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Bovicola ovis and *Melophagus ovinus*: Spatial distribution on Menz breed Sheep

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Abstract: This study was done from September 2006 to May 2007. A total of 105 Menz breed sheep from Yemenze Gera Midir district in the Amhara National Regional State, Ethiopia. The spatial distribution of sheep keds (*Melophagus ovinus*) and chewing lice (*Bovicola ovis*) on Menz breed sheep were examined which were naturally infested. The densities if sheep keds and lice were determined through counting after parting of the fleece/wool at five (5) points on a length of 10 cm areas of six (6) different regions (neck, shoulder, belly, back, rump and flank) on both sides of the body which sum up sixty (60) points of count. The percentage values of *Bovicola ovis* distribution on the sheep for the inspected regions were 57.5% on shoulder, 53.32% neck, 51% rump, 49.25% flank, 45.36% belly and 45.28 back. For *Melophagus ovinus* infested sheep, the sites more parasitized were flank, shoulder, rump, neck, belly and back with proportion of 69, 60.12, 51, 42, 33 and 21, respectively in order of importance. The minimum and maximum keds and lice count on a sheep at a time were varied between 0 to 178 and 0 to 1050 respectively. However, most frequently the number of keds and lice were range between 18-30 and 0-100 respectively. Infestation of sheep with sheep keds has statistical significant difference among the different regions examined and no statistical significant difference exist for lice at 95% confidence interval (CI) and p value of less than 0.05.

Key words: *Bovicola ovis*, Ethiopia, *Melophagus ovinus*, menz breeds, spatial distribution

INTRODUCTION

Small ruminants are important components of the Ethiopian farming system. The total number of sheep and goats in Ethiopia are 25.5 and 23.4 millions (CSA, 2008). Ethiopia offers a wide range of processed and semi-processed sheep and goatskins to the world market. Some of the skin and the skin products such as the high land sheepskin wing to its quality and natural characteristics have gained international reputations for making glove. Based on the off take rates of 33% for sheep and 32.5 for goats the annual production of skin is estimated at 16.6 million pieces. The total earnings of the country from 1998 to 2004 ranged between 405 USD and 590 millions of USD with annual average of 450 million USD for both hides and skins (Tadesse, 2005).

However, their contribution to food production, rural income and export income are still far below the expected potential. This is because small ruminants particularly sheep production in Ethiopia is constrained by the compound effects of diseases, poor feeding and poor management. Lice, keds, mange mites and ticks are major ectoparasites of small ruminants (Sertse and Abebe, 2007 a, b; Mulugeta *et al*., 2010; Berhanu *et al*., 2011). Losses from these skin diseases are due to downgrading and rejections of skins, unthrifitness, loss of body condition, mortality and decreased in production. This is reflected in tanning industries of the world in general and in Ethiopia in particular. Kassa *et al.* (1998) showed that skin diseases due to external parasites causes 35% of sheep skins and 56% of goat skin rejections in some of Ethiopian tanneries. Different studies and reports from different parts of the country showed that skin quality deterioration is very evident (Asegedech *et al*., 1999; Tefera, 2004; Mersha *et al*., 2010).

However, no work has been done on the spatial distributions of these ectoparasites on live animals. The determination of the spatial distribution of *Melophagus ovinus* and *Bovicola ovis* in particular and the other larger ectoparasites in general on sheep is very crucial to know their site of preference and their by applying control and prevention measures. Therefore, the main objective of this research was determining the spatial distribution of *Melophagus ovinus* and *Bovicola ovis* on Menz breed sheep in northeastern Ethiopia.

MATERIALS AND METHODS

Study area: The study was conducted in Yemenze Gera Midir district which is located at 256 km to northeast of Addis Ababa in Amhara National Regional State, Ethiopia. The topography of the area consists of 40% plain, 50% undulated with hilly, and 10% steepy slopes with cliffs . The area is divided into Dega and Woina-

Dega agroecologies with an altitudinal range of 2200-3100 m above sea level (masl). The area is characterized by low rainfall and cold temperature. The average annual rainfall and temperature are 724 mm and 12.5ºC, respectively. Mixed crop livestock production system is most widely practiced in this District (CSA, 2008; Abebe *et al*., 1999).

Study population: Indigenous Menz breed sheep managed under extensive management system were targeted study animals. Sheep brought to Veterinary clinics of Yemenze Gera Midir district were sampled for lice (*Bovicola ovis*) and sheep keds (*Melophagus ovinus*).

Study design:

Sampling method: Purposive sampling method was used to select animals. This is through clinical signs, gross lesions and observed ectoparasites on fleece parting on sheep.

Clinical and laboratory examination: A total of 105 sheep were clinically examined for the presence of ectoparasites. The clinical examination was performed by multiple fleece parting in the direction opposite to that in which wool normally rests. Visual inspection of the skin and wool were conducted to detect parasites. All parts of the body including the ears and the digits were examined. Ectoparasites (lice and sheep keds) were collected from the animals and preserved in 70% alcohol (Urquhart *et al*., 1996). Samples were then examined under stereomicroscope and parasite identification was performed according to the identification keys of Wall and Shearer (2001) and (Urquhart *et al*., 1996).

Lice and keds scoring: It was carried out on 105 out of 1000 sheep examined in the clinics. These were infested with either lice or keds or both. Then these animals were restrained. The parasites were then counted at six different parts of the body (neck, shoulder, flank, back, belly and rump). On each site a length of ten centimeters were examined to count the parasites by parting the wool/hair. Parasites on five such partings were counted at each site. Then parasite count on sixty partings on left and right side of the body were recorded. Based on the counts of lice and keds the degrees of infestation were determined quantitatively.

Calculations and statistical analysis: The arthmetic mean count of lice and keds (AM) was calculated as: AM = (Count S_1 + Count S_2 + …+ Count S_6/Sn). Where Sn = the number of sites on an individual animal. For the analysis of lice and keds scoring for these sites of infestation data were entered into Microsoft Excel. Statistical software Intercooled Stata 7 and (SPSS, 17.0) for windows were used for analysis. Descriptive statistics, percentages and 95% confidence interval were used to summarize the proportion of the severity of lice and keds infestation. Statistical significance was set at $p<0.05$.

RESULTS AND DISCUSSION

Bovicola ovis and *Melophagus ovinus* are economically important in Yemenze Gera Midir district. The common sites of infestation for *Bovicola ovis* were the skin of shoulder (57.5%), neck (53.32%), rump (51%), flank (49.25%), belly (45.36%) and back (45.28). For *Melophagus ovinus* infested sheep the sites parasitized were flank, shoulder, rump, neck, belly and back with proportion of 69, 60.12, 51, 42, 33 and 21%, respectively in order of importance. There was no significant difference among the sites of infestation for *Bovicola ovis* in sheep but there exists for *Melophagus ovinus* (Fig. 1 and 2).

Bovicola ovis and *Melophagus ovinus* count by parting the wool at 5 points on a length of 10 cm areas of 6 different sites (neck, shoulder, belly, back, rump and flank) on both sides of a sheep were done. This sums up 0 points of count. Therefore the minimum and maximum

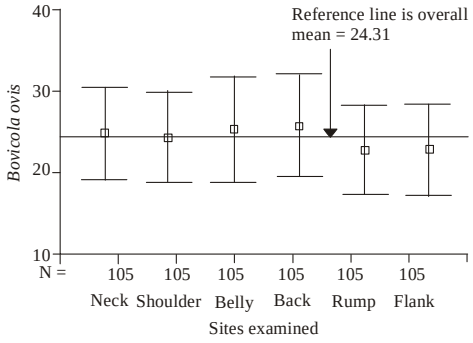

Fig. 1: Box-plot distribution of *Bovicola ovis* count by the site of infestation on taking 95% confidence interval for the mean (reference line)

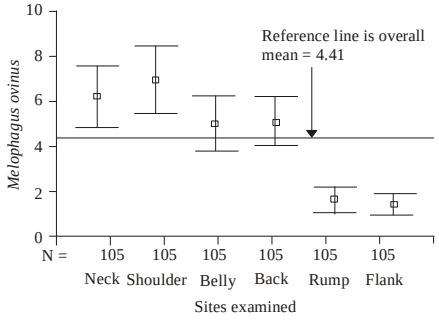

Fig. 2: Box-plot distribution of *Melophagus ovinus* count by the site of infestation on taking 95% confidence interval for the mean (reference line)

Table 1: Total count, percentage and frequency distribution of *Bovicola ovis* and *Melophagus ovinus* on sheep

Group	Lice count	Freq.	%	Cum. freq.	Keds count	Freq.	%	Cum. Feq.
01	0-100	30	28.57	28.57	0-17	16	15.24	15.23
01	101-200	20	19.04	47.67	18-34	25	23.81	39.05
03	201-300	8	7.62	55.27	35-51	20	19.04	58.09
04	301-400	10	9.52	64.79	52-68	16	15.24	73.33
05	401-500	10	9.52	74.31	69-85	5	4.76	78.09
06	501-600	10	9.52	83.83	86-102	6	5.71	83.8
07	601-700	10	9.52	93.35	103-119	8	7.62	91.42
08	701-800	4	3.81	97.16	120-136	6	5.71	97.13
09	801-900	1	0.95	98.11	137-153	1	0.95	98.08
10	901-1000	1	0.95	99.06	154-170	0	0	99.08
11	1001-1100	1	0.95	100	171-187	2	1.91	100
Total		105	100			105	100	

Table 2: Confidence interval for the population means at a 95% confidence level of the *Bovicola ovis* and *Melophagus ovinus* by site of inspection

Site of inspection	Lice/keds	No. of onimals	Mean	95% conf. Interval
Neck	Lice	105	25.2	20.40-29.99
	Keds	105	5.028	4.13-5.92
Shoulder	Lice	105	25.82	21.14-30.49
	Keds	105	5.13	4.31-5.95
Belly	Lice	105	22.77	18.69-26.85
	Keds	105	1.63	1.24-2.03
Back	Lice	105	22.87	18.79-26.96
	Keds	105	1.44	1.09-1.80
Rump	Lice	105	24.81	20.68-28.95
	Keds	105	6.24	5.26-7.72
Flank	Lice	105	24.39	20.31-28.46
	Keds	105	6.95	5.86-8.03

lice counted on a sheep were 0 and 1050 and for keds minimum of 0 and maximum of 178, respectively were registered. Most frequently lice and ked number lies in the range of 0-100 and 18-34 counts. Generally,>50% of sheep harboring these parasites having <300 lice and 51 *Melophagus ovinus*, respectively (Table 1 and 2).

Flank, shoulder, rump, neck, belly and back are the most important predilection sites found for sheep keds (*Melophagus ovinus*) and lice (*Bovicola ovis*). But this spatial distribution for sheep keds and lice were conditionally varied. Lice and keds were found on most wool covered areas of sheep although they were rare on the belly. They are not evenly spread over but have a clumped/aggregated distribution. In most observations, the densities of lice and keds were highest along the sides and on the back of sheep. Similar descriptions have been indicated in James and Moon (1999), Asp and Tauni (1988), Ward and Armstrong (1999), Ward and Armstrong (2000) and Small (2005).

The present study indicated that the more the concentrations of lice and keds the more is the signs of scratching and restlessness. Similarly, other studies found out that "Ekek", an Amharic word for cockle is severe with dense infestations of *Bovicola ovis* and *Melophagus ovinus* (Asegedech *et al*., 1999; Sertse and Abebe, 2007 a, b). Heath *et al*. (1995a) added that there is a direct correlation between louse (*Bovicola ovis*) scores and cockle, high louse scores being associated with a more severe degree of cockle. Legg *et al*. (1991) come across with the result that economic losses from the effects of feeding and scratching due to sheep ked on the skin with hard nodules (cockle) reducing the value of the skin. This louse and ked infestations may indicate some underlying problem such as malnutrition and chronic diseases.

Shearing removes lice and keds and causes mortality by exposing them to environmental factors. After shearing a greater proportion of the population are found at sites on lower body regions such as under the neck, lower flanks and upper legs (shoulder) and in areas where the wool has not been closely shorn (James *et al*., 1998). It is therefore particularly important that effective concentrations of insecticide are applied to these regions to gain good effect from post-shearing treatments and to prevent the development of resistance (Urquhart *et al*., 1996).

These have paramount economic losses due to skin downgrading and rejections incurred by the tanneries. Skins infested with *Bovicola ovis* and *Melophagus ovinus* were observed to have "Ekek" (an Amharic word for cockle). Kassa *et al*. (1998), Asegedech *et al*. (1999) and Sertse and Abebe (2007 a, b) in studied that "Ekek" was resulted in connection with the *Bovicola ovis* and *Melophagus ovinus* in sheep and *Linognathus* species and sarcoptic mange in goats which in support of the present finding. Heath *et al*. (1995b) added that there is a direct correlation between louse (*Bovicola ovis*) scores and cockle, high louse scores being associated with a more severe degree of cockle. Legg *et al*. (1991) and Heath *et al*. (1996) indicated that economic losses from the effects of feeding and scratching due to sheep ked on the skin with hard nodules (cockle) reducing the value of the skin. Louse infestation may indicate some underlying problem such as malnutrition and chronic diseases (Wall and Shearer, 2001). The irritation caused by even a modest population of lice leads to scratching and rubbing, causing damage to the skin (Kettle and Lukies, 1984) and severe infestation with *Linognathus* spp. may cause

anemia (Wall and Shearer, 2001). The gross lesions in sheep and goats are typical: presenting as nodules, loss of wool/hair, papules wheals, pruritis, scale crust, ragged wool and stained wool. Holdsworth *et al*. (2006) highlighted the same gross lesions of lice and sheep ked infestation.

When sheep are not thoroughly treated, lice and keds may be confined to untreated areas or areas of low chemical concentration. Once the residual effects of the chemical wane the lice and keds can spread over the remainder of the body and to other sheep. When inspecting sheep for lice, at most times of the year greatest attention should be paid to the sides and back of the sheep. However, soon after shearing inspections should also include the neck and lower body regions and areas where longer wool has been left.

It should be noted that the chance of detecting lice in the early stages of an infestation is very low. For example, for a sheep with 10 lice, the probability of detecting the infestation by inspecting 10 parts is less than 5%. Even with 40 parts the probability is less than 20% (James *et al*., 2002). If this sheep is running in a mob with many other louse free sheep the chance of both choosing the infested sheep and then finding lice on it once it is selected is extremely low indeed. However, rubbing is a powerful indicator of infestation and choosing a sheep with rubbed fleece greatly increases the likelihood of detection (James *et al*., 1998). Under most conditions more than 70% of nymphs and 60% of adults are found within 6 mm of the skin surface. However, when the fleece is shaded and warm lice will move up to the fleece tip. All instars of lice can be found in the tip wool at times, but most are adults or third instar nymphs (Ward and Armstrong, 1999; Murray, 1968).

CONCLUSION

Lice are easily overlooked because of their small size but they have the capacity to multiply very fast before being discovered. By this time, the animal might be too anaemic and emaciated to recover. The saliva and feces of lice contain substances capable of causing allergies giving rise to severe irritations to the skin. This is usually shown by the animal rubbing itself against objects. General unthrifitness, matted, dull fleece with tufts of wool may indicate lice and keds infestation. Animals exhibit reduced weight gain and loss in production. Lice and keds are also associated with development of cockle. Cockle is an inflammatory response of the skin to the presence of lice, keds and their saliva. This is seen after the wool or hair has been removed from the skin or at the stage of semi processed skins. Sheep in poor body condition are likely to be seriously affected.

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