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The Effect of Natural Pastures Grazing Conditions on Skin\Leather Quality of Sudan Desert Sheep

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ABSTRACT

This study was conducted to estimate the effect of natural pastures grazing conditions on Sudan Desert Sheep Skin\leather quality. Five Sudan desert sheep breeds aged 1-1.2 years old were used in this experiment. One hundred and fifty (150) pieces of fresh skins from Five (5) non-castrated male of Sudan desert sheep breeds which bring from different geographical area from west Sudan (Kordofan state) and east Sudan (Gezira and Butana). Sheep were divided in two groups according to geographical zone. 15 pieces of sheep skins for each breed were selected from animals grazed at poor pasture areas and similar number were obtained from animals grazed in enriched pasture areas, according to pasture measurements records at each breed locations. The results revealed that, fresh skin weight and Leather cracking load were significantly affected ($P \leq 0.05$) by pasture quality. Leather elongation, Tensile strength kg/cm^2, Thickness values and Flexibility values were not statistically ($P \leq 0.05$) affected by pastures quality. Moisture content of Sudan desert sheep leather values were significantly affected by pasture condition, with highest values of leather moisture content on Shugor sheep (group one) either on enriches and poor nutrition samples, and lowest values were in Kabashi and Hamari (group two) on poor pastures level. There were no significant effects of pasture quality on chemical characteristic (fat, ash and chrome oxide contents) on leather quality. The high values on fat content was in Shugor, Watish (group one) and Kabashi (group two) in both enrich and poor pastures levels. While the lowest fat contents were in Dubasi (group one) and Hamari (group two) sub-types on poor levels of pastures.

Keywords: Desert sheep, Leather quality, Natural grazing, Sudan.

INTRODUCTION

In Sudan, skin from Cattle, sheep and goat is valuable animal by products for local use as well for export market. Sheep are very important farm animals in Sudan, especially the Desert breed. One of the major problems facing the Desert sheep is the heat stress and the high ambient temperature. Sudan sheep population was estimated at 50.9 million head (M.A.R.,

2007). Sheep are predominately, about 90%, in the hands of traditional producers who mainly depend on natural pasture to raise their animals (Elrasheed, 2010). More than 80% of the sheep in Sudan are Sudan desert type; they are mainly predominant north of 12º N (Devendra and Mcleroy, 1982), where they were maintained under rangeland conditions for meat production (Idris *et al*., 2010). Animal managed under range land faced many problems including the nutritional limitation, low nutritive value of the range, high ambient temperature, scarcity of feed and water have great effect on the reproduction and production performance of the sheep in semi-arid area of Sudan.

The quality of sheep leather is influenced by the breed and age of the animals (intrinsic quality), by nutrition and by the marks on the skins acquired during the lifetime of the animal (extrinsic quality) (Jacinto *et al*., 2004). Sheep kept under this extensive system, are subjected to a series of environmental stresses during the dry season, mainly inadequate nutrition and inadequate drinking water (Idris *et al*., 2010). There is high variability in the amount and distribution of rainfall, which affects the vegetation and water availability, and in turn the flock movement, watering intervals and general husbandry. Thus this study was aimed to estimate the effect of feeding desert sheep under range conditions and it is impact on skin\leather quality, when compared to SSMO (Sudanese standards and Metrology) standards for leather quality.

MATERIAL AND METHODS

Study area

This study was conducted in Wad-Madani area. Sheep groups were bringing from Kordofan region, Gazira and Butana region. Kordofan region in the western part of the Sudan (latitudes 9°:30" and 16°:30 North and longitudes 24° and 32°:25 East). The mean annual rainfall ranges from 50-850 mm. The rainy season extends from July to October, reaching its peak in August.The natural vegetation consisted mainly of the grass species as *Panicum tugidum, Arisdia spp, Cympopogons spp., Ctenium elegan, Dactyloctenium aegyptium* and *Eragrostis tremula* (Idris *et al*., 2010). Gazira state in the east-central region of the Sudan (latitudes 14°:30 and 33°:30 North and longitudes 14°:5and 33°:5 East). Butana plain is a semiarid clay region (Latitude 13°:40and 17°:50 North and Longitude 32°:40 and 36° East). The rainfall ranges between 600 mm/year. The annual mean temperature ranges from 32°-16° C in January (winter) and from 46°-27°C 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.

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 aged 1-1.2 years old, which bring from different geographical area from west Sudan (Kordofan state) and east Sudan (Gezira and Butana). 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. 15 pieces of fresh skin for each breed were selected from animals raised at poor pasture areas and the other (15 pieces) were obtained good pasture (enrich) with available feeds.

Tanning procedures

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 was done according SSMO (Sudanese Standard and Meteorology Organization) methodology. Physomechanical properties that assessed were: Tensile strength and elongation% according to SSMO5 (2003), Flexibility test according to SSMO6 (2001) and Measurement of tearing load and resistance

to grain cracking according to SLTC (Society of Leather Trades Chemists, 1965). Whilst, chemical characteristics were: moisture% according to SSMO1 (2006), total Ash% According to SSMO2 (2006), fats and oils% according to SSMO4 (2006), and chromium% according to SSMO3 (2006) procedures.

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

Sudan desert sheep skin\leather physical properties:

Fresh skin weight was significantly affected ($P \leq 0.05$) by pasture quality and the highest weight values were recorded for sheep on good or enrich pasture. These findings were similar to those obtained by Williams and Thornberry (1992) who found that sheep lamb skins supplemented with higher level of concentrate had higher thickness than low level. This might be due to the better nutritive value of good quality pastures which attributes to better thickness. The effect of pasture quality on Sudan desert sheep leather elongation was not statistically detected ($P \leq 0.05$). The highest values were observed under poor pastures. Tensile strength kg/cm^2 was not significantly ($P \leq 0.05$) affected by pastures quality. These results were not on line with Oliveira *et al.* (2007) and Teklebrhan *et al.* (2012) who found that significant difference in strength and flexibility properties among sheep lamb breeds was not detected. Generally, the high records were detected on skin from sheep in good pastures levels for all breeds (Table 1).

Table 1. The effect of grazing of Sudan Desert Sheep at poor and enrich natural pastures on skin\leather physical properties

Parameters	Pastures	group one			group two	
		Dubasi	Shugor	Watish	Kabashi	Hamari
Weight	Poor	1.16±0.07^{f}	1.39±0.16^{cd}	1.19±0.11^{ef}	1.36±0.12^{cd}	1.26±0.13^{def}
	Enrich	1.31±0.04^{de}	1.57±0.26^{b}	1.47±0.09^{bc}	1.77±0.12^{a}	1.49±0.20^{bc}
Elongation	Poor	61.70±5.26^{cd}	67.17±4.66^{ab}	68.10±3.13^{a}	63.17±3.52^{bc}	70.32±1.74^{a}
	Enrich	54.59±4.15^{e}	58.19±3.73^{de}	60.83±5.60^{cd}	55.94±4.47^{e}	62.69±3.17^{c}
Tensile strength	Poor	174.13±18.54^{b}	159.59±26.89^{b}	155.63±37.85^{bc}	172.82±23.98^{b}	127.30±24.07^{c}
	Enrich	216.72±22.38^{a}	204.40±44.27^{a}	215.17±22.77^{a}	209.93±21.92^{a}	173.49±31.90^{b}
Cracking load	Poor	7.11±0.45^{e}	8.22±1.14^{cd}	8.97±1.63^{abc}	9.19±1.66^{ab}	7.81±1.37^{de}
	Enrich	8.57±1.18^{bcd}	9.37±1.40^{ab}	9.49±1.60^{a}	9.79±2.17^{a}	8.08±1.09^{cd}
Thickness	Poor	1.21±0.41^{abc}	1.13±0.32^{bc}	1.31±0.40^{abc}	1.33±0.30^{abc}	1.07±0.32^{c}
	Enrich	1.50±0.50^{a}	1.43±0.52^{ab}	1.45±0.48^{ab}	1.45±0.34^{ab}	1.35±0.34^{abc}
Tear load	Poor	37.42±3.95^{d}	41.90±5.58^{bc}	31.34±1.95^{f}	40.99±3.71^{c}	32.62±3.64^{ef}
	Enrich	42.20±6.32^{bc}	51.61±5.58^{a}	36.04±1.47^{de}	44.73±5.18^{b}	34.58±2.64^{def}
Flexibility	Poor	3.07±1.03^{abcd}	3.67±0.62^{a}	3.20±0.94^{abc}	3.27±0.80^{abc}	2.80±0.86^{bcd}
	Enrich	2.67±0.72^{cd}	3.60±0.74^{ab}	3.33±0.72^{abc}	3.60±0.83^{ab}	2.33±0.49^{d}

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

Leather cracking load was significantly affected ($P \leq 0.05$) by pastures quality levels, where the high values were reported on enrich levels of pastures. These findings were different from those reported by Williams and Thornberry (1992). Thickness values were not significantly affected ($P \leq 0.05$) by pastures quality. However, the lowest leather thickness values were recorded on poor pastures level were and the value. Tear load values were significantly ($P \leq 0.05$) affected by pastures quality. Thus, the highest value of tear load was reported on enrich pastures. These results were different from those reported by Murray (1996) who found that tear strength (N/mm^2) values were not significantly affected ($P \leq 0.05$)

by breeds and nutrition level of sheep lambs. Flexibility values were not significantly ($P \leq 0.05$) affected by pastures quality. These findings were agreed with Teklebrhan *et al.* (2012) who mentioned that no significant difference in strength and flexibility properties among sheep lamb breeds. However, the high valuable degree of flexibility was recorded on enrich pastures (Table 1).

Effect of grazing of Sudan desert sheep on leather chemical characteristics

Moisture content of Sudan desert sheep leather values were significantly affected by pasture condition ($P \leq 0.05$). The highest values of leather moisture content was observed on Shugor sheep (group one) either on enrich and poor nutrition samples. While the lowest values were determined for Kabashi and Hamari (group two) on poor pastures level, same results obtained by Briegel *et al.* (2012). These results might be due to the variation on the skin texture bundles which might be closer to each on Shugor (group one) and holds water within while in Kabashi and Hamari (group two) texture bundles might be not closer or tight to each other's or in occasional order which is helps on temperature losing in hot climate where they are raised. For the same reason Hamri and Kabashi (group two) were generally reported less tensile strength and tear loads than other sub-types of Sudan desert sheep this might be referenced to the texture bundles closeness which has low resistant against load separation force (Table 2).

Table 2. The effect of feeding Sudan Desert Sheep at poor and enrich natural pastures on skin\leather chemical characteristics

Parameters	Pastures	group one			group two	
		Dubasi	Shugor	Watish	Kabashi	Hamari
Moisture%	Poor	8.15 ± 1.35^{de}	11.83 ± 2.15^{a}	9.04 ± 0.76^{bcd}	7.73 ± 1.26^{e}	7.85 ± 1.33^{e}
	Enrich	9.75 ± 1.40^{bc}	11.36 ± 1.82^{a}	10.03 ± 1.25^{b}	8.64 ± 1.68^{cde}	9.38 ± 1.01^{bc}
Ash%	Poor	2.84 ± 0.39^{a}	2.78 ± 0.30^{a}	2.92 ± 0.26^{a}	2.79 ± 0.27^{a}	2.74 ± 0.32^{a}
	Enrich	2.93 ± 0.25^{a}	2.90 ± 0.36^{a}	2.84 ± 0.27^{a}	2.98 ± 0.31^{a}	3.01 ± 0.31^{a}
Fat%	Poor	5.97 ± 1.26^{b}	7.23 ± 2.07^{ab}	6.45 ± 1.27^{ab}	7.49 ± 1.69^{ab}	5.90 ± 1.26^{b}
	Enrich	6.83 ± 1.26^{ab}	8.06 ± 1.61^{a}	7.23 ± 1.06^{ab}	7.43 ± 1.36^{ab}	7.26 ± 1.46^{ab}
Chrome oxide%	Poor	2.89 ± 0.46^{ab}	2.82 ± 0.27^{ab}	2.92 ± 0.21^{ab}	3.05 ± 0.64^{a}	2.67 ± 0.31^{b}
	Enrich	2.97 ± 0.31^{ab}	2.91 ± 0.38^{ab}	2.93 ± 0.26^{ab}	3.04 ± 0.41^{a}	2.94 ± 0.26^{ab}

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

Effect of pastures quality were not significantly detected among Sudan desert sheep breeds on fat and ash contents ($P \geq 0.05$) .The high values on fat content percentages was recorded for Shugor, Watish (group one) and Kabashi (group two) in both enrich and poor pastures levels. While the lowest fat contents were reported in Dubasi (group one) and Hamari (group two) sub-types on poor levels of pastures, those results not online with the Lyne (1964). These findings were different from Wodzicka (1958).who reported that sheep has numerically higher natural fat in the skin when supplemented with higher level of concentrate when he studied Ethiopian sheep breeds (Table 2). Similarly, chrome oxide contents were not affected by pastures conditions, and no statistically variation were detected among all Sudan desert sheep sub-types either on enrich and poor pastures levels (Table 2).

This result were different from which was reported by Teklebrhan *et al.* (2012) and Stosic (1994) whom found that sheep lambs supplemented with low level of concentrate have numerically higher leather chrome-oxide content than higher level of concentrate (Table 2).

CONCLUSION

Physical properties of Sudan desert sheep leather; Fresh skin weight, thickness, elongation, tensile strength**,** cracking and tear load results; were significantly affected by pastures quality sheep fed on. While flexibility results were not significantly affected by pastures quality

levels, Thereupon, the improvements of pastures quality or sheep feeding generally would lead to an improvement in most parameters of leather quality.

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