

## Assessment of Major Factors That Cause Skin Defects at Bahir Dar Tannery, Ethiopia

*Zenaw Zemene and Mekonnen Addis*

Microbiology and Veterinary Public Health Team, School of Veterinary Medicine,  
College of Agriculture and Veterinary Medicine, Jimma University, P. O. Box 307, Jimma, Ethiopia

**Abstract:** A cross sectional study was carried out between October 2011 and April 2012 with the aim of assessing the major causes of skin defects that resulted in down grading and rejection of pickled sheep and goat skins at Bahir Dar tannery, Ethiopia. A total of 1000 randomly selected pickled skins (500 sheep and 500 goat skins) were examined visually for possible defects. Of the 1000 fresh pickled skins examined during the study, 99.9 % (999/1000) were found to be affected with one or more defects. Of the total skins examined in the study 49.2% (492/1000) fresh pickled skins were proved to be affected with cockle. Among the 492 skins known to have cockle defects 77.23% (380/492) were sheep skins and 22.76% (112/492) were goat skins. The species specific prevalence of cockle in sheep and goats were 76% (380/500) and 22.4% (112/500), respectively. Statistical analysis of the data showed that there was statistically significant difference ( $P<0.05$ ) on the prevalence of cockle between species of the animals examined. From the total examined skins 29.3% (293/1000) hosted one or more types of post slaughter defects of which, 66.55 % (195/293) were sheep skins and 33.45% (98/293) were goat skins. There was statistically significant variation ( $p<0.05$ ) on the occurrence of post slaughter skin defect between species. The overall prevalence of flying defects in this study was 27.8% (278/1000). The species specific prevalence of flying defects was confirmed to be higher in sheep (31.8%) than goats (23.8%). Of the 1000 skins examined, 25.1% were found to be affected with scar. The species specific prevalence of scar defect was higher in goats (15.2%) than sheep (9.9%). This difference on the prevalence of scar between sheep and goats was statistically significant ( $p<0.05$ ). Three hundred one (30.1%) out of 1000 sampled skins were proved to be affected by scratch with higher prevalence in goats (22.9%) when compared to sheep (7.2%). The difference on the prevalence of scratch between sheep and goats skins was statistically significant ( $p<0.05$ ). The present study showed high prevalence of skin defects at Bahir Dar tannery, Ethiopia and this suggests the need to implement awareness and rigorous training on the prevalence, causes and prevention of skin defects and safe handling and processing of skins among the livestock owners, abattoir workers, back yard slaughter men, skin collectors and factory workers in the areas which supply skin to the tannery in order to decrease the immense economic losses to the country, Ethiopia.

**Key words:** Skin defects • Sheep • Goats • Bahir Dar tannery • Ethiopia

### INTRODUCTION

Archaeological studies have shown that skins have been used since antiquity as clothes, vessels, bedding and possibly structurally in ancient dwelling places. Skins are renewable and easily perishable resources, their production is dependent on the rearing, management and disposal of the livestock population. The availability of skins through slaughtering or death of livestock is of

particular importance to the leather industry. Skins could be obtained from fish, birds and reptiles as well as wild and domesticated animals. The most important sources of skins are sheep and goats [1].

In Ethiopia hides and skins contribute much to the export earnings from the livestock sector. In addition, it has a large contribution to the leather industry in the country. Ethiopia has been exporting hides and skins in the past 100 years [2]. The country has big potential to

**Corresponding Author:** Mekonnen Addis, Microbiology and Veterinary Public Health Team, School of Veterinary Medicine, College of Agriculture and Veterinary Medicine, Jimma University, P.O. Box: 307, Jimma, Ethiopia.  
Mob: +251-912112251.

develop the sub-sector. In 2002 hides and skins represent major source of foreign exchange earnings for the country accounting for 14-16% of the total export revenue. Ethiopia's leather industry is at the forefront of the leather sector development of the Eastern and Southern African regions. The industry has reached an advanced stage of development and a reputation for excellence in the international market. The export performance of the sector showed very encouraging trends during 2005-2007. The major export contributor of the manufacturing sector in Ethiopia is the leather and footwear industries, which contributed 70% of the export earnings for the year 2005-2007 [3].

The export of processed and semi-processed skins constitutes Ethiopian's second largest commodity. However, over the last 10 years, there are indications that the quality of raw material has deteriorated with an increasing number of reject grades and the appearance of skin disease called 'cockle' that is mainly due to lice, sheep keds and mange infestations. It is becoming a grown concern that skin quality is deteriorated from time to time due to many factors. One of the major problems affecting the leather and especially tanning industry is related to the decreasing quality of skins. Skin diseases, scratches, scabs, flay cuts and holes, putrefactions and heat and poor substances are the main problems related to skin and hide quality that the tanners are facing [4].

In Ethiopia, very little attention was given for the different causes of skin defects and the works done so far on the prevalence of the different skin defects are scanty [2]. In line with the above fact, there is paucity of information on the magnitude of skin defects at Bahir Dar tannery, Ethiopia. Therefore, this study was geared to assess major causes of skin defects that results in down grading and rejection of pickled sheep and goat skin at Bahir Dar tannery, Ethiopia.

## MATERIALS AND METHODS

**Study Area:** The study was conducted at Bahir Dar tannery, Ethiopia which is located in Bahir Dar town, the capital city of Amhara regional state, Ethiopia. Bahir Dar is situated on the Southern shore of Lake Tana, the source of the Blue Nile (*Abay*), in what was previously the Gojjam province. The city is located approximately 578 km northwest of Addis Ababa, having a latitude and longitude of 11°36'N, 37°23'E, and an elevation of 1840 meters above sea level, with average annual rain fall of 1434 mms [5].

**Study Population and Study Units:** The study population was all skins that were brought to Bahir Dar tannery and the study units were the randomly selected skins of sheep and goat after pickling for the research. The randomly selected skin samples were thoroughly examined visually for defects. In the examination room skins were categorized according to the Ethiopian standard authority for size of skin as small, medium, large and extra large.

**Study Methodology and Sample Size Determination:** Simple random sampling technique was employed to assess the major factors that cause skin defects at Bahir Dar tannery, Ethiopia. To calculate the total sample size, the following parameters were used: 95% level of confidence interval (CL), 5% desired level of precision and with the assumption of 50% expected prevalence of skin defects in sheep and goats in the study area the sample sizes was determined using the formula given by Thrusfield [6].

$$n = \frac{1.96^2 \cdot P_{exp} (1-P_{exp})}{d^2}$$

Where, n=required sample size,  $P_{exp}$ =expected prevalence,  $d^2$ =desired absolute precision

Using the above formula, the sample size was calculated to be 384 for each animal species (sheep and goats). But to increase precision 500 skins were examined for each species. Hence, a total of 1000 sheep and goats skins were used in this study.

**Study Design:** A cross sectional study was conducted from October 2011 to April 2012. Sampling was carried out repeatedly at Bahir Dar tannery.

**Data Analysis:** Computation of descriptive statistics was conducted using SPSS version 16.0 software. The Pearsons chi-square ( $\chi^2$ ) test at a significance level of 5% and 95% confidence interval (CI) was used. The difference was statistically significant if the p-value was less than 0.05 ( $P < 0.05$ ).

## RESULTS

**Overall Prevalence of Skin Defects:** Of the 1000 fresh pickled skins examined during the study, 99.9 % (999/10000) were found to be affected with one or more defects. All the skins that were sampled from sheep were found to be affected by one or more defects and 499 out of the 500 goat skins were proved to be affected by one or

Table 1: overall distribution of defects among sheep and goats skins

Species	Examined	Prevalence	$\chi^2$ -value	p-value
Sheep	500	500(100%)	1.001	0.317
Goats	500	499(99.8%)		
Total	1000	999(99.9%)		

Table 2: Prevalence of cockle between species

Species	Examined	Prevalence	$\chi^2$ -value	p-value
Sheep	500	380(76%)	2.8742	0.000
Goats	500	112(22.4%)		
Total	1000	492(49.2%)		

Table 3: prevalence of post slaughter defects between species

Species	Examined	Prevalence (%)	$\chi^2$ -value	p-value
Sheep	500	195(39.0%)	45.421	0.000
Goats	500	98(19.6%)		
Total	1000	293(29.3%)		

more defects. Analysis of the data showed that there was no statistically significant difference ( $p > 0.05$ ) between the skins of two species with respect to defect (Table 1).

**Prevalence of Skin Defects Between Species:** Of the total skins examined in the study 49.2% (492/1000) fresh pickled skins were proved to be affected with cockle. Among the 492 skins known to have cockle, 380 were sheep skins and 112 were goat skins. The prevalence of cockle in sheep and goats were 76% (380/500) and 22.4% (112/500), respectively. Analysis of the data showed that there was a statistically significant difference ( $P < 0.05$ ) on the prevalence of cockle between species (Table 2).

From the total examined skins 29.3% (293/1000) hosted one or more types of post slaughter defects of which, 66.55% (195/293) were sheep skins and 33.45% (98/293) were goat skins. There was a statistically significant variation ( $p < 0.05$ ) on post slaughter skin defects between species (Table 3).

The overall prevalence of flying defects in this study was 27.8% (278/1000). The species specific prevalence of flying defects was confirmed to be higher in sheep (31.8%) than goats (23.8%). Analysis of the data showed that there was a statistically significant difference ( $P < 0.05$ ) in the prevalence of flying defects between sheep and goat skins.

Of the 1000 skins examined, 25.1% were found to be affected with scar. The species specific prevalence of the defect was higher in goats (15.2%) than sheep (9.9%) of the total 1000. This difference on the prevalence of scar between sheep and goats skins was statistically significant ( $P < 0.05$ ).

Three hundred one skins (30.1%) were proved to be affected by scratch with higher prevalence in goats (22.9%) compared to sheep (7.2%). The difference on the prevalence of scratch between sheep and goats was statistically significant ( $P < 0.05$ ).

Wart was proved to cause defects only in 7 (0.07%) skins which comprise 1 sheep skin and 6 goat skins and ring worm was known to result in defects in 2 skins (1 for each species). This difference on the prevalence of wart and ring worm between sheep and goats was not statistically significant ( $P > 0.05$ ).

## DISCUSSION

The present study revealed that Bahir Dar tannery produces fewer proportions of top graded skins. The reason for the production of low quality pelts may be attributed to the high prevalence of ectoparasitic diseases, the agro-climatic situations of the areas supplying fresh skins, the current market demand and price of semi processed and finished leather goods and the absence of skilled man power and modern mechanization at the tannery. This is because, ectoparasites have the tendency to damage skin directly, using their piercing mouth parts mechanically, or indirectly by causing irritations and annoyances as they feed on the skin debris, or crawl over the body surface and make the animal, rub their body against objects and then, by causing hyper sensitivity reactions to the body leaving unnoticeable scars at purchasing and/or curing stages [7].

In this study cockle was found to be the major cause of downgrading/rejection of sheep and goat skins at the pickling level, scoring 49.20%, followed by, scratch (30.10%) and post slaughtering defects (29.30%). Ring worm being the least with a prevalence of 0.2%.

On species basis, cockle was the most frequent defect in sheep skins (76.0%), where as scratch was the dominated skin defect observed on goat skins (22.9%) when compared to sheep skins (7.2). This result lies in line with that described by Worku *et al.* [8] that the dominant causes of skin rejection are cockle (30.11%) and scratch (26.26%) at Modjo Tannery and that of Solomon, [9] who described cockle as the major cause of skin rejection, contributing for about 60% of sheep skins rejected. Similarly, Tadesse, [10] at Dessie tannery and Ermias [11] at Sebeta tannery described that 70.8 and 89.0% of pickled sheep skins were downgraded/rejected due to the defect caused by cockle respectively.

The differences in the prevalence of cockle by the above researchers might be brought by differences in the origins for the raw skins and the differences in the period of the studies. The variation of the frequency of cockle between the two species could be because of the fact that, sheep are more susceptible for cockle causing known ectoparasites such as, chewing lice '*Bovicola ovis*' and sheep ked '*Melophagous ovinus*'. Sheep ked (*Melophagous ovinus*) is the most sounding cause of cockle, so that, though this parasite has a chance to be found in goats, they are most commonly found in sheep [12]. The likely reason for the preference of sheep by sheep ked when compared to goats might be because of, sheep have ticker hair coat that can give them a good living environment than those of goats [13].

The high proportions of scratches in goat skins may be because of the browser feeding behaviour of goats, so that they are vulnerable to spine abrasions, by thorny bushes on grazing and the thin layer of hair coat that cannot protect the skin from injury during rubbing against an object when there is an ectoparasite causing itching. As a result goats are more likely to acquire scratches and scars on their life-spans than of sheep [8].

Most of skin defects, were concentrated on large and extra large sized skins rather than small and medium ones. Cockle was seen on 72.5% of large sized skins, as scar was more prevalent on extra large sized skins with 45.1% prevalence. On the other hand scratch was observed in 36.3 and 37.7% of large and extra large skins respectively [3].

Wart and ring worm were exclusively apparent on large and extra large skins. This is because ectoparasitic diseases, though affects all age groups, they runs a more chronic course in adults than younger animals. Scar and scratch have the tendency to be more acquired in older animals than the younger ones. As big sized/older animals are prone to acquire defects on their lifespan, the quality/grades of skins coming from these animals are more likely to decrease because of these defects [14].

### CONCLUSION

The present study showed high prevalence of skin defects at Bahir Dar tannery, Ethiopia. This indicates that these defects were the aftermaths of diseases and injuries that the animal experienced during the pre slaughter lifetime so that the older the animal, the more the vulnerable to injuries and diseases and other defects from the bad management practices, like shearing and branding could play a role in the occurrence of skin defects. This

suggests the need to implement awareness and rigorous training on the prevalence, causes and prevention of skin defects and safe handling and processing of skins among the livestock owners, abattoir workers, back yard slaughter men, skin collectors and factory workers in the areas which supply skin to the tannery in order to decrease the immense economic losses to the country, Ethiopia.

### ACKNOWLEDGEMENTS

The work incorporated in this research was undertaken using the research grant allocated by College of Agriculture and Veterinary Medicine, Jimma University. The researchers are grateful to the University in particular and government of Ethiopia, in general, for providing them the research fund. We would like to express our gratitude to Bahir Dar tannery staffs for the support we received during the research.

### REFERENCES

1. Arunga, R., 1995. The role of hides, skins, leather and leather products for sustainable economic growth. Proceedings of a Regional Workshop. July 28-30, 2010, Addis Ababa, Ethiopia.
2. Girma, T., 2003. Confederation of National Associations of Tanners and Dressers of the European Union, Brussels Belgium.
3. Kassa, B., 2001. Major Skin Disease of Cattle, Sheep and Goats in Ethiopia. Food and Agricultural Organization of the United Nations, Rome, Italy.
4. Abadi, M., 2000. African economies, national workshop, 11<sup>th</sup> Sep.-5<sup>th</sup> Oct. 1995, Addis Ababa, Ethiopia.
5. CSA, 2011. Ethiopian Agricultural Sample Enumeration, 2011/2012. Central Statistic Authority, Federal Democratic Republic of Ethiopia.
6. Thrusfield, M.V., 2005. Veterinary Epidemiology, 3<sup>rd</sup> ed. Blackwell science, oxford, pp: 234-238.
7. FAO, 2003. World statistical compendium for raw hides, skins, leather and leather products in Ethiopia.
8. Worku, B., N. Haileleul, A. Sefinew and M. Hailu, 2011. Assesment on major factors that cause skin rejection at Modjo tannery, Ethiopia Trop. Anim. Health Prod., 43(5): 989-93.
9. Solomon, W., 2011. Impact of ectoparasite control campaign on quality of processed skins in tanneries of the Amhara Regional State, Ethiopia, Ethiopian Veterinary Journal, 15(1): 103-115.

10. Tadesse, H., 2005. Pre-slaughter Defects of Hides and Skins. In the Proceedings of a Regional Workshop. April 18-20, 2005, Addis Ababa, Ethiopia.
11. Ermias, Y., 2000. A study on ectoparasites of fresh sheep pelts and assessment of pickled skin defects processed at Sebeta tannery, DVM thesis, Faculty of Veterinary Medicine, Addis Ababa University, Ethiopia.
12. ESGPIP, 2009. Common defects of sheep and Goat skins in Ethiopia and their causes In: Ethiopian Sheep and Goat Productivity Improvement Program. Technical Bulletin, 19: 100-129.
13. Kassa, B., 2005. Pre-slaughter defects of hides/skin and intervention options in east Africa: Harnessing the leather industry to benefit the poor. Regional Workshop Proceedings, April 18-20, Addis Ababa, Ethiopia, pp: 71-84.
14. Radostitis, O.M., D.C. Blood and C.C. Gay, 2007. Veterinary Medicine, Text book of cattle, sheep, pigs, Goats and Horses, 8<sup>th</sup> ed. Bailliere Tindall, UK, pp: 1280-1308.