

Leather Quality of Sudan Nubian and Desert goats

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Abstract

This trial was aimed to study leather properties that produced from Nubian and Desert subtypes of Sudan goats. Five pieces of fresh skins from each of bucks, does and kids from the two subtypes were collected randomly during January 2015. The study samples were taken according to the Complete Randomized Design. The results revealed that, kid goat's skin was significantly ($p \geq 0.05$) produced better quality leather than bucks and doe's skin in tensile strength (kg/cm^2), cracking load (kg), thickness (mm), tear load (kg/cm) and flexibility degree. But kids and buck's skins were produced the same quality leather in elongation % and moisture% with significant variation ($p \geq 0.05$) to doe's leather. Kid's skin yielded leather with the same characteristics to buck's and doe's leather in Ash%, fat% and chrome%. Generally Desert goat produced slightly better quality leather than Nubian goat. Leather properties (cracking load (kg), tear load (kg/cm), and Ash %) were significantly ($p \geq 0.05$) affected by breed variation. On the other hand elongation%, tensile strength (kg/cm^2), thickness (mm), moisture%, fat %, flexibility and chrome% were not significantly ($p \geq 0.05$) affected by the breed.

Keywords: *Leather Quality; Nubian goats; Desert goats; Age; Sex; Breed*

Abbreviations: kg: kilogram; cm: centimeter; mm: millimeter

Introduction

In Sudan goats were estimated at 42.5 million head forming about 31.7% of ruminants in the countries, 18.2% of goats in Africa and 5.3% of the world goat population [1,2]. This population composed of four major local breeds, Nubian, Desert, Nilotic and the Dwarf, distributed throughout the country [3]. The Nubian goat is considered as a milk production, while the other breeds are generally considered as meat animals [4,5]. The Desert goat is characterized by the long drooping (lop) ears, as in the Zaraibi of Egypt and Nubian of the Sudan [6].

In regions that are not suitable for crop cultivation and cattle production goats are the most important livestock for rural inhabitants [7]. Goats are important in arid and semi-arid zones especially in developing countries due to their superior adaptation to environment and feeding habits [4]. Their inquisitive feeding habits enable them to extend their feed preferences and also perform well in situations where other ruminants may not be able to survive. Goats prefer variations in their feed and they are selective feeders [8].

In Sudan, goats and sheep play an important integral component in most traditional production systems. They provide milk for children, meat, skin and cash income from sales [9]. This trail is aimed to study two subtypes of Sudan goat's (Nubian and Desert) leather properties and to compare between them on leather quality in relation to age and sex.

Materials and Methods

Study area

Skins samples were collected from Elobaied leather market, North Kordofan state in latitudes 11° 5' - 13° 75' N and longitudes 27°- 29° 5' E in Sudan [10]. The area is located within the poor Savannah belt. The climate is warm in wet season, hot dry in summer and cool dry in winter. The rainy season is about four months (mostly from July to October), peaking at August and the annual average rainfall is between 300- 400 mm [11]. The soil is generally of smooth undulating sandy plain dissected by batches of loamy sand in the southern part. The dominant vegetation is a mixture of thorny trees, shrubs, herbs, where *Acacia senegal* is the most important type from economic point of view, for it produces Gum Arabic which is considered as the best cash crop. Grasses include *Dactyloctenium aegyptium*, *Cenchrus biflorus*, *Echinochloa colonum*, *Eragrostis tremula*, *Andropogon gayanus*, *Zornia glockidata*, and *Ipomea cordiosepala* [12].

Skin samples collection and tanning procedures

Five pieces of fresh skins of each of buck, doe and kid from two Sudan goats' subtypes (Nubian and Desert) collected randomly from Elobaied leather Market at north Kordofan state, Sudan. The collected fresh skins cured by salt-drying technique. The cured skins were transported to Khartoum National leather Technology Centre for tanning and laboratories analysis work. Leather was prepared from sheep skin according to the following main steps: Soaking, liming, de-liming, bating, degreasing, pickling, tanning, neutralization and re-tanning according to [13].

Sampling and assessment of chemical and physical characteristics were done according International Standards Organization [14,15]. Physical properties that assessed were Tensile strength and elongation percentage and it was determined according to [16]. Flexibility test was assessed according to [17]. Tearing load and resistance to grain cracking were done according to [18,19] respectively. Moisture, total Ash, fats and oils contents were determined according to [20]. Chrome content was measured according to [21] procedures.

Statistical Analysis

The data were statistically analysed using analysis of variance method. The Statistix 8 program was used for this purpose on Complete Randomized Design (CRD) according to [22]. Duncan's Multiple Range Tests (DMRT) was used for means separation [23].

Results and Discussion

Effect of age on leather quality of Nubian and desert goats

As shown in table 1 elongation percent was significantly affected ($p \geq 0.05$) by the age of the animals. The proper elongation percent was recorded at bucks and kid's leather 58.3 ± 3.6 and 58.7 ± 2.6 respectively. Bucks, does and kids elongation percentages were in the accepted limit for upper, garment and lining leather that estimated at 60% by [24-26]. Tensile strength (kg/cm^2) results were significantly affected ($p \geq 0.05$) by animal's age, and in the suitable standard of [24-26] for upper, lining and garment leather respectively. Cracking load (kg) was significantly affected ($p \geq 0.05$) by the animal's age, and the high records were obtained at kid's leather followed by buck's leather and last doe's leather. Thickness (mm) results were significantly affected ($p \geq 0.05$) by the animal's age, and the high record was in kid's leather (1.57 ± 0.1 mm). Thickness results were in the [24-26] standards for upper, lining and garment leather respectively. The high records of Tear load (58.4 ± 1.5 kg/cm) was assessed in kid's leather and it significantly different ($p \geq 0.05$) from which were reported for buck's and doe's leather. Kid's leather scored the better level of flexibility (1.2 ± 0.5) followed by doe's leather (2.1 ± 0.8) and the worst degree was observed in buck's leather (3.3 ± 0.6).

Chemical contents of Ash%, fat %and chrome% of goat leather were not affected ($p \geq 0.05$) by the animal's age. While moisture% results were significantly affected ($p \geq 0.05$) by the animal's age. The high content of moisture (11.7 ± 2.3) was reported at kid's leather. All chemical constituents were in the [24-26] standards for leather chemical thresholds.

Quality parameters	Ages		
	Buck leather	Doe leather	Kid leather
Elongation %	58.3 ± 3.6 ^B	61.8 ± 2.9 ^A	58.7 ± 2.6 ^B
Tensile strength (kg/cm ²)	194.40 ± 5.5 ^B	159.1 ± 13.1 ^C	226.1 ± 16.2 ^A
Cracking load (kg)	19.8 ± 1.1 ^B	16.3 ± 1.3 ^C	24.5 ± 1.2 ^A
Thickness (mm)	1.34 ± 0.1 ^B	1.22 ± 0.1 ^C	1.57 ± 0.1 ^A
Tear load (kg/cm)	43.5 ± 1.4 ^B	33.6 ± 0.7 ^C	58.4 ± 1.6 ^A
Flexibility degree	3.3 ± 0.6 ^A	2.1 ± 0.8 ^B	1.2 ± 0.5 ^C
Moisture%	9.6 ± 2.2 ^B	10.8 ± 1.6 ^A	11.7 ± 2.3 ^B
Ash%	2.74 ± 0.2 ^A	2.75 ± 0.4 ^A	2.64 ± 0.2 ^A
Fat %	4.07 ± 1.1 ^A	3.78 ± 0.7 ^A	4.30 ± 0.9 ^A
Chrome%	3.08 ± 0.5 ^A	3.02 ± 0.6 ^A	3.01 ± 0.4 ^A

Table 1: Age effect on Sudan goat's leather quality during January 2015. Values in the same row with different superscripts differ significantly.

Effect of breed type on leather quality of Nubian and desert goats

As shown in table 2 elongation percent was not significantly affected ($P \geq 0.05$) by the breed. This result is different from which was found by [13,27-29] who reported significant differences on goats and sheep leather in relation to breed variation.

Tensile strength (kg/cm²) was not affected ($P \geq 0.05$) by the breed. Similar results were obtained by [13,27,30] who reported that, significant difference in leather strength properties between goat breeds was not detected.

The strength and distension at grain crack and break of a leather act as a guide as to how the material will perform when a multi-directional stress is applied. Grain crack is primarily considered as a measure of the strength of the grain layer within the tested material. Generally, these variables are more important in shoe upper leather, although optionally used in garment leather as physical quality parameter. Distension and strength of grain cracking (kg) were significantly affected ($P > 0.05$) by breeds of the animal. However, indigenous Ethiopian goats had numerically better distension and strength of grain than cross breeds [27]. Similar result of significant different was reported by [13] on Sudan goat leather. As it is observed, thickness of skin was not affected ($P \geq 0.05$) by the goat breed. Previously, high degrees of homogeneity in thickness among different genotypes were obtained by [13,30-33].

Tear strength (kg/cm) values were significantly affected ($P > 0.05$) by breeds of animals. Indigenous Blackhead Ogaden has, however, numerically higher tear strength (N/mm) than Dorper x Hararghe Highland [27]. Similarly, Dorper x Blackhead Ogaden require numerically higher force to tear the leather than indigenous Hararghe Highland goats [27]. This indicates that pure desert goats resist more force. Previous research conducted on Brazilian indigenous x Dorper sheep genotype showed numerically higher progressive tear strength for the genotype Santa Inês (indigenous Brazilian sheep) than respective cross [30]. Oliveira, *et al* [30] also observed higher progressive tear strength of goat leather than sheep.

Tear load (kg/cm) was significantly affected ($P \geq 0.05$) by the breed variation. Higher progressive tear strength of goat leather within animal breed was observed by [13,31-33]. Breed effect was detected among goat leather flexibility and Ash. Similar results were reported by [13] findings on these parameters at Sudan goat's leather. This is evidence that leather produced from local breeds is stronger and could be extended more before the grain cracks.

Chrome oxide and fat percentages were not significantly affected ($p \geq 0.05$) by the breed. A different result of significant was obtained by [13] on Sudan goat leather in relation to breed variations.

Quality parameters	Breeds	
	Desert	Nubian
Elongation %	59.93 ± 3.1 ^A	59.27 ± 3.7 ^A
Tensile strength (kg/cm ²)	196.1 ± 29.3 ^A	190.4 ± 32.1 ^A
Cracking load (kg)	23.8 ± 3.7 ^A	18.6 ± 3.6 ^B
Thickness (mm)	1.37 ± 0.2 ^A	1.39 ± 0.2 ^A
Tear load (kg/cm)	59.53 ± 8.3 ^A	41.47 ± 9.5 ^B
Flexibility degree	2.13 ± 1.1 ^B	2.73 ± 1.3 ^A
Moisture%	10.93 ± 2.2 ^A	10.47 ± 2.7 ^A
Ash%	2.88 ± 0.2 ^A	2.54 ± 0.2 ^B
Fat %	4.31 ± 0.8 ^A	3.79 ± 1.1 ^A
Chrome%	3.09 ± 0.6 ^A	2.98 ± 0.5 ^A

Table 2: Breed effect on Sudan goat's leather quality during January 2015. Values in the same row with different superscripts differ significantly.

Conclusion

Kid goat's skin was produced slightly better quality leather than bucks and doe's skin on physical properties. But, it was yielded leather with the same chemical characteristics to buck's and doe's leather. Leather properties were affected by breed variation. Generally Desert goat's skin produced slightly better quality leather than Nubian goat's leather.

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