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Prevalence of Mange Mites on Small Ruminants at Nekemte Veterinary Clinic, East Wollega Zone, Northwest Ethiopia

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Abstract: A study was carried out during the period between November, 2011 to March, 2012 to determine the prevalence of sheep and goat mange mite infestation and identify the dominant mange mite in and around Nekemte town, Oromia Regional state, Northwest Ethiopia. A total of 200 sheep and 184 goats that came to Nekemet Veterinary Clinic were included in the study. Skin scraping was the method employed to collect mange mites for identification. Out of 384 sheep and goats examined, 20(5.2%) were infested with one or more mange mites. The overall prevalence of mange in sheep and goats were 4.5% and 9.24% respectively. The difference in the prevalence between the two host species was not statistically significant ($p>0.05$). The major mange mite identified on sheep and goats were genus Sarcoptes and Demodex with prevalence of 3.9% and 2.08%, respectively. *Sarcoptes scabiei* var *caprae* (5.43), *Sarcoptes scabiei* var *ovis* (2.50) and *Demodex caprae* (2.70%) and *Demodex ovis* (1.50%) were the most important species identified in a decreasing order. There was no statistical significance difference ($p>0.05$) in the prevalence of mange mite infestation between age and sex groups in both host species. The difference in the prevalence of mange mite infestation between poor and good body condition was statistically significant in both sheep ($P^2=23.613$, $p=0.000$) and goats ($P^2=20.113$, $p=0.000$). The lesion of mange mite infestation was observed concentrated on the face and head areas and the dominant lesions were formations of nodules and crusts and also loss of hair and ragged wool/hair. The study demonstrates that mange mite is among the most important health constraints of sheep and goats in and around Nekemte, hence requires immediate attention and control interventions. Moreover, further epidemiological investigations that consider the agro-ecology and other non-host related risk factors should be carried out for appropriate control of mange mites.

Key words: Sarcoptes % Demodex

INTRODUCTION

Agriculture is the mainstay of Ethiopian economy. It employs over 80% of the adult population and account for 45% of the gross domestic production (GDP) and 85% of the export earnings [1]. Ethiopia owns the largest number of livestock population in Africa which is approximately 44,318,877 cattle, 23619720 sheep, 23,325,113 goats, 6 million equines, 2.3 million camels and 43 million poultry [2]. Hence the livestock share of agricultural output in Ethiopia is about 40%. Self-sufficiency in food production, increases in rural income and increase in foreign currency earning of the country through improving the quantity and quality of export items are among the main objectives of agricultural development policy in Ethiopia. Hence small ruminants are important contributors to food production in Ethiopia, providing 35% of meat consumption and 14% of milk consumption [3]. In central highlands alone, where mixed crop livestock production system is practiced, small ruminants account for 40% of cash income and 19% of the household meat consumption [4].

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Owning to their high fertility, short generation interval and adaptation even in harsh environments, sheep and goats are considered investments and insurance to provide income to purchase food during seasons of crop failure and to meet seasonal purchase such as improved seed, fertilizer and medicine for rural households [5]. Hide and skins account for 12-16% of the total value of export [3]. The current utilization of hides and skins is estimated to be 48% for cattle hides, 75% goat skin and 97% sheep skin, with expected off-take rate of 33%, 35% and 7% for sheep, goats and cattle, respectively [6].

Even though small ruminants are important components of the Ethiopian farming system, their contribution to food production, rural income and export income are far below the expected potential [7]. This is because small ruminant production in Ethiopia is constrained by the compound effects of diseases, poor management and poor nutrition. Among the disease of goats and sheep, infestation by mange mites and ticks, as well as dermatophilosis play a considerable economic loss particularly to the skin and hide export due to various defects [8].

Skin diseases caused by ectoparasites are among the major diseases of small ruminants 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 and hides. According to tanneries report, skin diseases due to external parasites causes' 35% sheep skin and 56% goat skin rejection, respectively [9].

In Ethiopia, 56% of goats and 35% of sheep skin are rejected annually due to various factors, of which mange infestation account for 33% in sheep and 21% in goat [8]. Mange, a contagious disease of animals caused by parasitic mites is characterized by a variety of clinical signs depending on the species of mites. Five genera of parasitic mites can cause mange in sheep and goats (*Chorioptes* species, *Demodex* species, *Psorergates* species, *Psoroptes* species and *Sarcoptes* species) all demonstrate a high degree of host specificity [10]. Sarcoptic mange in small ruminants is chronic mange that may affect large areas of a body and is the most common cause of mange in goats. It is caused by *Sarcoptes scabiei* and is found on the sparsely haired parts of the body such as the face and ears. Mites burrow into the epidermis and feed on tissue fluids, which causes irritation and consequent scratching, leading to inflammation and exudation which forms crusts. *Demodex* species, which lightly parasitizes hair follicles and sebaceous glands of primarily hairs over the entire body, with highest populations occurring on the neck, flanks and shoulder [10].

Though the magnitude of the problem created by mange mite is believed to be huge, studies conducted in this regard in different parts of the country and information available are little in general and such kind of studies here not been conducted in and around Nekemte area. Hence, it would be essential to have a base line data on the prevalence of mange mites of small ruminants and determine the species responsible for related risk factors in the study area. Therefore, this study aims to determine the prevalence of mange mite and identify the dominant species of mange mites in small ruminants in the study area.

MATERIALS AND METHODS

Study Area: The study was conducted from November 2011 to March 2012 in and around Nekemte town, the capital of East Wollega Zone, Oromia Regional State. Nekemte is located at 331 Km West of Addis Ababa. It is situated at latitude of 09°04'9571N and longitude of 36°32' 9281E and at an altitude of 2124 meters above sea level (Masl). The climatic condition of the area is dega and woynedega with the mean annual rainfall and average temperature range from 1800-2200 mm and 20-25°C respectively. The area receives bimodal rainfalls that were long rain season and short rain season. The long rain season occur during the months of June to September while the short rain season observed during the months of March, April and May. The Nekemte people practice mixed framing system that is crop production and livestock rearing and own large number of livestock population. These are 82064 cattle, 13507 sheep, 10875 goats, 8281 equines and 53948 poultry [11].

Study Animals: Between November 2011 and March 2012, a total of 384 small ruminants brought to Nekemte veterinary clinic were subjected to detailed examination for the presence of skin lesions and ectoparasites. Of the 384 small ruminants, 200 and 184 were sheep and goats, respectively. Records were also taken with regards to age, sex and body condition of each selected animals. Body condition score was taken as poor if the spine was

prominent and sharp and good when the spine was smooth and round. Likewise, age was also determined as young (up to 2 years) and adult (above 2 years) by considering the rate of eruption of teeth (Annexes.1 and 2). These determinations of age and body condition score were carried out by modifying the method described by Gatenby [12] and Steele [13].

Study Design and Method: This study was conducted from November 2011 to March 2012, during the dry season. The examination of each animal was conducted by visual inspection and palpation of skin lesions and by the eventual identification of ectoparasites. When skin lesions were evidenced skin scrapping from suspected cases of mange were collected and preserved in 10% formalin. Mite identification was made according to Wall and Shearer [14] and Taylor *et al*. [15].

Data Analysis and Managements: The data were analyzed using SPSS version-20. Association between prevalence and explanatory variables such as species, sex, age and body condition scores were carried out by using chi-square (P^2) test. Significant difference was set at $P<0.05$ in all analyses.

RESULTS

The Overall Prevalence: In the present study small ruminants were found to be infested with one or more mange mites with an overall prevalence of 5.21% (20/384). The overall prevalence of mange in sheep and goats were 4.5% and 9.24%, respectively. The difference in the prevalence between the two host species was not statistically significant ($p>0.05$).

Overall, two genera of mange mites which belong to *Sarcoptes* sp sp. and *Demodex* sp. mange mites were found infesting sheep and goats in the study area. The most abundant mange mites identified were *Sarcoptes* sp. followed by *Demodex.* in both sheep and goats. Out of the 20 (5.21%) small ruminants infested with mange mites, 15 (3.91%) and 8 (2.08%) of them harbor *Sarcoptes* sp. and *Demodex* sp. respectively. Moreover, few of the small ruminants were infested with mixed mange mites consisting of both *Sarcoptes* sp. and *Demodex* sp. with an overall prevalence of 3 (0.78%) (Table 1).

Among the genus Sarcoptes, *Sarcoptes scabiei* var *caprae* and, *Sarcoptes scabiei* var *ovis* were identified in goats and sheep, respectively, while in the genus Demodex, *Demodex caprae* and *Demodex ovis* were

Table 1: Prevalence of *Sarcoptes* and *Demodex* mange mites in sheep and goats

	Sheep (n=200)		Goats (n=184)		
Species of mange mites	Number Infested	Prevalence (%)	Number Infested	Prevalence (%)	P^2 (P-value)
Sarcoptes sp.	5	2.50	10	5.43	2.199(0.188)
Demodex sp.	3	1.50	5	2.72	0.696(0.488)
Sarcoptes sp.+ *Demodex* sp.	1	0.50	2	1.09	0.426(0.609)
Total	9	4.50	17	9.24	

Table 2: Species, site and characteristics of lesion of mange mites

Species of mange mites	Prevalence (%)	Species	Site of Lesion	Lesions
Sarcoptes scabiei var *caprae*	5.43	Goats	Ear, face, rump, tail	Crust, loss of hair
Sarcoptes scabiei var *ovis*	2.50	Sheep	Ear, face, head	Nodule, ragged wool, crust
Demodex caprae	2.72	Goats	Ear, face, flank, tail	Nodule, alopecia, ragged wool
Demodex ovis	1.50	Sheep	Ear, face	Nodule, crust

Table 3: Prevalence of mange mites in sheep by different host related factors

Host related factors	No. animals Examined	Prevalence (%)	95% CI	P^2 (P-Value)
Sex				
Male	51	0(0.00)	-	2.482(0.194)
Female	149	7(4.69)	1.91-9.44	
Age				
Young	46	2(4.35)	0.53-14.83	0.127(0.662)
Adult	154	5(3.25)	1.06-7.41	
Body condition				
Poor	47	7(14.89)	6.20-28.30	23.613(0.000)
Good	153	0(0.00)	-	

Table 4: Prevalence of mange mites in goats by different host related factors

Risk factors	No of animals examined	Prevalence (%)	95% CI	P^2 (P-Value)
Sex				
Male	47	3(6.38)	1.34-17.54	0.045
Female	137	10(7.30)	3.55-13.01	(0.832)
Age				
Young	51	3(5.88)	1.23-16.24	0.153
Adult	133	10(7.52)	3.66-13.40	(0.698)
Body condition				
Poor	46	10(21.74)	10.95-36.36	20.113
Good	138	3(2.17)	0.45-6.22	(0.000)

identified in goats and sheep, respectively (Table 2). The most dominant sites of lesions of mange were the face and ear area and in general loss of hair, nodule and formation were the dominant lesions recorded in the present study (Table 2).

Prevalence of Mange Mites in Sheep and Goats by Host Related Factors: An effort was made to determine the prevalence of the different mange mites in different host factors including age, sex and body condition scores and the results were presented in Table 3 and 4.

Age Based Prevalence of Mange Mites: The prevalence of mange mite in sheep and goats in these different host factors In this study the prevalence of infestation with mange mites in different age groups revealed a higher prevalence in young sheep compared with the adult ones (Table 3), while in goats somewhat a similar prevalence rate was observed in both young and adults (Table 4). Nonetheless, there was no statistically significant difference ($p>0.05$) between the prevalence of mange mites in the two age groups in both host species.

Sex Based Prevalence of Mange Mites: In this study only female sheep were infested with mange mites with an overall prevalence of 4.69%, but both mange mites were not recorded in males (Table 3). Whereas in goats a higher prevalence rate was registered in females compared to the males (Table 4); however, the difference was not statistically significant ($p>0.05$).

Prevalence of Mange Mites Based on Body Condition Scores: The present study revealed that in sheep only poor body condition animals were found to harbor mange mites with an overall prevalence of 14.89%; however, no mange mites were recovered from good body conditioned sheep (Table 3). In the contrary, a prevalence of 21.74% and 2.17% was registered in poor and good body condition goats, respectively (Table 4). The difference in the prevalence between poor and good body condition sheep was statistically significant both in sheep (P^2=23.613, p=0.000) and goats (P^2=20.113, p=0.000).

DISCUSSION

The present study revealed an overall prevalence of 5.21% accounting 4.5% in sheep and 9.25% in goats. This finding was higher than previous observation made elsewhere in the country; in sheep 0.95% in Tigray region [7], 1.56% in and around Mekele [16] and 2.1% in Sidama zone [17] have been documented. In goats prevalence of 5.85% and 8.11% was registered in Wolita Sodo zone [8] and in Tigray [7]. But, the finding of the current study was lower than the prevalence reported in the Southern range land of Oromia, 14.64% in sheep and 16.45% in goats [18], 7.85% in sheep and 11.8% in goat [19]. This discrepancy might be due to the different management status and the use of acaricides and related control practices.

This study revealed two genera of mange mites namely, *Sarcoptes* and *Demodex*, in the study area. These genera of mange mites have been commonly reported from different parts of Ethiopia [1, 8, 20, 21]. The overall prevalence of *Sarcoptes* was 3.91% and it was observed that goats (5.43%) were predominantly infested by *Sarcoptes* than sheep (2.50%) as was previously reported in the country [7-8, 21]. However, the difference was not statistically significant ($p>0.05$). Sheep were reported to rarely be infested with *Sarcoptes* [22]. As was reported by Sertse [1] and Shiferaw *et al*. [8] elsewhere, the genus *Sarcoptes* was the most dominant mange mite in the current study area. Of the mange mite affecting sheep and goats, *Sarcoptes* is the most prevalent species in Ethiopia [23]. The lesion of *Sarcoptes scabiei* var *caprae* in goats was found distributed around the face, head, tail and on rare occasions around the rump and leg. The lesion in this species was characterized by loss of hair, ragged wool and crust formations in chronic cases. The lesion of *Sarcoptes scabiei* var *ovis* in sheep was observed mostly around the ear, face and head areas and nodule formation was the characteristics lesion recorded. Kettle [24] observed that, sarcoptic mange if they occur in sheep in general they are frequently observed in sparsely haired parts.

In this study, *Demodex ovis* and *Demodex caprae* were recorded at the prevalence of 2.08% and 2.70% in sheep and goats, respectively. Similarly several authors recorded the dominance of demodicosis in goats than in sheep. Numery [21] reported 1.36% and 2.63% demodecosis in sheep and goats, respectively in

Kombolcha, Northern Ethiopia and also Shiferaw *et al*. [8] reported prevalence of demodecosis 0.57% in sheep and 2.13% in goats from Wolita Sodo, Southern Ethiopia. Radostits *et al*. [25] documented that Demodectic mange is rare in sheep. The most important lesion in both hosts was nodule and crust formation around head and face in sheep and around face and tail in goats. Similar lesions of mange mites in sheep and goats were observed by Chanie *et al*. [26] and Kumilachew *et al*. [27].

When we looked at the prevalence of mange mites in the two sex groups of sheep, an overall prevalence of 5.4% was observed in female while there was no mange mite infestation recorded in the male sheep, whereas the prevalence of mange mites in male and female goats was 6.4% and 8.6%, respectively. However, there was no significance difference ($p>0.05$) in sex groups in both sheep and goats. This finding was in agreement with previous observation made elsewhere in the country. Yacob *et al*. [4] and Kasaye and Kebede [7] have reported that sex has no significant effect on the prevalence of mange mites. This study showed difference in mange mite infestation among different age groups being higher in young age group. Kasaye and Kebede [7] and Shiferaw *et al*. [8] reported higher prevalence of mange mite in young animals than the old age group. Furthermore, age was reported to have no significant effect on the prevalence of mange mites [4]. Mange mite infestation is described to be independent of age and sex [28]. Therefore, sex and age of the host animals are not contributing factors for the differences in the prevalence of mange in the study area.

In the present study, there was a significance difference ($p<0.05$) between animals with poor body condition and those which are good body condition ones, where the prevalence of mange mites was higher in the poor body condition sheep and goats. In a different report by Demissie *et al*. [5] prevalence of 15.3% mange mite infestation in poor body condition and 3% in good body condition goats was documented in selected sites of Amhara region. This might be due to nutritional status, where well-fed animals can better withstand parasites infestation than animals on an inadequate diet, which can influence the level of immunity. Alternatively, mange might be a cause for poor body condition; hence high prevalence was computed in this group of animals [27].

In general, the high prevalence of mange mites in the present study suggested that mange mites are among the major cause of production constraints of sheep and goats and quality deterioration of skin in and around Nekemte area. Among others, 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, hence requires immediate attention and control interventions. Moreover, further epidemiological investigations that consider the agro-ecology and other non-host related risk factors should be carried out for appropriate control of mange mites.

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