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Skin defects affecting quality of leather in Tigray Regional State, Northern Ethiopia

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Abstract

Skins of goat are among export animal products of the country that contributes foreign currency earnings. The purpose of this study was to determine the major skin defects causing low quality of leather in the leather industries of Tigray region. Randomly about 60 skins of goat were collected and were analyzed in Sheba Leather Industry at the wet-blue stage of processing. Accordingly the major defects encountered were scratch (83.33), wound (50.00), flay cut (46.67), improper bleeding (43.33), demodectic mange (20.00), poor substance (18.33), pox lesions (16.67), age (6.67), hole (6.67), crack (5.00), brand mark (1.67) and putrefaction (1.67), percent respectively. The frequently detected defects were scratch followed by wound and least detected defects were putrefaction (1.67%) and brand mark (1.67%). According to the grading guideline, Out of the 60 skins 58 of them graded under 6-8 and were affected with more than two defects. Overall, out of 60 skins 26 (43.3%) of them has been rejected. In conclusion, around 12 major skin defects that have high impact on the quality of leather have been identified. To minimize the defects of the skin, animal health extension service should be promoted to increase the public awareness and collaborative work of the government and other stakeholders should be improved.

Keywords: Goats; Grading; Skin defects; Leather quality; Tigray region

1. Introduction

The importance of goats in developing countries is much higher than in developed countries. According to [1], around one billion goats which are greater than 94% of the world goat populations are located in developing countries. Africa is home to about 42% of the world's goat population [1]. Although developing countries owned large number of goat populations, 90% of the goats are raring in traditional farming system which is characterized by low input or resource limited farms, absence of breeding control, limitations in feed supplementation, knowledge of diseases very limited and overall low productivity [1].

Ethiopians economy is based on agriculture, which accounts 60% of the total GDP [2]. According to [3], the total number of goats in Ethiopia are estimated about 32.74 million. The livestock sector accounts for 19% of the total Gross Domestic Product (GDP) and generates 16-19% of the foreign exchange earnings of the country [4] through exporting commodities, such as live animals, hides, and skins. The leather industry is one of the fastest growing investment sectors in Ethiopia. At present, there are 21 tanneries in the country. In 2018, the annual export gain from leather was 133 million USD [5]. Though we have a strong raw materials for the leather industry, only 50% of skins potential are being utilized currently [5]. This is due to the high rejection of hides and skins in the tanneries because of their low quality.

Abergelle goat breeds are among the known breeds for their meat and skin production in Ethiopia [6]. These breeds are mainly reared in the lowlands of Abergelle districts of Tigray and Amhara regional states and are among the majority species in the community since they are adaptive to harsh environment [7]. Accordingly they are the main source of

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economy to the community as well as to the country; Such as they are the main source of income through selling of live goat and skin for the community, skin for Sheba Leather Industry, and meat for Abergelle Export Abattoir.

Skin defect is a general term for any damage from whatever cause on raw or cured skins and likely to depreciate the leather produced from them [8]. The quality of the skin is to a large extent related to the amount of damage to the grain surface [9]. In Ethiopia, 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 quality is related to the diminishing of skin quality. Skins are downgraded as a result of various ante-mortem and postmortem factors including poor animal husbandry, parasites, bad slaughtering and flaying techniques and inappropriate practices including collection, transportation, storage, and general handling [4, 9, 10, 11].

Recently, the Ethiopian government had an external parasite reduction campaign and different community awareness to improve the quality of the skin in all parts of the country including Tigray region. The study area favors the development and propagation of various external parasites [12] and other skin defects, and easily vulnerable to drought which makes difficult to minimize the downgrading of the skin quality. The survey data could be an input for the government of Tigray region and Sheba Leather Industry to take preventive measures collaboratively to improve the quality of leather. Therefore, this study aimed to know the major goat skin defects affecting the quality of leather.

2. Methods

2.1. Study area

This study was conducted in Tanqua Abergelle woreda, which is one of the woredas (districts) in Tigray region of Ethiopia (**Fig1**). It is bordered on the west and south by Amhara region, then by Tekeze river from the west, on the north by Kola Tembien, on the east by Degua Tembien, and on the southeast by the Southeastern zone of Tigray region. It extends 13˚ 13.371́ north latitude and E38˚ 58.856́ east longitudes. The study districts are categorized as hot to warm sub-moist low lands sub-agro ecological zone of the region with an altitude of 1300–1600 meters above sea level and the mean annual rainfall ranging from 400 to 600mm, which is characterized by low, erratic and variable rainfall. The annual temperature ranges from 28 to 42 ^{0}C. The numbers of livestock population in the woreda are estimated to be 69285 cattle, 154330 goat, and 83042 sheep [13].

2.2. Study design and data collection

A cross-sectional (one time) study design was conducted. Randomly about 60 slaughtered skins of goat were collected from skin and hide retailers in the district that were preserved by using a process stack salting. After each skin coded, they were immediately taken to Sheba Leather Industry for further laboratory processing. The defects encountered from the skin were analysed at the wet blue stage of processing in the tannery industry.

2.3. Data analysis

A descriptive statistics regarding the proportion of the defects and grading were conducted in excel.

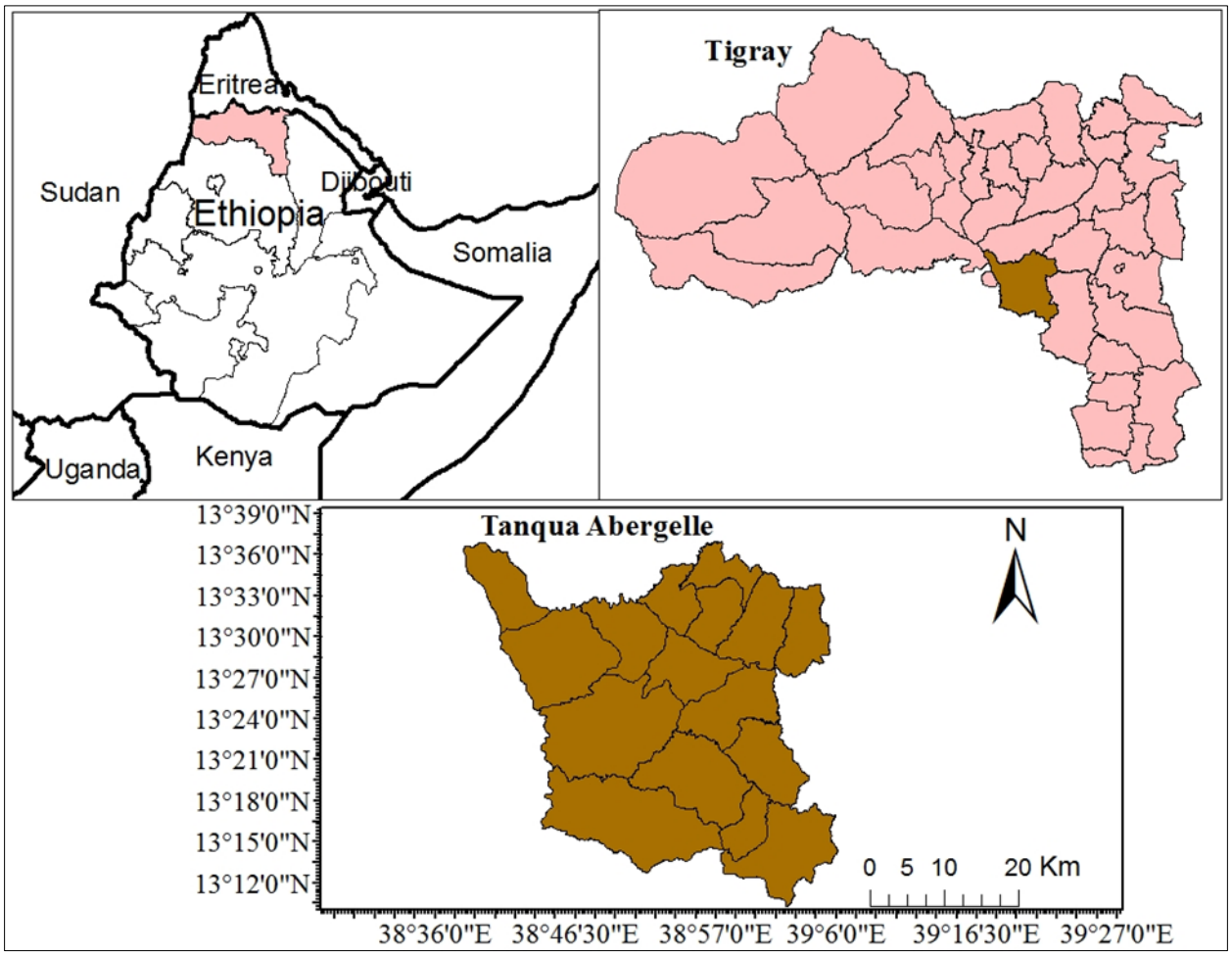

Figure 1 Topographic map of Tanqua Abergelle district

3. Results

3.1. Proportion of encountered skin defects at the blue stage of processing

Overall, about 12 defects has been identified and their proportions were as follows; scratch 83.33, wound 50, flay cut 46.67, improper bleeding 43.33, demodectic mange 20, poor substance 18.33, pox lesions 16.67, age 6.67, hole 6.67, crack 5, and brand mark 1.67 percents (**Table 1**). From the total defects encountered, the higher proportions were scratch (83.33%) followed by wound (50%). On the other hand, the least observed skin defects were brand mark (1.67%) and putrefaction (1.67%). The reason for the defects scratch and wound encountered higher might be due to the high distribution of bushes and shrubs in the study districts. Brand mark is uncommon in small ruminants (majorly applied for cattle) in the study districts as well as in Tigray region and might be the most probable reason for its least encountered defect. In Tigray community, brand mark usually applied for animals to distinguish animal owners (to whom it belongs) and as a traditional medicine to treat animals affected with infectious diseases. Flay cut and improper bleeding has also shown a significant effect in the down grading of skin quality and are the most frequently encountered defects during flaying. These defects significantly encountered usually due to the low awareness of the society because most of the Tigray community practices home slaughter (more often for small ruminants).

In addition, age and poor substance contributed significantly to the downgrading of skin quality as the community often slaughter animals after their production status ceased. Crack and hole are usually associated with sun drying and storage problems. Some examples of the encountered defects are shown in Fig 2.

Table 1 Proportion of major goat skin defects encountered during the blue stage processing

Defect name	Frequency	Percent
Improper bleeding	26	43.33
Scratch	50	83.33
Flay cut	28	46.67
Crack	3	5.00
Putrefaction	1	1.67
Pox lesions	10	16.67
Brand mark	1	1.67
Wound	30	50.00
Age	4	6.67
Hole	4	6.67
Poor substance	11	18.33
Demodectic mange	12	20.00

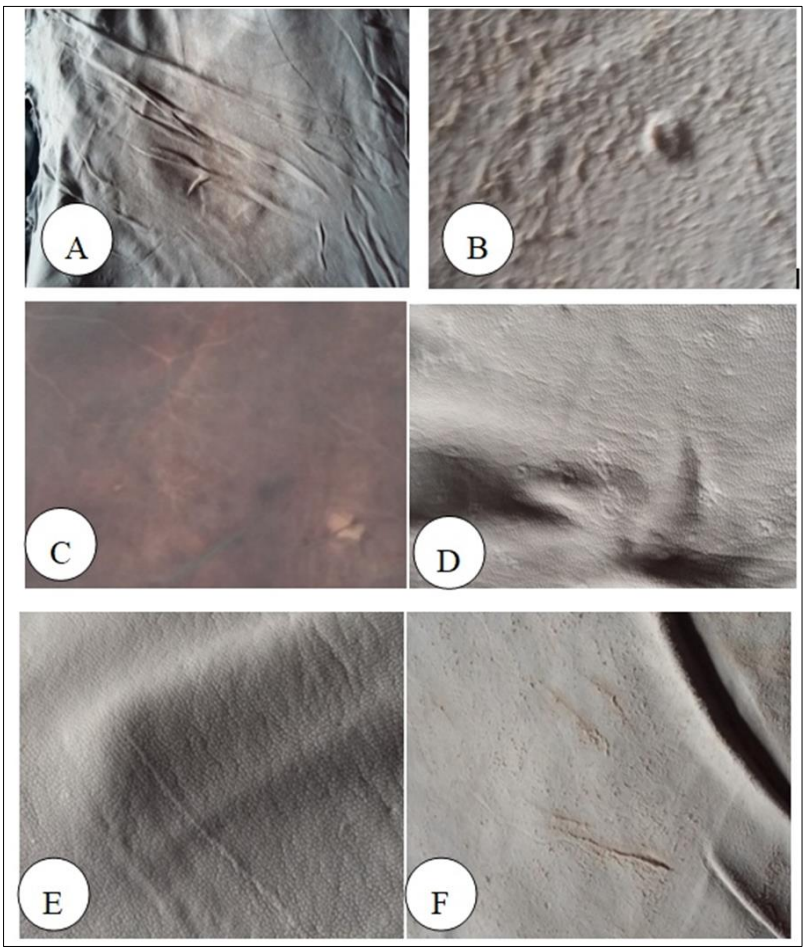

Figure 2 Some skin defects encountered; A) Age B) Demodectic mange C) Poor substance D) Wound E) Scratch F) Flay cut (Source: Photo taken by Guash Abay)

Demodectic mange causes a follicular dermatitis in the skin of small ruminants. It is manifested by nodules and crusts [14].

Pox lesions are caused by different species pox viruses that affect skin part of the sheep and goats characterized by fever, generalized papules and vesicles [15].

3.2. Grading of skins based on the encountered defects

Based on the Sheba Leather Industry grading system [16], about 13 skins affected with improper bleeding were graded under 6. Similarly most of the skins affected with scratch and wound were graded under 6 and 7. More skins (8 of them) affected with poor substance were graded under 7 and 8. Encountered skins affected with demodectic mange were graded 6 (7 of them) and 7(5 of them) on average. Age was also among the important factors to reduce the skin quality. Accordingly, the identified skins affected with age were graded under 6 (1 of them), 7 (2 of them), and 8 (1 of them). Overall, all sampled skins were graded under grade 5-8 (Table 2).

Table 2 Proportion of skin defects in different grades of skin quality

Defect s	Grade (%)			
	5	6	7	8
Improper bleeding	4 (6.67)	13 (21.67)	5 (8.33)	3 (5)
Scratch	9 (15)	19 (31.66)	14 (23.33)	9 (15)
Flay cut	6 (10)	13 (21.67)	7 (11.67)	2 (3.33)
Crack	-	1 (1.67)	1 (1.67)	1 (1.67)
putrefaction	-	1 (1.67)	-	-
Pox lesions	-	3 (5)	4 (6.67)	3 (5)
Brand mark	-	-	-	1 (1.67)
Wound	3 (5)	10 (16.67)	9 (15)	7 (11.67)
Age	-	1 (1.67)	2 (3.33)	1 (1.67)
Hole	-	-	4 (6.67)	-
Poor substance	1 (1.67)	2 (3.33)	5 (8.33)	3 (5)
Demodectic mange	-	7 (11.67)	5 (8.33)	-

According to [16] grading system, skins graded under 7 and 8 were rejected. Therefore, out of 60 goat skins 26 (43.3%) of them were rejected. Most of the rejected skins were affected with at least two and above defects.

As shown in **Table 3**, about 58 examined skins graded under grade 6, 7, and 8 were affected by two and more defects. Only two examined skins were encountered with a single defect and were graded under 5. Overall, 96.6 % (58/60) of the sampled skins were affected with two and more defects.

Table 3 Proportion of mixed skin defects under different grades of skin quality

No. of defects per individual skin	No. of skins affected and its prevalence (%)	Grade
1	2 (3.33)	5
2	20 (33.33)	5-8
3	21 (35)	5-8
4	15 (25)	6-8
5	2 (3.33)	7,8

About 20 and 21 skins were affected with 2 and 3 defects respectively and all were graded under 5-8. In addition, about 15 skins were affected with 4 defects and were graded under 6-8. Moreover 2 skins were affected with 5 defects and all were rejected.

4. Discussion

The opportunities of hides and skins sector in Ethiopia are raw material availability due to the large livestock base [4]. Defects in skin are costly from economical point of view and greatly reduce the sale value of the end product leather [10]. The common defects found during this study are scratches, improper bleeding, wound, demodectic mange, hole, putrefaction, flay cut, pox lesions, poor substance. These findings are similar to the previous studies done in Ethiopia [10, 11, 17] and Pakistan [9].

In our findings, the effect of demodectic mange on the skin quality was 20%. Our finding was higher than the previous findings by [17] in Shaba leather industry and less than the findings of [18] in Amhara region. A high contribution of skin rejection (56%) due to external parasites has been reported in Ethiopian tanneries [19]. Different studies explained the impact of ectoparasites on the skin damage in the world [9, 20]. This might be indicating us the continuous existence of mange mite infection in the study district despite the regular acaricide campaign conducting to all small ruminants all over Tigray region every year.

A high proportion of scratch (83.33%) and flay cut (46.67%) were reported in our study district as compared to the finding of [10, 11, 17]. Similar to our findings [17] and [11] were reported scratch was the prevalent defect in Sheba leather industry. The proportion of poor substance in our study was 18.33% which was smaller than the findings of [10].

Our results have shown that a high proportion of pox lesions (16.67) as compared to the previous study reported by [10]. This is an indication for the continuous existence of pox lesions in goat in the districts with a high level despite the regular vaccination against the isolated pox diseases in the whole region [12].

Our study revealed that more skins affected with scratch, poor substance, flay cut, and pox lesions were graded under 5 and above. These findings were similar with the findings of [10].

About five skins that were infested with demodectic mange were rejected. The predominant causes of downgrading and rejection of skin were demodectic mange [17, 21].

In our findings 96.6% of the skins were affected with two and above defects as compared to the findings of [10, 11].

Out of 60 goat skins 43.3% of them were rejected. Our finding was smaller than the finding of [11] who found 56.7% of goat skins were rejected in Modjo export tannery.

5. Conclusion

Our study revealed that scratch and wound were the most dominant skin defects causing downgrading and rejection of goat skin in the study district. Most of the skins were affected with more than two and above defects. These mixed defects have more impact than the impact of single defects. Based on this our findings concluded that mixed defects were the most probable reason causing skin rejections.

Based on the above conclusions the following recommendations are given

- Intensive training and community education needs to be provided for producers and collectors to reduce the pre-slaughter skin defects.
- Regular prevention measures against external parasites (demodectic mange) should be provided.
- Collaborative work with Bureau of Agriculture, Research institutions, Leather industries, Universities and other responsible organizations need to be enhanced to rule out the mixed defects and minimize the downgrading of skin qualities.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare that they have no competing interest.

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