

Prevalence of Ectoparasites in Sheep and Goats in and Around Chora Botor District, Oromia Regional State

Adisu Jote^{1*}, Tadale Daraje² and Temesgen Wolde³

¹Chora Botor District Agricultural Office, Jimma Zone, Oromia, Ethiopia

²Lalo Qile District Agricultural Office, Kellem Wollega Zone, Oromia, Ethiopia

³Hawa Gelan District Agricultural Office, Kellem Wollega Zone, Oromia, Ethiopia

*Corresponding author: Adisu Jote, Chora Botor District Agricultural Office, Ethiopia

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ABSTRACT

This study was conducted from November 2021 to April 2022 with the aim of studying the prevalence of ectoparasites of in small ruminants in and around Cora botor district. A total of 384 (202 sheep and 182 goats) were included in this study. Out of these animals 229 (59.6%) animals were found being infested with one or more species of ectoparasites. Of a total of examined animals; 118 (58.4%) of sheep and 101 (55.5%) of goats were positive for various species of ectoparasites. This study has revealed that lice were the predominant ectoparasites followed by tick, mange mite and fleas in sheep and goats. The present study has shown that ectoparasites are among important causes of skin damage which is likely to cause significant economic loss. To reduce this loss management practices should be put in the place to control infestations of valuable animals.

Keywords: Cora Botor; Ectoparasites; Ethiopia; Prevalence; Small Ruminants

Introduction

Ethiopia is believed to have the largest livestock population in Africa. The total cattle population for the country is estimated to be about 53.99 million [1], 25 million sheep and 23 million goats), as a result of this, leather has been at the core of Ethiopia's economy since many centuries [2]. Livestock fulfill several functions in the Ethiopian economy by providing food, traction power, cash income, fuel and organic fertilizer. Livestock is also an important provider of export commodities such as live animals, meat, hides and skins and over the past few years, livestock and its products has been Ethiopia's second most important source of export, after coffee [3]. However, poor health and productivity of animal due to disease has considerably become the major stumbling block to the potential of livestock industry [4]. Now a day parasitism represents a major obstacle to development and utilization of animal resource. In Ethiopia ectoparasites in ruminants cause serious economic loss to small holder farmers, the tanning industry and the country as a whole through mortality of

animals, decreased skin of skin and hide [5]. Tanneries reported that 35% of sheep skin and 56% of goats' skin are rejected due to external parasites, and out of the reject groups of the processed skin, about 80 to 90% defects were believed to be due to external parasites. The estimated economic loss due to drop in quality of sheep and goat skin is around USD 25.8 million per year [6].

In Ethiopia external parasites damage livestock hide and skins, sheep skins by cockle an irritation caused by sheep ked (*Melophagus ovinus*) and sheep louse (*Bovicola ovis*), goat skins by tick, sarcoptic mange caused by mites (*Sarcoptic scabies*), some are damaged during slaughter while relatively few are spoiled during preservation. Tick damage is caused by blood sucking parasite-ticks. They usually adhere to the inner part of the hides such as the dewlap and inner parts of legs. The defect has the shape of tiny holes or unhealed scars. These holes can be seen on the grain surface of the finished leather resembling tiny spots and hollows. While developing and growing into the adult organism, the male move about rapidly causing the

host animal to rub and scratch. Secondary infection leads to fare more extensive damage. Badly tick infested animals have poor health and provide hide with lack of substance. The damage to leather caused by tick is so deeply seated that even with grain correction, the scars will persist. The small hole and the more or less healed scars mark the smoothness of the grain and detract from the appearance of the finished leather [7]. Louse infestation arises from attack by a wide range of louse species on cattle, sheep and goats. These pests include both biting and sucking type such as *Linognathus*, *Solenoptes*, *Haematopinus* species (sucking lice) and *Damalina* (biting lice). The lesion caused by louse infestations are often almost circular and small size and the extent of damage to the eventual leather depends on the presence or absence of secondary infection [8].

In general, as a result of their activity ectoparasites may have a variety of direct and indirect effects on their hosts. Ectoparasites commonly ticks, mite, lice, flea and sheep ked affect the host species by the inflammation and the infection they infliction on the skin [9], and by their effect on the physiology of the animals as well as through transmission of different diseases. Infestations by ectoparasites significantly affect the quality of hide there by affecting the economy of Ethiopian farmer as well as international market. Although ectoparasites affect the health and productivity of ruminants, and the economy of the country [5], currently there is a paucity of information regarding to ectoparasites of small ruminants in and around Cora botor district. The present study was carried out to determine the prevalence ectoparasites in small ruminants and to assess host-related risk factors in the study area.

Materials and Methods

Study Area

Chora Boter district is located at 9°-10°24' North latitude and 37°56'-40° 35' East longitude with an altitude range of 1100-2200 m above sea level. The agroecology is characterized by 25% highland, 73.5% mid-highland, and 2.3% lowland. The annual average temperature ranges from 18.3 °C to 26.7 °C. Similar to the Limu Seka district, the district has two seasons. The rainfall is often more than 1,800-2,200 mm per annum. Chora Boter district has 228,846 cattle, 47,854 sheep, 68,037 goats and 215,348 human populations. The management system of the area is extensive (crop-livestock production) and semi-intensive (urban production) systems. Local [10].

Study Animals

The study animals were sheep and goats of both sexes and different age groups (young and adult) in and around Cora botor district.

Sample Collection

The survey of ticks, lice, fleas, sheep ked and mites was conducted on small ruminants of both sexes and different age groups. Collection

of ectoparasites was conducted after proper restraining of the animals. The adult parasites were manually collected from the body surface by hand. Hair coat was parted and examined for ectoparasites on five regions of the body surface namely; head, neck, thoracic, abdominal and tail region, both on the right and left sides of these areas and the collected parasites were preserved in properly labeled plastic containers containing 70% ethanol. The collection bottles were labeled with serial numbers while other data was written on specified register format prepared for this particular purpose (date, address, sex, age and species). Sample was then transported to veterinary laboratory for further identification of the parasites. Identification of the collected ectoparasites was carried out at veterinary laboratory by the aid of stereo- and compound microscope using identification keys set by Wall and Shearer [11] and [12] which includes the morphological appearance of the parasites. The ticks were identified by checking presence or absence of festoms, eye, ventral shield, bont-legged and mouth parts and the lice was mainly identified by appreciation of its mouth part. Skin scrapings from suspected cases of mange lesion was collected and preserved in 10% formalin. Mites were made to be released from scabs and crusts after addition of 10% KOH on the specimens according to the procedure described by Soulsby [12]. Then the parasites were identified based on their morphology including its mouth part, structures of legs and general shape.

Study Design

The study was conducted using cross-sectional study design to determine the prevalence of small ruminants' ectoparasites. The sample was collected from clinic and farms of extensive production system. Detailed examination of animals that was presented veterinary clinic was made and from farms was randomly collected from household of three kebele (Cora bage, Jama, Bage and Mica dire) in and around Cora botor district. From each household the ectoparasites were randomly collected from different species of animals and different sex and age group (young under one year of age and adult above one year of age for both sheep and goats [13] and [14] and age categorization of cattle was done as young and adult according to Pace and Wakeman, [15]. Thus, young age group were less than four years while adult above four years. This age estimation was based on eruption of one or more incisor teeth. Since no studies have been done on the ectoparasites of ruminants in and around Cora botor district in particular, 50% was taken as approximate expected prevalence. So, the sample size was calculated according to [16] sample size calculation, ninety five percent confidence levels, 5% precision and 50% expected prevalence used for the computation. Though, the required sample size was computed was 384.

$$N = \frac{1.96^2 pex(1 - pex)}{D^2}$$

where, N= required sample size

pex= expected prevalence, D= precision

Data Analysis

The collected data was first entered and managed into Microsoft Excel worksheet and analyzed by a statistical software namely, SPSS version 22. Prevalence was determined by the formula described by [16] as the rate of number of infested animals and total number of animals in population. Associations between explanatory variables (species of animals, age and sex) and prevalence were done by chi-square test and $P < 0.05$ were set to indicate significance.

Results

A total of 384 animals (202 sheep and 182 goats) were examined for the presence of ectoparasites. Of these 229 (59.6%) animals (118 sheep and 101 goats) were found to have one or more types of ectoparasites. The overall prevalence of tick, lice, mite, fleas and ked in sheep were 27.2%, 27.7%, 10.9%, 7.9% and 12.4% respectively (Table 1). In goats lice (29.6%) was the most prevalent followed by tick (28.0%), mite (12.1%) and fleas (7.1%) (Table 1). The genera of tick identified on ruminants during this study were *Ambyloma*, *Boophilus* and *Rhipicephallus* with prevalence of 8.5% and 7.1%; 7.5% and 8.2% and 11.4% and 12.6% in sheep and goats, respectively and also the genera of lice identified were *Linognathus* and *Damalina* with prevalence of 9.9% and 20.9%; and 14.9% and 2.7% in sheep and goats, respectively (Table 2). *Linognathus* were the most prevalent in goats while *Damalina* and sheep ked were most abundant in sheep. Statistical analysis has shown that statistically significant difference exists between prevalence of ticks, fleas and sheep ked and species of study animals and between fleas and sex ($P < 0.05$), while no statistically significant difference exists between prevalence of lice and mange mite and sex, age and species of study animals; tick and sheep ked and sex and age of study animals ($P > 0.05$) (Table 3). However, there was relatively high prevalence of lice infestation in sheep than in and goats and high prevalence of mange mite in goats than in sheep and over all prevalence of ectoparasites were high in sheep than in goats and high in female and young animals (Table 4).

Table 1: Prevalence of ectoparasites in small ruminants in and around Cora Botor district.

Ectoparasites	Species		χ^2	P-value
	Sheep (n=202)	Goats (n=182)		
Tick	55 (27.2%)	51 (28.0%)	0.16	
Lice	56 (27.7%)	54 (29.6%)	2.9	
Mite	22 (10.9%)	22 (12.1%)	3.1	
Flea	16 (7.9%)	13 (7.1%)	1.6	
Sheep ked	25 (12.4%)	0 (0.0%)	23.97	0.000*
Overall	118 (58.4%)	101 (55.5%)	0.21	
Total Ground	229 (59.6%)			

Note: n= number of animals examined, χ^2 =Person Chi-Square

Table 2: Genera of ectoparasites identified in species of small ruminants.

Species of Ectoparasites	Species of Animals		Overall
	Sheep n=202	Goats n=182	
<i>Ambyloma</i>	17 (8.5%)	13 (7.1%)	30 (7.8%)
<i>Boophilus</i>	15 (7.5%)	15 (8.2%)	30 (7.8%)
<i>Rhipicephallus</i>	23 (11.4%)	23 (12.6%)	46 (11.9%)
<i>Linognathus</i> species	20 (9.9%)	38 (20.9%)	58 (15.1%)
<i>Damalina</i> species	30 (14.9%)	5 (2.7%)	35 (9.1%)
<i>Sarcoptic scabies</i>	13 (6.4%)	13 (7.1%)	26 (6.8%)
<i>Demodex</i>	9 (4.5%)	9 (4.9%)	18 (4.7%)
<i>Ctenophalides</i> species	16 (8.0%)	13 (7.1%)	29 (7.6%)
Sheep ked	25 (12.4%)	0 (0.0%)	25 (6.5%)

Note: n=number of examined animals

Table 3: Prevalence of ectoparasites in the sheep depending on the sex and age group.

Animal Species	Age/Sex Group	No. (%) of Animals Positive for				
		Tick	Lice	Mite	Fleas	Sheep ked
Sheep (n=202)	M (n=67)	15 (22.3%)	23 (34.3%)	6 (8.9%)	3 (4.5%)	5 (14.7%)
	F (n=135)	40 (29.6%)	33 (24.4%)	16 (11.9%)	13 (9.0%)	20 (29.4%)
	Y (n=57)	16 (28.1%)	17 (29.8%)	1 (1.8%)	4 (7.0%)	6 (19.4%)
	A (n=145)	39 (27.0%)	38 (26.2%)	21 (14.5%)	12 (8.3%)	19 (26.8%)
Overall	N=202	55 (27.2%)	56 (27.7%)	22 (10.9%)	16 (7.9%)	25 (12.4%)

Note: n= number of animals examined, M=male, F=female, A=adult, Y=young

Table 4: Prevalence of ectoparasites in the goats depending on the sex and age group.

Animal species	Age/Sex Group	No. (%) of Animals Positive for			
		Tick	Lice	Mite	Fleas
Goat (n=86)	M (n=61)	14 (22.9%)	10 (16.4%)	2 (3.4%)	0 (0.0%)
	F (n=121)	31 (25.6%)	44 (36.4%)	19 (15.7%)	13 (10.7%)

	Y (n=54)	5 (9.3%)	8 (14.8%)	6 (11.1%)	3 (5.6%)
	A (n=128)	49 (38.3%)	46 (36.0%)	16 (12.8%)	10 (6.3%)
Overall	n=182	51 (28.0%)	54 (29.6%)	22 (12.1%)	13 (7.8%)

Note: n= number of animals examined, M=male, F=female, A=adult, Y=young

Discussion

The result of the present study showed a wide range of single and multiple ectoparasites infestation with an overall prevalence of 59.6% in the study area. This study has shown that ectoparasites are causing problems in ruminant production in the study area. The most common ectoparasites were ticks, mange mite, lice, fleas and sheep ked. One or more of these ectoparasites were recorded 118 (58.4%) of sheep and 101 (55.5%) of goats. Lower prevalence 43.9% in sheep and 10.2% in goats was reported from Ambo [17]. This could be attributed to management and differences in the epidemiology of sampling sites. Lice were found to be the most prevalent ectoparasites followed by mite in goats and in sheep followed by sheep ked. The present study in general revealed that ectoparasites are the most important causes of skin infection and damage. Since skin and hides is important export commodity for Ethiopia ectoparasites are among serious causes of economic losses through down grading of hides and skins [8]. Three genera of ticks (*Amblyoma*, *Boophilus* and *Rhiphicephalus*) were identified in this study. The prevalence of ticks infestation in sheep *Amblyoma* species (8.5%), *Boophilus* species (7.5%) and *Rhiphicephalus* (11.4%) whereas in goats *Amblyoma* species (7.1%), *Rhiphicephalus* (12.6%) and *Boophilus* species (8.2%). Previously some investigators found lower prevalence of *Amblyoma* (0.9%) was observed in Bahir Dar in goats [18]. The difference could be due to difference in agro-ecology management practices. The overall prevalence of lice infestation was 27.7% in sheep and 29.6% in goats.

The overall prevalence is lower than that Desalegn [19] who have reported prevalence of 56.5% in sheep and 55.2% in goats from Kombolcha and 57.0% and 47.1% in sheep and goats respectively in Gondar [20]. But this result is higher than the prevalence recorded in Tigray 1.3% and 6.1% in sheep and goats respectively [21]; in Bahir Dar 3.8% and 9.7% in sheep and goats respectively [18]. Two species of lice (*Linognathus* species and *Damalina* species) were identified from sheep and goats. The prevalence of lice infestation was *Linognathus* species 9.9% in sheep and 20.9% in goats; *Damalina* species 14.9% in sheep and 2.7% in goats; Comparable results; 33.69% of *Damalina* species in sheep and 21.6% of *Linognathus* species in the goats from Gondar [20] and *Damalina* species 22.28% in sheep were reported from Kombolcha [22]. *Linognathus* and *Damalina* species cause defects that appear on the grain side of semi-processed skin after pickling, which is not detected when the skin is examined in its raw or in live animals [23]. The present study also revealed that out of 202

sheep examined, sheep ked (*Melophagus ovinus*) had shown 12.4% prevalence. This is lower than report of (Ababayehu, et al. [22]), 32.57% from Kombolcha and 20.1% from Gondar [20] and higher than the report of (Rahmeto, et al. [21]), 6.7% from Tigray.

Conclusion and Recommendations

Present study showed that ectoparasites are infesting significant proportions of small ruminants in the study area. It was shown that ticks, mange mite, lice, fleas and sheep ked were the major small ruminants pests. All age groups and both sex of livestock were found infested with various type of ectoparasites. Ectoparasites especially lice, ticks and mange mites remain to cause skin damage in the area. Based on the findings of the current study, good veterinary services and management practices put in the place to control infestations of these valuable animals and awareness should be created among the farmers and animal health assistances to indicate the extent of the problem should be recommended.

Conflict of Interests

The authors have no conflict of interest regarding the publication of this paper.

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