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Prevalence of Mange Mites Infestation on Ovine in and Around Jimma Town, Southwest Ethiopia

Keywords: Mites; Mange; Prevalence; Sheep; Infestation; Skin Lesions; Jimma

Abstract

A cross sectional study was conducted on 384 randomly selected sheep in and around Jimma town, Oromia Regional State, Southwest Ethiopia to assess the prevalence of ovine mange mites by laboratory examination using skin scrappy. The results of the microscopical examination of the skin scraping revealed that 37 of the sheep were infested with mites with an overall prevalence of 9.6%. In this study, three genus of mange mites were recorded that parasitized sheep; namely, Sarcoptes, Psoroptes and Demodex with prevalence of 3.38%, 5.2% and 1.04% respectively, which were found on the back, shoulder, tail, ear, face, ventral abdomen regions of the animals' body. The prevalence of the infestation was highest in sheep younger than two years (12.4%) and the lowest in sheep with age older than two years (7.6%). The prevalence of mange mites in male sheep was 9.1% and 10.2% in females. There were no statistically significant difference (p>0.05) in the prevalence of mange mite infestation between the different age and sex groups. The difference in the prevalence of mange mites infestation in body condition score and management practices was statistically significant (x2=24.613, p=0.000), (x2=13.627, p=0.01, respectively). The dominant lesions of mange mites were formations of nodules and crusts and also loss of hair and ragged wool. Therefore, there should be immediate attention and control interventions against the disease to cut the losses that hamper sheep production and productivity in the study area.

Introduction

Sheep play a vital role as sources of meat, milk and wool for smallholder keepers in different farming systems and agro-ecological zones of Ethiopia [1]. Ethiopia is home to 23.6 million sheep [2] but the immense potential numbers represent has yet to be realized due to a multitude of factors. Ectoparasites are very common and widely distributed in all agro-ecological zones in Ethiopia [3]. Ectoparasites cause a wide range of health problems that confront the productivity of sheep. Lice, sheep keds, ticks, fleas and mange mites are reported to cause great pre-slaughter defects responsible for downgrading and rejection of sheep skins. It is reported that 35% of sheep skin rejections in Ethiopia are attributed to ectoparasites [4]. All these established facts imply that ectoparasites pose serious economic losses to the farmer, the tanning industry and the country as a whole [5].

In Oromia, there are an estimated 9,401,844 sheep, representing 36.2% of the national sheep population [2]. The Oromia region supplies an estimated 32.9% of sheep skins to the central market of the country. The export of processed and semi-processed skins constitutes the second largest industry, next to coffee, in Ethiopia. However, several recent reports indicate that over the last 10 years, the quality of raw materials has deteriorated with an increase of skin infestations associated with lice, sheep keds, ticks and mange mite [5].

Skin diseases caused by ectoparasites are among the major diseases

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of sheep causing serious economic losses to small holder farmers, the tanning industries and the countries as a whole. Such skin diseases cause mortality, decrease production and reproduction and down grading and rejection of skins. According to tanneries report, skin diseases due to external parasites causes' 35% sheep skin [6]. Mange is a highly contagious skin disease caused by one or a combination of several species of mites. Four genera of parasitic mites can cause mange in sheep, namely Chorioptes species, Demodex species, Psoroptes species and Sarcoptes species [7]. Hide and skin accounts for 12-16% of the total volume of export from Ethiopia and though hide and skins are important source of income, its contribution to the national economy may far below [6]. There was no report of mange mites' infestation on sheep in and around Jimma town, Ethiopia. Therefore, the objectives of the study were to estimate the prevalence of mange mites of sheep in and around Jimma town, and to identify the species of mange mites affecting sheep.

Materials and Methods

Study Area

The study was conducted in and around Jimma town, southwestern part of Ethiopia. Jimma town, the capital of Jimma zone, is located in oromia regional administration 346 km southwest of Addis Ababa at latitude of 7°40′N ′E and longitude of about 36°50′E at elevation of 1,780 m above sea levels. The annual mean rainfall of the area is about 1530 mm, and the minimum and maximum annual mean temperature is 14.4°C and 26.7°C, respectively.

Study Design

A cross sectional study design was carried out to estimate the prevalence of mange mites infesting sheep. The prevalence of mange mites, association of host related risk factors with the presence of mite infestation were investigated. The host risk factors considered was age, body condition, sex and management system. The examinations of each animal were conducted by visual inspection and palpation of skin lesions and by the eventual identification of ectoparasites. When skin lesions were evidenced skins scrapping from suspected cases of mange were collected. Mite identification was made according to Taylor and Wall [8] and Wall and Sharer [9].

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Study population: The study animals were selected from the population of sheep in and around Jimma town. Both sexes and all age groups were included in the study. Most samples were taken from sheep that were brought to Jimma veterinary clinic for various reasons. Records were also taken with regards to age, body condition, sex and management.

Sample size and sampling method: A simple random sampling method was used to select study animals. The sample size needed for the study was calculated by using the formula given by Thrustfield [10]. The study was considered 95% confidence interval and 5% level of precision.

$$n = 1.96^2 \text{ x P}_{exp} (1 - P_{exp}) / d^2$$

Where, n = required sample size

d = desired absolute precision at 95% confidence interval

 P_{exp} = expected prevalence

The study considered expected prevalence of 50% for the sample size calculation, and hence, the sample size was 384. Therefore 384 sheep were examined in the study area.

Study Methodology

During clinical examination, age, sex, management and body conditions of each sampled animal were recorded. Body condition score of the animal was made as poor, medium and good; by modifying the system described for sheep [11]. Poor body condition score was given to sheep which was extremely thin, medium to those with smooth and less prominent spinous process, transverse process in which finger can be pushed and moderate depth loin muscle. Good body condition score was given for the spinous process only stick up very slightly; smooth, rounded and well covered transverse processes and those having full loin muscle and very fat. Age categorization into young (lamb) and adult was performed as described by [11] for sheep. Accordingly, those sheep under 2 year were categorized as young and the rest as adults.

Observation was undertaken on selected sheep to identify for any lesions. From the area selected, skin scraping was taken using universal bottle; and scraping area included the edge of a visible lesion and the surrounding. After labeling the sample was transported to Jimma University Veterinary Laboratory. Then the sample was examined for mange mites under stereomicroscope. If during this initial examination no mites were detected, further the samples were heated on slide with a drop of 10% KOH. After allowing for 5-10 minutes with preparation to clear the debris, it was re-examined. The species of mange mites were identified according to Taylor and Wall [8] and Wall and Sharer [9].

Data Analysis

The data collected were entered into Microsoft Excel spread sheets and analyzed using SPSS (16.0) statistical software. The association of mange mite infestation between body condition, management, sex, and age of sheep were compared using Pearson Chi square test (χ^2) and a P-value of <0.05 was used as the determinant for level of statistical significance.

Results

A prevalence study on mange mites of sheep was conducted to determine the presence of the different mange mites and their association with different host factors including age, sex, management system and body condition scores. The current study revealed an overall prevalence of 9.6% (n=37) from the total of 384 animals examined.

Prevalence of mange mites infestation in sheep based on sex

With regard to sex based prevalence of mange mites in this study, both female and male sheep were infested with mange mites with an overall prevalence of 9.6%, but the infestation in female was higher than in male (**Table 1**). However, the difference was not statistically significant (p>0.05) (**Table 1**).

Prevalence of mange mites infestation in sheep based on age groups

The prevalence study of mange mite in the different age groups revealed a higher prevalence in young sheep compared with the adult ones (Table 2). Nonetheless, the difference was not statistically significant (p>0.05) between the two age groups (Table 2).

Prevalence of ovine mange mites with regard to body condition scores

With reference to prevalence of mange mites based on body condition scores, it is found that poor body conditioned animals were found to harbor more mange mite with a prevalence of 20.0%; whereas medium body conditioned were 5.1% and good body conditioned were 2.8% in prevalence (Table 3). The difference in the prevalence between poor, medium and good body conditioned animals was statistically significant (p<0.05) (Table 3).

Prevalence of ovine mange mites on the basis of management systems

The prevalence study of mange mite based on management

 Table 1: Prevalence of mange mites in sheep by different sex factors

Sex	№ of Animals Examined	№ of Positives	Prevalence	χ² (Chi-square)	P-value
Male	197	18	9.1%	0 115	0.734
Female	187	19	10.2%	0.115	
Total	384	37	9.6%		

Table 2: Prevalence of mange mites in sheep by age group

Age Group	№ of Animals Examined	№ of Positives	Prevalence	χ² (Chi-square)	P-value
Young	161	20	12.4%	0.470	0.116
Adult	223	17	7.6%	2.473	
Total	384	37	9.6%		

 Table 3: Prevalence of mange mites in sheep among different body condition scores

Body Condition Score	№ of Animals Examined	№ of Positives	Prevalence	χ² (Chi- square)	P-value
Good	76	2	2.8%	24.45	
Medium	178	9	5.1%		0.000
Poor	130	26	20.0%		
Total	384	37	9.6%		

revealed that sheep under extensive animal management practice were found to harbor more mange mite with a prevalence of 15.3% where as sheep under semi-intensive had a 3.1% and those sheep under intensive management had 6.8% prevalence (Table 4). The difference in the prevalence among the different management practices was statistical significant (p<0.05) (Table 4).

Distribution of lesions and species of mange mites identified in sheep

The predominant sites where mange lesions observed were the face, back, head and ear area, and in general loss of hair and nodule (solid dermal) formation were the dominant lesions recorded in the present study (Table 5). This study showed that sheep were infested with three genera of mange mites namely. *Sarcoptes scabiei* was found in 13 cases from a total of 37 infested cases with a relative percentage of 35.14%. *Psoroptes ovis* was 20 cases with a relative percentage 54.05% and *Demodex ovis* was 4 cases with a relative percentage of 10.81% (Table 5).

Discussion

The present study revealed an overall prevalence of 9.6%. This finding was higher than the previous findings in sheep documented elsewhere in Ethiopia; 0.95% in Tigray region [12], 1.56% in and around Mekele [13], and 2.1% in Sidama Zone [14]. However, the finding of the current study was lower than the prevalence reported in the Southern range land of Oromia, 14.64% in sheep [15]. This discrepancy might be due to the different management status and the use of acaricides and related control practices. This study revealed three genera of mange mites namely, sarcoptes, psoroptes and demodex, in the study area. The overall prevalence of sarcoptes was 3.38%. However, sheep were reported to be rarely infested with sarcoptes [16]. The lesion of Sarcoptes scabiei var ovis in sheep was observed mostly around the ear, face and head areas and nodule formation was the characteristic lesion recorded. Kassa [17] observed that, sarcoptic mange if they occur in sheep in general they are frequently observed in sparse hair. Kahn [16] also reported that sarcoptic mange mite in sheep is very rare and if any, it is only seen in non-wooly areas. In this study, psoroptes is the highest in prevalence (5.2%). This is deviant from other findings where sarcoptes was reported as the most prevalent species in [18].

In this study, Demodex ovis was recorded at the prevalence

Table 4: Prevalence of mange mites in sheep by different management factors

Management System	№ of Animals Examined	№ of Positives	Prevalence	χ² (Chi- square)	P-value
Extensive	183	28	15.3%	12 627	
Semi-intensive	128	4	3.1%		0.01
Intensive	73	5	6.8%	13.027	
Total	384	37	9.6%		

Table 5: Species of mange mites and distribution of lesions in the study sheep

Species of Mite	N <u>o</u> of Cases	Relative %	Overall Prevalence	Site of Lesion
Sarcoptes scabie var ovis	13	35.14	3.38%	Ear, face, head
Psoroptes ovis	20	54.05	5.2%	back, flank, face
Demodex ovis	4	10.81	1.04%	Ear, face

of 1.04%. Similarly, several authors have reported nearly similar prevalence, such as Numery [19] reported 1.36% in Kombolcha, north eastern Ethiopia and also Shiferaw *et al.* [20] reported a prevalence of demodecosis as 0.57% in sheep. According to Radostitis *et al.* [21], demodectic mange is rare in sheep. The most important lesion was nodule and crust formation found around the head and face. Similar lesions of mange mites in sheep were reported by Chanie and Sirak [6] and Kettle [22].

In this study, *psoroptes ovis* was recorded at the prevalence of 5.2%. This result is in line with the findings reported by Sertse [23] and Shiferaw *et al.* [20]. The genus psoroptes was the most dominant mange mite in sheep in other findings as well. For instance, psoroptes in sheep in Baghdad province was reported by Currier *et al.* [24] at 14% prevalence rate with *Psoroptes* mite and Tasawar *et al.* [25] has reported 15% sheep scab prevalence in Scotland. The causes for these variations may be due to the differences of the environmental conditions and geographical areas. In the current study, the most important lesion was nodule and crust formation that was found on back, flank region. According to Pangui [26], high temperature, humidity and sunlight favor mange mite infestation. The higher temperature, humidity and sunlight which prevail in lowland and midland may have accounted for the differences in prevalence.

Mange mite infestation is independent of age and sex [27]. Based on our observation in this study, it is possible to conclude that age and sex are not a predisposing risk factor to sheep with regard to mange mite infestation. Similar result was reported by Shiferaw et al. [20] where sex and age of the host animals are not determinant factors for the prevalence variation. This finding was in agreement with previous observation made elsewhere in Ethiopia. Yacob [28] and Kassaye and Kebede [4] also had reported that sex has no significant effect on the prevalence of mange mites. This may be due to the fact that both male and female are exposed to the infestation as they are left to graze in the same environment and no selective management is practiced in the locality based on the sexes [29]. This study showed difference in mange mite infestation among different age groups being higher in young age group. Kebede [4] and Shiferaw et al. [20] reported higher prevalence of mange mite in young animals than the old age group. The higher prevalence of mange in young than adult in the current study is in line with the previous observations [30] and most probably reflects the under-developed immunity in young animals.

Management practice attributed to the variation in the distribution and abundance of mange mite in sheep. The management system can contribute with regard to variations in prevalence of mange and the existence of higher population of sheep in small area can facilitate the infestation because the main way of transmission is intimate contact [8]. However, the current study revealed that the sheep that managed intensively has low prevalence than that was managed extensively, this might be due to regular use of acaricides, ivermectin and proper nutrition supplement practices in intensive management system. In agreement with the current finding, Radostitis *et al.* [21] have described that sarcoptic mange mite often go hand in hand with poor feeding and general mismanagement.

Body condition attributed to the variation in the distribution and abundance of mange mite in sheep. This highly significance difference might be due to the fact that poor husbandry practices make

favorable condition for mange mite infestation. There are reports elsewhere in agreement with this finding where animals which have poor body condition appear most susceptible to infestation [8]. The increased susceptibility of poor body conditioned animals to mange is responsible for such difference [21]. In a similar report by Demissie et al. [31], a prevalence of 15.3% mange mite infestation in poor body condition was documented in selected sites of Amhara region. This might be due to nutritional status, where well-fed animals can better withstand parasitic infestation than animals on an inadequate diet which can influence the level of immunity. In addition, the itching and stress caused by the infestation can result in loss of appetite and distraction from feeding and foraging activities of the animal which might cyclically result in poor body condition. The burrowing and feeding activities of S. scabie cause intense itching, inflammation, hair loss and formation of crusts of exudates, loss of condition and death [32]. Therefore, the economic impact of mange must be certainly high judging from poor condition of affected animals, loss of affected skin, deaths due to the disease and cost of treatments.

Conclusions and Recommendations

The study demonstrates that mange mite is among the most important health constraints of sheep in and around Jimma, This study demonstrated the occurrence and high prevalence of different species of mange mites in sheep of all age groups, both sexes, management practice and body conditions. The study revealed that psoropte is the predominant mite in sheep followed by sarcoptes and demodex species, hence requires immediate attention and control interventions. In comparison with others studies, the present study showed relatively higher mange mite infestation rate than the rest of the country due to backward level of management, poor level of awareness of farmers and weak animal health extension services are believed to have contributed for wide spread distribution and occurrence of mange mites in the study area leading to important economic losses.

Therefore, from the above conclusion, the following recommendations are forwarded:

- Control strategies should be instituted immediately taking in to account the impact of the parasite on the economy.
- The government should also give attention for control options besides application of acaricides spraying.
- In addition, further studies should be conducted taking in to account agro-ecological zones and mange mites' distribution. And,
- Appropriate extension programs should be launched to create public awareness about the economic importance, treatments and its impact on skin quality.

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