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Bovine dermatophytosis in Holeta agricultural research center, Ethiopia

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A cross sectional study was conducted at Holeta agricultural research center to determine the prevalence of dermatophytosis. The overall prevalence of dermatophytosis in a total of 384 animals was 167 (43.49%), as determined by using direct microscopic examination and culture isolation. There was difference in dermatophytosis infection rates among the cattle breeds examined, the highest being 86.49% in 25% Boran (BO) X 75% Holstein Frisian (HF) followed by 56.95% in 50% BO X 50% HF and 25% in 100% Jersey animals. The study also revealed a significant difference (χ^2= 24.7359, P = 0.001) in infection rates among different age groups, the highest being in calves (62.28%) and lowest in old animals (25%). A significant difference was also observed between the season of the year and infection rates, the highest being in the wet (64.12%) season, when compared with the dry season (27.10%). However there was no significant difference in dermatophytosis infection rates in the different categories of body condition scores and with sex of the animals. The study presents the highest prevalence of dermatophytosis in the study area and warrants immediate action accordingly.

Key words: Dermatophytosis, cattle, Holeta, dairy farm.

INTRODUCTION

Dermatophyte are pathogenic fungi that have a high affinity for keratinized structures like nails, skin or hair, causing superficial infections known as dermatophytosis in both humans and animals (Luciene et al., 2008). The Etiologic agents of the dermatophytosis are classified in three anamorphic (asexual or imperfect) genera, *Epidermophyton*, *Microsporum*, and *Trichophyton*, of anamorphic class *Hyphomycetes* of the *Deuteromycota* (Fungi imperfecti) (Irene and Richard, 1995). On the basis of anamorph morphology, two species of

Epidermophyton, approximately 18 species of *Microsporum* and 25 species of *Trichophyton,* are considered valid members of these genera (Mucoma, 2000).

Trichophyton verucosum is usually the cause of ring worm in cattle, but *Trichophyton metagrophytes*, *Trichophyton equinum*, *Microsporum gypsum*, *Microsporum nanum*, *Microsporum canise*, and other have been isolated too (Mcgavin and Zarchary, 2007). Animals can acquire infection with geophilic dermatophite

from soil or from contact with infected animals. Zoophilic and anthrophilic dermatophite are obligate pathogens which are unable to replicate in the soil.

Dermatophite growing on keratinized structures rarely produce macrocondia and consequently rely on the production of arthrospores for transmission. Each zoophilic species tends to parasitize a particular animal species (Weitzman and Summerbel, 1995) and disseminated by direct contact including fomite and premises (Hirsh et al., 2004).

T. verrucosum is the usual cause of ringworm in cattle. Calves are most commonly affected and often develop characteristic lesions on the face and around the eyes. In heifers, cows' lesions occur on the neck and limbs. Oval areas of affected skin are alopecic with grayish white crust. Infection is most common in winter months (Quinn et al., 2002). Ringworm fungi chiefly attack keratinized tissues, particularly the stratum corneum and hair fibers, which result in autolysis of the fiber structure, breaking off the hair, and alopecia. Exudation from invaded epithelial layers, epithelial debris and fungal hyphae produce the dry crusts which are characteristic of the disease.

The lesions progress if suitable environmental conditions for mycelial growth exist, including a warm humid atmosphere, and a slightly alkaline pH of the skin. Ringworm fungi are all strict aerobes and the fungi die out under the crust in the center of most lesions, leaving only the periphery active. It is in this mode of growth it produces the centrifugal progression and the characteristic ring form of the lesions (Radostitis et al., 2007). Diagnosis of dermatophytosis is based on demonstration of consistent clinical sign, examination of affected hair with a wood lamp, microscopic examination of hair or skin spacemen, and fungal culture (Songer and Post, 2005).

Animal in many cases, dermatophytosis is theorized with self limiting disease, with the duration of infection ranging from one to four month. The spontaneous regression is partly related to the development of a strong cell mediated response, correlates with the onset of a delayed type hyper sensitivity, which usually result in elimination of the dermatophite, resolution of the lesion and local resistance to re-infection. Immunity to dermatophytosis is transient and re-infection may occur (Moriello and Deboer, 1995; Smith, 2009). Other mechanism which is associated with the elimination of infection includes an increased rate of desquamation from the stratum corneum and an increase in the permeability of the epidermis allowing penetration of inflammatory fluids (Wagner and Sohnle, 1995).

Isolation and treatment of infected animals, the provision of separate grooming tools, blankets and feeding utensils and disinfection of these items after use on affected animals, are necessary to controlled disease. Cleaning and disinfection of stables with a commercial detergent or a strong solution (2.5 to 5%) of phenolic disinfectant, 5% lime sulfur, 5% formalin, 3% captan or 5% sodium hypochlorite is advisable where practicable. Good results are also claimed for the disinfection of buildings with a spray containing 2.0% formaldehyde and 1.0% caustic soda (Radostitis et al., 2007). Therefore, the objective of this study was to determine the prevalence of dermatophytosis in Holeta agricultural research center dairy farm.

MATERIALS AND METHODS

Study area

This study was conducted in Holeta agricultural research center (HARC - Holeta and Adaberga dairy farm), Oromia Region, in Central Ethiopia, from November 2010 to April 2011. The HARC has two farms in Holeta and Adaberga (around Enchine). 50% Boran cross with 50% Holstein Frisian breed and 25% Boran cross with 75% Holstein Frisian breed live in Holeta and 100% Jersey breed, live in Adaberga.

Geographically the area is located 32 km North West of Addis Ababa with 09°02 N latitude and 38°03 E longitudes. The climatic condition of the area is predominantly temperate and receives a mean annual rain fall ranging from 84.5 to 89.7 mm. The altitude is 2400 meter above sea level.

According to the data documented by Holeta agriculture resource center Metrology's (1999), the minimum and maximum temperature of the district is 4.8 to 22.4°C, respectively. The farm system of production is semi intensive. The farm had calving pens and individual calf pens form 0 to 6 months old animals and other animals, which had their own houses according to their breed. Calves were isolated from their dams' immediately after birth, taken to calf hatch for some time and then to calf pen, where they were housed and managed for about six months.

Study design and population

A cross sectional study design was used to determine the prevalence of dermatophytosis in Holeta agricultural center by simple random sampling method. The study population consist of both cross breed of 50% Holstein Frisian × 50% Boran and 75% Holstein Frisian × 25% Boran, of 100% Jersey.

Sample size determination

The sample size was calculated based on the formula given below as described by Thrusfield, 2005.

$$n= \frac{(1.96)^2 \times P \exp (1\text{-Pexp})}{d^2}$$

Where n= number of sample size
P exp= expected prevalence (50%)
d^2= absolute precision (5%)
CI= confidence interval (95%)
Therefore the total sample size is = 384

Sample collection

For the prevalence study of dermatophytosis, skin scabs were collected directly into petridish plates from the clinical lesions of the

Table 1. Prevalence of dermatophytosis in three breeds of cattle.

Breed	No of samples examined	No of positive samples	Prevalence (%)
50BO x 50HF	151	86	56.95
25BOx 75HF	37	32	86.49
100% Jersey	196	49	25.00
Total	384	167	43.49

χ^2= 66.2358 P-value = 0.001, HF- Holstein Frisian, BO- Borena

Table 2. Comparison of direct microscopic examination (KOH) with fungal culture identification.

KOH (direct microscopic examination)	Culture positive	Culture negative	Total
KOH negative	0	217	217
KOH positive	167	0	167
Total	167	217	384

animals by using gloves and scalpel blade. After sampling, the plates were labeled and transported to the laboratory immediately.

Microscopic examination and fungal culture

Direct microscopic examination was undertaken by placing the scrapings directly onto a microscope slide and covering them with 10% potassium hydroxide (KOH). The KOH positive cases were subjected to culture study, cleaned aseptically with 70% ethanol and the scabs were collected in a sterile slide with the help of sterile scalpel blades.

The cultures were performed in Sabouraud dextrose agar (SDA) media, and the mycological identifications were based on macroscopic and microscopic examination of the culture isolates. The macroscopic examinations of dermatophytes were characterized by duration of growth, surface morphology and pigment.

Data analysis

The collected sample was entered into Microsoft excel and was analyzed using statistical software packages for social science (SPSS). Descriptive statistic like percentage can be used to determine prevalence and chi- square (χ^2) used to look the association of between prevalence of dermatophytosis and risk factors. In the analysis, confidence level was held at 95% and p<0.05 was set for significance.

RESULTS

The overall prevalence of bovine dermatophytosis in Holeta Agricultural Research Center during the study period was 43.5%. All samples were positive to direct microscopic examination using KOH, which were also positive to culture determination (Table 2). There was difference in the prevalence of dermatophytosis infection rates between the different cattle breeds examined. The highest being in 25BO X 75HF (86.49%) followed by 50BO X 50 HF and 25BO X 75HF were 56.95 and 25%, respectively (Table 1).

The study revealed differences in the prevalence of dermatophytosis infection rates among different age groups, the highest being in calves (62.28%) and lowest in old animals (25%) (Table 3). No significant difference between the two sexes was found even though the proportion is relatively higher in males (46.75%) than in females (42.67%), as described in Table 4.

The study also revealed a significant difference (χ^2 =52.8165, P = 0.001) in infection rates between the wet (64.12%) and the dry season (27.10%), where wet environment cause higher prevalence of dermatophytosis as described in Table 5. Different in dermatophytosis infection rates were recorded among the three body condition categories of the animals, higher in the medium body condition animals (56%) and lowest in the poor body condition animals, as described in Table 6.

DISCUSSION

From the total of 384 animals selected randomly, 167 (43.39%) (Table 1) animals were positive for dermatophytosis. The present study is consistence with the study conducted outside of Ethiopia in Central Anatolia, Kirikkale province, Turkey, in which 38% prevalence of dermatophytosis in cattle was reported by Yildirim et al. (2010), and lower than other two studies; one reported by Ghafarokhis, (2009) in Iran showing a prevalence of 99% of *T. verrucosum* and another by kojovoii et al. (2011) showing a prevalence of 62.3% in Iran. Few studies in Ethiopia report dermatophytosis for example 1.89% by Regasa (2003) western Ethiopia (Nekemt) and 0.7% prevalence for Almata Wereda by

Table 3. Prevalence of dermatophytosis with respect to age.

Age	No of sample examined	No of positive samples	Prevalence (%)
Calve	114	71	62.28
Young	124	45	36.29
Adult	118	44	37.29
Old	28	7	25.00
Total	384	167	43.49

χ^2 = 24.7359   P-value = 0.001.

Table 4. Prevalence of dermatophytosis with respect to sex.

Sex	No of Sample Examined	No of Positive Samples	Prevalence (%)
Male	77	36	46.75
Female	307	131	42.67
Total	384	167	43.49

χ^2 = 0.4174   P-value =0.51.

Table 5. Prevalence of dermatophytosis based on season.

Season	No of sample examined	No of positive samples	Prevalence (%)
Wet	170	109	64.12
Dry	214	58	27.10
Total	384	167	43.49

χ^2 = 52.8165   P-value = 0.001.

Table 6. Prevalence of dermatophytosis based on body condition of the animals.

Body condition	No of sample examined	No of positive	Prevalence (%)
Poor	14	4	28.57
Medium	50	28	56.00
Good	320	135	42.19
Total	384	167	43.49

Aklilu (2008). These differences observed between the present and previous studies, may be due to the difference breed of animal and agro ecological zones.

Statically significant difference was not observed between the disease prevalence and sex of animals because dermatophytosis affects both sexes, even though the proportion of infection was relatively higher in males than in females (Table 4). The highest proportion in males may be due to fact that male animals lack proper caring since the farm purpose is dairy and thus attention is only given to female animals. Differences in prevalence rates of the disease were observed in the different breeds of cattle studied. This is due to disease resistance influenced by diversity and type of genetic resistance (Fries and Ruvinsky, 2006).

In this study there is higher prevalence of dermatophytosis in winter season (Table 5) which conceded with finings of others (Quinn et al., 2002; Songer and Post, 2005), who reported the incidence of dermatophylosis which is higher in winter, possibly because of crowding and increased with carrier animal or contaminated debris in barns. This shows that season is a significant factor affecting the disease prevalence. The main transmission of dermatophytosis is through close contact between an infected animal and a healthy one (Hirsh et al., 2004). High dermatophytosis in winter time due to the short rainy season, favors aggravation of the disease due to the ecology of dermatophytosis which are zoophilic in cold climates, where animals are stabled over long period of time that favor close contact (Radostitis

et al., 2007).

The study revealed that the disease was highest in calves and lowest in old age group (Table 3). This may be explained by the fact that old aged animals are highly resistance because they are adapted to the disease. Zoophilc dermatophytosis infection is most often observed in young animals that are kept in proximity to one another. Therefore, calves are more susceptible than adults (Songer and Post, 2005).

CONCLUSION AND RECOMMENDATIONS

The prevalence of dermatophytosis was found higher in the farm. Breed, age and season were found to be at high risk factors, while sex and body condition are not. Based on the results obtained, it is clear that cattle dermatophytosis is a major problem that hampers efficient utilization of production potential of the farm herd. Based on the above conclusion the following recommendations are forwarded:

(1) The farm should seriously implement appropriate control measures like hygienic practice; especially those associated with calve which avoid substitution of one animal place with another animal.
(2) Awareness should be created around the problems especially for personnel working in farm because, the diseases are zoonosis.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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