



Science

PREVALENCE OF MANGE MITES ON SMALL RUMINANTS IN HARAMAYA WEREDA (DISTRICT), EAST HARARGE ZONE, ETHIOPIA

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Abstract

A cross-sectional study was conducted between November 2011 and March 2012 to determine the prevalence of mange mites and to identify the major mite species affecting small ruminants in Haramaya wereda (district), East Hararghe zone, Eastern Ethiopia. A total of 810 animals from both species (384 sheep and 421 goats) were sampled using the formula of [1]. The study showed that the prevalence of mange mite in sheep and goats was 3.34% and 5.94%, respectively. From 197 and 613, young and adult small ruminants examined for mange mites the recorded prevalence rate was 6.09% and 4.61%, respectively whereas among 373 and 437, male and female small ruminants examined for mange mites the prevalence rate of 4.02 and 5.26% was recorded, respectively. The prevalence rate recorded in lowland and midland was 4.22% and 2.77%, respectively. No statistically significant association was observed between the prevalence rate and different species, age and sex of the animals ($p>0.05$). However, there was statistically significant association between the prevalence rate of mange infestation and agro-ecological zones ($p<0.05$). The major species of mites identified were *sarcoptes spp*, *psoroptes spp* and *demodex spp* in goat and only *psoroptes spp* in sheep. From the mange mite species-affecting goats, *sarcoptes scabies* was the most prevalent species observed on 4.28% of the goats followed by *psoroptes ovis* (0.95%) and *demodex caprae* (0.71%). In sheep, the prevalence of the only identified species, *psoroptes ovis* was 3.34%. Further studies should be done to evaluate risk factors and the seasonal occurrence of mange in small ruminants in the area to devise effective control measure.

Keywords: Prevalence; Small Ruminants; Mange Mites; Haramaya Wereda; Sarcoptes Scabies; Psoroptes Ovis; Demodex Caprae.

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1. Introduction

In Ethiopia there are about 23.6 million sheep and 23.3 million goats [9], which served as an important source of income for agricultural community and were one of Ethiopians major source of foreign currency through exportation of live animals, meat and skin. They were also a “living saving bank” and served as insurance (financial reserve) for a period of economic distress and crop failure as well as a primary source to cash income [18; 25].

However, diseases had been stumbling block against the full utilization of this resource [4; 10]. Although, small ruminants are known to adapt to harsh environments, the cumulative effects of overcrowding, poor nutrition and diseases could result in serious production losses [38]. Different causes of skin diseases of small ruminants in Ethiopia were accountable for considerable economic losses particularly to skin and hide export [19]. Among these disease; sheep and goat pox, mange mite, tick, melophagus ovinus, lice and dermatophiloses posed a great threat to skin and hide sector and livestock production [41].

Among the various etiological causes of skin diseases, parasitic causes of skin diseases played a great role in deteriorating the quality of skin and hide and productivity of the animal. From parasitic causes of skin diseases, mange mites worth due attention particularly in the tropic where favorable environmental condition together with poor management could severely affect production [12; 44]. Mange is one of the cutaneous diseases of domestic and wild animals of all ages and both sexes including human beings [33; 7; 22].

It has become an important disease problem causing the loss up to 93% of small ruminants in severely affected areas of the region [24].

A recent report showed that mange in sheep and goat could kill about 60% of the affected livestock [2]. [42] also reported mortality rate of 40 and 36.4% in 364 and 1386 sarcoptic mange infested goat and sheep in 33 weredas of Amhara Regional State, respectively. The incidence of mange has increased during the past 10 years to a level of preventing farmers from keeping sheep and goat in some areas of Amhara region, bordering Afar, Tigray and Sudan [2]. Besides, huge losses that mange was causing due to mortality and poor production, it was also the main cause of skin rejection and down grading in tannery. In Ethiopia 35% of sheep and 56% goat skin was rejected annually [5], of which 33% of sheep and 21% goat skin rejections were due to mange infestation.

Despite the huge economic losses incurred due to mange infestation, only few studies have been conducted to show the extent of the disease in all regions of the country. Some of these studies include the works of [30] in Robe area, Bale administration region; [36] in Harerghe; [11] in the administrative region of Harerghe; [27] in and around Addis Abeba; [14] in around Mekelle; and [27] in Dire-Dewa region. However the studies conducted so far on mange mites and its distribution were insufficient and specific to small area. Therefore, the present study was

designed to fill the information gaps that were present with regard to the disease in small ruminants in the Haramaya Woreda. Hence, the objectives of the present study were:

- 1) To determine the prevalence of mange mites in small ruminants in Haramaya wereda.
- 2) To identify the main species of mites causing mange in small ruminants in the study area.

2. Material and Methods

2.1. Study Area

The study was conducted in Haramaya wereda, which was located in Harerghe Administrative Region about 14 Km far from zonal capital, Harer and 497 Km from Addis Ababa. According to the [17], the Wereda had about 63,723 cattle, 13,612 sheep, 20,350 goats, 15,978 donkeys, 530 camels and 42,035 poultry. The production system of the Wereda was mixed type. Topographically, Haramaya wereda was within the eastern part of Harerghe, at an altitude of 1600-2100 meter above sea level. The amount of rainfall in the area varies among the season, with the highest rainfall of 866 mm being recorded from June to September and the smallest, 118 mm, recorded in February. The mean annual rainfall recorded was 498 mm and mean annual temperature was 24^oC. Geographically; it was located 041^o 59'58"N latitude and 09^o 24' 110"S longitude. The temperature ranges 9.5-24^oC with low temperature fluctuation. The wereda has two agro-climatic zones, where 66.66% was Weina Dega and 33.33% was Kola [17].

Specific study sites were:

Biftu Kebele (Lowland)-This area was located outside the town at a distance of 20km. The dominant species of animals in this area are sheep, goat, cattle and donkey. In the area, a total of sheep and goat population was 965 and 1470, respectively [17].

Haramaya town (Midland)-The area was capital town of Haramaya Wereda. The dominant species of animals in this area was sheep, goat, cattle and donkey. In this area, a total of sheep and goat population was 1320 and 1080, respectively [17].

2.2. Study Population and Study Animals

The study was conducted on local breeds of both sheep and goat reared in Haramaya town and Biftu kebele of Haramaya Wereda from November 2008 to March 2009. The study animals were selected by simple random sampling technique from two agro-ecological zones of the study area. The animals was grouped as young (sheep and goats up to 6 months of age) and adults (older than 6 months) following description by [1].

2.3. Sample Size and Sampling Method

The total number of sheep and goat population in the study area was about 13,612 and 20,350 respectively. The minimum sample size was calculated using the formula of [37], taking the expected prevalence of the disease to be 50% for both goat and sheep, the desired confidence level (CI) of 95% and level of precision to be within 5%. Accordingly, the minimum sample size

was determined to be 384 animals for each species and the study was conducted on 389 and 421 sheep and goats, respectively.

2.4.Study Type

The type of the study was cross sectional.

2.5.Sample collection and processing

Through visual inspection and palpation of skin, the animals were categorized into apparently healthy and clinically suspected animals. The apparently healthy animals were considered negative for mange infestation whereas skin scraping sample was collected from clinically suspected cases. The area selected for scraping was the moist part, hairless part, or the edge of the active lesion where pruritis or papules are seen after hair had been clipped. A drop of mineral was placed on a slide, and then the scalpel blade was cleaned by wiping it with paper. Next, the clean scalpel blade was dipped into the drop of oil on the microscopic slide, and then a fold of the patient skin was picked up at the edge of suspected lesion area.

The crest to the fold was scraped several times in the same direction with oily scalpel blade till oozing of blood was evident [32]. The scraped material from scalpel blade was transferred to the drop of oil inside, using slight rotational motion. A cover glass was put on the slide. To facilitate the skin scraping dissolution, the sample was heated with 10%KOH solution. Finally the preparation was examined under a microscope at low power (10x) setting for prevalence and identification of species at Haramaya University, Faculty of veterinary Medicine parasitology laboratory within one day of collection.

Identification of parasite species of mites was performed according to the method described by [23; 21] and [39] using their leg joints, presence or absence of sucker on their legs, mouth part and the location of the anus as identification marks.

2.6.Data Collection

Data was collected on various variables such as species, age, sex, body condition, affected body part of the animal, agro-ecology and clinical signs observed.

2.7.Data Analysis

The data was analyzed by chi-square test and descriptive statistics using the statistical software, SPSS V. 16.0.

3. RESULTS

From a total of 389 and 421 sheep and goats examined for mange mite in this study, an overall prevalence rate of 5.94% and 3.34% was recorded, respectively. The statistical analysis revealed that there was no statistically significant association between species of animal and mange mite infestation (table 1).

From 197 and 613, young and adult small ruminants examined for mange mites the recorded prevalence rate was 6.09% and 4.61%, respectively whereas among 373 and 437, male and female small ruminants examined for mange mites the prevalence rate of 4.02 and 5.26% was recorded, respectively. There was no any significant association in prevalence rate of mange mites with age and sex (table 1).

Table 1: The prevalence of mange mites and association with different Factors in sheep and goat in Haramaya wereda.

Factor	Number of animals examined	of Number of positive animals (Prevalence (%))	Chi-square	P-Value
Species of animals			$X^2 = 3.048$	0.081
Caprine	421	25 (5.94%)		
Ovine	389	13 (3.34%)		
Age			$X^2 = 1.141$	0.285
Adult	613	26 (4.61%)		
Young	197	12 (6.09%)		
Sex			$X^2 = 0.694$	0.405
Female	437	23 (5.26 %)		
Male	373	15 (4.02 %)		

Among 360 and 450 small ruminants examined for mange mite infestation in midland and lowland, a prevalence rate of 2.77% and 4.22% was recorded; respectively. Statistically significant association was observed in the prevalence of mange mites infestation in agro-ecological zone (table 2).

From a total of 28, 230 and 552 small ruminants examined for mange mite infestation with poor, medium and good body condition, 23 (60.53%), 15 (39.47%) and 0 (0%) were found positive, respectively. There was statistically significant association in mange mite infestation and body condition score, the highest prevalence being observed in animals with poor body condition (60.53 %), followed by medium (39.47 %). No animal was found positive from animals with good body condition as shown in table 2.

Table 2: The prevalence of mange mite infestation of small ruminants and their association with agro-ecological zones (lowland and midland) and body condition of the study area.

Factor	Number of animals inspected	of Number of positive animals (Prevalence (%))	Chi-Square	P-Value
Study site			$X^2 = 5.307$	0.021
Lowland(Biftu)	450	28 (4.22%)		
Midland(Haramaya Town)	360	10 (2.77%)		
Body condition			$X^2 = 4.045$	0.000

Poor	28	23 (60.53%)
Medium	230	15 (39.47%)
Good	552	0

The major genus of mites identified in small ruminants in the two agro-ecological zones of the study area were *psoroptes*, *sarcoptes* and *demodx* in lowland (Biftu) and *psoroptes* in midland (Haramaya town). Of mänge mites species identified, in the lowland (Biftu) the most prevalent species was *sarcoptes scabies* (7.44%), followed by *psoroptes ovis* (1.65%) and *demodex caprae* (1.24%). In the midland, the only species of mite observed was *psoroptes ovis* on the sheep at a prevalence rate of 5.52% (Table 3).

Table 3: The prevalence of major mite species identified in the studied areas of Haramaya Wereda.

Study site	Major species of mites	Total positive and Prevalence in sheep		Total positive and Prevalence in goat	
		Positive	prevalence	positive	prevalence
Biftu	<i>Demodex caprae</i>	-	-	3	1.24%
	<i>Sarcoptes scabies</i>	-	-	18	7.44 %
	<i>Psoroptes ovis</i>	3	1.44 %	4	1.65 %
Haramaya Town	<i>Psoroptes ovis</i>	10	5.52	-	-
Total		13	3.34%	25	5.94%

From a total of 25 goats found positive for mange mite infestation, 13(52%) and 12 (42%) of them had localized and generalized skin lesion, respectively whereas from a total of 13 sheep found positive 4 (30.77%) and 9 (69.23%) were having localized and generalized skin lesion, respectively. Generalized and localized skin lesions were observed at almost equal number of goats whereas most sheep were affected with generalized skin lesion (table 4).

Table 4: Categorization of the percent of positive identified cases of mange mites in sheep and goats based on the extent (type) of infestation in the study area.

Species	Total number of positive Cases	Number (%) of positive cases	
		Localized	Generalized
Caprine	25	13 (52%)	12 (42%)

4. Discussion

The present study, conducted from November 2008 to March 2009 had shown that the prevalence rate of mange mites in Haramaya wereda was 3.34 and 5.94 % in sheep and goat, respectively (table 2). The prevalence rate of mite in goats was in agreement with the prevalence rate of 6.83% reported by [34]. However, the prevalence rate recorded in this study was lower as compared to previous study reported in different parts of the country. [11] had reported a prevalence rate of 7.85% and 11.8% in sheep and goats in Harerghe Region, respectively while [26] reported 14.64 and 16.45% in sheep and goats, respectively, from Southern range land of Oromia. Similarly, [30] and [3] reported 67.6 and 32.44% in sheep and goat from Bale Region and SNNPR, respectively. [20] also reported 30.3 and 31.8% in sheep and goat from Tigray. This variation may be due to seasonal occurrence of mange, which reaches the peak during and after rainy season (cold months). [2] opined that the prevalence of infestation reached 100% in July and August and declined to 27% in February. In the same study, no goats were found infested in December and January. In this study, the majority of the sample was collected during dry season, November 2008 to March 2009, when mange mite infestation was supposed to be low. Another probable reason might be related to regular spraying of sheep and goat with acaricide in the area (Personal observation).

The prevalence rate of mange mite infestation in different sex and age groups was 5.26% and 4.02% in female and male and 4.61% and 6.09% in adult and young animals, respectively. This finding revealed no statistically significant variation between the groups ($p > 0.05$) (table 3 and 4). This finding coincides with other reports that indicated the independence mange mite infestation with age and sex of the host [6; 32; 15; 20].

The prevalence of mange mite infestation found in this study, 3.34% and 5.94% in sheep and goats, respectively, indicated that the prevalence of mange mites infestation was independent of species ($X^2 = 3.048$, $P > 0.05$). However, in some literature it is suggested that once sheep are infested, they are known to suffer more seriously than goats [31; 35; 26; 35].

The finding of this study on prevalence of mange infestation in small ruminants from each agro-ecological zone of the study was 4.22% and 2.77% in lowland and midland areas of Haramaya wereda, respectively. The prevalence was statistically significantly higher in lowland than in midland ($X^2 = 5.307$, $p < 0.05$). This result agreed with the findings of [2] that at present mange of sheep and goats was found to spread in the lowland altitudes of about 60% of the weredas of Amhara region. Such high prevalence of mange infestation might be attributed to the high temperature and prolonged sun light in lowland that leads small ruminants aggregate themselves for shading from sun light creating conducive condition for prolonged contact and transmission from one animal to another [28]. Another reason might be related to heat stress, which was the main predisposing stress factor for mange infestation [40].

In the present study, the mite species identified in small ruminants in two selected agro-ecological zones of Haramaya Wereda were *sarcoptes scabie*, *psoroptes ovis*, *démodéx caprae*

and *psoroptes ovis*. In lowland, the most prevalent species of mites in goats were *sarcoptes scabie* (7.44%), followed by *psoroptes ovis* (1.65%) and *démodéx caprae* (1.24%). In sheep, 1.44% of *psoroptes ovis* was found in the low land. In the midland, the only prevalent species of mites was *psoroptes ovis* (5.52%) in sheep. This finding agreed with other reports that indicated *sarcoptes scabies* was the most prevalent species in Ethiopia [31; 15; 26; 20] and 42]. The finding of this study on the prevalence rate of *demodex caprae* was also in agreement with other reports that opined *demodex spp* was the most important in goat than in sheep [13; 3]. The indicated prevalence rate of *Psoroptic* mange due to *psoroptes ovis* was also in agreement with the prevalence rate (4.67%) in sheep reported by [11] from Harerghe.

In this study, 60.53% of positive animals were in poor body condition whereas the rest 38.47% were in medium body condition states. No animal positive with mange was found in good body condition. This finding agreed with the report of [20] from Tigray that 78.7% and 17.0% of animals with mange infestation were in poor and in medium body condition, respectively. [16] opined that the humid tropical environment and under feeding are particularly advantageous for the spread and development of mites. [8] also said that during active stages of the infestation the more severely affected animal fail to eat normally and lose body condition, exacerbating the condition.

In the present study 52% (13 out of 25) of mange, positive goats were having localized type of infestation while the rest 48% (12 out of 25) were infested with generalized type. This finding agreed with Kedir, (2002) in Tigray which was 70.5% was localized and 29.5% were generalized and the fact that most *sarcoptic* mange cases are localized in nature [29].

5. Conclusion and Recommendations

The present study showed that the prevalence of mange in small ruminants in Haramaya Wereda was low as compared to the findings of mange infestation reported in small ruminants from different part of Ethiopia. The study showed that mange infestation was related to body condition and agro-ecology, which may have been indirectly related to the nutritional status of the animals. However, species, age and sex of the animal were found unrelated to the prevalence mange infestation in small ruminants.

Based up on the above conclusion the following recommendations were forwarded:

- Further studies should be done to evaluate risk factors and the seasonal occurrence of mange in small ruminants in the area to devise effective control measure.
- Further study should also be conducted to assess the economic impact of mange in productivity of small ruminants.
- The current good practice of spraying livestock with acaricide in Haramaya Wereda should be continued as it may have been one of the most important contributing factors for lower prevalence rate of mange infestation in small ruminants of the area and may also contribute in the future control of ectoparasites.

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