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Effect of Seasonal Changes on Skin\Leather Quality of Sudan Desert Sheep

M.A. Ebrahiem[1], I.Y. Turki[2] and H.E. Haroun[3]

[1] Faculty of Natural Resources and Environmental Studies, Kordofan University, P.O. Box 60, Elobied, Sudan
[2] Colleges of Animal Production and Technology, University of Sudan, Khartoum, Sudan
[3] College of Leather Engineering, University of Sudan, Khartoum, Sudan

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Corresponding Author:
M.A. Ebrahiem
mahaali5656@gmail.com

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ABSTRACT

This study was achieved to assess the effect of the seasonal changes on the Sudan Desert sheep skin\leather quality. Five Sudan desert sheep breeds were chosen for the study purpose. 150 pieces of fresh skins; non-castrated male desert sheep on an average age 1- 1.2 years; were taken as samples for the study analysis. Thirty (30) pieces of skins (10 at winter, 10 at summer and 10 at autumn) were selected for each breed. RCBD (Randomize Complete Block Design) was used for data analysis. The study concluded that, physical properties and chemical characteristics of Sudan desert sheep leather were significantly affected ($p \geq 0.05$) by the seasonal changes. Generally, high quality values were recorded at winter season for all leather quality parameters. While fat and moisture contents high values were observed at autumn season and elongation or elasticity high values were obtained at summer season.

Keywords: seasonal change, Skin\leather Quality, Desert Sheep.

INTRODUCTION

Various studies reported a high degree of variation in processed leather. The potential of using local and industrial tanning substances for improving tanned skin quality was also considered. On the other hand many studies concerned on sheep nutrition, performance, production, reproduction or either meat quality; but skin as a main by-product hasn't received any attention. Actually, few studies were carried out on either raw skins and hides production or leather processing and quality. So this study is intended to explore the impact of seasonal changes on Sudan desert sheep skin\leather quality.

MATERIAL AND METHODS

Study Area

This study was carried out at the National Centre for Leather Technology, Khartoum, Sudan. Sheep skins were collected from the three main locations of Sudan desert sheep:

- Kordofan region is located in the western part of the Sudan; between latitudes 9°:30" and 16°: 30- North and longitudes 24° and 32°: 25- East. The mean annual rainfall ranges from 50-850 mm, with availability ranging from 18% in the north to 100% in the south. The rainy season extends from July to October, reaching its peak in August. The natural vegetation consisted mainly of the grass species *Panicum tugidum, Arisdia spp, Cympopogons spp., Ctenium elegan, Dactylocteniun aegyptium* and *Eragrostis tremula* (Farah, 2006).
- Gazira state lies between the Blue Nile and the White Nile in the east-central region of the Sudan; between latitudes 14°:30- and 33°: 30- North and longitudes 14°:5-and 33°: 5- East (Wikipedia, 2014).
- Butana plain is a semiarid clay region ,covers part of Gazera and most of the present Kassala and Gedaref States in Eastern Sudan. It lies between Latitude 13°:40-and 17°:50- North and Longitude 32°:40- and 36° East. (Darosa and Agab, 2013). 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 (Saint-Martin *et al.*, 1992).

Selection of Experiment Animal Skins

One hundred and fifty (150) pieces of fresh skins from five (5) Sudan desert sheep breeds namely, Shgar, Watish and Dubasi from Gezira and Butana areas sheep; Hamari and Kabashi from Kordofan area sheep; was chosen for study analysis. Thirty (30) pieces of fresh skins; of non-castrated male desert sheep on an average age 1- 1.2 years; were taken from each breed three times a year as follow:

- 10 pieces in winter (from November to February) was taken in the last month of the season.
- 10 pieces in summer (from March to June) was taken in May.
- 10 pieces in autumn (from Gully to October) was taken in the last month of the season.

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. The leather quality was then assessed for chemical and physico-mechanical characteristics. The crust tanned leather was conditioned for 48 h at a desiccator prior to physico-chemical testing according to the guidelines of SSMO (Sudanese Standard and Meteorology Organization).

Sampling Measurement Procedures

- Thickness assessment in (mm.), this was taken from three parts of skin from shoulders (2reads); butt (2reads) and rump (2reads).
- Weight of the fresh skins in (kg).
- Physo-mechanical properties that assessed were: Tensile strength and elongation% according to $SSMO_5$ (2003), Flexibility test according to $SSMO_6$, (2001) and Measurement of tearing load and resistance to grain cracking according to SLTC (Society of Leather Trades Chemists), (1965).

- Chemical characteristics were: moisture% according to $SSMO_1$ (2006), total Ash% According to $SSMO_2$ (2006), fats and oils% according to $SSMO_4$ (2006), and chromium% according to $SSMO_3$ (2006) procedures.

Statistical Analysis

RCBD (Randomize Complete Block Design) was used for data analysis. One way ANOVA was done according to Gomez and Gomez (1984). LSD was used for means separation, beside comparing skin and leather measurements results with Sudanese Standard Thresholds for leather quality according to SSMO.

RESULT AND DISCUSSION

Skin\Leather Physical Quality of Sudan Desert Sheep

The values of the skin weight were significantly affected ($p \geq 0.05$) by the season of the year. The highest values were recorded generally in winter season for all breeds except in Watish where the high record was in autumn season.

Elongation percentages values were not significantly affected ($p \geq 0.05$) by the season variations. The highest values were reported by Hamari, Watish and Shugor in summer season. Generally, winter season values for elongation were the lowest records in all breeds of Sudan desert sheep.

Sudan desert sheep leather tensile strength loads kg\cm^2 were not significantly affected ($p \geq 0.05$) by the season. The maximum loads were scored generally in winter season followed by autumn and lastly the minimum loads were recorded in summer for all breeds of Sudan desert sheep.

Cracking load kg/cm^2 values were significantly affected by ($p \geq 0.05$) the season of the year. The highest values for leather cracking load were reported in winter season for all Sudan desert sheep breeds followed by autumn records and lastly the lowest values for the parameter were recorded in summer season.

Similarly, thickness of Sudan desert sheep leather was significantly affected by ($p \geq 0.05$) the season and the highest values of this parameter were observed in winter season followed by autumn results and lastly the lowest records was obtained in summer season for all sub-types of Sudan desert sheep.

As it in thickness the effect of the season was significantly affected ($p \geq 0.05$) tear load kg/cm values, where winter values were the heist followed by autumn and lastly summer season in which the lowest values were reported for all Sudan desert sheep breeds.

The result of leather flexibility was not significantly affected by ($p \geq 0.05$) the season. The optimum flexibility values were obtained on Hamari Sud-type in autumn season and significantly different from it is values in all sub-types of Sudan desert sheep. While the less valuable of flexibility was determined for Dubasi in summer, Shugor, Kabashi and Watish in all seasons (Table 1).

Sudan Desert Sheep Leather Chemical Characteristics

Sudan desert sheep breeds leather moisture content was significantly affected by ($p \geq 0.05$) the season. Accordingly, the high percentages of moisture contents were observed at autumn season except on Shugor where the high content was estimated on winter season and it was the highest value among all breeds.

Ash content was not significantly affected by ($p \geq 0.05$) the season but, the high records were observed in winter season and with no significant variation between all breeds.

Table 1: effect of seasonal changes on Sudan desert sheep skin\leather physical properties

Parameters	Season	Breeds				
		Dubasi	Shugor	Watish	Kabashi	Hamari
Weight(kg)	Summer	1.19±0.11 ^{F}	0.25±0.07 ^{ABC}	1.26±0.19 ^{DEF}	1.52±0.21 ^{ABC}	1.30±0.18 ^{DEF}
	Winter	1.26±0.09 ^{DEF}	0.23±0.07 ^{A}	1.35±0.17 ^{CDEF}	1.62±0.26 ^{A}	1.44±0.24 ^{ABCD}
	Autumn	1.24±0.08 ^{EF}	0.16±0.05 ^{DEF}	1.39±0.15 ^{BCDE}	1.56±0.26 ^{AB}	1.38±0.17 ^{BCDE}
Elongation%	Summer	61.36±7.03^{BCDE}	66.56±6.16 ^{AB}	67.76±4.23 ^{A}	61.47±5.34^{BCDE}	68.30±4.01^{A}
	Winter	55.44±5.11 ^{F}	59.26±4.87 ^{DEF}	61.34±5.79^{BCDE}	57.04±4.42 ^{EF}	64.67±5.77^{ABC}
	Autumn	57.64±4.06 ^{EF}	62.22±5.57^{BCDE}	64.30±5.81^{ABCD}	60.16±5.87^{CDEF}	66.54±3.50 ^{AB}
Tensile strength(kg\cm^2)	Summer	174.77±21.74^{ABCD}	158.05±39.97^{BCD}	158.46±44.07^{BCD}	178.61±31.44^{ABCD}	140.17±35.94^{D}
	Winter	209.39±21.74 ^{A}	195.42±45.89^{AB}	206.89±42.79^{A}	199.52±26.64 ^{A}	157.90±39.90^{BCD}
	Autumn	202.12±27.06 ^{A}	192.53±34.39^{ABC}	190.86±29.37^{ABC}	196.00±28.53 ^{AB}	153.12±34.51^{CD}
Cracking load (N\cm^2)	Summer	6.97±0.56 ^{FG}	7.40±0.95 ^{EFG}	7.23±0.87 ^{FG}	7.15±1.36 ^{FG}	6.75±1.26 ^{G}
	Winter	8.50±1.29 ^{DE}	9.79±0.82 ^{ABC}	10.47±0.50 ^{A}	10.81±0.64 ^{A}	8.62±0.72 ^{CD}
	Autumn	8.05±0.96 ^{DEF}	9.20±1.09 ^{BCD}	10.00±0.72 ^{AB}	10.51±0.69 ^{A}	8.47±0.56 ^{DE}
Thickness(Kg\cm^2)	Summer	0.93±0.36 ^{E}	1.06±0.32 ^{DE}	1.04±0.29 ^{ABCD}	1.06±0.22 ^{DE}	0.99±0.23 ^{E}
	Winter	1.69±0.42 ^{AB}	1.54±0.57 ^{ABC}	1.82±0.32 ^{A}	1.61±0.24 ^{ABC}	1.57±0.26 ^{ABC}
	Autumn	1.44±0.30 ^{ABCD}	1.25±0.31 ^{CDE}	1.28±0.25 ^{BCDE}	1.52±0.16 ^{ABCD}	1.08±0.25 ^{DE}
Tear load(Kg\cm^2)	Summer	34.67±5.65 ^{EFG}	41.57±5.99 ^{CD}	32.41±2.44 ^{FG}	38.30±1.75 ^{DE}	30.23±1.54 ^{G}
	Winter	43.74±3.77 ^{BC}	50.94±6.68 ^{A}	35.01±2.90 ^{EF}	46.96±3.88 ^{AB}	35.70±2.33 ^{EF}
	Autumn	41.02±3.33 ^{BC}	47.76±6.66 ^{AB}	33.66±3.09 ^{FG}	43.33±3.83 ^{BC}	34.87±2.74 ^{EF}
Flexibility(Degree)	Summer	3.80±0.79 ^{A}	4.00±0.82 ^{A}	3.60±0.97 ^{A}	3.90±0.88 ^{A}	3.00±0.94 ^{ABC}
	Winter	2.40±0.52 ^{BC}	3.50±0.53 ^{A}	3.20±0.79 ^{ABC}	3.30±0.66 ^{ABC}	2.40±0.52 ^{BC}
	Autumn	2.40±0.52 ^{BC}	3.40±0.52 ^{AB}	3.00±0.67 ^{ABC}	3.10±0.74 ^{ABC}	2.30±0.48 ^{C}

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

Table 2: effect of the seasonal changes on Sudan desert sheep leather chemical characteristics

Parameters	Season	Breeds				
		Dubasi	Shugor	Watish	Kabashi	Hamari
Moisture%	Summer	7.83±1.46 ^{EF}	9.82±0.52 ^{BC}	10.07±1.29 ^{BC}	8.78±1.50 ^{CDE}	8.30±1.57 ^{DEF}
	Winter	9.03±1.12 ^{CDE}	13.89±1.14 ^{A}	8.61±0.71 ^{CDE}	6.93±1.29 ^{F}	8.08±1.02 ^{DEF}
	Autumn	9.99±1.42 ^{BC}	11.08±1.13 ^{B}	9.92±0.72 ^{BC}	8.85±1.00 ^{CDE}	9.45±1.24 ^{CD}
Ash%	Summer	2.77±0.27 ^{AB}	2.80±0.38 ^{AB}	2.94±0.23 ^{AB}	2.93±0.29 ^{AB}	2.85±0.34 ^{AB}
	Winter	3.15±0.20 ^{A}	3.01±0.24 ^{AB}	2.95±0.25 ^{AB}	2.90±0.40 ^{AB}	3.01±0.37 ^{AB}
	Autumn	2.73±0.32 ^{B}	2.69±0.30 ^{B}	2.76±0.29 ^{AB}	2.81±0.18 ^{AB}	2.75±0.28 ^{AB}
Fat%	Summer	5.99±0.92 ^{BC}	6.62±1.07 ^{ABC}	6.62±1.02 ^{ABC}	7.01±0.70 ^{ABC}	6.70±1.30 ^{ABC}
	Winter	6.37±1.83 ^{BC}	8.71±2.54 ^{A}	6.53±1.02 ^{BC}	8.05±2.13 ^{AB}	5.65±1.67 ^{C}
	Autumn	6.83±0.97 ^{ABC}	7.61±1.13 ^{ABC}	7.38±1.30 ^{ABC}	7.32±1.28 ^{ABC}	7.39±1.07 ^{ABC}
Chrome oxide%	Summer	3.01±0.15 ^{BCD}	2.95±0.35 ^{BCDE}	2.97±0.18 ^{BCDE}	3.00±0.36 ^{BCDE}	2.73±0.27 ^{CDE}
	Winter	3.15±0.42 ^{AB}	3.02±0.25 ^{BCD}	3.06±0.15 ^{BC}	3.50±0.54 ^{A}	3.11±0.25 ^{ABC}
	Autumn	2.62±0.33 ^{DE}	2.63±0.25 ^{DE}	2.75±0.25 ^{BCDE}	2.63±0.23 ^{DE}	2.61±0.19 ^{E}

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

Fat content on Sudan desert sheep leather was significantly affected by ($p \geq 0.05$) the season, where autumn season values for the parameter were the highest records. While winter and summer season was statistically similar and with no significant difference among all breed of Sudan desert sheep.

Similarly, Chrome oxide content on Sudan desert sheep leather was significantly affected by ($p \geq 0.05$) the season, where winter season values for the parameter were the highest records, followed by summer season values and lastly autumn values (Table 2).

Generally, high values were recorded at winter season for all Sudan desert sheep skin\leather characteristics parameters. While fat and moisture contents high values were observed at autumn season and elongation or elasticity high values were obtained at summer season. These findings might be mainly referenced for seasonal changes. At winter season temperature was in its low degree and sheep avoid the heat stress which resulted from high temperature, this might be reflected on good leather attributes. Besides, the availability of winter range and agricultural byproducts which is remains from autumn crops planting. However, Sudan desert sheep leather fat and moisture optimum values at autumn season might be due to the abundance of natural pasture and drinking water was available for sheep at this season. But at summer season temperature were in it is high degree and skin as excretion system might be extended and bundle may extend and separate which resulting on more elasticity of the leather at this season.

CONCLUSION AND RECOMMENDATIONS

Physical properties and chemical characteristics of Sudan desert sheep leather were significantly affected by the season changes. Generally, high values were recorded at winter season for all Sudan desert sheep skin\leather characteristics parameters. While fat and moisture contents high values were observed at autumn season and elongation or elasticity higher values were obtained at summer season.

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