, in sheep the isolated fungi were *T. verrucosum* (17.3%), *T. tonsurans* (10.3%), *M. ferrugineum* (24.1%), *M. canis* (27.6%) and *M. gypseum* (20.7%) and in affected goats were *T. verrucosum* (20%), *M. ferrugineum* (50%), *M. canis* (50%) and *M. gypseum* (10%).

Table 3: The isolated dermatophytes species in cow, sheep and goats from Sharkia and Dakhalia Governorates (2018-2019) in Egypt

Dermatophytes	Cow		Sheep		Goat		Total	
	No	%	No	%	No	%	No	%
<i>Trichophyton verrucosum</i>	15	31.9	5	17.3	2	20	22	25.6
<i>Trichophyton mentagrophytes</i>	13	27.7	-	-	-	-	13	15.1
<i>Trichophyton tonsurans</i>	5	10.6	3	10.3	-	-	8	9.3
<i>Microsporium ferrugineum</i>	6	12.8	7	24.1	2	20	15	17.4
<i>Microsporium canis</i>	8	17	8	27.6	5	50	21	24.4
<i>Microsporium gypseum</i>	-	-	6	20.7	1	10	7	8.2
Total	47		29		10		86	

Dermatophytes belong to genus *Trichophyton* and *Microsporium* were equally distributed among the examined animals (50%, each).

Effect of probiotic on fecal *E. coli* count

The effect of probiotic on fecal *E. coli* count for the experimental period is shown in Table 3. The results revealed that calves fecal *E. coli* count 023+ the 2nd week of the experiment, the control and the probiotic group's fecal *E. coli* count were 7.48±0.12 and 7.02±0.22 CFU/g, respectively. While after the

3rd week of the experiment, the fecal *E. coli* count in the control and probiotic groups were 7.32±0.15 and 6.85±0.40 CFU/g, respectively. Finally, at the 4th week of the experiment, the fecal *E. coli* count in the control group and probiotic group were 7.44±0.12 and 6.74±0.15 CFU/g, respectively.

Table 4: Effect of probiotic on mean *Escherichia coli* count (CFU/g ± SE) in feces of neonatal buffalo calves

Day	non-supplemented gr591oup (control)(n=30)	Probiotic group (n = 35)	Sig (2-tailed)
7	7.40±0.45 ^a	7.12 ±0.22 ^b	0.213
14	7.48±0.12 ^a	7.02±0.22 ^b	0.213
21	7.32±0.15 ^a	6.85±0.40 ^b	0.213
28	7.44±0.12 ^a	6.74±0.15 ^b	0.213

Out of 21 representative (12 *Trichophyton* and 9 *Microsporium* isolates), 76.2% were positive by the use of PCR in which 9 samples (42.9%) were confirmed as *Trichophyton spp.* and 7 samples (33.3%) were *Microsporium spp.*

Amplification of ITS regions of 21 samples resulted in products for the different species such as *T. verrucosum* and *T. mentagrophytes* that were closely similar (690 and 683 bp, respectively) by amplification by ITS primers, while, each one had characteristic pattern by RFLP analysis as *T. verrucosum* was divided

into 4 restriction bands (406, 125, 89 and 50 bp) while the RFLP analysis of *T. mentagrophytes* gave 4 bands with different bp than *T. verrucosum*. Also, the similarity was observed between the profiles of the *M. canis*, *T. tonsurans*, *M. gypseum* band (740 bp), while *M. ferrugineum* produce band (590 bp) as detected in (Figure 2A). Digestion of these amplicons based on *MvaI* revealed unique different restriction patterns for each species for easy identification as indicated in (Figure 2B).

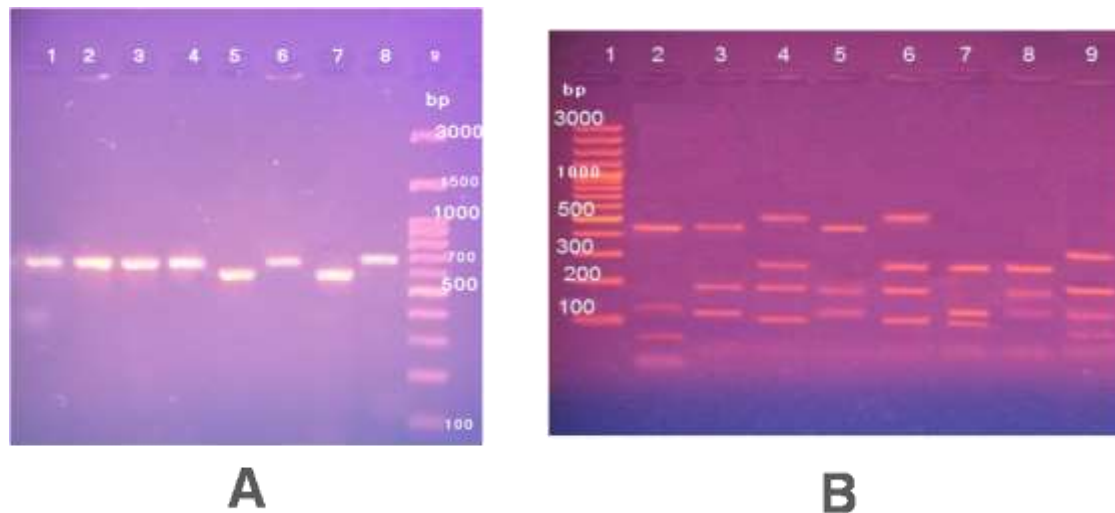


Figure 2: (A) PCR products of ITS1-ITS2 regions from representative clinical isolates of dermatophyte species: Lane 1: *T. verrocosum*, lane 2, 4: *M. ferrugineum*, lane 3, 5: *M. canis*, lane 6: *T. tonsurans*, lane 7: *T. mentagrophytes*, lane 8: *M. gypseum* and lane 9: 100 bp DNA ladder; (B) *MvaI* digested products from representative clinical isolates of dermatophyte species: lane 1: 100bp DNA ladder, lane 2: *T. verrocosum*, lane 3, 5: *M. ferrugineum*, lane 4, 6: *M. canis*, lane 7: *T. tonsurans*, lane 8: *T. mentagrophytes* and lane 9: *M. gypseum*.

Discussion

In the current study, infected cow were manifested with typical symptoms of dermatophytosis, which were consistent with other findings [6, 24, 33-35]. In cow, the rate of infection was higher in foreign breed than in native breed and this was consistent with Marai *et al.* [36].

The infection rate of ringworm varied in different animal species, it was; 30, 37.9 and 18.6%, respectively in cow, sheep and goats. This finding was in harmony with Al-Ani *et al.* [37] who reported that 30.6% of calves were infected with ringworm. Meanwhile, Habb *et al.* [38] and Abdel-Rady and Kotb [39] recorded that the rate of infection in calves were 7.7 and 17.03%, respectively. In an Indian study the prevalence of infection of various dermatophyte species in goats and sheep was 6.1% and 6.4%, respectively [40]. Also, a low rate of infection (12.55%) in goat was recorded by Rahbari [41]. In another study Mitra *et al.* [42] recorded only 0.12% infection rate in a population of 1655 goats in India. This variation may be attributed to geographical location, hygienic measures, breed of animals, virulence and species of isolated fungi. In the current study, an incidence of 37.9% of dermatophytosis recorded in sheep was almost similar to 35%

documented by Rahbari [41] and much higher than 1.5%-5% reported by Parmanov *et al.* [43] and 0.19% stated by Mitra *et al.* [42]

Higher prevalence of infection was found amongst calves over the age of 6 months compared to age more than 6 months except in infected lambs the opposite was recorded in concern to age. This result was in line with Acha and Szyfres [44] who stated that dermatophytosis is more common in animals under stress as immunocompromised or with a history of transportation under 1 year of age, with poor nutrition and animals kept at high-density populations [10]. These results disagree with Biswas *et al.* [40] who recorded lambs and kids less than 6 months of age were found to be less susceptible to infection than the older animals.

Dermatophytosis was more common in winter months than in hot season and this results may be attributed to high humidity and increase the contact between animals so act as stress which provoke the appearance of disease as recorded by Scott [45] and El-Ashmawy *et al.* [46]. In contrary, Biswas *et al.* [40] in India, found higher rate of infection in the summer and autumn compared to spring and winter due to higher rainfall and humidity along with high temperature which provoked propagation of dermatophytes in animals and

man. These results were inconsistent with Papini *et al.* [47] who recorded higher rate of infection in winter season.

Male animals are susceptible to ringworm infection than females in cow, sheep, and goat. This may be attributed to male animals are housed in close contact for long periods for the fattening purpose and the contagious aspect of the disease. These results are in agreement with those obtained previously by Abou-Eisha *et al.* [48] who found high rate of infection in males than females in cattle and sheep. However, the results are in contrary to Biswas *et al.* [40] who mentioned that female lambs and kids had higher rate of infection than males.

The predominant isolation of *T. verrucosum* (31.9%), *T. mentagrophytes* (27.7%) and *M. canis* (17%) in this study is in agreement with Abdeen and El-Diasty [49] who mentioned that *T. mentagrophytes* and *M. canis* were the most prevalent isolates from skin lesions of infected cows. More and less the same species affected sheep and goat were described in India by Biswas *et al.* [40] who determined *T. verucosum* as the most common species isolated from sheep then *T. mentagrophytes*, *M. gypseum*, *M. canis* and *T. rubrum*. Among goats, *M. gypseum* was the most common isolated species followed by *T. verucosum*, *T. mentagrophytes*, and *T. rubrum*. In Nigeria, Dermatophytes were recorded in sheep with an incidence of (7.0%) in which *T. verrucosum* was the most prevalent species (17.5%) followed by *M. gypseum* (10.0%) and *T. mentagrophytes* (7.5%). While in goats, the incidence of infection was (8.9%) in which *T. verrucosum* was the most isolated one followed by *T. mentagrophytes* and *M. canis*, otherwise, the incidence in calves was 49.0% in which *T. verrucosum* had the highest rate 16.4%. Also, *M. canis*, *T. mentagrophytes* and *M. gypseum* were detected [50]. In Libya, *Trichophyton spp.* (*T. rubrum* and *T. terrestre*) isolated from goat and sheep hairs were detected in 12% and 24% of the goat and sheep hair samples, respectively [51].

T. verrucosum was the most prevalent species in ruminants then *M. canis*. This result is in agreement with other reports Pepin and Austwick [52], Ranganathan *et al.* [53] and

Cabañes [54]. *T. mentagrophytes* can cause the disease in calves and this may be due to the presence of rodents, but *M. canis* detected in ruminant may be attributed to contact with dogs [11, 45, 54].

Diagnosis of the disease is achieved firstly by microscopical examination of skin scraping but cannot differentiate between pathogenic and saprophytic fungi and need skilled staff as recorded by Panasiti *et al.* [55] and El-Ashmawy and Ali [56]. Cultural and morphological characteristics approach is gold standard identification which is complicated due to similar morphology, variability and polymorphism, time-consuming, and expensive approach [57].

PCR-RFLP methods are a useful assay to identify and differentiate between dermatophyte species within short times even closely related strains for clinical and epidemiological purposes [22, 58]. *MvaI* revealed unique different restriction patterns of all isolated dermatophytosis species detected in this study for easily identification without further need for other tests as sequence and phylogentic analysis and also, overcome the failure of amplification by ITS primers to identify *T. verrucosum* and *T. mentagrophytes* that were closely similar by amplification by ITS primers, also, the similarity was observed between the profiles of the *M. canis*, *T. tonsurans*, *M. gypseum* band (740 bp) were disappeared when used the restriction enzyme of *MvaI*. This result was similar to El-Damaty *et al.* [59] who mentioned that the use of RFLP analysis using *MvaI* enables them to differentiate between *T. verrucosum* and *T. mentagrophytes* isolated from Arabian horse. Also, Rezaei-Matehkolaei *et al.* [60] reported the ability to the use of RFLP restriction pattern to differentiate between *Trichophyton spp.* and *Microsporum spp.*, while, Rezaei-Matehkolaei *et al.* [60] in contrary to this actual study cannot differentiate between *M. canis* and *M. ferrugineum*.

Conclusion

Trichophyton and *Microsporum spp.* are predominant among ruminant in Egypt. PCR-

RFLP is considered as rapid approach with high specificity and sensitivity for identification and differentiation of dermatophytes in ruminants.

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Conflict of interest

The authors have no conflict of interest to declare.

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الملخص العربي

القراع في المجترات في مصر: معدل الإصابة، التصنيف والمقارنة بين الطرق التقليدية والجزيئية

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القراع هو مرض جلدي يصيب حيوانات المزرعة يسببه أنواع مختلفة من أجناس ميكروسبورم و تراكوفاييتون. على الرغم من أن هذا المرض محدود ذاتياً، إلا أن القراع مشكلة صحية عامة كبيرة مع انتشار عالمي واسع يشمل مصر. هدفت هذه الدراسة إلى تقدير معدل الإصابة بمرض القراع في المجترات، وتحديد وتمييز الفطريات الجلدية باستخدام كل من الطرق التقليدية والجزيئية علاوة على ذلك تقييم دور عوامل الخطر البيئية في حدوث المرض. تم فحص 197 من الأبقار و 103 من الأغنام و 70 من الماعز التي لها سلالة و جنس و أعمار مختلفة في محافظتي الشرقية والدقهلية اكلينيكيا و جزيئياً خلال الفترة من يونيو 2018 إلى يوليو 2019. من الحيوانات التي خضعت للفحص، 111 (30%) لديهم اصابات جلدية مشابهه لمرض القراع. حيث كان معدل الإصابة بالمرض 30، 37.9 و 18.6% في الأبقار والأغنام والماعز على التوالي. كان معدل الإصابة أعلى في سلالة الهولشتاين (36.6%) مقارنة ب 30% في السلالة البلدى. و كان أعلى معدل للإصابة بين الحملان أقل من 6 أشهر بينما الأبقار والماعز أعلى معدل انتشار في الفئة العمرية الأكثر من 6 أشهر. الذكور أكثر إصابة بشكل عام من الإناث في جميع الحيوانات التي خضعت للدراسة، والعدوى أكثر شيوعاً في فصل الشتاء. كان تراكوفاييتون فيروكوسم من أكثر المسببات الفطرية لمرض القراع في المجترات 25.6% نجح تفاعل البلمرة المتسلسل باستعمال (ITS) الي جنب مع استخدام جين تخلصر (RFLP) الي تميز بين كل نوعين المعزولين تراكوفاييتون والميكروسبورم. الخلاصة يعتبر تفاعل البلمرة المتسلسل جنباً إلى جنب مع نتائج المزرعة الفطرية أفضل وأدق طرق لتشخيص المرض. اعتبرت طريقة تفاعل انزيم البلمرة المتسلسل لجين التخلصر (PCR-RFLP) طريقة سريعة وذات خصوصية عالية لتحديد وتمييز الفطريات الجلدية في المجترات.