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The effect of breed on Skin\ Leather Quality of Sudan Desert Sheep

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ABSTRACT

This study was carried out to estimate the effect of Sudan Desert sheep breed variations on skin\leather quality. Five Sudan desert sheep breeds on an average age of 1-1.2 years were selected for the study. One hundred and fifty (150) pieces of fresh skins from five non-castrated male of Sudan desert breeds were collected from west Sudan (Kordofan state) and east Sudan (Gezira and Butana). The results showed that, Fresh skin weight, elongation, tensile strength**,** flexibility, cracking and tear load results were significantly affected ($P \geq 0.05$) by breed variations. Thickness findings were not significantly affected ($P \geq 0.05$) by breed. Moisture, fat and chrome oxide contents findings were significantly affected ($P \geq 0.05$) by breed. Whereas, Ash content values were not significantly affected ($P \geq 0.05$) by breed variations.

Keywords: breed, Skin\ Leather, Quality, Sudan, Desert Sheep.

INTRODUCTION

Sudan produce about 22 million pieces of raw material hides and skins, which were obtained from about 140 million of cattle, sheep, goats, reptiles and snakes (MAR, 2008). The world sheep leather production was estimated at 571.4 million pieces, which represent about 15% of total world leather production. Sudan produces about 9.3 million pieces of sheep skins which represents about 42% of total Sudan leather production (FAO, 2008 and ATO, 2009). Sudan sheep flock was estimated at 50.9 million head with total growth rate of 149%. Sudan desert sheep and their crosses makeup about 80 % of the sheep found in Sudan and mainly predominant north of 12º N, they are raised mainly under harsh dry land farming conditions for meat production (Idris1 *et al.*, 2010; Alraed, 2011 and FAO, 2009).

Medani (1996) classified Sudan desert sheep under these main ecotypes: Gazera and Butana sheep this group includes (Shugor, Watich and Dubasi); Kabashi and Hamari sheep in Kordofan region; Medoub sheep; Albega sheep; Northern Nilotic sheep and Western Africa sheep this group include: Fulani and Zaggawa sheep. Idris *et al.,* (2001) reported that, the nutritional limitation, low nutritive value of the range, high ambient temperature, scarcity of

feed and water are have great effect on the reproduction and production performance of the sheep in semi-arid area of Kordofan state as compared to that in temperate regions. Generally, animals reared on natural pastures produce skins that vary in physical characteristics and chemical constituents when compared to animals raised in closed and semi closed systems or feed lots. These differences may be due chiefly to breeds and seasons variations especially in feedstuff matter quality (Ali, 2004).

Thus this study was aimed to estimate the effect of breed variations; in area of Kordofan stateand in Gezira and Butana region; on Sudan desert sheep skins production and hence leather quality, when compared with Sudanese standard specifications for leather quality.

MATERIAL AND METHODS

Study Area

This study was conducted at the national centre for leather technology Khartoum, Sudan. Skins from Sheep were collected from Kordofan region in the western part of the Sudan (latitudes 9°:30' and 16°: 30' North and longitudes 24° and 32°: 25' East), from Gazira state in the east-central region of the Sudan (latitudes 14°:30- and 33°: 30- North and longitudes 14°:50' and 33°: 50' East) and from Butana plain in Eastern Sudan (Latitude 13°:40-and 17°:50- North and Longitude 32°:40' and 36° East). The rainfall ranges between 600 mm/year in the southeast to less than 100 mm/year in the northwest.

The annual mean temperature ranges from 32° C during the day to 16° C at night in January (winter) and from 46° C during the day to 27° C at night in May-June (summer). Two vegetation zones are existing in the area, namely semi-desert Acacia shrub and short grasslands of the North Central Sudan and secondly, the low woodland savannah of central Sudan. The natural vegetation consisted mainly of the grass species *Panicum tugidum, Arisdia spp, Cympopogons spp., Ctenium elegan, Dactyloctenium aegyptium* and *Eragrostis tremula* (Farah, 2006; Darosa and Agab, 2013; Saint-Martin *et al*., 1992).

Selection of Experiment Animal Skins

One hundred and fifty (150) pieces of fresh skins from Five (5) non-castrated male of Sudan desert sheep breeds (30 from each breed) on an average age of 1-1.2 years old were collected for the study. Sheep were divided in two groups, group one consistent of Shugor, Watish and Dubasi represents east Sudan sheep; second group consistent of Hamari and Kabashi represents the semi-arid area of west Sudan sheep.

Tanning Procedures and Sampling

Leather was prepared from sheep skin according to the following main steps: Soaking, liming, deliming, bating, degreasing, pickling, tanning, neutralization and re-tanning. Sampling and assessment of chemical and physical characteristics.

Physo-mechanical properties that assessed were Tensile strength, elongation% , Flexibility test and Measurement of tearing load and resistance to grain cracking. Moisture, total Ash, fats and oils contents were determined according to AOAC (1984).

Statistical Analysis

The data were statistically analyzed according to complete randomized design using SPSS v.14.0 software package (SPSS, 1996). Duncan's Multiple Range Tests (DMRT) was used for means separation, beside comparing skin and leather measurements results with Sudanese Standard Thresholds for leather quality according to SSMO standards.

RESULT AND DISCUSSION

Skin\Leather Physical Quality of Sudan Desert Sheep

Green or fresh skin weight (kg) showed significant difference ($p \geq 0.05$.) between Sudan desert sheep breeds under studding. Thus, Kabashi and Shugor Sudan desert sheep breeds recorded the highest weight, while, Dubasi Sudan desert sheep breed was recorded the lowest weight of fresh skin. These results were different from Sudha *et al*., (2009); Salehi *et al*., (2014) and Passman and Sumner (1983) whom stated that, no type effects on leather weight on crust tanned sheep leather from different types. These findings might considered according to Triple Line Consulting (2002) which determined the size (weight) of a hide or skin is closely related to the weight of the animal from which it came, and is typically between 7 and 11% of the live weight.

Elongation percents were significantly ($p \geq 0.05$) affected by breed. Hamari Sudan desert sheep breed was reported the highest elongation percent. These results were exceeded the estimated value of elongation percentage (60.6±0.9) which reported by Sudha *et al*. (2009); Salehi *et al*., (2014) and Passman and Sumner (1983). Otherwise, these findings were similar to Teklebrhan *et al*., (2012) Craig *et al*., (1987) and Jacinto *et al*., (2005) reports on native Ethiopian sheep lamb leathers, which had numerically higher tensile strength and percentage elongation at break.

Tensile strength kg\cm^2 parameter was reported no statistically significant difference ($p \geq 0.05$.) between Dubasi, Shugor, Watish and Kabashi but, they were different from Hamri finding which was the lowest finding in comparison to which were reported by the above group of desert sheep breeds. Similar results of insignificant differences in strength properties was reported by Teklebrhan *et al.*, (2012) and Oliveira *et al.*, (2007) whom mentioned that, significant difference in strength properties among sheep lamb breeds was not detected when they studied Ethiopian sheep. However, it is below the estimated value for the parameter (203.6±5.1 kg /cm^2) which mentioned by Sudha *et al*., (2009); Salehi *et al.*, (2014) and Passman and Sumner (1983). In addition, these results were in line with Teklebrhan *et al.*, (2012) Craig *et al*., (1987) and Jacinto *et al*., (2005) whom reported that, the native Ethiopian sheep lamb leathers had numerically higher tensile strength and percentage elongation at break. This is evidence that leather produced from these breeds is stronger and could be extend more before the grain cracks.

Resistance to grain cracking N/cm^2 was affected by breed. Kabashi and Watish sub-types were scored the high load. These findings were in line with Sudha *et al*., (2009); Salehi *et al*., (2014) and Passman and Sumner (1983) whom stated that, leather from adult sheep had significantly higher values for cracking force (7.6±0.7 N/cm^2). Craig *et al*., (1987) and Oliveira *et al*., (2007) reported that 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.

The leather thickness was resulted in no a statistically difference ($p \geq 0.05$) observation between Sudan desert sheep sub-types. This result was in line with Oliveira *et al.,* (2007) Sudha *et al*., (2009); Salehi *et al*., (2014) and Passman and Sumner (1983) whom observed that, thickness of skin was not affected by sheep lamb breed and high degrees of homogeneity in thickness among different genotypes was obtained.

Shugor Sudan desert sheep sub-type was reported the high tear load and this was statistically different ($p \geq 0.05$) from which were recorded by Dubasi, Watish, Kabashi and Hamari. Watsh and Hamri were reported the low tear load findings. These findings were similar to Sudha *et al*., (2009); Salehi *et al.*, (2014) and Passman and Sumner (1983) estimation for tear load at 37.9±0.5 kg/cm^2 on crust tanned sheep leather from different types.

Hamari and Dubasi scored the better degrees of flexibility test results. These values was significantly different ($p \geq 0.05$.) from those were reported by Shugor, Watish and Kabashi. These results were similar to Teklebrhan *et al.*, (2012) and Oliveira *et al.*, (2007) results; significant difference in flexibility properties among sheep lamb breeds was not detected (Table 1).

Table 1: the effect of Sudan desert sheep breed on physical properties of skins

Parameters	Breeds				
	Dubasi	Shugor	Watish	Kabashi	Hamari
Weight (kg)	1.23 ±0.10^{c}	1.48 ±0.23^{a}	1.33 ±0.17^{b}	1.56 ±0.24^{a}	1.38 ±0.20^{b}
Elongation%	58.15 ±5.89^{c}	62.68 ±6.17^{b}	64.47 ±5.79^{ab}	59.56 ±5.40^{c}	66.50 ±4.62^{a}
Tensile strength (kg/cm^2)	195.4 ±29.61^{a}	182.1 ±42.60^{b}	185.4 ±43.11^{a}	191.4 ±29.43^{a}	150.4 ±36.37^{b}
Cracking load (N/cm^2)	7.84 ±1.15^{c}	8.80 ±1.39^{b}	9.23 ±1.61^{ab}	9.49 ±1.92^{a}	7.95 ±1.22^{c}
Thickness (cm)	1.35 ±0.47^{a}	1.28 ±0.45^{a}	1.38 ±0.43a	1.39 ±0.32^{a}	1.21 ±0.35^{a}
Tear load (Kg/cm^2)	39.81 ±5.72^{c}	46.76 ±7.38^{a}	33.70 ±2.93^{d}	42.86 ±4.82^{b}	33.60 ±3.28^{d}
Flexibility (Degree)	2.87 ±0.90^{bc}	3.63 ±0.67^{a}	3.27 ±0.83^{ab}	3.43 ±0.82^{a}	2.57 ±0.73^{c}

Values in same row with different superscripts differ significantly (P≤0.05)

Leather Chemical Quality of Sudan Desert Sheep:

Shugor Sudan desert sheep sub-type leather moisture percent was significantly different ($p \geq 0.05$) from all other studied sub-types of Sudan desert sheep. These results were in line with Sudha *et al*., (2009); Salehi *et al*., (2014) and Passman and Sumner (1983) and their estimation for moisture percent of 11.3±0.2 on crust tanned sheep leather.

Leather Ash content determined values range between 2.84-2.88% for all Sudan desert sheep breeds. These results were similar and no significant differences ($p \geq 0.05$) were observed between breeds. However, these results were below the estimated value for the parameter (6.2±0.4%) that reported by Sudha *et al*., (2009); Salehi *et al*., (2014) and Passman and Sumner (1983).

Estimated values of fat contents within Sudan desert sheep leather were reported significant difference ($p \geq 0.05$) between breeds. These values of fat contents were in range 4-10%, which were different from Sarkar (1991) who reported that, the natural fat content of sheep lamb skin after degreasing (reducing the natural fat content) ranged from 0.13-0.38%. Chrome oxide percent was significantly affected ($p \geq 0.05$) by breed.

Table 2. Effect of Sudan desert sheep breed on chemical constituents of skins

Parameters	Breeds				
	Dubasi	Shugor	Watish	Kabashi	Hamari
Moisture %	8.95±1.58^{bc}	11.60±1.97^{a}	9.53±1.13^{d}	8.18 ±1.53^{b}	8.61±1.40^{cd}
Ash%	2.88±0.32^{a}	2.84±0.33^{a}	2.88±0.26^{a}	2.88 ±0.30^{a}	2.87±0.34^{a}
Fat%	6.40±1.31^{c}	7.65±1.87^{a}	6.84±1.22^{abc}	7.46±1.51^{ab}	6.58 ±1.51^{ab}
Cr_2O_3%	2.93 ±0.38^{ab}	2.87 ±0.32^{ab}	2.93 ±0.23^{ab}	3.04 ±0.53^{a}	2.81 ±0.32b

Values in same row with different superscripts differ significantly (P≤0.05)

CONCLUSION

All studied Sudan desert sheep breeds produced leathers with chemical and physical characteristics compatible with the quality standards required by the leather industry. The Gezira and Butana breeds tended to produce slightly higher quality leather than the Kordofan breeds. Sudan Desert sheep leather is stout and strength enough and with optimum required thickness for making shoes upper, but for it is more elasticity (elongation); which is not desirable for this article; thus, it can use for diabetics patients shoe's making for it is ability to enfold and contained foot shape easily.

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