

EFFECT OF TANNING AGENT ON CHEMICAL PROPERTIES OF RED SOKOTO GOAT SKIN

[✉]Labaran, S., ^bMuhammad, B. F., [‡]Ghude, M. I. and [¶]H. Danyaro

[✉]Livestock Section, Agric Department, Mashi LGA, Katsina State

^bFederal College of Education (Technical), Bichi, Kano State

[‡]Veterinary Section, Agric Department, Nassarawa LGA, Kano State

[¶]Federal College of Agricultural Produce Technology, Kano, Kano State

Corresponding author: +234 (0) 803 610 0189

ABSTRACT

The study was carried out to investigate the effects of tanning agents, age and strain on quality properties of Red Sokoto goat leather. A total of 36 pieces of fresh goat skin were obtained and weighed individually, processed into crust leather for physio-chemical analysis. In the effects of tanning agent on physical properties of the leather, the result showed significant ($p < 0.05$) difference in tensile strength and percentage elongation, grain test by ball burst, water vapour permeability, shrinkage temperature and water absorption. However, no significant difference ($p > 0.05$) with respect to leather thickness, on the effect of tanning agent on chemical properties of leather. The result revealed that Acacia tanned leather recorded higher volatile matter (12.13%) and water soluble organic matter (26.17%) while the result of leather tanned with chrome water soluble inorganic matter value were (11.17%) respectively. It was concluded that matured Sokoto red goat leather tanned with *Acacia nilotica* produced optimum quality leather. It is recommended to use matured Sokoto red goat skin for good quality leather production.

Key words: Tanning agent, chemical properties, red Sokoto goat, skin, leather

INTRODUCTION

Globally, in modern civilization, the leather industry has made enormous impact on every sphere of man's life – economically, industrially, socially, religiously and politically. From the stone age to the beginning of the Egyptian civilization through the Romans' domination till today, man has regarded skins and leather as dependable materials for meeting his basic needs such as making footwear, tents, shields and sheaths, containers for liquids, boats and even armor (Landmann, 2003; and Kite and Thomson, 2007). Ever since, Leather work has characteristically been regarded as a major contributing factor in the economic development and industrial transformation of several countries including the United Kingdom, Italy, Germany, USA and France (Kite and Thomson, 2007). Hides and skins are the basic raw materials for leather production and Nigeria is known to possess a significant stock of animals from which these basic raw materials are derived. The most important are cattle, goats and sheep (Ihuoma, 1993). Hides are gotten from large matured animal, skins are obtained from small animals while kids are skins of immature animals (Aganga and Aganga, 1998). Hides and skin are still viewed as by-products of the meat industry instead of raw material for the leather industry, hence, much emphasis is on meat. Improvement in hides and skin processing and handling can enhance the role of leather industries in food security, poverty reduction and economic development. Therefore, this study was designed to evaluate leather quality properties as affected by tanning agents and its chemical factors for optimum utilization.

MATERIALS AND METHOD

Sample Collection and Sampling Location

A total of 36 fresh goat skin samples were used for the experiment following flaying of the animal and appropriate tagging. The skin sample was collected from Daura Central Abattoir in Katsina State (N 13° 02' 24.3", E 8° 19' 00.5"), Maigatari Market Abattoir in Jigawa State (N 12° 48' 50.3", E 9° 26' 30.4") and Kano Central Abattoir in Kano State (N 12° 00' 45.5", E 8° 31' 17.1").

Physical Tests

Physical properties such as leather thickness, tensile strength and percentage elongation, Grain test by ball-burst, water vapour permeability, shrinkage temperature and water absorption, have been measured as per standard procedures as described by ISO 3380, (2015) and ISO 2417 (2015).

Chemical test of leather

Chemical test determination on leather sample was carried out. The determination of volatile matter, water soluble organic matter, water soluble inorganic matter, sulphated total ash and sulphated water insoluble ash, water soluble magnesium salt (Epson salt), nitrogen and hide substances and pH value of different figure. It was carried out by procedures as described by ISO 4098, (2006) and ISO 4045, (2008).

RESULTS AND DISCUSSION

Effect of tanning Agent on Chemical properties of goat leather

From the Table 1 the result showed the significant difference ($P < 0.05$) on volatile matter, water soluble organic and water soluble inorganic matter. This is in agreement with the report of Wilson, (1992). However, no significant difference ($P > 0.05$) were observed on hide Substance, pH value, water soluble magnesium salt, sulphated total ash and water insoluble ash. The result revealed that leather tanned with Acacia recorded higher values 12.31% of volatile matter, 26.19% water soluble organic matter than that tanned with chrome. This report is in line with the reports of Zemene and Addis (2012) who reported that tanning processes had some effects on the quality of the leather. With regard to water soluble organic matter, leather tanned with chrome had higher value of 11.17% than those tanned with Acacia. There are significant difference ($P > 0.05$) recorded on the remaining chemical properties, therefore, both tanning agents have no effect on Hide substances, pH, water soluble magnesium salt, sulphated total Ash and water insoluble Ash this is similar to the report of Jabir et al, (2013)

Table 1: Effect of Tanning Agent on Chemical Properties of Goat Leather

Chemical Properties	Tanning Agent		t value	LS
	Chrome	Acacia		
Volatile Matter	11.92 ^b	12.13 ^a	1.450	*
Water Soluble Org.	19.28 ^b	26.17 ^a	3.162	*
Water Soluble In Org	11.17 ^a	6.89 ^b	2.611	*
Hide Substances	6.71	8.85	1.776	ns
pH Value	5.36	3.65	24.783	ns
Water Soluble Mag.	29.23	25.65	2.739	ns
Sulphated Total Ash	1.80	1.47	3.201	ns
Water Insoluble Ash	1.74	1.45	3.078	ns

* = $P < 0.05$, (significant), ns = not significant, LS= Level of significant

Effect of Tanning Agent and Age interaction on Chemical Properties on Goat Leather

The result indicated the significant difference ($P < 0.05$) on water soluble organic matter, pH, Water soluble magnesium salt and Sulphated total Ash. No significant difference ($P > 0.05$) recorded on volatile matter, water soluble inorganic, hide substances and water insoluble Ash. This result is in line with the report of Jabbar et al. (2012). The result showed that young goat leather tanned with acacia recorded highest value of 28.33% of water soluble organic matter which is statistically similar to value of (24.00%) and 22.22% obtained with mature and young goat leather tanned with acacia and chrome, while least value of (16.33%) was obtained on mature goat leather tanned with chrome. The highest pH value of 5.46 was obtained on matured goat leather tanned with acacia which is statistically similar to young goat leather tanned with the same tanning agent while the least value of 3.53 was obtained on young goat leather tanned chrome. Aganga and Aganga (1998) reported that quality of hides and skin is a determining factor on the quality of the leather as a product. With sulphated total Ash, highest value of 1.82% had with young goat leather tanned with acacia which is similar to the values of 1.78% and 1.57% obtained on mature and young goat leather tanned with acacia and chrome respectively while the lower value of 1.37% was recorded with young goat leather tanned with acacia.

Table 2: Effect of Tanning Agent and Age interaction on Chemical Properties on Goat Leather

Chemical properties (%)	Tanning agent				S.E
	Chrome		Acacia		
	Young	Mature	Young	Mature	
Volatile Matter	11.49	12.35	12.01	12.61	Ns
Water Soluble Org.	22.22 ^a	16.33 ^b	28.33 ^a	24.00 ^a	3.81
Water Soluble In Org	5.78	6.56	8.00	5.78	Ns
Hide Substances	7.28	6.15	7.49	10.22	Ns
pH Value	3.53 ^c	3.76 ^b	5.26 ^a	5.46 ^a	0.097
Water Soluble Mag.	27.78 ^a	30.68 ^a	24.61 ^b	26.17 ^a	1.848
Sulphated Total Ash	1.82 ^a	1.78 ^a	1.37 ^b	1.57 ^a	1.423
Water Insoluble Ash	1.76	1.72	1.35	1.53	Ns

abc-e means in the same column with different superscripts differ significantly ($P < 0.05$) ns = not significant, SE = Standard Error

CONCLUSION

Conclusively, with respect to chemical properties, the result further revealed that leather tanned with *Acacia nilotica* showed higher values in volatile matter, water soluble organic matter, hide substances and pH. On the other hand, leather tanned with chromium sulphate recorded higher water soluble magnesium salt, sulphated total ash, and water insoluble ash respectively. Interaction effect also showed higher values on these properties. However, matured Sokoto red goat skin tanned with *Acacia nilotica* produced optimum quality leather. It was recommended to use matured Sokoto red Goat skin for good quality leather production.

RECOMMENDATION

There is a good potentiality in the use of Sokoto red goat skin for leather industries. This study recommends the use of matured Sokoto red Goat skin for good quality leather production.

REFERENCES

- Aganga, A. O. and Aganga, A. A. (1998). Parasitic and nutritional diseases of cattle and their effect on hide Quality. *Journal of Leather Research 2 (14): 81-84*.
- Ihuoma, A. A. (1993). Growth Performance and Import constraints of the Nigerian Leather Industry. *Journal of leather Research 2(4) 71-79*.
- ISO 3380, (2002). International Organization for Standardization. Measurement of Shrinkage Temperature up to 100°C. www.iutcs.org Retrieved on 27th November, 2015.
- ISO 2417, (2015). International Organization for Standardization. Determination of water absorption in Leather. www.iutcs.org Retrieved on 27th November, 2015
- ISO 4045, (2008). International Organization for Standardization. Determination of PH value of difference figure. www.iutcs.org Retrieved on 27th November, 2015.
- ISO 4045, (2008). International Organization for Standardization. Determination of PH value of difference figure www.iutcs.org Retrieved on 27th November, 2015.
- Jabbar, M. A., Kiruthu, B., Gebremedhin, N. and Ehui, S. (2002). Essential Action to meet Quality Requirement of hide, skin and semi-Processed Leather from Africa. A Report prepared for the common Fund for Commodities Amsterdam, Netherland Pp 5-35.

- Jibir, M., Adamu, M. K., Muhammad, N., Sonfada, M. L. and Achibi, J. (2013). Effect of Breed and Age of Sheep and Goats on Leather Properties. *Biological and Environmental Science Journal for the Tropics*, 10(3): 148 - 152
- Kite, M. and Thomson, R. (2007). *Conservation of Leather and Related Materials*. London, New York, Boston, Paris, Singapore, Sydney and Tokyo, Elsevier Ltd.
- Landmann, W. (2003). *The Machines in the Tannery: A Review of Leather Producing Machinery and Equipment in Current Use*. West Yorkshire, UK: World Trades Publishing.
- Wilson, R.T. (1992). Goat and Sheep Skin and Fibre Production in selected Sub-Saharan African Countries. *Small Ruminant Research* 8:13-29.
- Zemene Z. and Addis, M. (2012). Assessment of Major Factors that Cause Skin Defects at Bahir Dar Tannery. *Ethiopia. Advances in Biological Research* 6 (5): 177-181.