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AN EXPERIMENTAL RESEARCH OF THE HARNESS LEATHER PROCESSING

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Some of the techniques for the production of curried leather for harness are described. The methods used are drum and pit tanning using crude mimosa and babul bark extract.

Key words: Curried leather; Tanning; Harness leather.

INTRODUCTION

The production of firm harness leather is usually carried out with blended vegetable tanning materials such as sweetened and normal chestnut extracts and quebracho and spray dried mimosa extracts in a typical blend by pit tanning system [1-5]. This leather is mostly used by mountaineers and defence personnel on account of its tensile strength and flexibility.

Curried leather [6] is produced in the local market but no two samples prepared by the same tannery conform to specifications set for such leather. It was, therefore, thought proper to study the currying process under our set of conditions and to develop recipes which may produce harness leather of standard quality.

This paper also deals with the pretanning of the stock with babul bark, an indigenous tanning material, instead of imported pretanning agent, and to study its effect on the grain and physical characteristics of finished leather.

EXPERIMENTAL

1. Preparation for study

(1) **Raw materials.** Wet salted buffalo and cow hides in the range of 22-25 kg were used throughout these studies. They were obtained from Rangiwara market, Karachi.

(2) **Equipment.** Concrete pits were used for soaking, liming, reliming and tanning and wooden drums were used for delimiting, pickling, retanning, bleaching and stuffing/oiling. A concrete beam was used for dehairing, scudding and fleshing. A concrete slope was also used for the application of tallow mixture. A setting out machine, barkometer, and pH meter were also used.

(3) **Chemicals.** Calcium hydroxide, sodium sulphide, ammonium sulphate, ammonium chloride sodium bisulphite, sodium chloride, sulphuric acid, acacia (babul) bark,

mimosa extract, cottonseed and sesame oils, tallow, anionic fat liquor agents etc.

METHODS

2. Beamhouse work

(1) **Soaking.** The hides were cut into sides, weighed and then soaked in a pit (72" x 48" x 35") containing 600 % water at 25-26°. The sides were handled in the pit and they were taken out, drained and weighed the next day.

(2) **Liming:** Liming was carried out in another pit (34" x 35" x 36") containing 600 % water with 2.5 % sodium sulphide and 4 % slaked lime. The sides were handled twice a day for three days and were afterwards unhaird by scudding and fleshed on the fourth day. They were relimed with fresh lime liquor (2 % calcium hydroxide) for another two days with intermittent handling twice a day.

3. Delimiting

Process I. The limed stock, called the pelt (one side), was weighed and rinsed with water for 30 min. in a drum (32 x 24"). The bath was drained and the side was delimited in the same drum using 1.5 % ammonium sulphate and 1.3 % sodium bisulphite with the float of 30 % water and the drum was run for 90 min. at 6 rpm. 0.2 % hydrochloric acid (1:10) was then added in two instalments running the drum for 20 min; 100 % water was then flooded and the whole was left undisturbed overnight. Next morning the drum was run for 10 min. and completion of delimiting process was checked with a phenolphthalein solution. The bath was drained off and then taken to the next step.

Pretanning. Method A (without pickling). The stock was pretanned with acacia bark (10°BK) without pickling and retanned at 90°BK after main tanning (Table 1).

Method B (with pickling). The side was pickled with 5 % sodium chloride in a float of 70 % water in the same

drum for 10 min. and after the addition of 0.5 % sulphuric acid (1:5) the drum was run for 1 h. (pH = 4.5). Acacia bark extract 10⁰BK and 1 % sodium bisulphite were mixed with the pickled stock and the drum was run for 30 min. and then left undisturbed overnight. The stock was tanned as mentioned under main tanning and finally retanned at 80⁰BK with mimosa extract (Table 1).

Method C (with syntan). The pickled stock was pretanned with Basyntan VG (10⁰BK) in the pit for two days only.

Process II. In this process weighed pelt was rinsed thoroughly for 30 min. in the same drum and the bath was drained off and the side was delimed using 1.5 % ammonium chloride and 1.3 % sodium bisulphite in the powder form with a float of 30 % water and the drum was run for 2 hr, then flooded with 100 % water and the drum was run for 30 min. then left overnight. Full deliming was checked with a phenolphthalein solution and the bath was drained off.

Pretanning. Method A (without pickling). The stock was pretanned with acacia bark tan liquor of 10⁰BK in a pit for two days. It was retanned at 70⁰BK with mimosa extract after main tanning (Table 1).

Method B (with pickling). The stock was pickled with sodium chloride and sulphuric acid and then pretanned with babul bark tan liquor at 10⁰BK in a pit for two days. It

was retanned at 60⁰BK with mimosa extract after main tanning (Table 1).

Method C (with mimosa). The stock was pretanned with mimosa tan liquor of 10⁰BK plus 2 % sodium bisulphite in a pit for two days. It was then retanned at 70⁰BK with mimosa tan liquor after main tanning.

4. Main tanning

(1) *Tanning process.* The pretanned sides obtained from both process I and II were laid in pits containing the following concentrations of mimosa extract tan liquors for the period mentioned against each pit:

Pit No. I	17 ⁰ BK for 2 days	5.5
Pit No. II	28 ⁰ BK for 3 days	5.0
Pit No. III	40 ⁰ BK for 4 days	4.5
Pit No. IV	51 ⁰ BK for 5 days	4.0

After full penetration the sides were piled up in the polythene sheet for two days for fixation.

(2) *Tempering and bleaching.* The sides were thoroughly washed in the drum and bleached with 2 % sodium bisulphite in the same drum. The stock was then piled up.

(3) *Stuffing.* The stock was fat-liquored with 2 % anionic coliquor MG/SG and 2 % sesame oil in the drum (32" x 24") for 30 min. then hung for semidrying. These were set

Table 1. Results of analysis with different tanning methods.

S. No.	Parameters	Unit	Process I		Process II		Standard Specification
			Method A (Delimed with (NH ₄) ₂ SO ₄)	Method B (Delimed with (NH ₄) ₂ (SO ₄), then pickled)	Method A (Delimed with NH ₄ Cl)	Method B (Delimed with NH ₄ -Cl, then pickled)	
1.	Oils and fats	(%)	20.00%	16.34%	16.20%	11.00%	10% Min
2.	Water solubles	(%)	13.70%	9.07%	10.90%	11.10%	9.15%
3.	Total ash	(%)	4.60%	2.72%	2.80%	1.50%	1.5 Max
4.	Insoluble ash	(%)	0.90%	0.97%	0.38%	0.30%	0.5% Max
5.	Degree of tannage	(BK ⁰)	72.8	73.97	66.0	56.6	45-65
6.	pH value of water extract		6.0	5.5	6.0	6.0	3.3 Min
7.	Apparent density	(gr/cc)	0.973	0.95	0.92	0.96	0.96 Min
8.	Tensile strength	(Kg/cm ²)	268, 285, 303, 321, 345	182, 197, 308	301, 340, 348, 369, 394	288, 291, 294, 305, 361	Av. 280 Min. 210
9.	Water absorption:						
	15	(%)	24.9	29	13.1	8.6	30 Max
	2 hr	(%)	30.6	32	30.6	21.3	45 Max
	24 hr	(%)	32.6	34	44.8	41.8	45 Max

out first with machine then finally by hand using steel slicker.

(4) *Dubbin with drying.* The grain as well as the flesh surfaces of the sides were applied with the mixture of tallow + sesame oil in equal quantities with the assurances that the tallow has penetrated into the fibres. Finally the sides are dried completely and the excess deposition of fat was wiped off. They were trimmed and buffed, if necessary. The physico chemical data on the processed harness leather are given in Table 1.

RESULTS AND DISCUSSION

In the present study weak salts such as ammonium sulphate and ammonium chloride were tried along with sodium bisulphite for the delimiting of pelts. When delimiting is done with ammonium sulphate, ash content was found to be on the higher side. However, if after delimiting with ammonium sulphate the stock was pickled, the ash content was slightly reduced. Ammonium chloride on the other hand has been found more useful for the reduction of ash than ammonium sulphate. However, if after treatment with ammonium chloride the stock was pickled, the ash content was found to decrease to the required limit (Table 1).

Pretanning was carried out with imported tanning agents such as mimosa extract and Basyntan VG, and an indigenous pretanning material i.e. acacia bark. They were used at lower degrees of barkometer. In the case of babul bark it has been found that the colour of the finished leather was according to the requirement and it also showed non-cracking characteristics. With the imported pretanning materials the leather was found to crack after the drying stage.

The stock was tanned with different concentrations of mimosa tan liquor in all the experiments and finally retann-

ed with mimosa extract of different degrees of barkometer varying from 90°BK to 60°BK in the drum. The leather obtained from 90°BK to 70°BK mimosa extract treatment always showed fluctuating degree of tannage, while the leather obtained at 60°BK showed constant degree of tannage which conformed to the standard specification for curried leather (Table 1).

For stuffing and dubbing different raw oils from cotton seed, fish, mineral, coconut and sesame were tried. Among the above mentioned oils til (sesame) oil together with anionic synthetic oil and tallow has shown good deal of flexibility and strength in the finished leather.

The rest of the physicochemical constants e.g. density, tensile strength, water absorption, ash, fat etc. of the curried leather produced by either of the two methods reported above have been found in fair agreement with that of standard specifications as shown in Table 1.

REFERENCES

1. D. Woodroffe, *Standard Hand Book of Industrial Leather* (The National Trade Press Ltd., London, 1949), pp. 64, 34-36.
2. C. Ogiwara, *A Practical Guide to Heavy Leather Processing* (Japan International Co-operation Agency, Tokyo, Japan, 1980), p. 195.
3. Tanin International S.A., Paris.
4. J.A. Wilson, *Modern Practice in Leather Manufacture* (Reinhold Publishing Corporation, New York, 1941), p. 624.
5. F.O. Flaserly, W.T. Roddy and R.M. Lollar, *Chemistry and Technology of Leather*, (Robert E. Krieger Publishing Company, Florida, 1956), Vol I, p. 202.
6. B.H.W. Humphreys, *The Manufacture of Sole and other Heavy Leathers* (Pergamon Press Ltd., London, W.1, U.K., 1966), pp. 196-7, 204.