Study on the prevalence of ectoparasite infestation of ruminanats in and around Kombolcha and damage to fresh goat pelts and wet blue (pickled) skin at Kombolch Tannary, Northestern Ethiopia

Abebayehu Tadesse [1], Endris Fentaw, Berhanu Mekbib, Rahmeto Abebe, Solomon Mekuria and Endrias Zewdu*

[1]Department of Parasitology and Pathology, Faculty of Veterinary Medicine, Hawassa University

** Corresponding Author: e mail abutadesse2@yahoo.com*

Abstract

An attempt was made to study the prevalence of ectoparasite damage on live cattle, sheep and goats in and around Kombolcha town and on raw goat skin to assess their skin defect on processed wet-blue (pickled) skins at Kombolcha tannery, south wollo zone, North-Eastern Ethiopia. A total of 240 cattle, 175 sheep, 66 goats, were used to study the prevalence of ectoprasites on live animals as well as 344 fresh goat pelts and pickled (wet-blue) goat skins were used to assess skin defects. The result obtained from live cattle demonstrated a high prevalence of Amblyomma (28.33%) followed by S*arcoptes scabiei* (23.75%), *Boophilus* (11.25%) *Demodex* (9.58%), *Psoroptes* (0.4 %), respevtively. The prevalence of ectoprasite infestation of live sheep revealed *Mellophagus ovinus* (sheep ked) (32.57%), *Bovicola ovis* (22.28%), *Amblyomma* spp (12.57%), *Sarcoptes scabiei* (14.28 %), *Ctenocephaliedes* spp (8.57%), *Demodex* (6.85%), *Linognathus africanus* (6.28%) and *Boophilus* spp (4%). The result from goats demonstrates a high prevalence of *Sarcoptes scabiei* (30.3%) followed by *Linognathus stenopsis* (9.09%), *Amblyomma* (4.54%), *Ctenocephalides* spp (3.03%), *Bovicola caprea* (1.51%) and *Demodex* (1.51%) in that order. Result obtained from fresh goats pelts revealed an over all high prevalence of *Sacoptes scabie* (53.29%) followed by *Linognathus stenopsis* (9.88%), *Bovicola caprae* (2.08%) and *Demodex* (2.08%). Examination of pickled (wet-blue) skins from follow-up skins show a high prevalence of scratch (74.25%) followed by "Ekek" (68.56%), scar (67.06%), processing defect (28.44%). "Ekek" (Typical scatter type cockle) was found to show a significant (P<0.5) association with *Sarcoptes scabiei, Linoganthus stenopsis,* scratch and diseases scars, indicating the likely multifactor causes and one major skin problems in the study area.

Keywords: Prevalence, Ectoparasite, Cattle, Sheep, Goat, Goat pelts, Kombolch

Introduction

The livestock population of Ethiopia is above 41 million cattle, 14.3 million sheep and 13 million goats (CSA, 2004). Ethiopia's resources of cattle, sheep and goats ranks first, third and second respectively in Africa (Leach, 1998). Because of this huge potential, Ethiopia is capable of supplying 16-18 million of skins and hides per year for the tenneries within the country. The Ethiopian skins and hides, especially the sheep skin is known in the world for the production of the finest leather in terms of its fine grain and compact structure. The quality wet-blue goat skins are known as "Bati – genuine" and they have also a good reputation in the international market and receive the biggest attraction for the number of leather producing companies in the world (Mulat Abegaz, 1999).

The exportation of skin and hides is the largest foreign exchange earners in the country. Yet as many as one quarter to one –third of all the skins processed at tanneries are unsuitable for export due to various defects (Kassa Bayu *et al*., 1998). The leather industry sector is one of the fourth growing economic sectors in the country. However, this sector of trade and the country as whole lost revenue due to a decline in quality and fall in export prices (Pittards, 1999; NBE, 2000). Up to 65% of these defects occur in the pre slaughter stage of production while the animal is still alive. A considerable portion of these pre slaughter defects are due to skin diseases caused by parasites (Kassa Bayu *et al*., 1998).

Ectopararasites commonly ticks, mites, lice and ked are important parasites because of their disease transmission, blood feeding habit and skin damage in most of the live stock population (CSA, 2004). Losses from tick damage to hides and skin were claimed to be about one million Ethiopian birr per annum, but are likely to be much higher (Sileshi Mekonnen, 1992). About 50% of the sheep skins processed are rejected because of ekek (Zelalem Tefera , 1994) Further more ectoparasitic mites cause mange in a wide range of domestic and wild vertebrates hosts including man. A considerable economic negative impact associated with mange infection is due to pesticide prices, extensive skin damage and morbidity and mortality of the infested animals (Osman *et al*., 2006). Therefore the objectives of the current work were to determine the prevalence of ectoparasites on ruminants in and around Kombolcha town and to identify and determine the impact of ectoparasite on skin defectes at wet-blue stage in Kombolcha tannery.

Materials and methods

The study area

The study was conducted from November 2007 to April 2008 in and around Kombolcha town and Kombolcha tannery which is located some 375 Km away from Addis Ababa in South Wollo, Northern Ethiopia at an altitude of 1500-1847 m.a.s.l. Topographically South Wollo Zone is marked by the presence of numerous mountains, plateaus, hilly and sloppy areas, rivers, stream, and lakes. The mountain ranges of the region stretches from south to north. Generally, the climate of south wollo zone is divided in to sub humid ("witch Degas"), semiarid ("woyna-Dega"), arid ("kola"), and semi desert ("Kefil-Berha") climatic conditions. Kombolcha and its surrounding are categorized as ("Dega"). Komblocha has an average monthly minimum and maximum temperature of 11.7 ^{0}C and 23.9 ^{0}C respectively. The mean annual rainfall of Kombolcha is in the range of 581-1216 mm. The vegetation of the areas changes with altitude ranging from scattered trees and bushes to dense shrubs and bushes. The soil around kombolcah and Dessie is mainly verstisol which is deep clay soil. The major crops grown in the area includes: sorghum, wheat, teff, barley, maize, oat and others. Farming in the study area is mixed crop-livestock production system where small ruminant production is an integral component of the traditional farming system. The livestock population is 90,664 cattle, 12975 sheep, 31043 goat, 489 horse, 28 mule, 7758 donkey 866 camel and 49010 poultry (KWADO, 2006).

Kombolcha tannery

Kombolcha tannery was established in 1967 on a land plot of 10,000 m^2 of which factory shed covers 11,264 m^2 like wise a land area of 3,118 m^2 covered by office building, stores and work shop. The tannery was established with the objective of processing goat and sheep skins for export with an annual production capacity of 1.1 million. The tannery mainly specializes in the production of wet-blue goat-skin. Daily attainable capacity of the tannery is 3500 pieces of skin with normal and relaxed working conditions. It has 115 permanent and 15 contract workers of different professional levels

The supply of raw skins to Kombolcha tannery is from diverse sites such as South and North wollo, Afar, Tigray, Gondar and Gojam. The tannery is known for its high quality goat skin production for export to the European markets, mainly to Italy (KT, 2007).

Study subjects and protocol

Live animal examination

A total of 66 live goats, 240 cattle and 175 sheep were examined to determine the impact of ectoparasite infestation on skin quality. The animals were from Kombolcha and nearby rural areas. Detailed examination of animals that were presented to Kombolcha veterinary clinic was made. hair coat was parted and examined for ectoparasite on six parts of the skin namely, Neck, shoulder, flank, back, belly and rump, both on the right and left sides of these areas. Animals with problems of skin lesions and history of itching as well as in contact animals were examined closely by inspection and laboratory examination of skin samples. Direct smears were made from exudates appearing when the crusts were removed. Deep skin scrapings with potassium hydroxide was taken from the periphery of the lesions and examined under microscope.

Raw goat skin examination

Raw goat pelts were examined for ectoparasite before being subjected to preservation and tanning process. The skins were obtained from Kombolcha tannery skin store where they are either air dried or preserved with salt. Weekly investigation was made on fresh goat pelts which were initially selected for better quality by experienced raw skin selectors who reject any skin with visible defects such as pox lesions, scabs, crusts and alopecia on the grain side, flaying defects and discoloration on the flesh side.

Follow up- was made on these raw skin up to the wet-blue stage to appreciate the defects and relate the defects of wet-blue stage with the identified ectoparasite before tanning. To enable easy identification at wet-blue stage, these pelts were marked using a belt pincer by making punctured holes representing serial numbers.

Skin scrapings were taken from these areas when *Sacroptes* mites are suspected. Finally, these fresh pelts, having different marks, were processed in the tannery, which were to be re-examined at wet-blue stage for defects.

Post-Tanning examination

The tanning process

The pelts were transported in a labeled sac to the tannery and processed to the pickled stage which is the only export from the tannery. Before pickling,

the raw skins have to pass through the following steps in their chorological order; trimming, soaking, liming, flushing, delimming and bating, scudding, and finally pickling. The whole process took about 5 days.

Pickled skin examination

After the follow-up skin passed through the tanning process and reached pickled stage, their specific identities were checked and they were examined by selectors for any defects. Any relevant information such as skin size and grading were recorded on a "Data collection sheet" to their respective identities.

Skin size classification and grading

The wet-blue goat skins were classified into 4 size categories; small, medium, large and extra large. Classification, grading and examination of the skins for defects were made by both junior and senior professionals. Skin size is measured in dm^2 or ft^2per skin (QSAE, 2000). Skins are graded based on the number, type and site of defects depending on grading criteria of wet-blue skins in relation to defects (QSAE, 2001).

Data analysis

Simple statistical tests like percentage (%) prevalence were calculated for the different measured parameters. A chi-square (x^2) test was used to assess the association between different variables using statistical soft ware known as Intercooled STATA version 9.

Results

The prevalence of ectoparasite infestation in live cattle

A total of 240 live cattle with a problem of ectoparasite infestation and incontact cattle were examined. Out of these 68 (28.33%) were found to be infested with *Amblyomma* followed by S*arcoptic* mange 57 (23.75%). Other ectoparasites observed were *Boophilus* 27 (11.25%), *Demodex* 23 (9.58%) and *Psoroptes* 1 (0.4%) (Table 1).

Table 1: The prevalence of ectoparsites in cattle at Kombolcha veterinary clinic.

Name of the ectoparasits	No (%) of positive cattles
Sarcoptes scabiei	57 (23.75)
Demodex	23 (9.58)
Amblyomma	68 (28.33)
Boophilus	27 (11.25)
Psoroptes	1 (0.4)

The prevalence of ectoparasite infestation in live sheep

A total of 175 live sheep were examined to determine the prevalence of ectoparasite infestation at Kombolcha veterinary clinic, from which 57 (32.57%) were found to be infested with sheep ked (*Mellophagus ovinus*) and 39 (22.28 %) were infested with *Bovicola ovis*. Other ectoparasites observed include S*arcoptes scabiei* 25 (14.28%), Amblyomma 22 (12.57%), *Ctenocephalides* 15 (8.57), *Demodex* 12 (6.857%), *Linognathus africanus* 11 (6.28%) and *Boophilus* 7 (4%) (Table 2).

Table 2: The prevalence of ectoparsites in cattle and sheep at Kombolcha veterinary clinic.

Name of Ectoparasite	No. (%) Positive sheeps
Sheep ked (*Melophagus ovinus*)	57 (32.57)
Damalinia ovis	39 (22.28)
Sarcoptes scabiei	25(14.28)
Amblyomma	22(12.57)
Ctenocephalides	15(8.57)
Demodex	12 (6.58)
Linognathus africanus	11 (6.28)

The prevalence of ectoparasite infestation on live goats

The prevalence of ectoparsites from a total of 66 live goats eximined were 30.3%, 9.09%, 4.54% 1.51%. 1.51%, 1.51% for *Sarcoptes scabiei, Linognathus stenopsis*, *Amblyomma*, *Bovicola caprae*, *Demodex caprae* and *Ctenocephalides* spp (Table 3).

Table 3: The prevalence of ectopariste infestation on goats at the clinic

Name of Ectoparasite	No (%) goats positive
Sarcoptes scabiei	20(30.3)
Linognathus stenopsis	6(9.09)
Amblyomma	3(4.54)
Bovicola caprae	1(1.51)
Demodex caprae	1(1.51)
Ctenocephalides spp	1(1.51)

The present study demonstrates that from live animals examined, the prevalence of *Sarcoptic scabiei* was significantly higher (P<0.05) in goats, (30.3%), than in cattle (23.75%) and sheep (14.28%) respectively. The study also showed that the prevalence of *Demodex* was significantly (P<0.05) higher in cattle (9.58%) than in sheep (6.58%) and goats (1.15%) respectively. Simillarly the prevalence of *Amblyomma* was significantly (P<0.05) higher in cattle (28.33%) than in sheep (12.57%).

The prevalence of ectoparasite infestation in fresh goat pelts

Out of 334 fresh goat pelts examined, 178 (53.29%) had S*arcoptes scabiei var caprae*. While only 33 (9.88%) had sucking louse *Linognathus stenopsis*. Other ectoparasites identified were *Demodex caprae*7 (2.08%) and *Bovicola caprae* 7 (2.08%). See table 4 below.

Table 4: The prevalence of ectoparasite infestation in fresh goat pelts at Kombolcha tannery

Species of Ectoparasite	No. (%) goats positive
Sarcoptes scabiei var caprae	178(53.29)
Linognatus stenopsis	33(9.88)
Demodex caprea	7(2.08)
Bovicola caprae	7(2.08)

Defects on pickeld skin

From 334 follow up skins (fresh pelts) which reached the pickled stage, scratch was the most prevalent (74.25%) identified skin defect followed by "Ekek" (68.56%), diseases scar (67.06%) processing defects (28.44%). See table 5 below.

Table 5: Defects on pickled skin

Skin defect	Percentage of fresh (followup) positive pelts and Number.
Scratch	74.25 (248)
Ekek	68.56 (229)
Scars	67.06 (224)
Processing defect	28.44 (95)

The study showed that the presence of "ekeke" lesions on pickled skins were found to be significantly associated (P<0.05) with the presence of S*arcoptes scabiei var caprae* and *Linognatus stenopsis* on fresh goat pelts. A significant (P<0.05) association was also observed between "Ekek" and the presence of scratch and disease scars. The association between the involved agents and the "Ekek" lesions most probably suggests the cause – effect relationship.

Impact of "Ekek" on grading

The majority of the skins examined were accorded poor grades and even some of them were rejected. Out of 229 pickled skins (wet-blue skins) from follow-up skin that have "Ekek" lesions the majority (61.15%) were grade VI followed by grade V (22.27%) reject (VII) (10.04%), IV (5.2 %) and grade III (1.3%).

"Ekek" Intensity and skin size categories

"Ekek" lesions were found to be more prevalent in small and medium sized skins 79.04 % and 76.09 % respectively. In the case of large and extra large categories the prevalence of "Ekek" lesions was 70.98% and 60.97% respectively.

Discussions

The prevalence of one or more ectoparasites in Kombolch Zuria was relatively high. The overall prevalence of cattle skin parasites (73.3%) was markedly higher than the prevalence reported from southern rangelands (55.85%) by Assegid Bogale (1991). This could be attributed to management and differences in the epidemiology of sampling sites. The prevalence of *Amblyomma* and *Boophilus* in the cattle were 28.33% and 11.25% respectively. The higher prevalence of tick in cattle in this study was due to managemental and epidemiological factors. Ticks require moisture and warm environment for survival and the activity of most ticks commences during spring (Sileshi Mekonnen *et al*., 1992). A study from the western oromia zone reported a high

prevalence of ticks especially *Amblyomma* and *Boophilus* (Tirazu Mohammod, 2008). *Amblyomma varigatum* known by its common name "Tropical bont tick" is widely distributed and is the most important tick which is regarded as major constraints for cattle productivity in Ethiopia (Sileshi Mekonnen, *et al*., 1992). The study from western Ethiopia reported that there is high prevalence of *Amblyomma* and *Boophilus* in a range of altitude between 1400-2600 m (Sileshi Mekonnen *et al*., 1992).

The present study also showed that *Sarcoptes scabiei* (23.75%) was the second skin parasite that causes skin damage followed by *Demodex* (9.58%). The relatively very low prevalence were observed on psoroptes mites (0.4%). The major skin lesion in cattle were mangemite infestation including *Demodex*, *Sarcoptes* and *Psorpotes* (Chalachew Nigussie, 2000). The high prevalence of *Sarcoptes scabiei* (23.75%) in the current study was inconsistent with a low prevalence report of 4.63% from Wolayta by Chalachew Nigussie (2001) and a prevalence of 6 % and 4.85% by Assegid Bogale (1991) and Amanuel Kassie (1992) from southern rangelands respectively. The characteristic of management practices in handling animals in Wolayta (Tesfaye Deribe *et al*., 1999) might have played a role in reducing the establishment and occurrences of skin diseases.

The present study also revealed that out of 175 sheep examined, sheep ked (*Melophagus ovinus*) had shown higher prevalence (32.57%) followed by *Bovicola ovis* (22.28%) *Sarcoptes scabie* (14.28%), *Amblyomma* (12.57%), *Ctenocephalides* (8.57%) *Demodex* (6.857%) *Linognathus africanus* (6.28%) and *Boophilus* (4%) in decreasing order of prevalence respectively. The high prevalence of sheepked and *Bovicola ovis* infestation of sheep in the present study was in agreement with the report of Ermiayas Yishak (2000). Poor animal management and husbandry practice and host range might contribute this high prevalence in the study area. The study also showed *S. scabiei* as one of the ectoparasite encountered in the study area and this was supported by a report showing that, out of 33 woredas of Amhara Region 22 districts are affected by mange of sheep and goats (Wondewosen Asfaw, 2000). *S. scabiei* is the cause of dermatitis and it was considered to be a major reason for emaciation and death in goat in Malaysia (Dorny *et al*., 1994).

The study revealed that the prevalence of tick infestation was significantly ($p<0.05$) higher in cattle than sheep and goat these might be due to the managemental factor that most of the cattle were from rural areas close to Kombolcha town that have low access to the veterinary service found in the

town, and relaxed tick control. The higher prevalence of demodex in cattle was consistent with the report of Chalacew Nigussie, (2001) and the difference was statsistically significant (P<0.05). The prevalence of *Sarcoptes scabiei* was significantly (p<0.05) higher in goats than in cattle and sheep. This is comparable with the prevalence report of chalachew (2001) and Gashaw Takele(1986). The prevalence found in this area higher due to environmental factors where higher temperature, humidity and sunlight favor mange mite infestation (Pangui, 1994).

Examination of live goat ectoparasites were similar to those demonstrated on fresh goat skins but there is additional report of flea (*Ctenocephalides* spp). The prevalence of ectoparasites on live goats showed almost similar trends with the prevalence of ectoparasites on fresh goat pelts. This study demonstrated that (30.3%) and (9.09%) of the goats examined had sarcoptes *Scabiei var caprae* and *Linognatus stenopsis* respectively. Others are *Ctenocephalides* spp (1.1%), *Ambloyomma* (4.54%), *Bovicola caprae* (1.51%) and *Demodex caprae* (1.51%). Comparing the prevalence of each ectoparasite on fresh pelts and the prevalence of ectoparasites on live goats, we can appreciate the lower prevalence on live goats except for *Amblyomma* which has higher prevalence in live goats.

The relatively lower prevalence of ectoparasites on live goats is most probably due to the fact that the goats are from Kombolcha and near by areas where there is an access to veterinary services and hence the owners can get their animals treated earlier. The exception was *Ambloymma* which was found to be higher in live goats because in the case of fresh goat pelts the predilection sites of this tick such as the ears and the scrotum are trimmed before the fresh pelts are examined.

The present study demonstrated that 53.29% and 9.88% of the fresh pelts examined had *Sacroptes scabiei var caprae* and *Linognatus stenopsis* respectively. Examination of these fresh pelts (follow-up skins) after tanning process revealed the presence of "Ekek" lesions with high prevalence (68.56%).

Analyses of the results have shown the existence of a significant association between ectparasites and "ekek" lesions. The presence of *Sarcoptes scabie var caprae* was found to be significantly associated (P<0.05) with "Ekek". This finding suggested that the "ekeke" lesions in goat skins are mostly caused by *S. scabiei var caprae* and *L. stenopsis*.

A study conducted by the Ministry of Agriculture and FAO from 1996 to 1998 on sheep skin diseases in stayish (North Wollo) and goat skin diseases in Bati revealed that the predominant cause of goat skin rejection in Bati was *Sarcoptic mange* caused by S*acroptes sabiei*. A study by Dorny *et al.*, 1994, revealed the prevalence of *S. scabies* to be 55.8% among goats in Malaysia. This high prevalence of *S. scabies* indicates efficient transmission of mites between animals. Parasistic disease such as mange, lice, and keds are found widely distributed and are major constrains of sheep and goat production in most regions of Ethiopia. In 1998/99 three tanneries (including the one at Kombolcha) in the Amhara Region have reported 443,602 pieces of skin rejection per annum, which worth USD 1.4 million loss (Wondwosen Asfaw, 2000).

This study also revealed that, the goat sucking louse; *L. stenopsis*, is the second most prevalent ectoparasite in freshly examined goat pelts at the Kombolcha tannery. The sucking louse *L. stenopsis* (9.98%) is found to be more prevalent than the biting louse *Bovicola caprae* (2.08) in the freshly examined goat pelts in Kombolcha tannery. This finding is comparable with that of Numeri Abdulhamid (2001). Comparisons of the regional variations in disease and ectoparasite incidence on goat skins indicated one of the most notable differences between the regions to be a relatively higher level of sucking lice on the northern skins of goats.

The level of sucking lice in the northern goat skins is about 20% compared to the other regions which are about 5% (Stosic, 1996). Besides, the present study showed that *Demodex caprae* (2.08) is one of the ectoparasites encountered in fresh goat pelts. A prevalence of 2.7% demodicosis was reported by Numeri Abdulhamid (2001) in the same area which is comparable with this study.

The present study revealed that scratch is the most prevalent defect (74.4 %) followed by Ekek (68.56%), disease scars (67.08 %) and processing defect (28.44%) at Kombolcha tannery. “Ekek” is the leading defect in posing serious damage on goat skin defects that are consistent with this study (Numeri Abdulhamid, 2001). 76%. “Ekek” was reported in Awash tannery by Stosic (1996) and Ermias Yishak (2000) in his study at Sebeta tanneries reported 89.07 %. “Ekek”.

A significant association ($P<0.05$) was observed between “Ekek” lesions and scratch. A similar observation was made by ASP and Tauni, 1988 in pickled sheep skins in which ekek lesions are associated with parasites that cause

allergy . The allergy is caused by the saliva and the feces that cause itching and scratching. This association indicates that goats infested by lice and mites rub themselves against thorns, bushes, posts and barbed wire (Soulsby, 1982 and ASP & Tauni, 1988) so that this will be manifested by a scratch defect at the wet-blue stage.

A significant association ($P<0.05$) was found between "Ekek" and disease scars also. This could probably due to secondary bacterial complication at sites where the mites and lice feed; causing lesions which up on healing leaves scars that are similar to that of other skin diseases (ASP and Tauni, 1988).

The majority of "Ekek" observed during the examination of wet-blue goat skins from the follow-up skins was associated with poor grades; (61.15%) of "Ekek" occurred in grade VI, (22. 27%) of "Ekek" in Grade V and 10.49% of "Ekek" in grade VII (rejects) these findings imply that. "Ekek" is the major factor for poor quality skins. These skins fetch very low price in the world market, posing poor foreing exchange earning and great economic loss to the Nation.

Conclusions

Majority of the animals examined were in poor body condition upon arrival to the clinic and in field observation. Examination of live cattle revealed higher prevalence of *Amblyomma* followed by *Sarcoptes scabiei* and *Boophilus*. Other observed ectoparasites on live cattle were *Demodex* and *Psoroptes* respectively. Like wise results from live sheep examination showed a high prevalence of sheep ked (*Malephagus ovinus*) followed by *Damalinia ovis, Sarcoptes scabiei*, *Amblyomma*, *Ctenocephhalides*, *Demodex* and *Linognathus africanus*.

Amblyomma was found to show significantly ($P<0.05$) higher prevalence in cattle than in sheep. Like wise *Sarcoptes scabiei* was significantly ($P<0.05$) higher in goats than cattle and sheep respectively. Further more the prevalence of *Demodex* was significantly higher in cattle than sheep and goats.

Examination of live goats, fresh pelts and wet-blue goat skins at Kombolcha veterinary clinic and tannery revealed high prevalence of *Sarcoptes scabiei* followed by *Linognatus stenopsis* on live goats. Other observed ectoparasites on live goats were *Ctenocephalides* species, *Amblyomma*, *Bovicola caprae*. Results from fresh goat pelts examined showed a high prevalence of *S. scabiei* followed by *Linognatus stenopsis*, *Bovicola caprae* and *Demodex.*

"Ekek" (scatter type cockle) was found to show a significant association with *S. scabiei* and *Linognathus stenopsis*. The diseases are known to be transmitted through contact between the infected and healthy animal. This association suggests that *S. scabiei* and *L. stenopsis* are the most likely cause of Ekek lesion at wet-blue stage in goat skins. These two agents might be responsible for the highly prevailing Ekek lesions which cause poor skin quality.

Examination of wet-blue goat's skins from follow up skins of the tannery revealed a high prevalence of scratch followed by Ekek, disease scars and processing defect. Processing defects were found to be 28.44% and this indicates that, on top of natural defects, processing defects are also one of major skin defects at Kombolcha tannery causing degradation of quality goat skins. Therefore to reduce or prevent the effects of ectoparasites on goat skins, control programmes should target on live goats, hence control of ectoparasites (mainly mites and lice) should be started in the shortest time possible. Man made defects such as flay cuts, brand marks and smoking are traditional causes of down grading of skins, hence a considerable extension effort (public education) needs to be mounted. Tanners should trace back the origin of skins so that areas with higher prevalence of skin defects can be identified and hence control measures can be taken in that particular area. Detailed studies on the true distribution, prevalence and incidence of ectoparastes that degrade goat skin quality including studies showing the difference between the mange affected side of the skin and with the one which is not affected (corium side) should be conducted.

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