Skin defects affecting goat skin quality in Tanqua Abergelle district, Northern Ethiopia

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Abstract

Background: Skins of goat are among export animal products of the country that contributes foreign currency earnings. But many skins are rejected in the tanneries of Ethiopia due to their low quality. The purpose of this study was to identify the major defects causing low quality of skins in Tanqua Abergelle districts.

Methods: Randomly 60 skins of goat were collected to identify the major defects that degrade the quality of skin in Tanqua Abergelle districts and were analyzed in Sheba Leather Industry at the wet-blue stage of processing.

Results: Accordingly the major defects encountered were scratch (83.33), wound (50.00), knife (46.67), improper bleeding (43.33), demodectic mange (20.00), poor substance (18.33), pox/wart (16.67), age (6.67), hole (6.67), crack (5.00), brand mark (1.67) and putrifaction (1.67), percent respectively. The frequently detected defects were scratch (83.33%) followed by wound (50%) and least detected defects were putrifaction (1.67%) and brand mark (1.67%). From the total defects the proportion of demodectic mange was 20%. Out of the 60 skins 58 of them were encountered two and more than two defects. Those skins with more than two defects and above have been graded under 6 and above. According to Sheba Leather Industry guidelines, those skins graded under grades greater than 7 are rejected. Therefore, out of 60 goat skins 26 (43.3%) of them has been rejected. Most of the rejected skins were affected with at least two defects and above.

Conclusions: In conclusion, around 12 major defects that have high impact on the quality of skin have been identified. Therefore, to minimize the defects of the skin extension service should be promoted to increase the public and butchers awareness and collaborative work with stakeholders should be enhanced.

Background

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. 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 (International Trade Center, 2020). According to [2], 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 [3] 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 [4]. Though we have a strong raw materials for the leather industry, only 50% of skins potential are being utilized currently [4]. This is due to the high rejection of hides and skins in the tanneries because of their low quality.

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 [5]. The quality of the skin is to a large extent related to the amount of damage to the grain surface [6]. 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 and especially tanning industries is related to the decreasing quality of skins. 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 [3, 6, 7].

Recently, Ethiopian government had an external parasite campaign and different community education to improve the quality of the skin in all parts of the country including the study district. The study area favors the development and propagation of various external parasites [8] and skin defects, and easily vulnerable to drought which makes difficult to minimize the downgrading of the skin quality. Therefore, the objective of this study was to know the major goat skin defects in the area.

Methods

Study area

This study was conducted in Tanqua Abergelle woreda, which is one of the woredas (districts) in Tigray region of Ethiopia. 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° 13.371' north latitude and E38° 58.856' 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 °C. The numbers of livestock population in the woreda are estimated to be 69285 cattle, 154330 goat, and 83042 sheep [9].

Study design and data collection

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

Data analysis

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

Results

Proportion of encountered skin defects

Overall about 12 defects has been identified with their proportions as follows; scratch 83.33, wound 50, knife 46.67, improper bleeding 43.33, demodectic mange 20, poor substance 18.33, pox/wart 16.67, age 6.67, hole 6.67, crack 5, and brand mark 1.67 percents (**Table 1**). From the total defects the proportion of defects from scratch (83.33%) followed by wound (50%) were higher. On the other hand, the least observed skin defects were brand mark (1.67%) and putrifaction (1.67%). Scratch and wound were encountered in a high proportion might be due to the high distribution of bushes and shrubs in the study

districts. Brand mark was the least encountered defect. This is because brand mark is not frequently applied in small ruminants as compared to cattle in the studied local community. Brand mark usually applies to animals for owner identification and to treat animals infected with infectious diseases. Knife cut and improper bleeding has also significant effect in the down grading of skin quality. These are the most frequently encountered defects during flying. These defects might be higher because of low awareness of butchers and the society at higher.

Table 1. Proportion of major goat skin defects in Tanqua Abergelle districts

Defect name	Frequency	Percent
Improper bleeding	26	43.33
Scratch	50	83.33
Knife	28	46.67
Crack	3	5.00
Purification	1	1.67
Pox/wart	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

Age and poor substance also contributes significant contribution as a skin defects because the society has a habit of slaughtering animals after they finish their production i.e. when they get old. Crack and hole are mostly associated with storage and drying problems.

Grading of skins based on the encountered defects

As shown in **Table 2**, 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 affected with poor substance were graded under 7 and 8. Encountered defects due to demodectic mange were graded 6 (7 of them) and 7(5 of them) on average. Age is also among the important factors to reduce the skin quality where those skins affected with age were graded under 6 (1 skin), 7 (2 skin), and 8 (1 skin). Overall, all skins were graded under grade 5-8.

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)
Knife	6 (10)	13 (21.67)	7 (11.67)	2 (3.33)
Crack	-	1 (1.67)	1 (1.67)	1 (1.67)
Putrify	-	1 (1.67)	-	-
Pox/wart	-	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 Sheba Leather Industry guidelines, those skins graded under grades greater than 7 are 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 defects and above. Most of skin rejection was seen due to first scratch, followed by wound.

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 skins were encountered with a single defect and were graded under 5. Overall, 96.6 % (58/60) of the skins were affected with more than two or 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. 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. In general, the grade of the skins was decreasing as the numbers of defects encountered were increasing.

Discussion

The opportunities of hides and skins sector in Ethiopia are raw material availability due to the large livestock base [3]. Defects in skin are costly from economical point of view and greatly reduce the sale value of the end product leather [7]. The common defects found during this study are scratches, improper bleeding, wound, demodectic mange, hole, putrifaction, knife cut, pox, poor substance. These findings are similar to the previous studies done in Ethiopia [6,7,10] and Pakistan [11].

In our findings, the effect of demodectic mange on the skin quality was 20%. Our finding was higher than the previous findings by [10] in Shaba leather industry and less than the findings of [11] in Amhara region. A high contribution of skin rejection (56%) due to external parasites has been reported in Ethiopian tanneries [14]. Different studies explained the impact of ectoparasites on the skin damage in the world [13,14]. This might be indicating us the continuous existence of mange mite infection in the study district despite the regular acariced campaign conducting to all small ruminants all over Tigray region every year.

A high proportion of scratch (83.33%) and knife cut (46.67%) were reported in our study district as compared to the finding of [6,7,10]. Similar to our findings [10] and [7] 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 [6].

Our results shown that a high proportion of pox lesions (16.67) as compared to the previous study reported by [7]. This is indicating us there is still a continuous existence of pox infections in goat in the districts with a high level [12].

Our study revealed that more skins affected with scratch, poor substance, knife cut, and pox lesions were graded under 5 and above. These findings were similar with the findings of [6]. About five skins that were

infested with demodectic mange were rejected. The predominant causes of downgrading and rejection of skin were demodectic mange [6,10,13]. In our findings 96.6% of the skins were affected with two and above defects as compared to the findings of [6,7]. Out of 60 goat skins 43.3% of them were rejected. Our finding was smaller than the finding of [6] who found 56.7% of goat skins were rejected in Modjo export tannery.

Conclusion And Recommendation

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 preslaughter 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

Declarations

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analysed during the current study are not publicly available due to the regulation prohibition article to third party from our organization (Abergelle Agricultural Research Center) but are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

GA conducted laboratory analysis, data entry, data analysis, full write up and preparing and processing the manuscript for publication. ZN has participated in data collection and proposal preparation.

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Figures

Figure 1

Some skin defects encountered; A) Age B) Demodex C) Poor substance D) Wound E) Scratch F) Knife cut