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Prevalence of Mange Mites of Goats in and Around Kombolcha, South Wollo, Amhara National Regional State, Northeastern Ethiopia

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Abstract: This study was carried out in order to determine the prevalence of mange mite of goats, their species composition and associated risk factors in and around Kombolcha, Northeastern Ethiopia. Both questionnaire and cross-sectional study were employed. The result of the questionnaire survey indicated that goats were the main species of animals owned by the farmers and mange was a known and considered as an important disease by small ruminant holders. The cross sectional study was carried out on 350 goats (238 female and 112 male). Accordingly the overall infestation rate of mange mites was 11.7% (41 of 350). Prevalence of 5.1% and 6.6% was observed in and around Kombolcha, respectively; however, there was insignificant difference (P>0.05) in the two study areas. The highest level of infestation was observed in female adult goats (9.1 %) than in male adult goats (2.6%). However, there was no statistically significant difference (P> 0.05) between the different age and sex groups. On the other hand, the prevalence of mange mites in poor body conditioned (7.4%) animals was significantly higher than (P<0.05) those of the good body condition (3.1%) animals. With regard to species composition *Sarcoptes sp.* and *Demodex sp.* were identified with the prevalence of 10.6% and 1.1%, respectively. *Demodex sp.* was not observed on good body conditioned and young goats, whereas, *Sarcoptes sp.* were found on both poor and good body condition as well as in different age groups. In conclusion, mange mite of goats had been observed to decrease in its extent of infestation problem because of the endeavors on disease control launched in the study area. Therefore, it was the suggestion of this study to further strengthen the efforts to put the disease under control.

Key words: *Sarcoptes* · *Demodex* · Skin · Goats

INTRODUCTION

Small ruminants play significant contribution to Ethiopian economy and contribute about 30% of the total population of Ethiopian small ruminants [1]. Both sheep and goats contribute 35% and 14 % of meat and milk consumption. Sheep and goats for most of the small holders are the major or the only source of income in some parts of Ethiopia. In the central high lands where mixed crop livestock production system is practiced, small ruminants account 40% of cash income [2]. The national sheep and goat population is estimated at 25.5 and 23.7 million, respectively [3]. Annually 16.6 million pieces of skins are produced in the country. Their skins share 12-16 % of the total export earnings of the country [4].

The current utilization of hides and skins is estimated to 77.3% for cattle hide, 58.4% for goats skin and 29.7% for sheep skin with expected off- take rate of 33%.35% and 7% for sheep, goats and cattle, respectively [5]. Even though small ruminants are important components of the farming system in Ethiopia, their contribution is far below the expected potential. Although large number of sheep and goat are slaughtered per-annum, the production of high quality skins remains very low [6-7]. This is partly because small ruminants' production is confronted by different factors such as disease, poor feeding and poor management practices [8]. Skin problems caused by lice, keds, ticks and mange mites result in serious economic loss to smallholder farmers, to tanning industry and to the country at large. These external parasites of small ruminants can result blood loss,

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irritation mortality, affect reproduction and productivity and cause down grading and rejection of skins. According to Kassa [6], external parasites causing skin problems accounts for rejection of 35% and 56% of sheep and goats skins, respectively.

In Amhara region, various dermatological problems affecting skin quality in goats have been reported [9]. According to Demissie *et al.* [10], apart from loses of productivity and skin rejection, mange was estimated as a cause of death for 57.3% of goats in the region. Based on reports and its significant economic impact, the region practiced ectoparasite control including mange mites in goats using acaricides in previous years as a measure to intensify the productivity of these animals and to maximize export earnings from their skins. However, the extent of prevalence reduction brought about by control measures taken is not known. Therefore, the major objectives of the current study are to find out prevalence of mange mite and possible risk factors.

MATERIALS AND METHODS

Study Area and Animal Population: The study was conducted in and around Kombolcha of the Amhara Region, Northeast Ethiopia. It was located at 375 kms North of Addis Ababa. The approximate geographical location of the area is between 11°08 North and 39°73 East with the altitude of 1840 meter above sea levels masl. Area coverage has different geography and climate ranging from 1500 to 2600 masl. Average daily temperature is 11.5 to 27.5°C. The mean annual rainfall of the area is 1150 mm. Relative humidity ranges from 23.9 up to 79%. The estimated animal population in the area is 108803 bovine, 58182 caprine, 26957 ovine, 10530 equine, 79669 birds and 2769 camel. Indigenous goats of different age groups, sex and body condition, owned by farmers and managed under extensive system were the target animals.

Study Design

Questionnaire: Questionnaire were used to get appropriate information about the general attitude of the individual farmers and to asses preventive and control practices against mange mites and evaluate risk factors on the occurrence of the disease. Goat owners from three Peasant Associations (PA's) were selected as representatives of 15 PA's and 20 individuals for each were also included amounting the total of 60 individual farmers.

Cross Sectional Study: A cross sectional study involves skin scrapping examination of a total of 350 goats (238 female and 112 male). Age, sex and body conditions were considered as explanatory variables. Investigated animals were grouped into poor body condition and moderate body condition based on their physical body condition as described by Steele [11]. Those animals with the age of less than one year were considered as young while those greater than or equal to one were considered as adults according to the classification of age groups by Kumssa *et al* [12].

Sample Size and Sampling: The sample size for the study was determined using Thrusfield [13] using expected prevalence of 34.63% of mange mites [14] and 95% confidence level and 5 % desired level of precision. Based on this, the expected sample size was determined to be 350. The animals were inspected visually and through palpation and examination for any skin lesion and parasites. Mange mite suspected goats were clinically identified for the presence of skin lesions such as erythema, pruritus and scales. Samples were collected from suspected cases of mange mites by clipping the hair, scraping the edges of active lesions with scalpel as described by Chauhan *et al*. [15] until capillary bleeding is seen. Then the material scraped falls on paper held underneath and transferred to clean universal bottle and the samples were transported to Kombolcha Regional Veterinary Laboratory using Oudeman's fluid until they were immediately processed in the laboratory. In the laboratory, a few drops of 10% Potassium hydroxide was added to the sample and allowed to stand for 30 minutes. A drop of the sediment was examined for the presence of mites on a slide with cover slip under the lower power of the microscope. In cases where nodular skin lesions suspected due to demodectic mange, the contents were collected and direct smear was made for microscopic examination. Mite identification was made according to Wall and Shearer [16] and Taylor *et al*. [17].

Data Analysis: The significance of differences between the prevalence of mange mite in the different groups of goats was determined using Chi-square test using SPSS version 15.

RESULT

The result of the questionnaire survey indicated that goats were the main species of animals owned by the farmers for the main objectives of income generation and for meat requirement of the family. Eight five percentage (50 out of 60) respondents from the study area explained that they were aware of mites causing skin disease of goat which is locally known by the name "Qeto". About 87.5 % (53 out of 60) respondents replied mange had great effect

Table 1: Questionnaire Survey on Different Focal Points

The main objective for keeping goats	No of Respondents
- For income generation and insurance	49
- For meat	9
- For fertilizer	2
More important species in the area	
- Goat	48
- Sheep	12
Highly affected species in the study site	
- Goat	46
- Sheep	9
- Other (Cattle)	5
More affected age groups	
- Young	17
- Adult	23
- All	20
External parasites causing skin disease that affect goats more	
- Mange mite	36
- ticks	14
- Lice	10
Choice used to treat the skin disease	
- By dipping	4
- By spraying	56

Table 2: Prevalence of mange mites in and around Kombolcha

Selected sites	No. of animals examined	No. of Positive (%)	X^2 (P-Value)
In Kombolcha	167	18 (5.1)	0.270 (0.363)
Around Kombolcha	183	23 (6.6)	
Total	350	41 (11.7)	

Table 3: Prevalence of mange mites in goats by different risk factors

Risk factors	No of animals examined	Positive (%)	X^2 (P-Value)
Sex			
Female	238	32 (9.1)	2.174
Male	112	9 (2.6)	(0.337)
Age			
Young	170	14 (4.0)	5.937
Adult	180	27 (7.7)	(0.051)
Body Condition			
Poor	82	30 (8.6)	65.830
Good	268	11 (3.1)	(0.000)
Total	350	41 (11.7)	

Table 4: Prevalence of *Sarcoptes* and *Demodex* between different groups of goats

		Species of mites identified	
Risk factors	No of animals examined	Sarcoptes (%)	Demodex (%)
Sex			
Male	238	29 (8. 3)	3 (0.9)
Female	112	8 (2.3)	1 (0.2)
Age			
Young	170	14 (4)	-4
Adult	180	23 (6.6)	(1.1)
Body Condition			
Poor	82	26 (7.4)	4 (1.1)
Good	268	11 (3.1)	-
Total	350	37 (10.6)	4 (1.1)

on the sale of live goats and their skins. Ninety seven percentage (58 out of 60) representatives indicated that mange mite was being treated more commonly by modern care of treatment. The interviewed individuals explained mange mite, ticks and lice were the main skin diseases in small ruminants in the study area and they informed that goats were highly affected by mange than other species of animals. Concerning the seasonality of mange mite infestation, 75% (45 out of 60) of the respondents agreed that the infestation highly aggravates after the rainy season. Ninety three percentage (56 out of 60) participants also responded transmission of mange mite was mainly by contact of sick animals at grazing and watering places.

In the cross-sectional study, out of the total 350 goats (238 females and 112 males) examined for mange mite infestation, 11.7% (41 of 350) were positive. The highest level of prevalence (6.6%) was observed around Kombolcha while the lowest prevalence (5.1%) was observed in Kombolcha. However, there was insignificant difference between the two sites ($P<0.05$) (Table 2).

Different level of mite infestation 9.1 % (32 out of 350) and 2.6 % (9 out of 350) were identified in female and male goats, respectively (Table 3). However, there was no statistical significance ($P >0.05$) difference between the prevalence of mange mites in male and female goats. Out of the total 350 animals, the highest prevalence 7.7% (27 out of 350) was observed in adult goats, while only 4% (14 of 350) was observed in young ones. However, the finding was statistically ($P > 0.05$) insignificant in these two age groups. The prevalence of the disease in the poor body condition animals was insignificant ($P < 0.01$) compared with the good body conditioned ones (Table 3). In the present study, *Sarcoptes* and *Demodex* were recovered with the prevalence of 10.6 % and 1.1 % of the total examined animals, respectively. *Demodex* was not recovered on good body condition and young goats whereas, *Sarcoptes* were found on both poor and good body condition as well as in the different age groups (Table 4).

DISCUSSION

The result of this study indicated that mange was a recognized disease by small ruminant owners. However, the extent of awareness was not at early stage as it appears but during later stage after the animals are affected that it is identified. This implies the need to create awareness regarding management practices. The interviewed individuals informed that susceptibility of goats was more compared to other species and the importance of goats was higher than other animals in the study area because of their resistance to harsh environment. Mange mite affecting goats and other species were *Sarcoptes* which was more prevalent than other mites in the study area. High temperature, humidity and sunlight are suitable for spreading the sarcpotic mange infestation [18].

In this study, a total prevalence of 11.7 % (41 out of 350) was observed. This result was lower than the findings by Kedir [19] in Tigray, Zelalem [20] in Dire Dawa and Numery [14] in Kombolcha. This discrepancy in prevalence might be due to the control action taken by the region and in addition, it may be due to the difference in the method followed in detection of mange mites and better management practices applied in the area. However, it was higher than the previous studies conducted in by in Southern rangelands Oromia [21], Wolita Sodo [22], Sidama Zone [23] and North-East Ethiopia [24] who reported prevalence of 4.07%, 0.94%, 1.39% and 6.1% respectively. The disagreement from other previous reports might be because of the variation in the level of infestation in the different areas in relation to environmental factors and management practices applied. Nonetheless, Gashaw [25] in Hararghe reported comparable mange mite infestation in the same species of animals with prevalence of 11.8%.

In the present study, the highest prevalence was observed around Kombolcha (7.4%) and the lower prevalence in Kombolcha (4.3%). This difference in prevalence might be associated with difference in animal population which causes favorable condition for the transmission of mites between animals and results in high level of mite infestation [18]. Therefore, incidence of mange mite is higher in wet, cold area (i.e., high temperature humidity and sun light in which moisture and temperature are optimum for mite development favoring its infestation) [26]. The effect of ecto-parasites can be influenced by nutritional status of the host. Well-fed animals can withstand the parasite infestation better than animals with nutritional deficiency. Therefore, the difference in prevalence might be due to the nutritional status of the animals in the study areas which can affect level of immunity.

With regard to the two sex groups the prevalence of mange mites were 9.1% and 2.6% in female and male goats, respectively with no statistically significant difference ($P>0.05$). This finding supports the general perception that female animals are more affected by non-

sex related diseases. Parturition and lactation cause relaxation of the natural immunity of female animals [27].

Even though not significant, the higher prevalence observed in adult animals (7.7%) than in young ones (4%) in the present study, might be related to the difference in the grazing behavior, i.e. young animals may have poor access to grazing or pasture than adult ones.

In the current study, the highest level of prevalence was observed in animals with poor body condition (8.6%) compared to the prevalence in the good body condition (3.1%). Tsrese and Wosene [24] reported that poor body conditioned goats were 4.3 times at risk for sarcoptic mange. The difference in prevalence between animals of different body condition might be due to the difference in the level of infestation. Poorly nourished animals appear to be less competent in getting rid of infestation as compared to that of well-managed animals. In the present study, two genera of mites have been identified namely, *Sarcoptes sp.* and *Demodex sp*. Out of the total the 41 mite infested animals, 37 were due to sarcoptes and 4 were due to demodex giving a prevalence of 10.6% (37 of 350) and 1.1% (4 of 350), respectively. This result is different from the report of Numery [14] who reported prevalence of 33.27% and 1.36% for sarcoptes and demodex respectively in the study area (Kombolcha). This discrepancy could be due to the reduction rate of infestation following the use of control measures by the MOARD [5].

When the level of infestation of the two genera of mites were observed with respect to sex, age and body condition, *Sarcoptes* was observed with prevalence of 9.1 % and 2.6% in female and male goats; prevalence of 7.7% and 4 % in adult and young animals and prevalence of 8.6% and 3.1 % in poor and good body conditioned animals, respectively. This shows that high level of *Sarcoptes* infestation was observed in female goats than males, in adult goats than young ones and in poor than good body conditioned animals while *Demodex* infestation was only observed in adult male and female goats and in poor body conditioned animals.

In general, this cross-sectional study of mange mites in goats revealed an overall prevalence of 11.7% in and around Kombolcha. Therefore, mange mite infestation has decreased by two-third from the previous level of infestation (34.63%) [14]. Moreover, Sex, age and body condition were found to be important risk factors in the occurrence of mange mites in goats and hence future control plans should take these factors into consideration. Since there is a lower level of prevalence of mange mites in goats in the study area compared to previous studies, the region and the concerned veterinary service should strengthen their action of controlling and preventing these parasites. Furthermore, the level of awareness of the farmers should be increased regarding the effect of mange, its modern prevention and control methods and other management practices.

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