Journal of Biology, Agriculture and Healthcare
ISSN 2224-3208 (Paper) ISSN 2225-093X (Online)
Vol.7, No.3, 2017

Prevalence Study of Sheep Lice and Species Composition in Tiyo District of Arsi Zone

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Abstract
A study was carried out to evaluate the prevalence of lice on sheep from October 2012 to March 2013 in three selected PAs of Tiyo District of East Arsi Zone. A cross-sectional study of sheep lice was used as subject of the study. Accordingly, 300 sheep were randomly examined to identify the species of sheep lice and record was made. In this study, two species of lice which grouped under two genera were identified. The study revealed that *Damalinia ovis* was the dominant lice followed by *Linognathus ovillus* with prevalence of 73.34%, 0.01% respectively and an overall prevalence of 83. 34% in 300 examined sheep was recorded. The difference in the prevalence of lice infestation between sex, age and body condition was found to be statistically non significant ($p>0.05\%$). Statistically significant difference ($\chi^2=29.389\%$, $p=0.000$) was observed between each PAs; Gorasilingo (96.8%), Konicha (73.6%) and Dosha (71.8%). Favorable climatic conditions, backward level of management, poor level of consciousness and awareness of farmers and weak animal health extension services are believed to have contributed for widespread distribution and occurrence of lice. Attention should be given to the control and prevention of lice, since they cause severe damage to the skins of sheep and thereby reduce the foreign exchange of the country.
Keywords: Lice, prevalence, sheep, Tiyo district, south East Ethiopia.

1. INNTRODUCTION

It has been estimated that more than 38 million cattle and 30 million small ruminants, constitute the major portion of livestock resources in Ethiopia (CSA, 2004). In Asella and its surroundings a total of 98966, 33817, 16121, 6913, 8109 and 1358 cattle, sheep, goats, donkeys, horses, and mules were found, respectively (APEDO, 2008).

The livestock sub-sector contributes 16% of the total GDP and over 30% of the agricultural GDP, with an estimated 47.57 million cattle, 26.12 million sheep, 21.71 million goats, 1.01 million camels and 7.73 million equines (Abera *et al*., 2010). In the central highlands of Ethiopia where mixed live-stock production system is practiced, small ruminant accounts for 40% of cash income and 19% of the household meat consumption. 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 the owner (Abunna *et al*., 2008). Ethiopia is earning significant foreign currency by exporting skins and hides to international market (Kassaye and Kebeda, 2010).

Even though small ruminants are important components of the farming system in Ethiopia, their contributions are far below the expected potential. Endoparasites, Ectoparasites and management problems are known to be the main factors that can affect the productivity (Tadesse and Mabrahitu, 2010; Mulugeta *et al*., 2010). Their small size, high reproductive capacity and rapid growth rate makes small ruminants more flexible for research and development agencies than cattle (Alemu, 1996).

According to the study conducted by Hailu (2010), the recorded prevalence of ectoparasites of sheep were; *D. ovis* (*Damalinia ovis*) (67.1%), *Melophagus ovinus* (5.65%), Tick infestation (23.8%), *L. ovillus (Linignathus ovillus*) (14.6%), sarcoptic mange (0.3%) and psoroptic mange (1%). In Ethiopian tanneries, 35% of sheep and 56% of goat skins have been downgraded and rejected due to defects caused by external parasites (Channie *et al*., 2010). Skin problems caused by lice, keds, ticks and mange mites can result in mortality, decreased production and reproduction, down grading and rejection of skins (Abebe and Tefera 2007).

Many ectoparasites harm the health of their hosts by blood sucking and this leads primarily to often enormous losses of blood. Furthermore, the biting sites become super infected with bacteria and these wounds attract licking flies (Heinz *et al.,* 2010).

Accordingly, the enormous economic losses incurred by lice in sheep necessitate thorough investigation on their incidence in order to organize efforts to at least minimize losses. Therefore, the objectives of the current study were to estimate the prevalence of sheep lice in the study area, to identify the species of lice that is more prevalent in the study area and to assess the potential risk factors associated with sheep lice infestation.

2. MATERIALS AND METHODS

2.1. Study Area

The study was conducted in Tiyo Woreda at three peasant associations (PAs) of East Arsi Zone, from October 2012 to March 2013. The three selected PAs are Konicha, Dosha and Gorasilingo. The production system is mixed crop livestock in which livestock are managed under extensive system in all the three PAs (APEDO, 2008). Asella is located about 175 km South East of Addis Ababa at $6^0 59'$ to $8^0 49'$N and $38^0 41'$ to $40^0 44'$S. And its surroundings are in the highland areas with altitude ranging from 1780-3100m above sea level. The area has mild subtropical weather with minimum and maximum temperature ranging from 5^0C to 28^0C, and relative humidity ranging from 43% to 60%. The area has bimodal rainfall, occurring from March to April (short rainy season) and July to October (long rainy season) (APEDO, 2008).

2.2. Study population

Indigenous sheep owned by farmers and managed under extensive management system in three selected PAs constitutes the study animals. Individual sheep was selected randomly and examined for the lice infestation.

2.3. Sampling and Sample Size Determination

The study was a cross-sectional study where household and sheep from household is selected using simple random sampling method taking neighborhood in each PA as a sampling frame. The sample size for the study was determined based on expected prevalence of the disease in the district which was75.5% (Hailu, 2010). The total number of sheep required for the study was calculated based on the formula given by Thrusfield (2005) using simple random sampling method by taking 95% confidence interval and 5% absolute precision. Accordingly, the number of sheep required to estimate the prevalence of sheep lice for this study was calculated to be 284. However, the sample size has been increased to 300 to generate more reliable data.

2.4. Investigation procedure

Both field and laboratory investigation was conducted to find out the most prevalent species of lice in the area.

2.5. Study Design and Methods

Sheep in the target PAs were selected randomly from animals grazing on communal pastures. Before clinical examination, explanatory variables such as sex, age and body condition were recorded. Body condition score of the animals was classified as poor, medium and good and was made as described in Mulugeta *et al.* 2010. Age categorization as young and adult was made as described in Gatenby, 1991. Accordingly, sheep under 1 year of age were categorized as young and the rests were classified as adult.

Clinical examination was conducted by partitioning the lice as lice of neck, shoulder, wither, flank and ramp in the direction opposite to that in which wool or hair rests and visual inspection was made. Any animal presented with any stage of life cycle of lice was considered as positive. Lice were collected during clinical examination and identified according to the keys provided by Urquhart *et al*.1996.

2.6. Data Analysis

The collected data was recorded on Microsoft Excel for data management. Chi-square was used for comparison of binary variables. The effects of different epidemiological risk factors such as PAs, sex, age and body condition on prevalence of sheep lice were analyzed by logistic regression using SPSS software windows version 17 and $p<0.05$ was considered to be statistically significant.

3. RESULTS

Out of 300 sheep examined, 241 (80.34) of sheep were found to be infested with one or both lice species. *D. ovis* (73.34%) were more prevalent than *L. ovillus* (0.01%) in each PA. Only few animals were ever found to be free of lice (19.67%) during the study period. *L. pedalis* and *L. africanus* were not found in this study site.

The rate of lice infestation was higher in young 111 (84.73%) than adult sheep 130 (76.92%). There was no statistically significant difference ($p>0.05$) in the prevalence of lice infestation between age groups (Table 1).

Table 1. Prevalence of lice infestation based on age group

Age	No. examined	Positive	Negative
Young	131	111 (84.73%)	20 (15.26%)
Adult	169	130 (76.9%)	39 (23.07%)
Total	300	241 (80.34%)	59 (19.67)

χ^2 3.474; p=0.324

The prevalence rates in lice infestation in animals with good, medium and poor body condition were 80%, 8.6% and 81.53% respectively (table 2). The occurrence rates in lice infestation among animals with different body conditions were closer. Thus, the difference in prevalence among animals with good, medium and

poor body condition was not statistically significant (P>0.05).

Table 2. Prevalence of lice infestation on the basis of body conditions

Body condition	No. examined	Non infestation	Infestation rate
Good	71	14 (19.72%)	57 (80.28%)
Medium	99	21 (21.2%)	78 (78.8%)
Poor	130	24 (18.47%)	106 (81.53%)

χ^2 3.474; p=0.324

This study recorded higher prevalence of lice infestation in male 86 (86.8%) than in female 155 (77.1%). The difference in prevalence of lice infestation between sex groups (table 3), was not statistically significant (p>0.05%).

Table 3. Distribution of lice infestation between sex groups.

Sex of the animal	No. examined (%)	No. infested (%)	No. non infested (%)
Male	99	86 (86.8%)	13 (13.2%)
Female	201	155 (77.1%)	56 (22.9%)
Total	300	241 (83.34%)	59 (16.66%)

χ^2 4.557; p=0.207

The prevalence of lice infestation in the different PAs was the highest for Gorasilingo 93 (96.8%) followed by that of Dosha 56 (73.6%) and the lowest rate was recorded for Konicha 92 (71.8%). The difference in prevalence among the three PAs showed statistically significant (p<0.05) values (table 4).

Table 4. Distribution of lice infestation in different PAs

PAs	No. examined	No.infested	Positive (%)	Negative (%)
Gorasilingo	96	93	96.8	3.2
Konicha	128	92	71.8	28.2
Dosha	76	56	73.6	26.4
Total	300	241	80.34	19.67

χ^2 4.557; p=0.207

The infestation rate of the different site of lice attachment with *D. ovis* was the highest for flank (29.3%) and lowest for shoulder (9.56%). On the other hand, the infestation rate of the attachment site with *L. ovillus* was the highest for shoulder (37.5%) and the lowest for ramp (12.5%). The rate of mixed infection was found to be highest on shoulder (50%) and lowest on neck (10%) (table 5).

Table 5. Distribution of lice species and proportion in different attachment sites.

Predilection site	Species of lice involved			Total (%)
	D.ovis	*L. ovillus*	Mixed	
Neck	133	2	1	20.42
Shoulder	62	3	5	10.5
Wither	78	-	4	12.3
Flank	190	2	2	29.12
Ramp	185	1	3	28.37
Total	648	8	10	666

4. DISCUSSION

Out of 300 sheep examined, 241 (80.34%) of the sheep were found to be infested with *D.ovis*, *L.ovillus* or both. This prevalence rate is comparable to the infestation rate reported in Arsi Zone of Oromia Region (75.5%) by Hailu, (2010). The similarity in the prevalence reported could be linked to the agro-ecology of the study area where both studies were undertaken in the same geographical area.

The prevalence rate of D. ovis obtained in this study was (73.34%). This figure is by far higher than other works done by chanie *et al.*, (2010) who reported lower prevalence rates than the present study in Yeomen Gears Midir (47.86%), Bati (6.17%) and Kalu (34.43%) districts. Moreover, the present study revealed higher rate of lice occurrence than prevalence rate (15.3%) reported by Mulugeta *et al*., 2010, from Tigray Region, North Ethiopia. The variation in the prevalence between the present study and works reported by chanie *et al*., (2010) and Mulugeta et al., (2010) could be ascribed to difference in the agro-ecology, season of the year when the study was made and the management practices in those study areas. On the contrary, this study result is consistent with the prevalence rate of *D.ovis* (83.23%) reported by Bekele *et al*., (2011) in Wolmera District of Oromia Regional State. The fact that Bekele *et al.,* (2011) reported findings consistent with the present study on *D. ovis* may be due to the similarity in the agro ecology of Wolmera District with Tiyo District which are both highlands.

On the other hand, the overall prevalence of *L. ovillus* found in the present study (0.01%) is by far lower than previous work done by Hailu (2010) in Arsi Zone of Oromia Region (14.6%). This difference in the

prevalence rate could be attributed to differences in season during which the study was conducted, management practices and awareness of sheep owners on the impact of lice on productivity. These conditions were personally noted during the sample collection where only a few respondents were discovered to know the impact of lice in causing health problem or reducing the quality of skin (personal communication).

The rate of lice infestation was higher in young 111 (84.73%) than adult sheep 130 (76.92%), but this result is not statistically significant. The study conducted in Brazil by Santose and Faccini (1996) on the prevalence of lice infestation between both age groups was consistent with the present finding. 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 lice. 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). Other study conducted in selected sites of Amhara Regional State (Sartse, 2004) and in Tigray Region, Northern Ethiopia (Kassaye and Kebede, 2010) agreed with this finding indicating that young animals were more susceptible to lice than adult. Radostitis *et al*. (2007) and Heath *et al.* (1995) also reported similar findings that young animals are heavily infested and the number decrease as the animals mature.

The prevalence rate in lice infestation was relatively higher in animals with poor (81. 53%) followed by medium (78.8%) and good (80.28%) body conditions. The absence of significant difference in prevalence of sheep lice with body condition agreed with previous works done by Bekele *et al*. 2011 in Wolmera District of Oromia Regional State and Sartse, 2004 in selected sites of Amhara Regional State. This could be due to the fact that loss of body condition in the study animals could result from other factors, such as seasonal change of forage and pasture and the presence of other concurrent disease. The absence of association in prevalence of sheep lice between body conditions disagreed with the observation made in Tigray region, North Ethiopia (Mulugeta *et al*., 2011) with the implication that loss of body condition was due to lice infestation. Animals in poor body condition 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 (Urquhart *et al*., 1996). 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.

The rate of lice infestation in the current study was higher in male (86.8%) than in female (77%). But the difference is insignificant and this show that sex seems have no great affection on the prevalence and both sexes are nearly equally susceptible and exposed to infestation. This might be due to poor management where both sex groups grazed together providing greater chance for direct contact which contributes for transmission of lice between them. Similar results have been observed by Hailu, 2010 in Arsi Zone of Oromia Region.

The prevalence among PAs showed statistically significance difference the highest being in Gorasilingo (96.8%) and the lowest in Konicha (71.8%), this might be due to difference among owners in understanding the significance of the problem in each PA.

Each species of lice in the study tend to prefer a site of attachment on the animal body. In the present study *D.ovis* had the highest rate of infestation for flank (29.3%) and lowest for shoulder (9.56%). On the other hand, the infestation rate the attachment site with *L.ovillus* was the highest for shoulder (37.5%), nil for wither and the lowest for ramp (12.5%). The rate of mixed infection was found to be highest on shoulder (50%) and lowest on neck (10%). According to the study conducted by Sartse, 2004 in selected sites of Amhara Regional State, the common sites of *D.ovis* infestation on sheep were the shoulder, the neck, the sides and the back with proportion of 60.7%, 50%, 42.4% and 34.1% respectively. The difference in the preference of lice attachment site may arise from the severity of infestation or the wool length of the preferred site during sample collection.

The irritation caused by even the modest population of lice leads to scratching and rubbing, causing damage to the skin and severe infestation with *Linognathus* species may cause anaemia (Wall and Shearer, 1997). *D. ovis* is responsible for development of nodular hypersensitivity reaction lesions (cockle or “ekek”) in pickled pelts (Mulugeta *et al*., 2010). Adult sheep have a heavier fleece than young, which provides a habitat, which is readily colonized by lice and Damalina is susceptible to high temperature (Urquhart *et al*., 1996).

According to Kettle (1984), D. ovis requires both suitable temperature (33-39 ^{0}C), and fiber of appropriate diameter to which eggs can be attached. The present study revealed that, *D. ovis* can survive at temperature ranging from 8.4^{0}C to 22.6^{0}C.

Previous studies have also demonstrated the wide spread nature of lice in sheep in Ethiopia (Bekele *et al*., 2011), which have caused severe skin defects. The irritation caused by lice leads to scratching and rubbing that could damage the skin (Chanie *et al*., 2010) resulting in alopecia, a description similar to my observation.

The prevalence of sheep lice examined had shown that *D.ovis* (73.34%) was the dominant lice followed by *L. ovillus* (0.01%) in causing skin damage in the area. Considering the importance of skin and hide as a main source of foreign currency to Ethiopia, the high prevalence of lice recorded in sheep of the study area deserves serious attention at all levels in order to minimize the spread of infestation and improve the living standard of farmers which are dependent on their animals.

5. CONCLUSION AND RECOMMENDATIONS

The current study results indicated that sheep lice are a common problem in the study area. In this study, two genera of lice belonging to two species (*D.ovis and L. ovillus*) are important affecting the health and productivity of sheep in Tiyo district. Lacks of awareness about the significance of the problems among owners and inaccessibility for control schemes have contributed to the wide spread nature of lice 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 lice prevailing in sheep in the area require serious attention to minimize the effect of the problem. The veterinary personnel need to be mobilized to institute mass treatment programs for urgent action which need to be regularly with simultaneous awareness creation to the owners. Along this the following recommendation is forwarded:

- Strategic treatment of sheep with insecticides should be practiced in the study area to minimize the negative impact of lice on the health of animals.
- Awareness creation for the local farmers about the control method of lice is essential.
- Estimating of economic losses is essential to justify the authenticity of planning a control program, therefore further study is essential to determine the economic losses per year by lice infestation in sheep from the area.

6. ACKNOWLEDGMENT

We would like to thank Asella Regional Veterinary Laboratory for allowing us using their facilities. We also express our heartfelt thanks to households of each Peasant association (PA) of the study settings for their cooperation and commitment in this study.

7. REFERENCES

Abebe, W., Tefera, S. 2007. Study on ectoparasites of sheep and goats in eastern part of Amhara region, northeast Ethiopia. Small Ruminant Research. 69: 62-67, Elsevier.

Abera, M., Mohammed, T., Abebe, R., Aragaw, K and Bekele, J., 2010. Survey of ixodid ticks in domestic ruminants in Bedelle district, South western Ethiopia. *Trop Anim Health Production*. 42: 1677-1683.

Abunna, F., Kasa, D., Shelima, B., Megersa, B., Regassa, A., Amenu, K., 2008. Survey of tick infestation in small ruminants of Misses district, West Harargie, Oromia Region, Ethiopia. *Tropical Anim Health production*. 41: 969-972.

Alemu, S., 1996. A survey on small ruminant lung worm infection in six districts of Wollo. DVM Thesis Faculty of Veterinary Medicine, Addis Ababa University, Debrezeit, Ethiopia.

APEDO, 2008. Socio economic on Arsi Zone. Assela, Arsi P. 1-15.

Bekele, J., Tariku, M. and Abebe, R., 2011. External parasite infestation in small ruminants in Wolmera District of Oromia Region Central Ethiopia. Journal of Animal and Veterinary advances. 4: 518-523.

CSA (2004). Ethiopian Agricultural Sample Enumeration 2002, Central Statistic Authority; Federal Democratic Republic of Ethiopia

Chanie, M., Negated, T and Sirak, A., 2010. Ectoparasites as the major causes of various types of skin lesions in small ruminants in Ethiopia. Trop Anim Health production. 42: 1103-1109.

Gatenby, R.M., 1991. Sheep: The tropical Agriculturalist, London and MACMILLAN educational ltd, ACCT. Pp. 7-8.

Hailu, W., 2010. Major Ectoparasites of small ruminants in Arsi Zone of Oromia Region: Prevalence, species composition and Acaricidal Efficacy of Medicinal plants against lice of sheep. MSc, School of Veterinary Medicine, Addis Ababa University, Debrezeit, Ethiopia.

Heath, A.C, Cooper, S.M., Cole, D.J. and Bishop, D.M., 1995. Evidence for the role of the sheep biting louse Bovicola ovis in producing cockle, a sheep pelt dept. Veterinary Parasitology 59: 53-58.

Heinz, M., Khaled, A., Fathy, A., Sven, K., Herbert, P. 2010. Life cycle and attacks of ectoparasites on ruminants during the year in central Europe: Recommendations for treatment with insecticides.

Kassaye, E. and Kebede, E., 2010. Epidemiological study on mange mite, lice and sheep keds of small ruminants in Tigray Region, northern Ethiopia. *Ethiop. Vet J.* 2: 51-65.

Kettle,D.S., 1984. Medical Veterinary Entomology, Mackeys of Chatham Ltd, UK. Pp.132-135.

Mullen, G., Durden, L., 2002: Medical and Veterinary Entomology, Academic press, An imprint of Elsevier Science. Pp. 431.

Mulugeta, Y., Yacob, H. and Ashenafi, H. 2010. Ectoparasites of small ruminants in three selected agro-ecological sites of Tigray Region, Ethiopia. *Trop Animal Health Production*. 42: 1219-1224.

Radostitis, O.M., Gay, C.C., Hinchcliff, K.W. and Constable, P.D, 2007. Veterinary Medicine: A text book of the diseases of Cattle, Sheep, Pigs, goats and horses, 10th ed. Saunders, London. Pp 1606-1607.

Santose, A.C. and Faccinni, J.L.H., 1996: A cross-sectional study of louse infestation caused by Damalina ovis in semi arid Regional of the state of Paraiba. Rivista Brazilia de Parasitology Veterinaria (Brazil) 5: pp. 43-46.

Sartse, T., 2004. Investigation on ectoparasites of small ruminants in selected sites of Amhara Regional State and their impact on the tanning industry: MSc thesis, FVM, Addis Abeba University, Debrezeit. Addis Abeba.

Tadesse, A. Mebrahitu, K. (2010) Study on ectoparasitic defects of processed skins at Sheba Tannery, Tigray Northern Ethiopia

Taylor, M.A. 2007. Veterinary Parasitology: 3rd ed. Blackwell publishing. Pp.27-28, 228

Thrusfield, M., 2005. Veterinary Epideiology, 3rd ed. BlackwellScience Ltd., UK, Pp. 229-245.

Urquhart, G.M., Armour, J., Duncan, J.L., Dunn, A.M., Jennings, F.W., 1996. Veterinary Parasitology, 2nd ed. Blackwell Science Ltd., UK, Pp 169.

Wall, R and Shearer., 1997. Veterinary Entomology, 1st ed. Chapman and Hall, UK, Pp. 439.