Prevalence and Identification of the Species of Mange Mites in Small Ruminants in Bedele Town, Oromia, South West Ethiopia

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Abstract: A cross sectional study was carried out with the objectives of determining the prevalence and identifying the species of mange mites involved in sheep and goats in Bedele from November 2008 to February 2009. Samples were collected by simple random sampling techniques both from apparently healthy and suspected cases of mange mite infestations. Accordingly, the prevalence of mange mites in sheep and goats were 4.2 % (n = 214) and 5.34 % (n = 206) respectively with no significant variation (P > 0.05). The prevalence of mange mites among males, females, young and adults were 6.31 %, 3.27 %, 5.0 % and 4.58 % respectively, again with no significant difference among the different sex and age groups (P > 0.5). The major mite species identified in the area were Sarcoptes scabies var ovis, Psoroptes ovis, Sarcoptes scabies var caprae and Demodex caprae with the prevalence of 2.8 %, 1.4 %, 4.4 % and 0.97 % respectively. The most prevalent genus of mange mites in the study area were Sarcoptes and Psoroptes, the former with greater prevalence in goats than in sheep and even of greatest prevalence as a whole. In general, the prevalence of the disease is lower in the present study than in several studies conducted in different areas in Ethiopia, but the disease should be taken into consideration wherever and whenever be it with low or high prevalence since it contributes for the decline of the income of the country which would come through exportation of the hides from small ruminants.

Key words: Bedele · Mange Mite · Prevalence · Small Ruminants

INTRODUCTION

Ethiopia with its greatest variation in climate and topography possesses one of the largest small ruminant populations in the world, which is mostly managed by small holder farmers under extensive low input, traditional production system and in adjacent to crop production. It has been estimated that more than 38 million cattle and 30 million small ruminants constitute a major portion of livestock resources [1].

In Ethiopia, small ruminants are important for food production providing 35 % of meat and 14 % of milk consumption [2]. Owing to their high fertility, short generation interval and adaptation even in harsh environments, sheep and goats are considered as investments and insurance to provide income to purchase food during a period of crop failure and to meet seasonal purchases such as improved seed, fertilizer and medicine for rural households. Hides and skin account for 12 up to 16 % of the total value of exports in Ethiopia [2].

Although small ruminants are known to adapt to harsh environments, the cumulative effects of overcrowding, poor nutrition and diseases can result in serious production losses [3, 4]. Currently different causes of skin diseases of small ruminants in Ethiopia are accountable for considerable economic loss particularly to the skin and hide export due to various defects. Among these diseases; sheep and goat pox, mange mite, tick, Oestrus ovis, lice and dermatophilosis possess a great threat to skin and hide export sector and livestock.
production [5]. Mange is a parasitic skin disease that affects all species of animals and it has become an important disease problem causing the loss of up to 93% of small ruminants in severely affected areas of the regions [6, 7]. Mites occur in wide range of mammals, but by biological adaptation 'trains' have evolved which are largely host-specific. The mite infestation is well known ecto-parasite in both human and animals as a cause of mange, the disease in man generally known as scabies [8].

A recent report showed that mange in sheep and goat killed about 60% of the affected livestock in Amhara region. Demissie et al. [9] and Wondwosen [10] reported mortality of 40% in 364 goats and 36.4% among 1386 sarcotic mange infested sheep in 33 districts of Amhara region. The incidence of mange has increased to a level of preventing farmers from keeping sheep and goats in some areas of Amhara, bordering of Afar, Tigray and Sudan [9].

Beside huge losses that mange is causing due to mortality, poor product is also one of the main causes of skin rejection and down grading in tanneries. In Ethiopia, 35% of sheep and 56% of goat skin are rejected annually [11], of which mange infestation accounts for 33% of sheep and 21% of goat.

Though mange mites in small ruminants are prevalent in different parts of the country (Regions, Zones, Districts, Kebeles), the distribution and identification of the disease was not studied in Bedele until the present study was conducted. Therefore, the objectives of the present study were:

- To determine the prevalence of mange mites in small ruminants in Bedele and
- To identify the species of mites causing mange in sheep and goats in the area.

**MATERIALS AND METHODS**

**Study Area:** The prevalence study on mange mites of small ruminants (sheep and goats) was conducted in Oromia Regional State, Ilubabor zone, in Bedele district starting from November 2008 to February 2009. Bedele woreda is found on a distance of 484 km from Addis Ababa to South west of Ethiopia and it is geographically located at 8°26’ N latitude and 36° 26’ E longitude with an altitude of 1500 m to 2300 m above sea level. The agro-climatic condition of the district is divided into three: Dega (5%), Woina Dega (14%), and Kolla (81%). The area has the mean annual rain fall of 1950 mm and means annual temperature of 17 degree celcius which is the average of the sum of 23-degree celcius (highest) and 11-degree celcius (lowest). The main farming system carried out in the area is mixed farming and small ruminants are the third most kept animals next to cattle and poultry. At present, there are a number of livestock and human populations in the district and accordingly, 81,021 livestock populations (52,197 cattle, 15,230 sheep, 11,090 goats and 2504 equines) plus 38,364 poultries and human populations of 89,822 (49,370 males and 40,452 females) from rural area and 29,358 (14,652 males and 14,706 females) from town are there [12].

**Study Population:** The study population were small ruminants (sheep and goats) of local breeds, embracing both sexes of the two species (male and female ovine and caprine) and two age groups (young and adults) which were cases presented to Bedele veterinary clinic.

**Study Design:** Cross sectional study type was used. The animals were grouped as young (sheep and goats up to 6 months of age) and adults (older than 6 months) following description by Radostits [13] based on estimation of age by examination of the teeth. The sample collection format was including code, species of animal, age, sex, and laboratory findings.

**Sample Size and Sampling Technique:** During the study, simple random sampling technique was used and for estimation of level of disease occurrence, the sample size was decided by formula of Frerot et al. [14] and Shiferaw et al. [15].

\[
N = \frac{Z^2 \times P(1-P)}{D^2}
\]

where:

- \(N\) = sample size required
- \(Z\) = Taken from level for 95% CI (1.96)
- \(P\) = Prevalence (50%)
- \(D\) = Level of precision (5%)

Accordingly a total of 420 small ruminants (214 sheep and 206 goats) sample data were collected from small ruminants in Bedele that had been brought to the veterinary clinic of the town in both apparently healthy animals and clinically suspected cases of mange mites.

**Study Methodology:** The sample collection method was following the parasitological technique as follows:
Samples were collected from suspected cases of mange mite infestation as well as apparently healthy animals. The procedures followed were: Place a drop of mineral oil on a slide, and then clean scalpel blade by wiping it with paper. Next, deep the clean scalpels into the drop of oil on the microscope slide, and then pick up a fold of the patient’s skin at the edge of suspected area. Scrap the crest to the fold several times in the same direction with only scalpel blade till oozing of blood is evident. Transfer the scraping from scalpel blade in the drop of oil on slide, using rotational motion.

The samples were treated with 10% KOH solution and examined under microscope for prevalence and/or identification study of mange in small ruminants at Bedele regional veterinary laboratory within one day of collection. In case where nodular skin lesions were suspected to be due to demodectic mange, the contents (white creamy pus) were collected and direct smear was made by mixing with 10% KOH for microscopic examination. Any sample not showing the intact parasite was considered to be negative. In positive cases mites were identified by their leg joints, presence or absence of sucker on their legs, mouth part and the location of the anus.

Skin Scraping and Identification of Mange Mites:
Skin scrapings were taken from the affected areas as well as apparently healthy areas. The area selected for scraping was the moist part, hairless part, or the edge of the lesion. If sarcoptic mange was suspected, the scraping has been taken from the hairless area or where pruritis or papules are seen after wool or hair had been clipped [16]. In psoroptic mange of sheep (sheep scab), the area selected was the edge of the progressing lesion. In general, for mites living on the skin surface (i.e. Psoroptes or Chorioptes) scrapings were taken with the scalpel blade held at an acute angle, shaving rather than scraping off the outer epidermis. Demodex or Sarcoptes were found burrowing into the skin and the scalpel blade should be held at right angles and the skin scraped until it oozes blood. A drop of mineral oil is put on the skin or the scalpel blade before the skin was scraped which aid in the collection of mites. In demodectic mange, mites were usually abundant and can be demonstrated on examination of the cheesy contents of an expressed or incised pus nodule [16].

Identification of parasite species of mites was performed according to the method described by Zeryehun and Tadesse [17]. Sarcoptes were identified on the basis of shape and morphology. The body out line of adult mites was circular with transverse striation on the dorsal view. The cuticle (integument) was striated, bearing a central patch of raised tooth and peg-like structures on the dorsum that decreases in density postero-laterally. Legs were weakly developed and in both sexes the pretarsi of legs I and II bear empodial claws but the funnel shaped ambulateral suckers were on long unjointed pedicels (stalks). Legs III and IV in the female (identified by the transverse egg laying slit (oviparous) in the middle of the ventral surface) were short and end in long setae and lack a stalked pedicel. They were located on the ventral surface and not visible in dorsal view. A male was smaller and distinguished by the presence of a stalked pedicel on legs IV, between which there was an obvious sclerotised genital apparatus. Nymphs were similar to the female, but smaller and without an oviparous. Larvae resemble nymphs, but have only three pairs of legs. Studies of populations of Sarcoptes mites from a wide range of hosts have suggested that there is only one type of species (Sarcoptes scabies). Demodex was easily recognized by its annulate, vermiform (‘worm-like’) shape from pus sample of goats. Male demodex live at or near the skin surface and females in the follicles.

Data Analysis: The prevalence rate was the prevalence of the number of positive animals out of the total number of animals sampled. After entry of the collected data into the Microsoft Excell sheet, it was summarized by descriptive statistics like percentage, and then displayed by tables. Difference in prevalence by explanatory variables (sex, age and species of animals) was investigated by the chi-square test with a significance level of $P < 0.05$ using computer software program of Inter cool STATA version 8.

RESULTS

A total of 420 small ruminants (sheep and goats) were studied. Both apparently healthy and suspected cases were members of the total sample collected during the study time. The prevalence of mange mites was 4.2% in sheep and 5.34% in goats and the overall prevalence of both species (ovine and caprine) was 4.76%.

From the study conducted in Bedele concerning mange mites of small ruminants, it was possible to put the prevalence in categories such as age and sex in both species of the animals.

From among 420 small ruminants (sheep and goats) examined for mange mite infestations, 20 (4.76%) were found to be positive of which 214 were sheep and 206...
Table 1: The prevalence of mange mites in small ruminants (sheep and goats) in Bedele

<table>
<thead>
<tr>
<th>Species of animals</th>
<th>Number of animals examined</th>
<th>Number of positive animals</th>
<th>95 % CI</th>
<th>χ²</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ovine</td>
<td>214</td>
<td>9 (4.2 %)</td>
<td>1.49-6.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caprine</td>
<td>206</td>
<td>11 (5.34 %)</td>
<td>2.24-8.44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Over all</td>
<td>420</td>
<td>20 (4.76 %)</td>
<td>2.71-6.80</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

χ² = 0.2977, P-value = 0.585

Table 2: Prevalence of mange mites by age and sex in small ruminants in Bedele

<table>
<thead>
<tr>
<th>Category</th>
<th>Number of animals examined</th>
<th>Number of positive animals (%)</th>
<th>95 % CI</th>
<th>χ²</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adult</td>
<td>240</td>
<td>11 (4.58)</td>
<td>1.78-8.21</td>
<td>0.0394</td>
<td>0.843</td>
</tr>
<tr>
<td>Young</td>
<td>180</td>
<td>9 (5.00)</td>
<td>1.97-7.24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>214</td>
<td>7 (3.27)</td>
<td>0.86-5.67</td>
<td>2.1380</td>
<td>0.144</td>
</tr>
<tr>
<td>Male</td>
<td>206</td>
<td>13 (6.31)</td>
<td>2.96-9.65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>420</td>
<td>20 (4.76)</td>
<td>2.71-6.80</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3: The prevalence of major mite species identified in small ruminants in Bedele

<table>
<thead>
<tr>
<th>Major mite species</th>
<th>Total positive and prevalence in sheep</th>
<th>Total positive and prevalence in goats</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive</td>
<td>Prevalence (%)</td>
</tr>
<tr>
<td>Sarcoptes scabies</td>
<td>6</td>
<td>2.8</td>
</tr>
<tr>
<td>Psoroptes ovis</td>
<td>3</td>
<td>1.4</td>
</tr>
<tr>
<td>Demodex caprae</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 4: Prevalence of species of mange mites infesting small ruminants in Bedele in both species of the animals (ovine and caprine) by sex and age

were goats with respective positivity for mange mites as 9 (4.2 %) and 11 (5.34 %). Sheep were found to be positive for Sarcoptes and Psoroptes while goats were positive for Sarcoptes and Demodex. The prevalence of Sarcoptes and Demodex in goats was 4.4 % and 0.97 % respectively.

Three genuses of mange mites infesting small ruminants were identified in the study area and their prevalence were put separately for sex and age in both sheep and goats.

There is no statistically significant difference in prevalence of mange mites between sheep of both sex (χ² = 1.293, 1df, P = 0.255) and age (χ² = 0.001, 1df, P = 0.974), but the prevalence was found to be higher in males (5.825 %) than in females (2.70 %) and also found to be higher in young (4.255 %) than in adults (4.166 %). There is also no statistically significant difference in prevalence of S. ovis and P. ovis between sheep under different sex group (χ² = 0.8496, 1df, P = 0.357; χ² = 0.4187, 1df, P = 0.518) and among different age groups (χ² = 0.0925, 1df, P = 0.761; χ² = 0.1386, 1df, P = 0.710) respectively, but the prevalence is higher in males (3.88 %; 1.94 %) than in females (1.8 %, 0.90 %) and also higher in young (3.19 %) than in adults (2.5 %) (for Sarcoptes scabies var ovis) but the prevalence is higher in adults (1.66 %) than in young (1.06 %) (for Psoroptes ovis).

No statistically significant difference was observed in prevalence of mange mites between goats of both sex (χ² = 0.8643, 1df, P = 0.353) and age (χ² = 0.0657, 1df, P = 0.798), but the prevalence was found to be higher in males (7.76 %) than in females (2.90 %) and also found to be higher in young (5.80 %) than in adults (5.00 %). Again there is no statistically significant difference in prevalence of S. caprae and Demodex caprae between goats of different sex (χ² = 1.0457, 1df, P = 0.307; χ² = 0.0000, 1df, P = 1.000) and among different age groups (χ² = 0.274, 1df,
During the study the major genus of small ruminant mange mites identified in the study area were Sarcoptes and Psoroptes. Among this the major species of mites were Sarcoptes scabiei and Psoroptes ovis. Of the mange mite species affecting sheep and goats, Sarcoptes scabiei is known to be the most prevalent species in Ethiopia [21, 23, 25 and 26]. The present finding proves this fact. Demodectic mange, due to Demodex caprae was observed at a prevalence of 0.97 % in goats and this finding coincides with that of Tefera [23] in which the prevalence of demodicitosis in goats was 0.9 %. Demodex is more important in goats than in sheep [29] and the present study is in line with those findings.

Sarcoptic mange due to Sarcoptes scabiei was identified at a prevalence of 4.4 % in goats and 2.8 % in sheep. This finding is low as compared to other similar studies conducted in different parts of the country: in Central Ethiopia goat (3.96 %) Haffize [25], in Southern range land of Oromia goats (16.45 %) and sheep (14.64 %) Molu [21], in Eastern Amhara goats (6.1 %) Tefera [23] and in SNNPR goat (32.44 %) Deferes and Geresu [29]. This might be related with the sample collection method hence Sarcoptic mange needs scaraping of hairless area or wool less area and since they are burrowing mites, they need deeper skin scraping [16]. Another probable reason was that sarcoptic mange mites have seasonal occurrence, being active mainly during rainy seasons [30].

CONCLUSION

The present study depicted that small ruminant mange mites are important even if the prevalence was low because it indicated the magnitude of the disease in the area of study. The species of mange mites identified in the area were Sarcoptes scabiei var ovis, Sarcoptes scabiei var caprae, Psoroptes ovis and Demodex caprae. Among these species, the former two were more abundant than the latter two and this study was the first in Bedele area. Currently, it became known that mange in small ruminants is widely distributing diseases in different parts of the country with different prevalence. However, the prevalence obtained in the present study is lower when compared with the other studies conducted in other areas in the country. From this study it was possible to conclude that the disease is not a serious problem leading one to the stoppage of keeping either of the species of the animals (Ovine and Caprine) as the prevalence of the disease was low and more or less equal in both, and sex and age of the animals are not determinants of the prevalence variation in small ruminants.
Based on the above conclusion, the following recommendations were forwarded:

- Further studies should be carried out in the area at different sites as there may be chance of even getting another species of mites.
- The study should be conducted in all seasons (if possible) since the seasonal occurrence of some genus (e.g. Sarcoptic mange) can affect the value of the prevalence.
- Public awareness and extension work: Educating animal breeders on the problem caused by mange mites and the prevention and control measures taken against the disease.

REFERENCES


