

## External Parasite Infestations in Small Ruminants in Wolmera District of Oromiya Region, Central Ethiopia

Jemere Bekele, Martha Tariku and Rahmeto Abebe

Faculty of Veterinary Medicine, Hawassa University, P.O. Box 1337, Hawassa, Ethiopia

**Abstract:** A cross-sectional study aimed at determining the prevalence and identifying the major species of external parasites in small ruminants was carried out in seven localities (peasant associations) of Wolmera district from October 2008 to April 2009. External parasites were collected manually by hand or using forceps (for ticks). Specimens were preserved in 70% ethanol and subsequently examined in the laboratory for identification. Out of 322 sheep and 130 goats examined, 99.38% of sheep and 96.92% goats were infested with one or more external parasites. Seven genera of external parasites were identified in both sheep and goats which belong to lice, ticks, fleas and sheep ked. *Damalinia ovis* (83.23%) was the most dominant of all external parasites identified in sheep while *Amblyomma variegatum* (66.15%) was the uppermost of other external parasites in goats. Moreover, external parasites like *Damalinia caprae*, *Linognathus ovillus*, *Linognathus stenopsis*, *Boophilus decoloratus*, *Rhipicephallus evertsi*, *Melophagus ovinus* and *Ctenocephalides* species were detected at different degrees of magnitude. This finding has unveiled that external parasites are major problems in small ruminants in the study area. Lacks of awareness about the significance of the problems among owners and inaccessibility for control schemes have contributed to the widespread nature of external parasites in the area. In view of the significance of skin and hide production as a main source of foreign currency to the country and the ever increasing demands of livestock market, the high prevalence of external parasites prevailing in small ruminants in the area requires serious attention at the district level to minimize the effect of the problem.

**Key words:** External parasites, prevalence, sheep, goats, Wolmera district, Ethiopia

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### INTRODUCTION

Livestock production is an important sector of Ethiopia's agricultural economy, providing a significant contribution to gross domestic and export products and raw materials for industries. With an estimated 25.02 million sheep and 21.88 million goats (Central Statistics Authority, 2009), small ruminants represent an important component of the farming system, providing about 12% of the value of livestock products consumed at the farm level and 48% of the cash income generated (Kassahun *et al.*, 1989). They contribute to food production, providing 35% of meat and 14% of milk consumption. There is also a growing export market for sheep and goat meat in the Middle Eastern Gulf States and some African countries. At optimum off-take rates, Ethiopia can export about 700,000 sheep and 2 million goats annually and at the same time supply 1,078,000 sheep and 1,128,000 goats for the domestic market. Hides and skins also account for 12-16% of the total value of exports from Ethiopia (Asfaw, 1997). The country has however, benefited little from this enormous

resource owing to a multitude of problems, disease being the most important. Many important livestock diseases that inflict major economic losses occur every year. Currently, different causes of skin diseases in Ethiopia are accountable for considerable economic losses particularly to the skin and hide export.

Of these, the most important problems that result in poor quality skin and hide products are external parasites such as lice, ticks, ked, fleas and mange mites that cause noticeable lesion in the coat (Mullen and Durden, 2002; Pugh, 2002). Their end result may be mortality, decreased productivity and reproduction, downgrading and rejection of skins. External parasites are problem in both extensive and intensive livestock production systems (Phillips, 2005).

Though the magnitude of the problem created by external parasites is believed to be huge, studies conducted in this regard in different parts of the country and information available are little. Hence, it would be essential to have up-to-date information on the importance of external parasites in various ecological regions to provide an option to develop and implement a

cost effective and ecologically sound control strategy in the country. Therefore, this research is aimed at determining the status of external parasites in small ruminants in Wolmera district of Oromiya region (Ethiopia).

## MATERIALS AND METHODS

**Study area:** The study was carried out in seven selected localities (peasant associations) of Wolmera district around Holeta town in West Shewa zone of Oromiya region from October 2008 to April 2009. The area is situated at 9°04'-9°13'N latitude and 38°29'-38°39'E longitude. The average altitude for the area ranges from 2200-2500 m above sea level. It receives an average annual rainfall of 1060 mm. The monthly mean minimum and maximum temperatures are 4.6 and 23.3°C, respectively. Mixed crop-livestock farming system is the basis of livelihood practiced. The livestock population is estimated at 139020 cattle, 75850 sheep, 13237 goats, 19251 equines and 96804 poultry.

**Study animals and sampling method:** Indigenous sheep and goats kept under extensive management system in the area were used for the study considering different age and sex groups. The minimum sample size required was estimated using the formula described by Thrusfield (2005) considering 95% confidence interval with a 5% desired absolute precision. Seven localities (Peasant Associations (PA)) were randomly selected from 22 in the district. With the assumption of 1-10 sheep and goats in one flock study animals from the PAs were then systematically selected from flocks and examined. Moreover, animals brought for veterinary clinical services were also considered whenever they were not examined earlier at PA level.

**Collection and identification of external parasites:** A total of 452 small ruminants (322 sheep and 130 goats) were systematically selected and examined for the presence of external parasites and/or lesions. Records were also taken with regards to age, sex and body condition of each selected animal. Body condition score was made by modifying the scoring system described by Gatenby (2002) and Steele (1996) for sheep and goats, respectively. Likewise, age was also determined as young (up to 2 years) and adult (above 2 years) by considering the rate of eruption of teeth (Gatenby, 2002; Steele, 1996). The clinical examination for external parasites was performed by multiple fleece parting in the direction opposite to that in which hair or wool normally rests and visual inspection and palpation of the skin for parasites and/or lesions on all parts of the animal including ears and digits. External

parasites such as ticks, lice and fleas were collected manually by hand from their attachment sites and by using forceps especially for ticks. Specimens were kept in 70% ethanol in vials for preservation until subsequent examination as described by Taylor *et al.* (2007).

Skin scrapings for mites were processed according to the method described by Wall and Shearer (2001). The collected samples were examined by using stereomicroscope at National Animal Health Research Centre (NAHRC) and identification was performed according to the identification keys given by Okello-Onen *et al.* (1999) and Walker *et al.* (2003) for ticks and Wall and Shearer (2001) and Taylor *et al.* (2007) for lice and fleas.

**Data management and analysis:** After uploading the collected data into Microsoft Excel 2003, it was summarized and then imported to STATA for windows version 9.2. The data was then analyzed by considering different risk factors which were thought to have effect on prevalence of external parasites. Descriptive statistics, percentages, 95% confidence interval and Fisher's exact test were applied to see the effect of different risk factors in comparing infested and non-infested animals. Statistical significance was set at  $p < 0.05$ .

## RESULTS AND DISCUSSION

**Overall prevalence:** Out of 322 sheep and 130 goats examined for external parasites, 320 (99.38%) sheep and 126 (96.92%) goats were infested with one or more external parasites. High proportions of animals in both hosts were found to harbour multiple external parasites (Table 1). No significant variation ( $p > 0.05$ ;  $\chi^2 = 0.06$ ) was noticed in harbouring either single or multiple external parasites between sheep and goats.

Overall, seven genera of external parasites which belong to lice, ticks, fleas or sheep ked were found infesting sheep and/or goats in the study area (Table 2). The most abundant external parasite identified in sheep was lice, i.e., *Damalinia ovis* (83.23%) followed by low rates of infestation with *Amblyomma variegatum* (11.8%) and *Melophagus ovinus* (8.07%).

In goats, infestation with *Amblyomma variegatum* (66.15%) was the most dominant followed by Ctenocephalides species (32.31%) and *Linognathus stenopsis* (20%). No mange mite infestation was ever detected during the study period. The main attachment sites of lice in sheep were belly, shoulder, neck, ear and face while that of ticks were belly, ear and shoulder. In goats, the main attachment sites for tick were ear, belly and leg and for lice was the belly.

Table 1: Intensity of occurrence of external parasite species in infested sheep and goats

Intensity of parasite species/host	Sheep (n = 322)		Goats (n=130)	
	Infested (Prevalence %)	95% CI	Infested (Prevalence %)	95% CI
Single	234 (72.67)	67.78-77.56	88 (69.23)	61.19-77.27
Multiple	86 (26.71)	21.85-31.57	38 (29.23)	21.31-37.15
Total	320 (99.38)	98.51-100.0	126 (96.92)	93.91-99.93

CI: Confidence Interval

Table 2: Overall prevalence of external parasites in sheep and goats

Parasite species	Sheep (n = 322)		Goat (n = 130)	
	Infested (Prevalence %)	95% CI	Infested (Prevalence %)	95% CI*
<i>Melophagus ovinus</i>	26 (8.07)	5.08-11.06	-	-
<i>Damalinia ovis</i>	268 (83.23)	79.12-87.33	-	-
<i>Damalinia caprae</i>	-	-	4 (3.08)	0.07-6.09
<i>Linognathus ovillus</i>	26 (8.07)	5.08-11.06	-	-
<i>Linognathus stenopsis</i>	-	-	26 (20.00)	13.03-26.97
<i>Amblyomma variegatum</i>	38 (11.80)	8.25-15.34	86 (66.15)	57.91-74.40
<i>Boophilus decoloratus</i>	8 (2.48)	0.8-4.19	4 (3.08)	0.07-6.09
<i>Rhipicephalus evertsi</i>	18 (5.59)	3.07-8.11	4 (3.08)	0.07-6.09
<i>Ctenocephalides</i> species	22 (6.83)	4.06-9.60	42 (32.31)	24.16-40.45
Over all	320 (99.38)	98.51-100	126 (96.92)	93.91-99.93

\*CI: confidence interval

Table 3: Prevalence of external parasites in sheep and goats by age groups

Parasite species	Sheep (322)				Goats (130)			
	Young (100)		Adult (222)		Young (44)		Adult (86)	
	Prevalence	95% CI	Prevalence	95% CI	Prevalence	95% CI	Prevalence	95% CI
<i>Melophagus ovinus</i>	8.0	2.6-13.4	8.1	4.5-11.7	-	-	-	-
<i>Damalinia ovis</i>	86.0	79.1-92.9	81.9	76.9-87.1	-	-	-	-
<i>Damalinia caprae</i>	-	-	-	-	-	-	4.7	0.1-9.2
<i>Linognathus ovillus</i>	6.0	1.3-10.7	9.0	5.2-12.8	-	-	-	-
<i>Linognathus stenopsis</i>	-	-	-	-	13.6	3.1-24.2	23.3	14.2-32.4
<i>Amblyomma variegatum</i>	10.0	4.0-15.9	12.6	8.2-17.0	77.3	64.4-90.2	60.5	49.9-71.0
<i>Boophilus decoloratus</i>	-	-	3.6	1.1-6.1	-	-	4.7	0.1-9.20
<i>Rhipicephalus evertsi</i>	-	-	8.1	4.5-11.7	-	-	4.7	0.1-9.20
<i>Ctenocephalides</i> species	14.0	7.1-20.9	3.6	1.1-6.1	50.0	34.6-65.4	23.3	14.2-32.4
Overall	98.0	95.2-100	100.0	-	100.0	-	95.3	90.8-99.9

**Prevalence by age group of animals:** The overall prevalence of external parasite infestations in animals of different age groups revealed somewhat similar pattern in sheep and goats (Table 3). In sheep, infestation for young age group was 98% while 100% in adults. In goats, it was 100% for young and 95.3% for adults. In both host species, young group had significantly higher prevalence of *Ctenocephalides* species than adults ( $p < 0.05$ ), however there were no differences for the remaining external parasites.

**Prevalence by sex groups:** The overall prevalence of external parasite infestations in male and female animals (sex groups) was 98.4 and 100% for sheep and 96.2 and 97.4% for goats, respectively (Table 4). This result revealed that there was no significant disparity in harbouring external parasites between sex groups.

**Prevalence of external parasites in sheep and goats by body condition:** The overall prevalence of external parasites in animals having poor and good body conditions were 100 and 99.3% in sheep and 100 and

96.3% in goats, respectively (Table 5). In both hosts, there were no significant differences in prevalence of all external parasites between body conditions.

This study has shown that 99.38% of the sheep and 96.92% of the goats examined were found to be infested by at least one or more external parasites. The current result reflects that the occurrence of external parasites in small ruminants of the study area is extremely high. Sertse and Wossene (2007) reported about 50.5 and 56.4% prevalence of external parasites, respectively in sheep and goats in different agro-climatic zones of eastern Amhara region of Ethiopia. The finding of such a high prevalence of external parasites in the current study area might have been attributed to poor handling, lack of awareness about the effect of external parasites on small ruminants and to a greater extent lack of access to control schemes. The problem of external parasite seems to be crucial as they are widely distributed despite species, sex, age groups and body condition of animals. Of the lice infestations *Damalinia ovis* was the most prevalent external parasite recorded in sheep while *Linognathus stenopsis* was 3rd rank in goats. The finding of louse infestation might

Table 4: Prevalence of external parasites in sheep and goats by sex groups

Parasite species	Sheep (322)				Goats (130)			
	Male (128)		Female (194)		Male (52)		Female (78)	
	Prevalence	95% CI	Prevalence	95% CI	Prevalence	95% CI	Prevalence	95% CI
<i>Melophagus ovinus</i>	7.8	3.1-12.5	8.3	4.3-12.2	-	-	-	-
<i>Damalinia ovis</i>	81.3	74.4-88.1	84.5	79.4-89.7	-	-	-	-
<i>Damalinia caprae</i>	-	-	-	-	-	-	5.1	0.1-10.1
<i>Linognathus ovis</i>	4.7	1.0-8.40	10.3	6.0-14.6	-	-	-	-
<i>Linognathus stenopsis</i>	-	-	-	-	15.4	5.2-25.5	23.1	13.5-32.6
<i>Amblyomma variegatum</i>	14.1	8.0-20.2	10.3	6.0-14.6	57.7	43.8-71.6	71.8	61.6-82.0
<i>Boophilus decoloratus</i>	3.1	0.1-6.20	2.1	0.04-4.1	-	-	5.1	0.1-10.1
<i>Rhipicephalus evertsi</i>	4.7	1.0-8.40	6.2	2.8-9.6	-	-	5.1	0.1-10.1
<i>Ctenocephalides</i> species	10.9	5.5-16.4	4.1	1.3-6.9	46.2	32.1-60.2	23.1	13.5-32.6
Overall	98.4	96.3-100	100.0	-	96.2	90.7-100	97.4	93.8-100

Table 5: Prevalence of external parasites in sheep and goats by body condition

Parasite species	Sheep ( 322)				Goats (130)			
	Poor (52)		Good (270)		Poor (22)		Good (108)	
	Prevalence	95% CI	Prevalence	95% CI	Prevalence	95% CI	Prevalence	95% CI
<i>Melophagus ovinus</i>	15.4	5.2-25.5	6.7	3.7-9.70	-	-	-	-
<i>Damalinia ovis</i>	84.6	74.5-94.8	83.0	74.5-87.5	-	-	-	-
<i>Damalinia caprae</i>	-	-	-	-	-	-	3.7	0.1-7.3
<i>Linognathus ovis</i>	15.4	5.2-25.5	6.7	3.7-9.70	-	-	-	-
<i>Linognathus stenopsis</i>	-	-	-	-	9.1	0.0-22.1	22.2	14.3-30.2
<i>Amblyomma variegatum</i>	-	-	14.1	9.9-18.3	54.6	31.9-77.1	68.5	59.6-77.4
<i>Boophilus decoloratus</i>	-	-	3.0	0.9-5.00	-	-	3.7	0.1-7.3
<i>Rhipicephalus evertsi</i>	-	-	6.7	3.7-9.70	9.1	0.0-22.1	1.9	0.0-4.4
<i>Ctenocephalides</i> species	7.7	0.2-15.2	6.7	3.7-9.70	100.0	-	18.5	11.1-26.0
Overall	100.0	-	99.3	98.2-100	100.0	-	96.3	92.7-99.9

be indicative of some other underlying problems such as malnutrition and chronic diseases (Mullen and Durden, 2002; Radostits *et al.*, 2007; Wall and Shearer, 2001). The irritation caused by even a modest population of lice leads to scratching and rubbing causing damage to the skin and severe infestation with *Linognathus* species may cause anaemia (Mullen and Durden, 2002; Wall and Shearer, 2001; Taylor *et al.*, 2007). *Damalinia ovis* is mobile and can spread over the entire body causing considerable irritation, restlessness, interrupted feeding and loss of condition and is responsible for development of nodular hypersensitivity reaction lesions (cockle or ekek) in pickled pelts (Heath *et al.*, 1995; Wall and Shearer, 2001). *Damalinia* is much more active than *Linognathus*, roaming in the wool over the whole body of sheep. *Linognathus* affect more goats than sheep and this might be explained by the habit of parasites that *Damalinia* species need much fleece (provided by sheep) than *Linognathus* (Taylor *et al.*, 2007).

Moreover, no significant discrepancy was observed in the prevalence of lice infestations with regard to age groups, sexes and body condition. This could be attributed to the management condition where most animals are kept together providing greater chance for direct contact which contribute for transmission and maintenance of external parasites. Lice are transmitted by direct physical contact; lousy sheep in a flock is the means of spread to new animal (Mullen and Durden, 2002; Taylor *et al.*, 2007) or by contact with contaminated areas

of the environment (Pugh, 2002). Animals in poor condition and that are improperly fed and exposed to cold and debilitating diseases carried the heaviest infestations of lice, since debilitated animals do not groom themselves and leave the lice undisturbed (Mullen and Durden, 2002; Taylor *et al.*, 2007). Despite this fact, body condition has shown no effect in the occurrence of lice infestation in the current study. This might be the result of widespread nature of external parasites in the area letting infestations to occur regardless of body condition or related features.

This study demonstrated that three species of ticks comprising of *Amblyomma variegatum*, *Boophilus decoloratus* and *Rhipicephalus evertsi* were identified both from sheep and goats. Reports of similar composition of species were indicated by Abunna *et al.* (2009) in small ruminants in Mieso district of Ethiopia and in sheep by Regassa (2001). *Amblyomma variegatum* ranked second of all external parasites detected in sheep while it was the uppermost of all external parasites in goats. The finding of *Amblyomma variegatum* in both sheep and goats with greater frequency of occurrence in this study is consistent to Sertse and Wossene (2007). This species of tick is known to be distributed mainly in Africa and transmit the important disease, heartwater and higher in the highland districts where there is grazing pastures and lower in the much woodland and thorny bush areas (Tesfay *et al.*, 2007). Age and body condition had no effect on the prevalence of ticks in both hosts.

This might be linked to the management system of the animals where they are kept together in communal grazing lands with all groups allowed to graze together. *Melophagus ovinus* was found only in sheep and the third most important external parasite observed. An overall prevalence of 12.5% was reported by Sertse and Wossene (2007) only in sheep from different agro-climatic zones of eastern Amhara region where it was recorded in high and midlands.

The current finding is closer and in agreement with this earlier record. According to Radostits *et al.* (2007), the parasite is mainly seen in colder, wetter areas and infestations may be lost when sheep are moved to hot dry districts and seasonal pattern of infestation also occurs. Heavy infestations usually occur in winter months and they decline in the summer. Spread is generally the result of direct contact between hosts. Sheep in poor condition suffer most from infestations (Mullen and Durden, 2002; Radostits *et al.*, 2007; Taylor *et al.*, 2007). As the current study area could be explained with such a cooler climatic condition, the result obtained is in agreement to the above report. Since keds suck blood, heavy infestations may lead to loss of condition and anaemia. The inflammation caused by keds lead to pruritus, biting, rubbing, wool loss and a vertical ridging of the skin known as cockle (Taylor *et al.*, 2007; Wall and Shearer, 2001; Mullen and Durden, 2002).

Flea infestation with *Ctenocephalides* species was higher in goats with overall prevalence of 32.31 and 6.83% in sheep. Such a tendency of abundance of flea in goats was also reported by Sertse and Wossene (2007) where the prevalence was 22.3% in midlands. According to Tesfay *et al.* (2007) flea infestation is usually associated with close contact of animals with infested dog or cat and also the same host. *Ctenocephalides* is the only important genus in the dog and cat but when animals have close contact with infested host they acquire the parasite and develop the signs of itching, pruritus and excoriation. Moreover, high humidity often above 70% is required for oviposition of flea eggs to take place (Wall and Shearer, 2001) and prove favourable for the continuation of life cycle and hence, contribute to their widespread availability in the area.

## CONCLUSION

In this study, seven genera of external parasites belonging to lice (*Damalinia*, *Linognathus*), ticks (*Amblyomma*, *Rhipicephalus*, *Boophilus*), fleas (*Ctenocephalides*) and Ked (*Melophagus*) were the most important external parasites affecting the health and productivity of small ruminants in Wolmera district. Most

small ruminants of the area are found to harbour either single or multiple burdens of external parasite infestations. Lacks of awareness about the significance of the problems among owners and inaccessibility for control schemes have contributed to the widespread nature of external parasites in the area. In view of the significance of skin and hide production as a main source of foreign currency to the country and the ever increasing demands of livestock market, the high prevalence of external parasites prevailing in small ruminants in the area require serious attention at the district level to minimize the effect of the problem. The veterinary personnel (officers) at the district level and the veterinary technicians at the grassroots level need to be mobilized to institute mass treatment programs for urgent action which need to be repeated regularly with simultaneous awareness creation to the owners.

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