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Identification of Major Ectoparasites Infesting Sheep in Aba Jima District, Oromia Region, Ethiopia

Hailegebrael Bedada*¹, Fikru Gizaw¹, Gelane Fekadu¹ and Wossen Negash¹¹ College of Veterinary Medicine, Samara University, P.O.Box 132, Semera, Afar, Ethiopia

Abstract

A cross-sectional study was conducted from November 2013 to July 2014 with the objectives of determine the prevalence and identifying ectoparasites infesting sheep in Aba Jima districts. A total of 646 sheep were examined for presence of ectoparasites. Accordingly, from the total sheep examined 570 (88.24%) were infested with one or more ectoparasites. The ectoparasites identified from were 81.4% *B. ovis*, 0.9% *Linognathus* spp, 19.2% sheep keds, 1.79% *B. decoloratus*, 2.62% *A. variegatum*, 9.29% *R. evertsi evertsi*, 4.3% mixed tick infestation and 32.2% mixed ectoparasite infestation. Age, sex, body condition, management and hair type were not shown association with ectoparasite infestation. However, significantly high prevalence of tick and *M. ovinus* were recorded in female and wooly sheep ($p < 0.05$). Favorable climatic conditions, poor husbandry and animal management, lack of farmer's awareness regarding to the importance of ectoparasite, and weak animal health extension services are believed to have contributed for widespread distribution and occurrences of ectoparasites.

Keywords: Ectoparasites, Ethiopia, Aba Jima, identification, Prevalence, Sheep

Introduction

Agriculture is the mainstay of the Ethiopian economy; it employs over 80% of the adult population and account for 45% of the GDP and 85% of the export earnings. Livestock production performs several functions primarily as source of household incomes, food and animal drought power for livestock producers (UNECA, 2012). Small ruminants represent the most important part of the Ethiopian livestock system; about 24.2 million sheep are estimated to be found in the country (CSA, 2012). In Ethiopia sheep is reared in all agro climatic zones. The highland area comprises 70% of the sheep, while the lowland pastoral and agro pastoral area have 30% of the sheep population (Degume, 2002). However, the current levels of contributions of sheep in Ethiopia, either the macro or micro level is below the expected potential. Among major constraints hindering the productivity of sheep in the country are diseases, among which sheep

skin diseases caused by ectoparasites accounts a wide range of health problems that confront the productivity. Ectoparasites are very common and widely distributed in all agro-ecological zones in Ethiopia (Berhanu *et al.*, 2007; Kumsa *et al.*, 2012; Yacob, 2014).

Skin diseases caused by lice, keds, ticks, and mange mites; are among the major diseases of sheep causing serious economic loss to small holder farmer, the tanning industry and the country as a whole. Skin diseases cause mortality, decreased production and reproduction; in addition to these, currently skin diseases affecting the tanning industry very seriously causing enormous down grading and rejection of skins and hides (Bayou, 1998; ESGPIP, 2010; Yacob, 2013). It is reported that 35% of sheep skin rejections in Ethiopia are attributed to ectoparasites (Bayou,

1998; Kassa 2005). All these established facts imply that ectoparasites pose serious economic losses to the farmer, the tanning industry and the country as a whole (Berhanu *et al.*, 2007; ESGPIP, 2009; Chanie, *et al.*, 2010). According to Demissie *et al.* (2000); Asnake *et al.* (2013) and Yacob (2014), in many part of the Ethiopia, skin diseases due to ectoparasite have prevented many farmers from keeping sheep and becoming serious threat to sheep production.

Despite the large population of sheep in the study region the status of ectoparasites infesting sheep was not yet studied. Therefore, the objectives of this study were determining the prevalence of ectoparasites and identifying ectoparasites found on sheep of the study area.

Materials and Methods

Study Area and Population

The study area is found in the central part of the Oromiya Regional State, astronomically lies between 60 45' N to 80 58'N and 380 32' E to 400 50' E. The mean annual temperature of the study area is found between 20-25⁰C in the low land and 10-15⁰C in the central high land with the mean annual rainfall varies from 633.7 mm to 1059.3 mm. The production system implemented in the study area is mixed crop livestock. According to CSA (2012) the study areas contain a total population of cattle 976,138, sheep 845,182, goats 321,327, Equines 593,272, poultry 1,449,583 and 94,456 beehives (District Agricultural Bureau).

Study Design and Sampling method

A cross-sectional study was employed from November 2013 to July 2014 to address the objectives of the study. The study involves district, peasant associations (PAs) and sheep as a sampling unit. The study districts were selected purposively based on their history of previously study was not conducted. From the total 12 PAs five and from each PAs fifteen flock of sheep were selected randomly. 15-20% of sheep from each flock was randomly sampled. Hence, in order to achieve the proposed objective a total of 646 sheep were included in the study.

Clinical Examinations and Sample Collection

646 sheep randomly selected from the study districts were clinically examined for presences of ectoparasites and/ or lesions. Before clinical examination, PAs, sex, age, body condition and hair size of the selected sheep was recorded. Body condition score of the animal was made as poor and good; by modifying the system described in Gatenby (1991). Age categorization into young and adult was performed as described by Gatenby (1991). Accordingly those sheep (up to 1 year of age) were categorized as young and sheep (older than1 year of age) as adult. The clinical examination was performed by multiple fleeces parting in the direction opposite that in which hair or wool normally rests and visual inspection and palpation of the skin for parasites and/or lesion on all parts of the animals including the ears and the digits. Those sheep found infested by ectoparasites were considered as positive.

Sheep keds, ticks and lice were collected manually from their sites of attachment. The ticks were removed from the host skins whilst retaining their mouth parts for identification using forceps. Coat brushing techniques were used for collection of lice. They were placed in labeled universal bottles containing 70% ethanol and identified under a stereoscopic microscope according to the descriptions of Walker *et al.* (2003) and Wall and Sheare (2001).

Data Analysis

Raw data was carefully recorded and stored in Microsoft Excel database system used for data management. Statistical software package SPSS version 20.0 was used for data analysis. Descriptive statistics and percentages were used to summarize the proportion of infested and non-infested animals. The effect of different risk factors was analyzed by regression and χ^2 test. In the analyses, the confidence level was held at 95% and *P*-value less than 0.05 was considered as significant.

Results

Out of 646 sheep examined for ectoparasite infestation 570 (88.24%) were infested with one or more ectoparasites (Table 1). Ectoparasites identified from sheep of the study area were lice 82.35%, sheep keds

19.2%, tick 17.97% and 32.19% mixed infestation. Lice species recovered were *B. ovis* 81.4% and *Linognathus* spp 0.9%. The tick species identified on sheep from the study district were 1.79% *R. (B). decoloratus*, 2.62% *A. variegatum*, 9.29% *R. evertsi evertsi* and 4.3% mixed infestation.

Table 1: Prevalence of ectoparasites in the study areas.

Ectoparasite	<i>B. ovis</i>	<i>Linognathus</i> spp	<i>R.(B). decoloratus</i>	<i>A. variegatum</i>	<i>R. evertsi evertsi</i>	Mixed tick infestation	<i>M. ovinus</i>	Overall
No infested sheep	526	6	12	16	60	28	124	570
Prevalence %	81.4	0.9	1.79	2.62	9.29	4.3	19.2	88.24

Prevalence of Ectoparasite by Sex

The overall prevalence of ectoparasite in female and male was 88.24% and 88.23% in the study area

respectively (table 2). Statistically significant variation in the prevalence of tick infestation was recorded between male and female sheep of the area (OR=1.861 p=0.035) (table 10).

Table 2: Sex wise prevalence of ectoparasites in the study district

Sex	Ectoparasites				Overall
	<i>B. ovis</i>	<i>Linognathus</i> spp	<i>M. ovinus</i>	Ticks infestation	
Male(n=204)	83.3(170)	1.9(4)	17.6(36)	23.5(48)	88.23(180)
Female(n=442)	80.5(356)	0.5(2)	19.9(88)	15.4(68)	88.24(390)

Prevalence of Ectoparasite by Age

The overall prevalence of ectoparasite in young and adult sheep of the study area was 88.2% and 88.3%

respectively (table 3). Statistically significant difference was never recorded (p>0.05) in the overall prevalence of lice, tick and *M. ovinus* infestations between young and adult sheep of the area.

Table 3: prevalence of ectoparasite in controlled and uncontrolled area by age

Age	Ectoparasites				Overall
	<i>B. ovis</i>	<i>Linognathus</i> spp	<i>M. ovinus</i>	Ticks infestation	
Young(n=254)	83.3(204)	2.4(6)	16.5(42)	14.9(38)	88.23(224)
Adult(n=392)	82.2(322)	-	20.9(82)	19.9(78)	88.3(346)

Prevalence of Ectoparasite by Body Condition

The overall prevalence of ectoparasites in good and poor body condition sheep of the district was 90.1% and 86.2% respectively (table 13). Statistically significance difference in prevalence of tick

infestations (OR=0.478, p=0.015) between sheep with poor and good body condition of the study area was recorded (table 10). However, significant variations (p>0.05) were never observed in the prevalence of *B. ovis*, *Linognathus* spp, and *M. ovinus* infestations between sheep with poor and good body condition.

Table 4: prevalence of ectoparasite in controlled and uncontrolled area by body condition

Body condition	Ectoparasites				Overall
	<i>B. ovis</i>	<i>Linognathus</i> spp	<i>M. ovinus</i>	Ticks infestation	
Poor(n=362)	79(286)	1.1(4)	19.3(70)	22.6(82)	86.2(312)
Good(n=284)	84.5(240)	0.7(2)	19(54)	11.9(34)	90.1(256)

Prevalence of Ectoparasite by Hair Type

The overall prevalence of ectoparasites in hairy and woolly sheep of the study was 78.9% and 48.7%

respectively (table 5). Statistically significant difference in prevalence of *M. ovinus* between hairy and woolly sheep was observed (OR=0.017, p=0.000) (table 9).

Table 5: prevalence of ectoparasite in controlled and uncontrolled area by hair type

Hair type	Ectoparasites				Overall
	<i>B. ovis</i>	<i>Linognathus</i> spp	<i>M. ovinus</i>	Ticks infestation	
Hairy(n=342)	78.9(270)	1.1(4)	-	15.2(52)	78.9(296)
Woolly(n=304)	84.2(256)	0.7(2)	40.8(124)	21.1(64)	48.7(274)

4.2.6. Prevalence of Ectoparasite by Management

The overall prevalence of ectoparasites in separately reared sheep and sheep reared with other animals was 88.9% and 88.1% respectively (table 6). However,

significant variations (p>0.05) were never observed in the prevalence of *B. ovis*, *Linognathus* spp, *M. ovinus* and tick infestation between sheep reared separately and those reared with other animals.

Table 6: prevalence of ectoparasites management wise

Management	Ectoparasites				Overall
	<i>B. ovis</i>	<i>Linognathus</i> spp	<i>M. ovinus</i>	Ticks infestation	
Separately(n=126)	80.9(102)	-	25.4(32)	20.6(26)	88.9(112)
Mixed(n=520)	81.5(424)	1.2(6)	17.7(92)	17.3(90)	88.1(458)

Table 7: Ectoparasite result of the study district

Risk factors	SE	p-value	OR	95%CI for OR	
				Lower	Upper
Age	Young	.914	1.040	.516	2.096
	Adult				
Sex	Female	.952	1.023	.490	2.133
	Male				
Body condition	Good	.196	1.598	.785	3.254
	Poor				
Hair type	Hairy	.310	.697	.347	1.400
	Woolly				
Management	Separately	.911	1.051	.437	2.529
	Mixed				

Table 8: Result of lice infestation in the study area

Risk factors	SE	p-value	OR	95%CI for OR	
				Lower	Upper
Age	Young	.887	1.053	.513	2.162
	Adult				
Sex	Male	.340	1.476	.633	3.282
	Female				
Bodycondition	Good	.491	1.284	.630	2.618
	Poor				
Hair type	Hairy	.273	.670	.328	1.371
	Woolly				
Management	Separately	.912	.952	.394	2.300
	Mixed				

Table 9: Summary results of *M. ovinus* in the study area

Risk factors		SE	p-value	OR	95%CI for OR	
					Lower	Upper
Age	Young	.344	.723	1.130	.575	2.219
	Adult					
Sex	Male	.356	.888	.951	.474	1.910
	Female					
Body condition	Good	.330	.923	.969	.507	1.849
	Poor					
Hair type	Hairy	.733	.000	.017	.004	.071
	Woolly					
Management	Separately	.395	.149	1.767	.815	3.830
	Mixed					

Table 10: Summary results of tick infestation of the study area

Risk factors		SE	p-value	OR	95%CI for OR	
					Lower	Upper
Age	Young	.299	.599	.855	.475	1.537
	Adult					
Sex	Male	.295	.035	1.861	1.044	3.316
	Female					
Body condition	Good	.305	.015	.478	.263	.868
	Poor					
Hair type	Hairy	.289	.345	.762	.432	1.341
	Woolly					
Management	Separately	.351	.621	1.189	.598	2.368
	Mixed					

Discussion

Results presented in this study revealed an overall prevalence of ectoparasites in the study area was 88.24%. This finding is most probably attributable to several important factors including management problems, conducive environment, malnutrition and poor husbandry systems, poor awareness of farmers and inadequate veterinary services in the study districts (Mekonnen *et al.*, 2007; Mekonnen *et al.*, 2001; Pegram *et al.*, 1981). The findings of the current study is comparable with the previous reports from different parts of Ethiopia (Asnake *et al.*, 2013; Asmare *et al.*, 2012; Tewodros *et al.*, 2012) who reported high prevalence and great importance of ectoparasites in sheep.

Lice infestation was the most prevalent ectoparasite recorded in the study area 82.35%. The effects of climate change and other factor such as changes in animal management and husbandry systems, usage of antiparasitics and increase in animal trafficking or movements may also contribute to the changes in the

prevalence, or emergence of lice infestation in certain localities (Kufman *et al.*, 2012). High prevalence of lice recorded in the study area is inline with other findings of (Yesehak, 2000). However, current finding is much higher than other studies (Shibeshi *et al.*, 2013; Asmare *et al.*, 2012; Dawit *et al.*, 2012; Tewodros *et al.*, 2012; Rahmeto *et al.*, 2011; Enquebaber *et al.*, 2010; Mulugeta *et al.*, 2010). Such differences in prevalence might arise from season during which the study was conducted, variations in management, health care of sheep in the study areas, and the sensitivity of the diagnostic method used. Lice infestation may reflect some other underlying problems such as malnutrition and chronic diseases (Wall and Shearer 2001). The possible reasons for such high prevalence of lice in the study area include management problems, poor feed availability, and inadequate veterinary services. *B. ovis* was the most common louse that infesting sheep of the study area. The prevalence of *B. ovis* recorded in the district was correspondent with work made in other parts of the country by Jemere *et al.* 2011.

M. ovinus was the second most important ectoparasite observed on sheep of the study site 19.2%. According to Radostitis *et al* (1994) in the hot, humid tropics the parasite is restricted to cooler highlands and infestations may be lost when sheep are moved to hot dry areas. Andria *et al* (2006) suggested as an account for this fact; temperature may play an important role in the dynamics of the keds. The finding of higher prevalence *M. ovinus* on woolly sheep of the study area (19.2%) while its total absence from hairy sheep of the area is suggestive of the fact that woolly breeds are susceptible to ked infestation (Wall and Shearer, 2001). woolly sheep of the study site were 0.715 times at risk for *M. ovinus* infestation. The current findings of sheep *M. ovinus* is inline with previous works conducted in different part of the country by (Asmare *et al.*, 2012; Bersisa *et al.*, 2012; Mulugeta *et al.*, 2010; Tewodros *et al.*, 2010).

Tick infestation with an overall prevalence of 17.97% was recorded in the study district. The current study was conducted in highland area, with tick prevalence was less than most studies accompanied in the country this might be due to higher temperatures and relative humidity and prolonged sunlight favour the survival and reproduction of ticks, as has been suggested by Pegram *et al.* (1981) and Kumsa *et al.* (2012). Current finding is in agreement with the previous observations reported by (Asnake *et al.*, 2013; Tadese *et al.*, 2013; Tewodros *et al.*, 2012; Mulugeta *et al.*, 2010). Heavy tick burden cause sufficient worry to interfere with feeding which may lead to loss of production and weight gain. They also cause anemia and loss of production (Radostits *et al.*, 1994; Wall and Shearer, 1997). Hence, the prevalence of tick infestations in poor sheep of the study area was significantly ($p=0.015$) higher than sheep with good body condition and sheep with poor body condition score were 0.478 times higher at risk of infestation by ticks than those sheep with good condition. This finding coincides with the previous reports of Tefera (2004), Mulugeta *et al.* (2010) and Tewodros *et al* (2012). Likewise the prevalence of tick infestation was significantly higher in females than males ($p=0.035$). Female sheep were 1.861 times higher at risk of infestation with tick than male. This finding might be due to female sheep stay in the flock for long period of time while male may sold as age of around six month to year. Likewise during breeding season and nursing time female sheep are in close contact with the rams and the lambs. Therefore, such conditions favour transmission and maintenance of tick in the area.

Several health problems, welfare issues and losses in productivity due to blood loss, pain, lameness, irritation, debilitation, mechanical damage, inflammation and hypersensitivity, secondary complications and transmission of pathogenic agents to sheep in the current study areas are possibly associated with the ectoparasites identified, as has been described by Kok and Fourie (1995), Jongejan and Uilenberg (2004) and Mekonnen *et al.* (2007). For instance, Walker *et al.* (2003) have described *R. (B.) decoloratus* as a vector of *Borrelia theileri* in ruminants and horses. In addition, Kumsa *et al.* (2012) recently reported molecular detection of zoonotic bacteria pathogenic to humans from *M. ovinus* and *B. ovis* of sheep and other lice of ruminants in Ethiopia. The other ectoparasites such as ticks are well-known vectors of piroplasmosis and rickettsial diseases of ruminants, zoonotic rickettsial, and viral diseases (Kumsa *et al.* 2012a; Mekonnen *et al.* 2007; Pegram *et al.* 1981; Walker *et al.* 2003). In view of these facts, ectoparasites should play a role in the transmission of pathogenic organisms to sheep of the study areas.

Conclusion

This study was conducted to identify the major ectoparasites infesting sheep and associated risk factors in Guna district. Therefore, 646 sheep were examined for presence of ectoparasites and from the total sheep examined 570 (88.24%) were found positive. The most important ectoparasite identified in this study were lice, sheep keds and tick. Lice were the most abundant ectoparasite which followed by sheep keds and tick. Ectoparasites are among the major causes of sheep production constraints and quality deteriorations of exported skin in the Ethiopia. In view of the findings of the present study it is possible to conclude that the awareness of the local farmers on the way of ectoparasites transmission and impact on the production and productivity is low. In addition the trend of rearing different animal species together may favour the transmission of ectoparasites. Therefore, control programs should be designed and implemented with the participation of all stakeholders and there should be strong coordination between neighboring regions and/or districts with strict follow up and control.

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