

Research Article

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## Prevalence of Small Ruminant Ectoparasites in and Around Hawassa, Ethiopia

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### Abstract

#### Keywords

Ectoparasite,  
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Goats,  
Prevalence,  
Sheep.

The study was conducted in and around Hawassa, a capital city of SNNPRs from November 2016 to April 2017 to determine the prevalence of ectoparasite problem in small ruminants. A total of 384 small ruminants (192 sheep and 192 goats) were examined in the equal ratio for the presence of any ectoparasites. The prevalence rate of ectoparasites in relation to species, sex, body condition, flock type and age of animal were determined. The study revealed that the most common ectoparasites encountered in order of their predominance were tick (10.8%) in both sheep and goat, mange mite (9.37%) in goat and (5.2%) in sheep, lice (6.25%) in goat and (7.3%) in sheep, and fleas (1.56%) in goat and (1.04%) in sheep. The higher ectoparasite infestation rate was found in goats (28%) than sheep (24.5%) in the bases of animals breed and there was no significant ( $p > 0.05$ ) difference in the prevalence rate of all the ectoparasites infestation between sheep and goats. Four species of tick such as *Amblyomma variagatum* (6.25%) in sheep and goat, *Amblyomma gemma* (0.5%) only in sheep, *Rhipicephalus evertsi evertsi* (1.56%) in goat and (0.5%) in sheep, *Bophilusovis* (3.12%) in goat and (3.64%) in goat, two genera of lice, three genera of mite and two flea species were registered. Out of the ticks identified, *Amblyomma* had the highest proportion followed by *Boophilus* and *Rhipicephalus*. *Ctenocephales felis* was the most frequently observed flea species in both sheep and goats whereas; the low prevalence of *Ctenocephalides canis* was also encountered. Lice genera identified were *Damalina* and *Linognathus*. Out of all examined animals in both species, ectoparasite were more prevalent in non-treated animals than treated animals, more prevalent in mixed flock type than single, more prevalent in poor body condition than medium and good and it were also more prevalent in young animal than adult animals. Therefore, to reduce the high prevalence of ectoparasites and their impacts on the productivity in small ruminants, appropriate and strategic control measure should be implemented in the study area.

## Introduction

Small ruminants are important contributors to food production in Ethiopia, providing 35% of meat consumption and 14% of milk consumption (Asfaw, 1997). 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 seasons of crop failure and to meet seasonal purchases such as improved seed, fertilizer, and medicine for rural households (Morel, 1989). It has been estimated that there are more than 38 million of cattle and 30 million small ruminants in Ethiopia. The current level of contribution of the livestock sector in Ethiopia is below the expected potential (CSA, 2007). Export of livestock and livestock by-products have contributed to the economy of the country by providing foreign exchange earnings accounting about 15 and 40% of all export earnings and export from agriculture exports respectively (FAO, 1996).

However, due to several factors, the contribution from sheep and goats resource to either the national or the study area population income is significantly small. Diseases of various etiological origins are among the numerous factors responsible for poor production and productivity. Parasitic diseases are a global problem and considered as a major obstacle in the health and product performance of livestock. Among parasitic diseases, ticks and tick-borne diseases are major constraints to livestock improvement in many parts of the world, especially in the tropics. More than 60 species of ticks infesting both domestic and wild animals have been recorded in Ethiopia (Walker, 2003). Arthropod pests limit production in the sheep and goat industry in many ways. External parasites feed on body tissue such as blood, skin, and hair. The wounds and skin irritants produced by these parasites result in discomfort and irritation to the animal (Sertse, 2004). They can reduce weight gains and milk production. In general, infested livestock cannot be efficiently managed to realize optimum production levels. Small ruminants are exploited in the country for diverse purposes including meat, milk and skin production, breeding and as means of cash income. They also serve similar purposes and functions for people living in urban and rural towns adjacent to the pastoral areas. However, their contribution to food consumption, rural income and export economy is below the expected potential, because small ruminant husbandry is constrained by

compound effect of disease, poor feeding, and poor management (Chalachew, 2001).

Skin diseases cause mortality, decreased production and reproduction and downgrading and rejection of skins. According to tanneries report, skin diseases due to external parasite causes 35% sheepskin and 56% goatskin rejections (Berhanu *et al.*, 2011). It is estimated that 70% of hiding and sheep skins are derived from the highland areas of the country; while 75% of goat skins and about 30% hide output comes from the lowland areas, of these, afar region account 17.55% of goat skin and 10% of sheep skin. Nevertheless, a large number of sheep and goats are slaughtered per annum; quality skins production remains very low due to the effect of ectoparasites (MoARD, 2008). The study done for assessment of major factors that cause skin rejection at Modjo export tannery, Ethiopia, revealed that ectoparasites play a key role in the rejection of skin. All ectoparasites cause intense irritation to the skin, the extent depending on the parasite involved. Infested animals scratch, rub and bite the affected areas and this end up with skin damage. Ectoparasites of small ruminants cause blood loss and very heavy infestations result with severe anemia (Berhanu *et al.*, 2011). Skin parasites of small ruminants such as ticks, lice, fleas, mange mite, and mites are the major agents causing serious economic loss to small holder farmers, the tanning industry, and the country as a whole (ESGPIP, 2009).

In general, Livestock is the principal source of subsistence providing milk and cash income to cover family expenses for food grains and other essential household requirements (mostly consumer goods). In many countries, the final product of the goat production system, besides the kid and the fiber or skin, is the milk, directly used for family consumption or put on the market as a dietetic product (FAO, 2010). Identifying and characterizing the common ectoparasites involved in small ruminants is an important step towards developing and implementing strategic control and preventive measures (Dawit *et al.*, 2012). Hence the species composition and distribution of these parasites is crucial. Therefore the objective of the current study was to estimate the prevalence and to identify the species of ectoparasites which affects small ruminants at the study area.

## Materials and Methods

### Description of study area

The current study was conducted around Hawassa, a capital city of the Southern Nations Nationalities and Peoples Regional State (SNNPRS), which is one of the high potential areas for milk and other livestock product production in Southern Ethiopia. It is located 275 km south of Addis Ababa along the Addis Ababa - Moyale highway. Hawassa is situated at an altitude of 1750 meters above sea level and according to an estimate, it lies between 6°83' to 7°17' N and 38°24' to 38°72' E. It is bounded by Lake Hawassa on the west and north-west, Chelelaka swampy area on the east and south-east, TikurWuha River on the north and Alamura Mountain on the south (CSA, 2007). Hawassa receives an average annual rainfall of 955 millimeters with a mean annual temperature of 20°C and the city has a total area of about 50 km<sup>2</sup> divided into eight sub-cities and 32 kebeles. The availability of large grazing pasture and abundant water resource throughout the year attracted the highland farmers and the low land pastoralists at the area (BoFED, 2007).

### Study Population

Study populations were small ruminants of various sexes, age groups and body condition managed under small holder mixed and single crop-livestock farming system.

### Sampling Method and Sample Size Determination

A cross-sectional study was employed to address the objective of the study. The study animals were selected by systematic random sampling technique and the required sample size was determined based on an expected prevalence of 50% and the formula given by Thrusfield, (2005). The study considered 95% confidence interval and 5% precision level. Accordingly, a total of 384 sheep and goat in equal ratio were selected and studied. During sampling of a study, considered risk factors were species, age, sex and body condition of the animal, flock type in which the animal reared and treatment history of the animal.

### Study Design and Study methodology

The sampled animals were examined for the prevalence of ectoparasite infestation and the presence of major ectoparasite species. A total of 384 animals (192 sheep and 192 goats) in equal ratio were

randomly selected. Before the clinical examination, the age and body condition of each selected animals were recorded. Ectoparasites such as ticks, lice, and fleas were collected by hand from their attachment site and mange mite was collected by skin scrapings, then put in a clean universal bottle with formalin and brought to the laboratory for examination (Walker *et al.*, 2003; Fische *et al.*, 1989).

### Data management and analysis

Data obtained from the collected sample and microscopic examination were recorded on spread sheet of Microsoft Excel and analyzed by using SPSS version 20.0 software program. Logistic regression was used to examine the effects of the various risk factors on the presence or absence of ectoparasites. In all the analysis, comparisons having  $p < 0.05$  were considered to be statistically significant.

## Results

The current study revealed that ectoparasites were common problems in small ruminant production in the study area. The overall prevalence of ectoparasites in small ruminants in current study area was 26.3% and the prevalence in each species (sheep and goat) were 24.5% and 28% respectively. The finding reveals that relationship between animals' body condition, treatment history with acaridae, and flock type with prevalence of ectoparasites were showed significant association with  $P < 0.05$  (Table 1). The most common ectoparasites identified at the area were mange, tick, lice, and fleas with a rate of 5.2%, 10.8%, 7.3%, 1.04% in sheep and 9.37%, 10.8%, 6.25% and 1.56% in goats respectively. Tick was found to be the most prevalent ectoparasites followed by mange in both animal species. This shows that tick was the predominant cause of loss of small animal production (Table 2). The tick species identified in the current study were *Amblyoma variagatum*, *Amblyomagma*, *Boophilus ovis*, and *Rhipicephalus evertsi evertsi* with the rate of 6.25%, 0.5%, 3.64%, and 0.5% respectively in sheep while 6.25%, 0%, 3.12%, and 1.56% respectively in goat. The highly prevalent tick species in small ruminants was *Amblyoma variagatum* followed by *Boophilus ovis*. The common flea species in both goat and sheep were *Ctenocephalides felis* and *Ctenocephalides canis*. *Damalina* lice was the most prevalent lice species in small ruminants than *Linognathus* lice species. The identified Mange mites species in sheep were *Psoroptes* and *Sarcoptes* while in goat were *Demaodex* and *Sarcoptes* (Table 3).

**Table 1: Overall prevalence of ectoparasites in sheep and goat related to their associated risk factors;**

Risk factor		Not infected	Infected	Total	Prevalence (%)	P values
Species	Caprine	138	54	192	28	0.981
	Ovine	145	47	192	24.5	
Flock type	Mixed	221	100	321	31	0.009
	Single	62	1	63	1.6	
Sex	Male	196	66	262	25	0.312
	Female	87	35	122	28.7	
Treatment History	Treated	281	2	283	0.7	0.008
	Not treated	2	99	101	99.3	
Body condition	Good	243	6	249	2.4	0.00
	Medium	38	52	90	57.8	
	Poor	2	43	45	95.6	
Age	Below 3 yr	120	49	169	29	0.02
	Above 3 yr	163	52	215	24	
Total		283	101	384	26.3	

**Table 2: Major Ectoparasites and their prevalence in sheep and goat**

Ectoparasite	N	Goat infected		N	Sheep infected	
		n	Percentage (%)		n	Percentage (%)
Mange	192	18	9.37	192	10	5.2
Tick		21	10.8		21	10.8
Lice		12	6.25		14	7.3
Fleas		3	1.56		2	1.04

**Table 3: Prevalence of major Ectoparasite in species level:**

Ectoparasite		Ectoparasite Species in Goat (N = 192)		Ectoparasite Species in Sheep (N = 192)	
		No. of Species	Prevalence (%)	No. of Species	Prevalence (%)
Tick	<i>Amblyoma variagatum</i>	12	6.25%	12	6.25
	<i>Amblyomagama</i>	0	0	1	0.5
	<i>Boophilus ovis</i>	6	3.12	7	3.64
	<i>Rhipicephalus evertsi evertsi</i>	3	1.56	1	0.5
Fleas	<i>Ctenocephalides felis.</i>	2	1.04	1	0.5
	<i>Ctenocephalides canis</i>	1	0.5	1	0.5
Lice	<i>Damalina</i>	8	4.16	9	4.6
	<i>Linognathus</i>	4	2.08	5	2.6
Mange	<i>Psoroptes</i>	0	0	8	4.16
	<i>Demaodex</i>	10	5.21	0	0
	<i>Sarcoptes</i>	8	4.16	2	1.04

## Discussion

Three genera of ticks (*Amblyoma*, *Boophilus* and *Rhipicephalus*) were identified in the current study. The prevalence of tick species infestation in a goat such as, *Amblyoma* species (6.25%), *Boophilus* species (3.12%) and *Rhipicephalus* species (1.56%) were found and in sheep, *Amblyoma* species (6.77%), *Boophilus* species (3.64%) and *Rhipicephalus* species (0.52%) were identified. Previously some investigators found similar prevalence for ticks in small ruminants especially that of *Amblyoma* in different parts of Ethiopia (Chalachewu, 2001). Also the previous report of Teshome, (2002) who reported that these three tick genera as predominant genera in Sidamma zone of Southern Ethiopia agrees with the current finding. In the current study, a relatively lower prevalence of tick infestation (10.8%) for each in sheep and goat species were observed compared to Abunna *et al.* (2009) who reported a higher prevalence of tick infestation in sheep (87.5%) and goat (89.9%) in Miesso district. Furthermore, the present study also showed relatively lower prevalence as compared to the report by Tadesse, (2010) in Bedelle district who showed 16.3% in sheep and 15.5% in goat.

Two flea species were identified namely *C. felis* and *C. canis* in the current study. Relatively low flea prevalence was encountered in sheep and nearly similar finding in goat with 1.04% and 1.56% respectively compared to the study by Tadesse *et al.* (2011) in Kombolcha who reported a total prevalence of 8.57% in sheep and 1.51% in goat. In the present study, the general flea infestation was showed significant association ( $p < 0.05$ ) between adult and young age groups in both species. The higher prevalence of flea in the adult animals were recorded and it might associated to the grazing system and their increased access to the other animals during grazing and watering in which the flea can easily access the skin and penetrate them without any difficulty. The prevalence of lice was slightly higher in sheep (7.3%) than in goats (6.25%). Genera of lice identified in sheep were *Damalina* (4.6%) and *Linognathus* (2.6%). Also similar genera of lice were found in goats with a rate of 4.16% and 2.08% respectively. The finding in Wolaita sodd reported by Yacob *et al.* (2008a) contrasts with the present finding where lice were found only in sheep. However, a consistent result with the present study was reported by Yacob *et al.* (2008b) where lice infestation were found both in sheep and goats around Adama. The variation might possibly be attributed to management factor such as overcrowding, feeding and climate variations among the study areas.

Lice infestation might be higher in debilitated animals that suffer from malnutrition and intestinal parasitism (Pugh, 2002).

Three genera of mite (*Sarcoptes*, *Psoroptes*, and *Demodex*) were identified in this study. Of the mite species affecting sheep and goats in the study area, *Sarcoptes* was found to be the most prevalent in goats. The current finding agrees with the previous report made by Sherman (1998) who found *Sarcoptes* to be the most prevalent species in Ethiopia. The current study also showed that *Psoroptes* was the dominant mite in sheep than goat. This finding nearly agrees with the report of Teshome (2002) who observed the prevalence of 1.53% in sheep and 0.95% in goats from Sidama zone. *Psoroptes ovis* have been known to cause sheep scab which is a disease of economic and welfare importance in sheep flocks throughout the world. Among the risk factors, the treatment history, body condition and flock type were showed significant associations with the prevalence of ectoparasite ( $P < 0.05$ ). In general, ectoparasites were a significant challenge to small ruminant production and health in the study area.

## Conclusion and Recommendation

The present study revealed that low prevalence and moderate spread occurrence of ectoparasites in small ruminant in the study area. The major ectoparasites identified were tick, lice, fleas, and mite. There were acaricide application campaigns in the study area hence the burden/trend of ectoparasite infestation in the area were remain low. This might be due to the effectiveness, formulation and application of acaricides minimized mixing of animals with infested flock after acaricide application, holding the animal in hygienic manner and control approach as well as lack of ectoparasite amplifying weather condition like lack of rain for a long period of time. Based on the prevailing findings, the following outlooks were forwarded:-

- ✓ Thorough disease prevention and control packages should be established and implemented.
- ✓ Effective extension programs that would raise public awareness on the effect of ectoparasites should be designed and implemented.
- ✓ Further detailed studies should be conducted on the seasonal dynamicity and epidemiology of ectoparasites in the study area that helps to set appropriate measures.

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