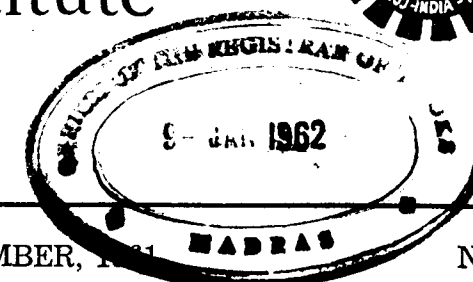


Bulletin of
The Central Leather
Research Institute
Madras

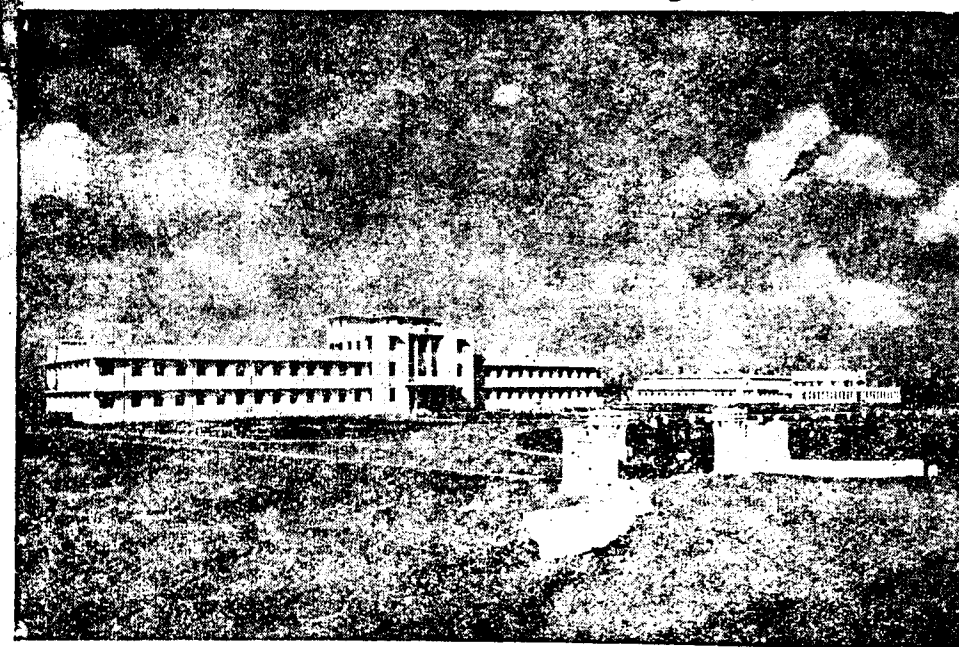


Vol. VIII

SEPTEMBER, 1961

No. 2

354



COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH
INDIA

Bull. cent. Leath. Res. Inst., Vol. 8, No. 2, Pp. 49-100, Madras, September, 1961

Bulletin of The Central Leather Research Institute

Vol. VIII

SEPTEMBER, 1961

No. 2

CONTENTS

Electrophoretic Method for Separation and Estimation of Different Fractions of Chrome Complexes —T. J. Devassy & Y. Nayudamma ..	49
Research Bears Fruit—A modified bag tanning process —W. N. Pandav & A. Ganesan ..	60
Letters to the Editor Biosynthetic Studies: Part III: Polyols, plant acids and amino acids of dhawa —K. Krishna Reddy et al ..	64
Biosynthetic Studies: Part IV: Polyols, plant acids and amino acids of myrobalan and divi-divi —J. B. Rao et al. ..	66
Technical Seminars: (1) Studies in neutralisation of chrome leather —R. B. Hajela ..	67
(2) Studies on aluminium tannages —R. Selvarangan ..	68
Tanners' Corner ..	70
Classified Abstracts ..	72
Notes and News ..	95
C.L.R.I. News ..	99

Editorial Board :

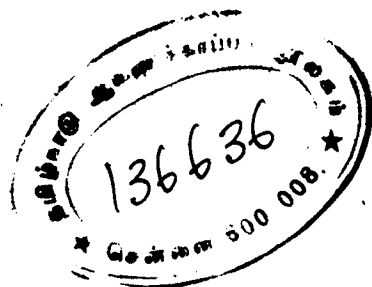
Dr. Y. NAYUDAMMA (*Editor*)
Dr. V. S. PADMANABHAN (*Managing Editor*)
Dr. S. K. BARAT
Dr. S. N. SEN
Mr. M. A. GHANI
Mr. N. SUBRAMANIAN (*Secretary*)

Annual Subscription.—Rs. 9/- (inland); Rs. 18/- (foreign); Single Copy 75 nP.

The Bulletin of the Central Leather Research Institute is issued monthly.

Communications regarding contributions for publication in the Bulletin, books for review, subscriptions and advertisements should be made to the Managing Editor, C. L. R. I., Madras-20.

All remittances by cheque or money order should be made payable to the Director, Central Leather Research Institute.



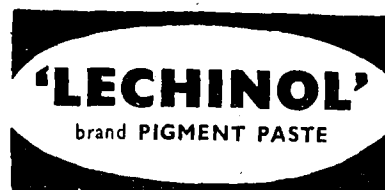
Leather in early days...

Since time immemorial, leather has been playing a vital role, even in its crudest form, in every sphere of our life.

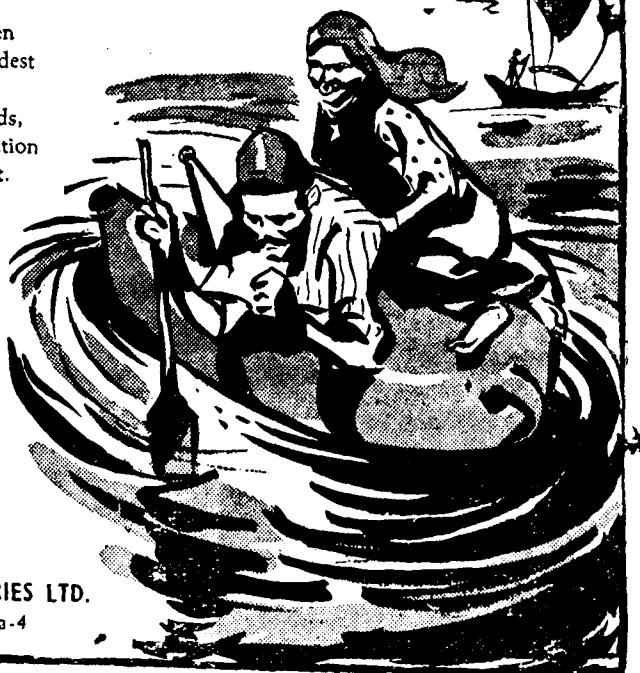
Now under modern scientific methods, no effort has been spared to give perfection to the finish of this versatile product.

Range of Products:-

- Pigment pastes in different shades
- Binders ● Lenol 'C' Fat Liqueur
- Resin Top ● Waximul 25
- Top Luster etc.



LEATHER CHEMICALS & INDUSTRIES LTD.
9, Muraripukur Road, Calcutta-4



Bulletin of the Central Leather Research Institute

SUBJECT & AUTHOR INDEX

For

VOLS. II & III

are available

DIRECTOR, CENTRAL LEATHER RESEARCH INSTITUTE
ADYAR, MADRAS-20.

ELECTROPHORETIC METHOD FOR SEPARATION AND ESTIMATION OF DIFFERENT FRACTIONS OF CHROME COMPLEXES

BY

T. J. DEVASSY & Y. NAYUDAMMA
Central Leather Research Institute, Madras

Received on February 17, 1960

SUMMARY

An electrophoretic method has been developed for the separation of the different fractions of chrome complexes, using a 1:1 mixture of 0.05N HNO_3 and $\text{N}/30 \text{ HClO}_4$ as the conducting solution. By this method, it has been possible not only to differentiate between the cationic, nonionic and anionic complexes, but also to separate the cationic complexes into three different fractions. The quantitative estimation of the complexes has been through spectrophotometry utilising the colour developed by diphenyl carbazide with Cr(VI) .

Introduction

The electrical charge of the complexes in chrome liquors plays a great role in determining their tanning potential. In chrome tanning,¹ the initial attraction between the oppositely (electrically) charged chrome complexes and hide protein leads to further co-ordination of the different reactive groups of collagen with the chrome complex; this results in formation of leather. Displacement of co-ordinately held H_2O molecules in chromium sulphate by COO^- or OH^- or any other anion (resulting in formation of covalent bond) alters the charge of the complex. The number and sign of the charge of the different complexes in a system may depend on the anions or alkali added to it. Also these complexes may themselves combine to form olated or oxolated^{2,3} compounds or get cross linked through the complexing anions, bringing about changes in the apparent charge of the complexes. As each of these fractions has a definite influence on the tanning characteristics of the chrome liquor as a whole, separation and estimation of each fraction becomes very important.

By the use of ion exchange resins⁴⁻⁷, it has been possible only to separate the chrome complexes into cationic, nonionic and anionic ones. Further separation of complexes of any one type into different fractions depending on the number of charges has not been achieved. The method has been found defective^{8,9} in the case of liquors which contained a good proportion of anionic and non-ionic complexes. Kawamura *et al.*¹⁰, however, have found it possible to separate pure complexes of one type on the basis of the number of their charge, by absorbing them on polystyrene exchange resins and preferentially eluting with dilute perchloric acid. It might not be possible to use this method in the study of complexes of basic chromium sulphate; in this case, preferential elution would be very difficult.

Electrophoresis¹¹⁻¹⁴ has been found to be much useful in the study of electrical charge of chrome complexes. When an ion is subjected to an electrical field, it migrates to one of the electrodes depending on its charge type, cations moving to the cathode and anions to the anode, electrical charge being necessary for this movement¹⁵. Uncharged molecules in an isoelectric state also may possibly migrate in an electrical field. Among the cations or anions themselves, the movement of different fractions may depend on the number of charges of a particular sign, the greater the number of charges, the greater the distance travelled. Some of the factors governing the migration of an ion in electrical field are charge, size, shape, amphoteric behaviour if any, electrolyte concentration, pH etc. In inorganic separations, adsorption also plays an important role. The degrees of dissociation of the different complexes, which are inversely related to the stability of the complexes and thereby to the valency and charge may be an important factor in effecting their separation. Earlier workers¹¹⁻¹⁴ employed paper strip electrophoresis for separating cationic, anionic and nonionic complexes. Not much work has been done in separating quantitatively and estimating the different fractions of cationic chrome varying in the number of charges. It was suggested by Gustavson¹² that it might be possible to separate different fractions depending on charge and estimate them using electrophoresis. Shuttleworth¹³ used 0.05N nitric acid as conducting solution for these experiments while Gustavson¹² used 0.1M sodium chloride solution with pH adjusted to 3.5 by hydrochloric acid. Kawamura *et al.*¹⁴ used N/30 perchloric acid in their studies to separate differently charged chrome complexes in a qualitative way. Later they suggested the possibility of estimating the separated complexes

by cutting out the different portions, extracting with water and determining colorimetrically.

It was felt necessary to devise an electrophoretic method for separation of different fractions of cationic chrome, quantitative estimation of these fractions, and fixing the charge of the separated fractions, so that a correct study of reaction between chrome liquor and pelt could be made.

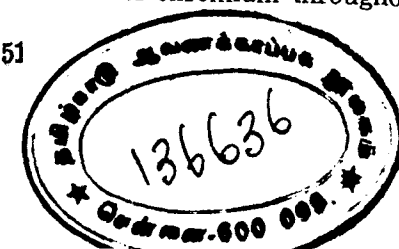
Experimental

The apparatus used was an ordinary paper strip electrophoresis apparatus with platinum foil electrodes, manufactured by Arthur H. Thomas Company. Experiments were carried out at 30°C.

Development of method:

Conducting solution: The nature and strength of the conducting solution should be such as not to affect the chrome complexes constitutionally but aid effective separation of different complexes. So most of the earlier workers¹¹⁻¹⁴ used dilute solutions containing inorganic anions having the least complexing ability as conducting solutions. It has been shown¹³ that nitrate and perchlorate ions did not complex with basic chromium sulphate. But sodium chloride at appreciable concentrations definitely modifies the chromium complexes as seen from experiments in this laboratory.

Under the conditions of the present experiments, none of the conducting solutions used by earlier workers was found to give good separation of cationic complexes into different fractions. A 1:1 mixture (by volume) of 0.05N nitric acid and 0.05N perchloric acid in equal volumes so as to give an ionic strength of 0.042, was found to effect good separation of cationic complexes into three different fractions (Figure 1). The pH of the above solution was 1.7. The following conducting solutions with pH adjusted as desired were tried with variations in voltage and time: (1) 0.05N potassium nitrate solution with pH adjusted to that of chrome liquor with nitric acid (about 3.0), (2) N/30 sodium perchlorate with pH adjusted to about 3.0 with perchloric acid, (3) mixture of potassium nitrate and perchlorate and (4) mixture of potassium chloride and sodium perchlorate in different proportions with pH adjusted. Very good separation of the cationic chrome into different fractions was obtained in all cases except No. 4. But there was a continuous trail of chromium throughout.



As buffers (1) boric acid and borax which are known to have no complexing ability with chrome and (2) sodium acetate and acetic acid at pH 3.0 and 3.5 were tried as conducting solutions and still the trailing persisted. In all the above cases, trailing disappeared when a pH 2.0 or below was used. So it can be concluded that a low pH is necessary to avoid trailing whether the conducting solution is a buffer solution or salt solution. It is known that chromium complexes with three positive charges are not very stable above pH 2.0. In chrome liquor though the pH is about 3.0, they have already come to an equilibrium. So when higher pH values are used in electrophoresis, there may be a progressive conversion of chrome complexes into stabler complexes which may be getting adsorbed continuously bringing about the trail. Also with rise in pH, adsorption may become more prominent, in which case, with progress of electrophoresis a small portion may be getting adsorbed throughout the duration of the experiment.

Effect of voltage, time and concentration of chromium on electrophoresis:

Optimum conditions in the voltage and time have to be determined for the best separation with the available length of the paper. After many trials, it was found best to run the electrophoresis initially for 2½ hours at 100 volts and then stepping up to 150 volts to run it further for 1¼ hours. The concentration of chromium should be such as to be enough for subsequent micro-estimation and not more than what could be efficiently separated. Chrome liquor containing 0.000026 gm. Cr was found ideal for separation. No. 1 Whatman filter paper strips were used for all the experiments and the paper was cut against the weave of the fibres; this gave better results. The physical obstruction in the free flow of ions could be responsible for this.

Development of micro-quantities of chromium on paper:

A suitable technique for the development of the paper strips having micro-quantities of Cr is necessary for locating the different fractions after electrophoresis. Oxidation of the trivalent Cr to the hexavalent state followed by colour development with alcoholic diphenyl carbazide¹⁶ in the presence of sulphuric acid was resorted to. Wet methods utilising oxidising agents like potassium persulphate and ammonium persulphate in the presence of silver nitrate were tried; however in spraying these reagents one after another, the chromium got spread on the paper. Also the colour developed with diphenyl carbazide faded quickly. The difficulties were avoided through using Alizarin red S or alizarin-dyes¹⁷

which form coloured lakes (in the presence of ammonia) with trivalent chromium itself. The paper strips were, after electrophoresis, sprayed with a saturated alcoholic solution of alizarin which gave a fast pinkish coloured lake with Cr (VI) after exposure to ammonia and drying.

After considerable trial with many variables, the following method was adopted.

Separation of cationic, nonionic and anionic complexes:

Chrome liquor containing 0.000026 gm. chromium was spotted in the centre of the paper strip and electrophoresis was carried out for one hour at a potential of 150 volts. The conducting solution was a mixture of equal volumes of 0.05N nitric acid and N/30 perchloric acid such that it had an ionic strength 0.042. After electrophoresis, the strips were dried in an air oven, sprayed with alcoholic solution of Alizarin red S and left overnight; the different developed fractions were cut out, ashed, and oxidised with a 1:1 mixture of sodium carbonate and sodium chlorate. The fused mass was dissolved in 2N H₂SO₄ and the chromium estimated spectrophotometrically using diphenyl carbazide. Full details are available in an earlier communication.¹⁹

Separation of cationic chrome into different fractions:

In this case, chrome liquor containing 0.000026 gm. of Cr was spotted at the positive electrode end of the paper. A potential of 100 volts was applied for 150 minutes after which it was stepped upto 150 volts and electrophoresis was continued for another 75 minutes. The conducting solution used and the method of development and estimation were the same as used for separation of cationic, nonionic and anionic ones.

As the spotting was done at one end of the paper, in the initial stages chromium travelled as a whole due to capillary action irrespective of its charge. After migrating a little distance, the fractions began separating. So in the case of a mixture of cationic, anionic and nonionic complexes, it was found possible to account for anionic and nonionic fractions separately apart from the three individual fractions of cationic chrome. (Fig. 1)

Fixing the charge of the separated fractions:

As the electrical charge is the main factor influencing the separation of different complexes in this type of electrophoresis, it could be safely concluded that each fraction separated had a differ-

ent charge. To determine the actual number of charges, electrophoresis was effected simultaneously with basic chrome liquor, pure solutions of chromium perchlorate and chromium nitrate at pH 1.5. After electrophoresis, it was seen that the starting point of the third fraction (fastest moving) coincided with that of chromium perchlorate and chromium nitrate which migrated as a whole without separation (Figure 2). So the charge of the fastest moving fraction would be 3 as the chromium complexes of these salts at that pH would have only 3 positive charges.

In neutral salt free 33% basic chromium solution (2.5% Cr) aged for 6 months, the fraction having 3 positive charges formed 44.8% of total chrome. This figure compares well with the observation of Laswick and Plane¹⁸ in their studies on basic chromium perchlorate solution using ion exchange technique. Quantitative estimation of the separated chromium was done as published earlier.¹⁹ After development with alizarin, the developed portions were cut out and Cr estimated. Alizarin was not found to interfere with estimation as it was completely destroyed during oxidation.

To check up the efficiency of the method of separation and estimation, pure complexes, chloropentamminechromium chloride and trioxalato chromiate (prepared in the laboratory^{20,21}) were subjected to electrophoresis individually and in admixture (immediately after mixing); as shown in table I, the same proportions of different complexes as in the original were obtained. These two were mixed with a known commercial chrome liquor and analysed immediately. In this case also, the proportions in the original liquors were obtained as shown in table I.

TABLE I

Absorbance readings at 540 mμ of chromium diphenyl carbazide complexes as per adopted method

Complex used	Absorbance readings		
	Cationic	Nonionic	Anionic
(a) Chloropentamminechromium chloride	0.101	0.002	0.002
(b) Trioxalato chromiate	0.002	—	0.263
(c) Commercial chrome liquor	0.202	0.016	0.013
(a) + (b)	0.102	—	0.264
(a) + (b) + (c)	0.302	0.019	0.280

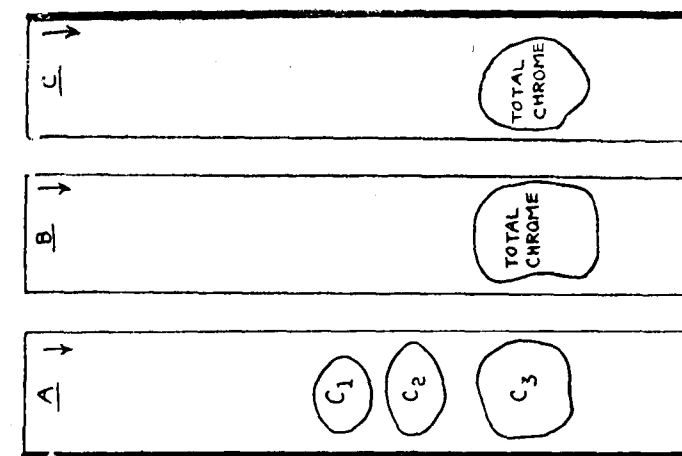


Fig. 2

A = Basic chrome liquor.
B = Chromium perchlorate.
C = Chromium nitrate.

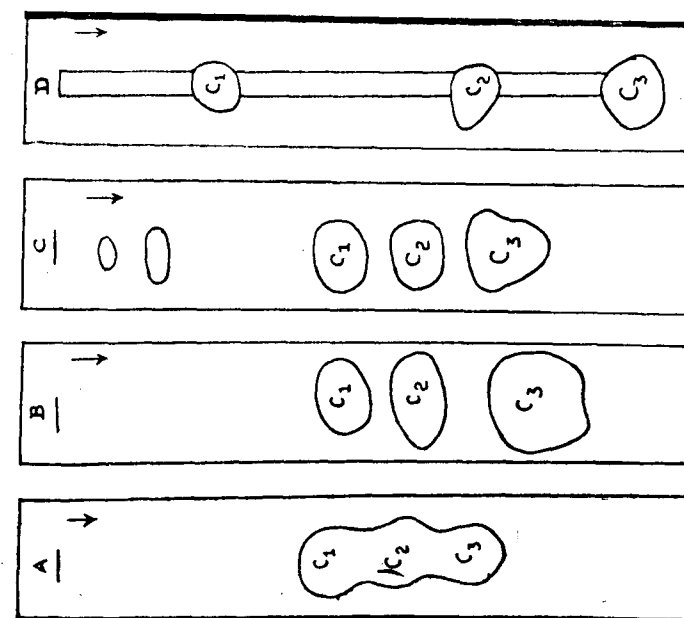


Fig. 1

A = Improper separation of cationic chrome.
B = Good separation of cationic chrome into 3 fractions.
C = Good separation of cationic chrome in presence of nonionic and anionic.
D = Separation with continuous streaking.

Spectrophotometric studies:

Any change in the structure of the complexes during electrophoresis may bring about some variation in the absorption characteristics and hence this study may be much helpful.

Stability of the complexes in the presence of the conducting solution:

The possible effects due to conducting solutions are the entry of the anion of the conducting solution into the chrome complexes and deolation of the complexes. In each of four 50 ml. standard flasks 2 ml. of 0.5% chromium solution was taken and to this 4 ml., 6 ml., 8 ml. and 10 ml. of acid solution used for electrophoresis (the range of dilution used on paper) were added and allowed to remain for about 4 hours. They were suitably diluted and the absorbances read in spectrophotometer against conducting solution as blank at different wavelengths from 235 mμ onwards. The maximum absorption for olated compounds is round about 240 mμ.²² Similarly absorbance of a completely deolated chrome liquor prepared by refluxing chrome liquor with sulphuric acid, was also taken. At any particular wavelength, this value and the value for chrome liquor alone may be entirely due to olated groups. In another experiment, 48 hours contact time was given and the effect studied; results are given in table II.

The data clearly show that only insignificant changes occur during the normal period of electrophoresis used in these experiments.

Effect of heat:

As in the previous case, a study was made to find the effect of heat generated during electrophoresis on the complexes. As in the above case, chrome liquor portions, alone and with different amounts of conducting solution, were gradually heated up in a water bath to raise the temperature by 15°C in about 4 hours (approximately the rise in temperature during electrophoresis as measured by contact thermometer).

The absorbance readings (table III) show that there is no change happening during electrophoresis.

Effect of passage of current:

Current was passed at the same voltage and time as used in electrophoresis through chrome liquor in presence of conducting solution. Absorbance readings were measured at different wavelengths after making necessary dilution. It was seen there was no change in absorption characteristics due to passage of current in presence of conducting solution.

TABLE II

Absorbance values of combined chrome-acid solutions at various wavelengths (Blank: acid)

Wave-length in mμ	4 hours ageing in the proportion		48 hours ageing in the proportion		Chrome liquor alone	Deolated chrome liquor		
	2:4	2:6	2:8	2:10				
235	0.298	0.296	0.295	0.295	0.253	0.165	0.300	0.200
240	0.225	0.224	0.225	0.224	0.195	0.161	0.238	0.120
245	0.166	0.163	0.165	0.166	0.138	0.113	0.167	0.100
250	0.123	0.124	0.124	0.125	0.095	0.081	0.127	0.073
260	0.079	0.080	0.082	0.080	—	—	0.082	0.048

TABLE III

Wave-length in $m\mu$	Absorbance of chrome liquor alone 2 ml.	Absorbance readings. 2 Cr liquor: 6 Acid.		Absorbance readings. 2 Cr liquor: 8 Acid.	
		immediately	4 hours aged	immediately	4 hours aged
235	0.208	0.210	0.208	0.205	0.203
240	0.165	0.162	0.162	0.163	0.163
245	0.130	0.129	0.128	0.130	0.128
250	0.102	0.100	0.100	0.101	0.100

REFERENCES

1. Gustavson, K. H., "The Chemistry of Tanning Processes" p. 19, Academic Press Inc., N.Y. (1956).
2. Stiasny, E. and Balanyi, D., *Collegium*, 99 (1927).
3. Balanyi, D., "Handbuch Der Gerbereichemie" 2, part 2, pp. 77-176 (1939).
4. Gustavson, K. H., *J. Am. Leather Chemists' Assoc.* 19, 446 (1924); 44, 388 (1949); 45, 536 (1950); *Svensk Kem. Tidskr.* 56, 14 (1944); 58, 2,274 (1946); 63, 167 (1951); 64, 137 (1952); *J. Colloid Sci.*, 1, 397 (1946); *J. Intern. Soc. Leather Trades' Chemists*, 30, 264 (1946); *J. Soc. Leather Trades' Chemists*, 34, 259 (1950); 35, 160, 270 (1951); 36, 182 (1952).
5. Adams, R. S., *J. Am. Leather Chemists' Assoc.* 41, 552 (1946).
6. Theis, E. R., and Thorstensen, T. C., *J. Soc. Leather Trades' Chemists*, 32, 137 (1947).
7. Forman, G., Thompson, G. and Tolliday, J. D., *J. Am. Leather Chemists' Assoc.* 45, 378 (1950).
8. Inouye, Y. and Kawamura, A., *J. Am. Leather Chemists' Assoc.* 49, 678 (1954).
9. Shuttleworth, S. G., *J. Am. Leather Chemists' Assoc.* 49, 598 (1954).
10. Inouye, Y., Kawamura, A., Wada, K. and Okamura, H., *Japan Analyst*, 4, 281 (1955) Through C. A. 50, 1275b (1956).
11. Plant, D. A., *J. Soc. Leather Trades' Chemists*, 32, 88 (1948).
12. Gustavson, K. H., *J. Am. Leather Chemists' Assoc.* 47, 151 (1952).
13. Shuttleworth, S. G., *J. Soc. Leather Trades' Chemists*, 38, 110 (1954).
14. Kawamura, A., Okamura, H. and Kanek, N., *Japan Analyst*, 4, 158 (1955); *Anal. Abstr.* 3, 97 (1956).
15. Lederer, M., "Introduction to paper electrophoresis and related methods" Elsevier Publishing Co., London (1957).
16. Bose, M., *Anal. Chim. Acta*, 10, 201 (1954).
17. Feigel, F., "Chemistry of specific selective and sensitive reactions" p. 534, Academic Press Inc., N.Y. (1949).
18. Laswick, J. A. and Plane, R. A., *J. Am. Chem. Soc.* 81, 3564 (1959).
19. Devassy, T. J., *Bull. Cent. Leath. Res. Inst.* 3, 252 (1957).
20. Bailar, J. C. & Jones, E. M., *Inorganic Syntheses* 1, 37 (1939) [New York: McGraw-Hill Book Co.]
21. Schlessinger, G., *Inorganic Syntheses* 6, 138 (1960) [New York: McGraw-Hill Book Co.]
22. Ramaswamy, D., *J. Leather Tech. Assoc. of India*, 4, 52 (1956).

RESEARCH BEARS FRUIT

A modified bag tanning process

BY

W. N. PANDAV & A. GANESAN

Introduction

The process described below avoids the use of lime and is the nearest substitute for the *Jawasi* or *Akh* process of unhairing followed in rural areas in North India. The leathers obtained herein are almost equal in strength to those processed by enzyme unhairing. The advantage of this method is that the leathers can be quickly processed in contrast to the *Jawasi* or *Akh* process without sacrificing the quality. The foul smell associated with the latter method is also eliminated.

The process was successfully demonstrated at Patan (North Gujarat) and was much appreciated by the local tanners.

Details of the Process

Raw material:

Air dried stock—buffalo hides, cow hides or calf skins of any weight—may be used.

Soaking:

The raw material taken is soaked for 2 days in sufficient water to which a little sodium sulphide has been added to render it alkaline. A rough fleshing during soak is advantageous. Soaking should be thorough. Care should be taken to soak thoroughly all the parts of the hides, sufficient time being allowed for soaking. A typical soaking procedure is given below:

For every 100 kg. of air dried stock taken, 800 kg. of water is put in a pit. About 0.7 kg. (1½ lb.) sodium sulphide of good quality is added to the water. The alkalinity of the water should be ensured by testing it with turmeric (*Haldi*) or phenolphthalein. The hides are kept well immersed in this bath using heavy stones if necessary. After 24 hours, the hides are taken out, worked on

the flesh side on a beam and put back in the bath. The alkalinity of the bath is maintained by adding some more sodium sulphide to the bath. Care should be taken to ensure that all portions are well soaked. The hides are retained in the bath for 24 hours more. They are then taken out, drained and the soaked weight is noted. Stock should not be taken to the next stage without proper soaking.

N.B.: All percentages given here after are based on soaked weight.

Unhairing:

3rd and 4th days: The soaked hides are taken out and fleshed to remove the meat and the hard tissue on the flesh side. They are then spread on the ground (floor) hairside up.

2% sodium sulphide of good quality is taken in a mud pot and dissolved in three times its weight of hot water. After the sulphide is completely dissolved, the solution is applied on the hairside with a brush. (In the case of buff hides, use of 0.5 to 1.00% soda ash along with sodium sulphide is recommended for easy removal of scud). On the thicker portions, some more of the solution is applied. The edges of the hides are well painted and are carefully folded in. They are next carefully folded and bundled so that the solution applied does not drain away. They are then stacked one over the other and covered with a gunny bag.

Next morning, the hides are tested on the thick portions for ease of unhairing. If this is achieved, the goods may be unhaired without further application of the sulphide solution. If not, another coat of sulphide solution of the concentration mentioned above, may be given and the unhairing carried out subsequently. Generally unhairing takes 2-3 days if the hides are not too dry.

Brining:

4th to 9th day: The unhaired hides are kept in a pit and flooded with 100% water; 10% salt is added to the water. The hides are well handled and kept immersed in the salt solution.

N.B.: It is advisable not to put the hides in the brine bath before proper unhairing. Salt should be added only after unhairing has been carried out.

The hides may be kept in the brine bath for 6 days (144 hours) after which period, they are taken out, fleshed, scudded and washed well in fresh salt solution. They are then kept overnight in 5% salt solution to which ½% ammonium chloride or ½% ammo-

nium sulphate is added. If these chemicals are not easily obtained, their use could be dispensed with by giving two or three additional washes with plain water or brine to remove the alkali. Removal of the alkali is possible here by trampling. The washed hides should be never kept for a long time in plain water. They should be kept immersed in brine solution when left overnight. A 5% brine solution is sufficient for this. It is also possible to use exhaust tan liquors for removing the slight alkalinity still present. However, for this, a good deal of handling in liquors of various acidities and skill on the part of the workers are required. It is also advisable to dip this stock in $\frac{1}{4}\%$ naphthalene sulphonic acid prior to colouring to obtain clean white pelt. Instead of sulphonic acid, any other acid or old fermented tan liquor may be used.

Tanning:

The tan liquor is prepared taking sufficient quantity of used tan liquor freed from dirt and sediment and adding about 55% tanning material (on the fleshed weight) like babul or avaram. It is preferable to use avaram for colouring (Malni) and babul in the bag. This ensures good colour.

Malni:

10th to 12th day: The hides are put in the colouring pits and handled well.

Bag tanning:

13th and 14th days: The hides are stitched into bags and hung above the pit. The tan liquor is poured into the bags.

15th day: The bags are opened and stitched again after reversing the side. The tan liquor is again poured into the bags and they are hung up.

16th day: The bags are opened, the liquor is let out into the pit and the hides are put into the pit.

17th day: The tanned hides are aged in the same pit.

18th day: *Washing and bleaching:* Bleaching is done as follows: $\frac{1}{4}\%$ - $\frac{1}{2}\%$ bleaching syntan (C.L.R.I.) is dissolved in about 200% of water. The hides are kept in this liquor for one hour and handled occasionally.

Salting: Enough bag tan liquor is taken separately in a pit or in a vat and 15-20% of iron free salt is added to this. The

tanned stock is now dipped in this salt solution, handled for 10 minutes and left here for three hours.

N.B.: 1. The quality of the salt used should be checked on small pieces of leathers before being used. Quite often, the finely powdered salt is likely to contain finely divided iron arising from grinding. Pieces of vegetable tanned hides will become stained if they are put in a salt solution containing iron. The bulk addition of salt should be affected only after ensuring that the salt sample does not have any harmful effect.

2. Tanning can be carried out without using salt. However, leathers having salt have a better feel and appearance under the dry conditions prevailing in these parts (North Gujarat).

The tanned hides (salted or unsalted) are then taken out, beamed and oiled off with 2% free oil like pungam or castor oil. They are then hung up to dry.

19th day: The hides are sammed and set out. The stock is now ready for market.

N.B.: After completion of tanning, the leathers should be squeezed well and dried with or without oiling. Where a better colour is needed bleaching may be done, the leathers being given a mild rinse in plain water after bleaching.

LETTERS TO THE EDITOR

Biosynthetic Studies: Part III.

Polyols, plant acids and amino acids of dhawa

(*Anogeissus latifolia*)

In the two earlier communications^{1,2} studies on certain polyphenolic constituents of the leaves of avaram and babul have been reported. The path of formation of these phenolics would correspond to the path of aromatic biosynthesis in plants. The significance of the cyclohexane carboxylic acids—shikimic, quinic and dehydro quinic acids—in this context has come to be realised. Studies on occurrence of these acids as well as of polyols and amino acids in the various parts of indigenous tanniferous plants have been initiated. The present communication deals with Dhawa—a leaf tanning material. Dhawa (*Anogeissus latifolia*) is used in the light leather industry.

Samples of the various parts of dhawa were collected from Mamandur forest in Andhra Pradesh. The tannins of dhawa have been found to be mainly gallo-tannins. By the procedure detailed below, it has been possible to detect shikmic acid and quinic acid in the leaves but not in the other parts. Rhamnose, arabinose, fructose and galactose were the sugars found in the leaves; in the other parts, the sugars were totally absent. Alanine and phenylalanine were the amino acids found in the bark; no amino acids could be found in the leaves.

EXPERIMENTAL

(a) Polyols and cyclohexane carboxylic acids:

The powdered fresh plant material (such as leaf, bark, heartwood, root, etc.) was extracted with 80% methanol. The methanol solution was concentrated to small volume *in vacuo*, diluted with water and continuously extracted with ethyl acetate. The ethyl acetate solution was concentrated to dryness *in vacuo* and treated with water and filtered. From the filtrate, tannins were removed by treatment with lead acetate. The clear solution obtained was passed through Dowex 50W $\times$ 8 resin to remove the excess lead

ions. The solution was then concentrated to small volume and tested for sugars and cyclohexane carboxylic acids. For cyclohexane carboxylic acids, unidimensional ascending chromatography was effected with phenol-water (3:1 W/V)³ mixture containing 0.9% formic acid. The paper was sprayed successively with aqueous sodium metaperiodate solution and an ethanolic solution of sodium nitroprusside and piperazine.⁴ Pale yellow spots developed at various points on the paper, corresponding to different acids. In the case of sugars, the above solution was tested by single way ascending chromatography with *n*-propanol: ethyl acetate: water (7:1:2 V/V)⁵ as the solvent system and spraying was done with *p*-anisidine hydrochloride solution.⁶

(b) Amino acids:

The acetone extracts from different parts of dhawa plant were taken up in water and tannins removed from them by precipitation with lead acetate solution. The filtrate was acidified with 2N HCl and the precipitated lead chloride was filtered off. The clear solution obtained was concentrated to dryness *in vacuo* (room temperature) and extracted with a little phenol-*n*-butanol mixture (3:2 V/V). The solution was tested for amino acids by subjecting it to single way ascending chromatography with *n*-butanol-acetic acid-water (4:1:5 V/V)⁷ and spraying with ninhydrin solution.

August 8, 1961
CL.R.I., Madras-20.

K. KRISHNA REDDY,
K. N. S. SASTRY,
S. RAJADURAI,
Y. NAYUDAMMA.

REFERENCES

1. Bhanu, K. U. *et al. Bull. Cent. Leath. Res. Inst.* 8, 23 (1961).
2. *Idem, ibid*, 8, 24 (1961).
3. Stark, J. B., Goodban, A. E. and Ownes, H. S., *Anal. Chem.* 23, 413 (1951).
4. Cartwright, R. A. and Roberts, E. A. H., *Chem. and Ind.* 230, (1955).
5. Albon, N. and Gross, D., *Analyst* 77, 410 (1952).
6. Hough, L., Jones, J. K. N. and Wadman, W. H., *J. Chem. Soc.* 1702
7. Levy, A. L. and Chung, De, *Anal. Chem.*, 25, 396 (1953).

Biosynthetic studies: Part IV
Polyols, plant acids and amino acids of myrobalan and divi-divi

In the previous communication,¹ studies on the polyols, plant acids and amino acids in dhawa were reported. The present communication is concerned with similar studies on myrobalan and divi-divi. Hathway² carried out analogous studies with myrobalan nuts. Since the leaves are seats of metabolic activity, data about the occurrence of these three types of compounds in the leaves would be greatly interesting vis-a-vis biosynthesis of tannins. The studies carried out in this direction with leaves and other parts of myrobalan (*Terminalia chebula*) and divi-divi (*Caesalpinia coriaria*) are reported hereunder. In view of the reported effect of drying, both dried and fresh samples of the plant parts were studied.

It was possible to identify shikimic, dehydroshikimic and quinic acids in the leaves (and nuts/pods) but not in the other parts of both the plants. Arabinose, fructose, glucose and sucrose were found in the leaves and nuts/pods, rhamnose being an additional component in the dried samples of the same. While both glucose and fructose could be detected in the bark and stem regions of divi-divi and in the bark region of myrobalan, glucose alone was identified in the stem region of myrobalan. As regards amino acids, more of them were found in the nuts/pods than in the leaves, bark or stem, the leaves containing the minimum number. Drying led to an increase in the number of amino acids in the case of nuts/pods only (from 9 to 12 in divi-divi pods and from 11 to 17 in myrobalan nuts).

The results obtained with myrobalan nuts are in broad agreement with those of Hathway.² It would appear reasonable to expect generally the presence of the cyclohexane carboxylic acids, in tanniferous plants.

Experimental: In the case of myrobalan, the samples of plant parts were collected from a tree in a forest near Yercaud Hills, 20 miles from Salem (Madras State) and in the case of divi-divi, from a plant growing in the Institute premises. The experimental procedures followed were the same as in the case of dhawa.¹

September 2, 1961
C.L.R.I., Madras-20.

J. B. RAO,
S. RAJADURAI,
K. N. S. SASTRY,
Y. NAYUDAMMA,

1. Reddy, K. K., et. al, Bull. Cent. Leath. Res. Inst. 8, 64 (1961).
2. Hathway, D. E., Biochem. J. 63, 380 (1956).

TECHNICAL SEMINAR
Studies in neutralisation of chrome leather*

BY

R. B. HAJELA**

For having a better insight into the mechanism of neutralisation, the changes in chrome complex and the changes in properties of leather at different stages of neutralisation have been studied keeping the dilution, reactant concentration and the temperature constant, with NaOH as the neutralising agent; basicity, nitrogen content, chromium contents (total, soluble and irreversibly fixed), sulphate contents (total and complexly bound) and IEP of the neutralised leather have been determined at different time intervals.

Based on the data obtained, the following observations are made:

With increasing duration of neutralisation, T_s , total sulphate content and irreversibly fixed chrome content decrease, while pH, overall basicity, soluble chrome content and moisture content register an increase; nitrogen is constant and the complexly bound sulphate decreases in the later stages.

Neutralisation is a rate process; however, no reaction order could be assigned. The heat of activation and free energy and entropy changes have been calculated. The reaction is endothermal in the initial stages, but tends to become exothermal in subsequent stages. Entropy change is negative and increases with the progress of neutralisation.

It would appear that the 33% basic chrome sulphate complex, weakly bound by secondary valence forces in the leather, tends to become 66% basic and to get precipitated partly on the surface as $\text{Cr}(\text{OH})_3$ at pH 5.0-5.1. The irreversibly bound chromium complex also tends to get precipitated as $\text{Cr}(\text{OH})_3$ at later stages of neutralisation. This precipitation, however, is a surface phenomenon.

*Summary of the talk given on April 28, 1961.

**Present Address: Central Building Research Institute, Roorkee (U.P.).

TECHNICAL SEMINAR
Studies on aluminium tannages

BY

R. SELVARANGAN

I. Chemistry of aluminium tanning salts: *

Aluminium salts and alum tanning have not received as much attention as chromium salts and chrome tanning. Hence systematic studies have been made on (1) chemistry of basic aluminium salts, (2) mechanism of tannages with these salts and (3) better utilisation of the same.

In contrast to basic aluminium chloride solutions, basic aluminium sulphate solutions are not stable on dilution. Since the sulphate solutions are superior as tanning agents, investigations have been carried out on stabilising basic aluminium sulphate solutions by addition of various salts. Na_2SO_4 though efficient in this direction is ruled out since presence of considerable amount of neutral salt in solution retards fixation of aluminium. The studies carried out have shown that a masking salt containing both OH and COO groups is a better complexing agent vis-a-vis aluminium. Introduction of a sulphonic group into a phenolic carboxylic acid as well as increase in the number of carboxyl groups effect an increase in the complexing capacity. Increase in the length of the hydrocarbon chain, on the other hand, has the opposite effect. Citrate has been found to be the most suitable complexing agent, possibly because the optimum ratio of carboxyl to hydroxyl groups and optimum hydrocarbon chain length are obtained herein.

Calgon may be added without precipitation to a masked aluminium sulphate solution. In contrast to chromium complexes, aluminium complexes are not easily penetrated into by sulphite ion. Aluminium does not complex with formaldehyde.

It has been found that unlike chromium, aluminium does not complex appreciably with dicarboxylic anions like oxalate and malonate and monocarboxylic anions like formate and acetate.

*Summary of the talk given on July 7, 1961.

Based on the present studies, the following order has been arrived at for the complexing ability of the different anions:

acetate < succinate < malonate < formate < oxalate <
gluconate < lactate < glycollate < tartrate < citrate.

The increase in pH on the addition of salts of organic acids to aluminium sulphate solution has been found to be attributable to buffer action, repression of hydrolysis and displacement of the hydroxyl groups by the added anions. With salts of hydroxycarboxylic acids, this effect becomes less pronounced and is actually reversed. The factors now operating are co-ordination of the OH group of the masking agent accompanied by a release of $[\text{H}^+]$ and dissociation and oxolation of the complexes in solution. However, on addition of large quantities of these salts, the pH increases again due to buffer action. The observed change in pH is thus the net effect of all these various factors.

II. Alum tannage: *

Fixation of aluminium by hide powder increases upto pH 5.0 and 50% basicity when tanned with potash alum masked with citrate (1/3rd equivalent). However, the fixation from liquors of higher basicity (66%, 88% and 100%) is less since the pH of these tanning solutions is greater than 5. Al-fixation from basic aluminium chloride free from neutral salt increases with the increase in basicity (0—83%) and pH 0.4 to 4.0. The maximum fixation [7.35 gm. Al_2O_3 per 100 gm. hide substance] was obtained with 83½% basic liquor of pH 4.0. The fixation of aluminium complex by collagen when tanned with 75% basic aluminium chloride may be due to ionic and covalent linkages; the resultant complexes can be cationic, nonionic and anionic.

The addition of organic salts like formate, acetate, oxalate, lactate and citrate, to aluminium sulphate solution raises the fixation of aluminium by hide powder at lower additions (1/6 to 1/4 equivalent) and then lowers it. The maximum amount of aluminium is fixed in the case of citrate. The equivalent amount of citrate required also is less as compared to the other salts.

different concentration, pH values and with addition of sodium chloride, sodium sulphate and sodium citrate.

The collagen-aluminium complex formed on tannage contains OH groups, acidic groups like sulphate, chloride, the anion added and the carboxylic groups of the collagen and it may be cationic, non-ionic or anionic in nature. The hydrothermal stability of the aluminium tanned leather is less than that of the chrome tanned one. Drawing an analogy from the low thermal stability of the aluminium carboxylate complex as against that of chrome in tanning liquors, the weaker penetration power and the less stable nature of the link formed between aluminium and collagen are explained.

TANNERS' CORNER

The Central Leather Research Institute has been since its inception rendering technical aid to the leather industry through answering technical enquiries on specific problems. The number of such enquiries has been increasing year by year. In order that the information contained in the replies to the technical enquiries may be made available to all those who have similar problems, this new feature "Tanners' Corner" has been inaugurated. Typical questions will be reproduced herein with the relevant answers. It is hoped that the industry will fully utilise this new feature and bring more and more of its problems for solution by this Institute.

Q. III. How can the plumpness (of skins) be retained in the bark tub in the E.I. tanning?

Answer: The following may be tried for retaining plumpness in the bark tub:

- (1) Using soft water for deliming and tanning.
- (2) Omitting pickling and depickling operations.
- (3) Pickling alone being carried out without being followed by depickling.
- (4) Using $\frac{1}{4}$ - $\frac{1}{2}$ % soda ash in the lime bath.

Q. IV. How are raw hide pickers manufactured? What is the equipment needed for their manufacture?

Answer: Picker is a rolled strip of leather or raw hide used on looms to arrest the travel of the shuttle and to send it back on

the return journey. An outline of the process for the manufacture of raw hide pickers is given below:

Raw material: Raw buffalo hides.

Process for manufacture of raw hide pickers: Limed butts as they come from the lime yard are delimed, completely drained and then drummed for one hour with 20% of glycerine which is absorbed by the pelts. They are then horsed up, struck out and nailed out to dry in a good warm current of air. A little essential oil (i.e., citronella, sassaffras, sage or clove oil) is added to the glycerine to prevent growth of micro-organisms on the finished products.

Alternatively alum (5%) or formaldehyde (1%) is sometimes mixed with glycerine and essential oil to impart slight degree of tannage to the products. The alum is dissolved in the minimum quantity of water mixed with glycerin; the pelts are drummed with the mixture as before.

The equipment needed for the manufacture of picker is given below:

- (1) Hand cutting or chopping machine.
- (2) Guillotine chopper.
- (3) Moulds of cast iron to suit the looms and chopping moulds.
- (4) Moulding press—20-25 ton capacity.
- (5) Cast iron rods of various sizes: Length—3"-4",
Dia. — $\frac{1}{4}$ "-1".
- (6) Rivetting nails: Length: $\frac{1}{2}$ "-1 $\frac{1}{2}$ ", Dia.: $\frac{1}{16}$ "- $\frac{1}{8}$ ".
- (7) Emery stone wheels having some curvature.
- (8) Milling machine with moveable bench.
- (9) Drilling machine with moveable bench.
- (10) Milling cutter.
- (11) Edge chopper (or a hammer press with a cutting knife).
- (12) Racks for drying raw hide pickers.
- (13) Squeezing machine for caps.
- (14) Knives.
- (15) Drying chamber (asbestos), blower fan, variable speed motor, air blow speedometer, dry and wet bulb thermometers, thermostat control and humidostat, 4 water jets.

The estimated cost of equipment may come to about Rs. 15,000-16,000. The cost of building and the capital required for raw material and chemicals are extra.

CLASSIFIED ABSTRACTS*

GENERAL

The John Arthur Wilson Memorial Lecture: How to protect the leather industry

Marcel Riviere (1st Vice President l'Association Francaise des Chemistes des Industries Du Cuir, Strasbourg (Bas-rhin) France).

I. *By understanding the present situation and acting accordingly:* We should not be greatly surprised by the changes which have occurred in the worlds structures and institutions during the past 25 years. We should consider these changes as natural evolution and adapt ourselves to them.

It is necessary that the leather industry as well as other industries submit to the general demands of our age whether they be economical, industrial, financial, or changes in the human point of view. To ignore any changes which result from scientific discoveries or from the evolution of peoples is out of question. It is dangerous to minimize the facts that new generations do exist, and that they are inspired by the flow of acquired knowledge and by the beliefs which they develop for themselves. On the whole, there is only one proper course of action for us to take. It consists of understanding the present, appraising the future, and then acting with courage to improve our scientific, technical and human knowledge.

II. *By developing co-operation between all phases of the leather industry:* As tanners we all appreciate the enlightened collaboration that exists between the suppliers of chemicals and machinery and ourselves. There is, however, a lack of similar collaboration between the hide dealers and ourselves; and there are disagreements on many problems between various tanners. Most of these disagreements are on minor matters and arise only because the larger problems of the industry are not clearly understood. These broader problems should be considered on an industry wide scale and ways should be found to improve both the industry and its product.

*Abstracts of papers presented at the Washington Session of the I.U.L.C.S. held from Aug. 20 to 25, 1961.

III. *By adopting means to insure the future of our industry:* (1) By pursuing scientific research in all fields which might aid in the fullest possible understanding of the tanning process and in the better utilization of skins. (2) To disseminate, by all means at our disposal and in all countries all exploitable knowledge regarding our industry. (3) By vigorously promoting all over the world, improved means of collecting and preserving skins under conditions which can be maintained and controlled. (4) By developing some means of setting the prices of skins and undressed hides according to their class and real value. (5) By developing a world wide means of improving the general quality of leather, to simplify production, and to reduce selling prices. These are necessary conditions to insure the future of the industry. (6) By recognizing and aggressively studying the possible effects of the synthetic chemical developments which are prowling around leather; to determine whether their marriage will be a blessing to the industry or an irretrievable error. (7) By persuading the people who work in the leather industry of the necessity of having suitable human relations.

American and European leather manufacture:

H. G. Turley (Rohm & Hass Company, Philadelphia, Pennsylvania, U.S.A.). There are certain important differences between American and European leathers. Apart from the possibility of different end-uses, the philosophy of leather making is not necessarily the same. The grand tradition of hundreds of years of vegetable tanning in Europe was carried over to the newer chrome leather in some respects. The ideas in beaming in many instances are quite different. What is the reason for this? In some ways the greater impact of the chemical industry on the European leather industry has not been altogether beneficial. The scientist in a broad way plays a more important role in the European tanneries, but the skill of the American practical tanner is very great. How can we reconcile these ideas? The author attempts to explain the origin of some of the developments and point out the similarities and dissimilarities in a number of tannery processes.

5, 6-Dichlorobenzoxazolinone as a leather fungicide

Sverre Dahl (National Bureau of Standards, Washington 25, D.C., U.S.A.) and A. Kaplan (Quartermaster Research & Engineering Command, Natick, Massachusetts, U.S.A.). 5, 6-Dichlorobenzoxazolinone, a new non-phenolic fungicide, has been investigated in application to leather. A concentration of 0.4%, based on air-dry leather weight, will prevent all but negligible mildew

growth on vegetable sole leather. A smaller percentage is adequate for other types of leather. The compound is stable, colorless, and from the standpoint of the factors that influence permanence, appears to have excellent properties. 5, 6-Dichlorobenzoxazolinone is a much more effective leather fungicide than benzoxazolinone, indicating that the chlorine substituents are important. Rupture of the oxazolinone ring with production of the *o*-aminophenol and the latter compound constituting the fungitoxic moiety might be postulated. However, this does not seem to occur in leather, as 5, 6-dichlorobenzoxazolinone is very stable under acid conditions. Furthermore, *o*-aminophenol at equivalent molar concentration showed no inhibition of mildew growth on leather, although it reportedly is effective when tested on agar substrate against *Penicillium chrysogenum*. Some possible ways in which the inherent fungitoxicity of a compound may be decreased or inactivated by the leather substrate are discussed.

RAW MATERIALS

The fatty acid composition of lipids from different layers of fresh steerhide

Edward F. Mellon, S. F. Herb, R. A. Barford, Samuel J. Viola and Francis E. Luddy (Eastern Regional Research Laboratory, Department of Agriculture, Philadelphia 18, Pennsylvania, U.S.A.). Columnar and gas-liquid chromatography have been employed to study the detailed composition of the lipids from fresh steerhide. An area, 5 by 16 inches, was cut from the middle of the back of a fresh, washed and thoroughly fleshed steerhide. This piece was shaved with a dry razor, frozen, and split into five layers of approximately equal thickness. Each layer was cut into small pieces and extracted by grinding with a mortar and pestle in a mixture of ether and ethyl alcohol. The principal lipid constituents—wax esters (esters of sterols and aliphatic alcohols), glyceryl esters, free sterols, free acids, and phospho-lipids—were separated by adsorption chromatography on silicic acid columns. The methyl esters of the fatty acids of each lipid constituent were obtained by methanolysis and analyzed by gas-liquid chromatography employing a polyester stationary phase.

The distribution of the principal lipid constituents was similar to that found by Koppenhoefer. The concentration of all constituents was higher in the grain layer than in the corium. The wax esters, glycerides, free fatty acids, and phospholipids were also more concentrated in the flesh layer than in the centre of the corium.

The fatty acid composition shows that each of the lipid components is different in the different layers of the hide. Thus, all the wax esters, glycerides, or phospholipids do not have a common origin.

Recent developments in brine cure

Fred O'Flaherty (Tanners' Council Research Laboratory, University of Cincinnati, Cincinnati 21, Ohio, U.S.A.). During the past several years there has been an increased interest and production in brine curing of hides. A programme of research sponsored by the United Hide and Leather Fund has been conducted by personnel in the Tanners' Council Laboratory at the University of Cincinnati. This paper will cover the proceedings of a technical committee and their recommendations. The state of cure effected by drum, pit and raceway equipment will be discussed. The cure analysis is then correlated with the quality and yield of leathers made from such hides.

Conservation of calf skin by salting

M. I. Jullien (Institut de Recherches pour les Industries du Cuir, Lyon, France). In the past the author and his coworkers studied numerous products mixed with salt. The goal was to avoid frequent faults in calfskins salted during the hot season, such as red and violet stains and pits on the flesh and grain. A naphthalene, sodium carbonate, salt mixture gave excellent results. This mixture has been used industrially and several thousand skins have been evaluated. Preservation was excellent and no difficulty was encountered in the series of leather manufacturing operations. Since naphthalene is becoming scarce and expensive, the author and his associates have done research on products capable of replacing it. Numerous tests have been carried out on chlorinated derivatives of benzene; the results obtained are satisfactory and comparable with those given by naphthalene. Industrial tests are currently being made which will permit verification of these preliminary findings.

Salt stain investigation

Jean J. Tancous (Tanners' Council Laboratory, University of Cincinnati, Cincinnati 21, Ohio, U.S.A.). Some studies have been made concerning "salt stains" or "filth stains" which are commonly found in chrome and vegetable tanned leathers. Evidence of the cause is no longer present in the damaged leather but spectrographic and chemical analyses of the stained areas in limed hide have revealed that calcium phosphate is involved. The calcium

originates from impure curing salt and phosphate from hide tissue breakdown. In producing the stain in laboratory trials, delayed cure and long storage periods were found to promote the stain formation.

PROCESSES PRIOR TO TANNING

Disadvantages of the pickling process and how to avoid them

Gerhard Otto (Badische Anilin u Soda Fabrik A. G., Ludwigshafen, Germany). The conventional pickling systems with high salt concentration cause the pelt to fall, and to be fixed in this condition in the subsequent tannage. A skin structure fixed in this way is disadvantageous for many types of chrome leathers.

High salt concentrations are often used to effect a more rapid penetration of the pelt in the pickle and in the subsequent tannage. They necessitate a correspondingly strong basification at the end of the chrome tannage. This, however, is liable to impair the quality of the leather.

Consideration is given to the use of a salt-free or salt-poor pickle containing a non-swelling acid such as chromic acid, a polyphosphoric acid or an aromatic sulfonic acid.

The degree of acceleration of the pickle and the subsequent chrome tannage obtainable by the addition of formaldehyde to the pickle is indicated. This effect is discussed and the conclusion drawn that, besides the usual acidification of the pelt, a pretreatment with methylol compounds of modified nitrogen bases is to be recommended for preparing the pelt for the chrome tannage.

The advantages of such pretreatments are discussed.

VEGETABLE TANNING

Some theoretical and practical aspects of a fast vegetable tanning system

G. Mauthe, E. Komarek and W. Luck (Farbenfabriken Bayer A.G., Leverkusen-Bayerwerk, Germany). A brief description is given of the principle and the disadvantages of customary tannage for heavy leathers with vegetable tannins by counter-current method and in the "open" tanning system. Reasons are offered why it seems necessary to evolve processes which permit a greater degree of rationalization; the essential characteristics of such a system are listed.

The suggestions for rapid tannages based on "closed" tanning systems known from literature are summarized.

Efforts to introduce "closed" rapid tanning systems in the field led to observations which could not be explained on the strength of the experience gained with conventional tanning methods. We have tried to show on a laboratory scale the causes of some phenomena encountered in "closed" tanning systems and to determine factors governing the tanning mechanism when using powdered or highly concentrated extracts.

The correlation between the tanning agent and the water of the pelt is studied by means of a pycnometric method which has also been used by other workers in studies of tanning chemistry. It was observed that the overall volume of the tanning system (liquor + pelt) remains constant. A quantitative discussion is offered of the potential reasons which keep the overall volume of the tanning system constant.

The effects of the following factors are described: diffusion rates of various tanning agents, concentration of tan liquors, water content of the pelt, and the temperature. The reversible case hardening, which may be encountered when working with concentrated liquors or powdered extracts, is governed by a plurality of factors, some of which are explained as to their mutual relationship.

Rules are derived from this which apply not only to tannage in a stationary liquor but also to drum tannage. A laboratory apparatus simulating the action of drum tannage is described. Laboratory and field analyses of leathers and tan liquors are listed.

Conclusions are drawn for an industrial process of this type, and a brief description is offered of a "closed" fast tanning system consisting of a specific pretannage and a drum tannage with powdered extracts which has given good results in the field.

Vegetable one-bath pretanning in buffered solutions

Ernesto Mezei (Buenos Aires, Argentina). The sole leather tanner of today is forced to apply new and more simple methods of processing. The whole process can be divided in two steps: the pretanning and the retanning. Both problems have to be solved separately. The most important improvements in pretanning consist in the use of mineral and synthetic tanning agents, single or in combination, which accelerate the pretanning. But in most

of these cases the pelt has to be immersed in pits or processed in liquors of different concentrations.

The present one-bath pretanning process — consists in a 24 hour tanning in a drum of the delimed pelt, in a bath of only 100%. The residual liquor contains 1-2% tannin and is discarded. Tanning is carried out in a solution of buffer salts (100-250 g/l), strengthened by 25-30% of a commercial pulverized tanning extract in increasing portions. The pH value starts at 7-8 and falls to about 6. The temperature is maintained at 35°C. Borates, sulfites, phosphates, formates, lactates, oxalates etc. serve as buffers. Their composition and concentrations must be adapted to the tanning extract used, in order to avoid salting out effects.

Two examples will explain the working of the process. Different tanning extracts have been selected for the pretanning and for the retanning, the buffer salts are also different. The test conditions and the analytical data of the pretanned and retanned leathers are given in four tables.

From the above mentioned data it can be seen, that it is quite possible to obtain, despite the high pH values, a light coloured leather, free of oxidation, in a one-bath process, and in no more than 24 hours. The leather is suitable for retanning by standard methods. The penetration of the tannin reaches 80-100%, according to the thickness of the used pelt, but it is always sufficient for the retanning in concentrated extracts. The degrees of tannage of the leathers so obtained are similar to those observed in a classical pit-method after several weeks.

The first tests made on an industrial scale showed such as uneven grain, lack of firmness, higher soluble matters and lower yields — deviations almost always observed in modern rapid methods. In most cases, however, these differences have been mastered by technical adaptations of well known retanning and finishing principles.

The simultaneous use of syntans proved to be very efficient and is under further study.

The art and science of Indian bag tanning

Sanjoy Sen (National Tannery Co. Ltd., Mercantile Buildings, Calcutta 1, India). This paper gives a descriptive account of the Indian bag tanning process of manufacturing sole leather. This process has been practised in India since time immemorial and

merits a critical and scientific assessment. The main outstanding features of this method of tanning are as follows:

- (1) The hide is the container and the crushed bark and liquor is the contained.
- (2) Continuous leaching and tanning takes place in the hide in the form of a bag.
- (3) The entire tanning is done in very weak liquors.
- (4) The penetration is very rapid.
- (5) Carrying out the process requires practically no machines and can be practised even by villagers.

On a critical survey it is surprising to see how by trial and error the ancient Indians were able to develop a tanning process which though rapid is without the consequences of case hardening, grain drawing or loss in tensile strength as is usual with modern methods of rapid vegetable tanning of heavy hides. Explanation of the above process involved and their significance are given in the discourse.

CHROME TANNING

Modern methods of chrome tanning of upper leather

Ing. P. J. Van Vlimmeren (Leather Research Institute T.N.O. Waalwijk, Holland). In this paper a survey will be given of the modern developments in chrome-tanning of upper leather, with the restriction that only the tanning process proper will be treated.

Irrespective of some points with secondary importance, it is possible to summarize this development with two words, viz. "masking" and "temperature", the concept of masking and its practical consequences predominating. When using chrome liquors which have been prepared by reduction of dichromate with organic reducing agents, a masking of these chrome liquors is applied consciously or unconsciously. A more regulated masking can be reached by:

- (a) The addition of masking salts during pickling of chrome tanning. Investigations are described in which the effect of the following masking salts was studied: formate, phthalate, acetate and oxalate; special attention is given to the influence of the quantity of the masking agents and of the way in which they are added, on the quality of the leather produced.
- (b) The application of sulphate masking by tanning with basic chromium sulphate in powder form, which is not dissolved before tanning. When preparing such chromium salts, many sulphate ions will enter the chromium complexes during drying, leading to the formation of

strongly masked anionic complexes. When these salts are dissolved in cold water, the sulphate ions will leave the chromium complexes fairly slowly. (c) The use of synthetic tannins in the basification of the tanning bath. Masking will take place because the anions of the synthetic tannins will enter the chromium complexes.

The application of higher temperatures during chrome tanning can also be considered as a modern development. The elevation of the temperature can be obtained either mechanically or by direct heating. It can be obtained mechanically by working with a small ratio of liquor and by using drums with dimensions and with a speed which will cause considerable heating of the tanning liquor. Direct heating can be achieved either by the addition of hot water in the beginning or at a later stage of tanning, or by circulating the tanning liquor and heating it outside the drum.

Reducing power of various products against chrome

Manuel Portavella (Fabrica de Curtidos y Tintoreria, Barcelona, Spain). Studies were made of variations in the reducing power of a number of commercial products on Cr(VI). The results were expressed in terms of the theoretical equation for the conversion of all carbon to carbon dioxide. Experiments were based on concentrations of Cr_2O_3 , acidity and temperature which are commonly used in commercial practice. Previously published results are confirmed and it is further shown that: (1) If the glucid materials tested do not contain unusual charges and are of advanced hydrolysis, they give a return which depends principally on their richness in dry extract. (2) Operating at a concentration of 151.2 g/l Cr_2O_3 , a yield greater than the theoretical 100% is obtained on adding the first fractions of the reducing material. The yield is greater at a basicity 35% than at 45%. These high yields are not attained when operating at 100 g/l Cr_2O_3 and at a basicity 41 to 48%. This is attributed to a release of oxygen promoted by the addition of the reducing material while the concentration in unreduced bichromate remains higher than 100 g Cr_2O_3 /l. (3) Notes are given on the method of comparing in the laboratory, the industrial behaviour of various products tested.

Basicity of chrome tanning compounds and solutions

Winslow H. Hartford (Solvay Process Division, Allied Chemical Corporation, Syracuse, New York, U.S.A.). Since the basicity of chrome tanning solutions is a ratio involving the determination of both chromium and hydroxyl, the accuracy of both

determinations can affect the determined basicity. Methods for determining both factors are critically reviewed, and it is shown that statistical calculations lead to an expected spread of 1.0% basicity with 95% confidence limits for the best analytical work. In checking between different procedures or analysts, spreads of twice this magnitude are not infrequent.

With the same relative titration accuracy, there is a mathematical advantage in the Lehigh determination of hydroxyl if the basicity is below 50%.

The two commonly used methods for hydroxyl (A.L.C.A. and Lehigh) will always give differing results if other elements capable of forming basic salts are present in addition to chromium in the analytical sample. The amount of this difference can be shown to be directly proportional to the relative amounts of admixing elements and chromium, and experimental data confirm this fairly closely.

The expression of the true basicity of the chromium in such a mixed tan is related to the pH-basicity curves of the elements involved. For elements having a higher basicity than chromium at the same pH, the A.L.C.A. method is more accurate; for elements present at lower basicity, the Lehigh method is preferred.

Reaction of chrome salts with synthetic polypeptides

E. Heidemann, P. Führen and H. Kröll (Institut für Gerbereichemie, an der Technischen Hochschule, Darmstadt, Germany). Water insoluble but rather hydrophilic synthetic polypeptides may be simply prepared in way of Leuchs' anhydrides of different amino acids. They represent either gelatinous substances or voluminous flakes so that all COOH-groups are available for the basic chrome complexes whether they are at the end of the molecule or in the side chain position. In this respect they behave more advantageously than polyamides.

It was found that adsorption of cationic chromium depends upon the amount of the COOH-groups present. The ratio between chrome and COOH-groups was found in the most cases to be 1:0.6 up to 1:2.5. A crosslinkage between 2 COOH-groups of two different polypeptide molecules may be emphasized assuming that the chrome complexes under the conditions of this work are binuclear. The fact that synthetic polypeptides do not shrink after being tanned seems to be proof of the crosslinkage. Anionic sulfito-chromium complexes react with the amino groups of synthetic polypeptides.

OTHER TANNAGES

A study of tannin precipitation by dialdehyde starch

A. Simoncini (Stazione Sperimentale Per L'Industria, Delle Pelli E Delle Materie Concianti, Napoli, Italy). The aldehyde groups of dialdehyde starch react with urea producing condensate and polymers which have the capacity of precipitating tannin. The dialdehyde starch urea reaction proceeds more or less rapidly with time as a function of molecular ratio and pH value, and can be easily followed by viscosity measurements.

From the comparative examination of viscosity slopes, experimentally determined for the various molecular ratios of DAS/urea and examined pH values, it appears that the dialdehyde starch solutions—although having lost most of their own characteristics of real starch solution—still keep some of them. The effect of hydrogen-ion strength on condensation degree and rates is very marked, and immediate condensation for nearly all molecular ratios can be obtained as long as pH values of 2.0-2.5 are maintained. If, instead, a slowly proceeding condensation is required, it is sufficient to employ higher molecular ratios of DAS/urea, and to work at pH values of 3.5-4.0. Under these latter conditions, precondensates may be obtained, which develop slowly and remain fluid for long periods of time without giving rise to precipitation through dilution in water.

In the second part of the work, research was performed on reaction activity of binary condensate towards tannin at various concentration. Precipitates of various composition and quantity have been obtained by means of 0.5% chestnut extract solutions, and total insolubilization of tannin was attained as the binary compound DAS/urea reached a viscosity of 3 to 5 centipoises. Out of all the solutions tested, the one at pH value 3.0 and for molecular ratios 1:8-1:9 proved to be most efficient for obtaining complete insolubilization of tannin with a minimum amount of dialdehyde starch.

When tannin solutions are used whose concentration is 10 times greater, the maximum amount of insoluble tannin is about 85% of the added tannin. By a further set of experimental tests it was possible to establish that—as far as the amount of insolubilized tannin is concerned—even more favourable results may be obtained by means of DAS/urea solutions at pH 4.0. At this pH value, such solutions keep fluid for a long time, and by addition of tannin no precipitation occurs; however, when acidified after a certain time of ageing, they are able to precipitate up to 95% of tannin brought to reaction with very small amounts of dialdehyde.

Binary solutions at high condensation level give the richest precipitates in the presence of tannin; however, the precipitate does not increase proportionately with the amounts of DAS/urea added, and over certain limits of condensed tannin, considerable amounts of DAS/urea must be used to obtain even slight increases in the amount of precipitated tannin.

Studies on the interaction of collagen with dialdehyde starch

Y. Nayudamma, K. Thomas Joseph and S. M. Bose (Central Leather Research Institute, Madras, India). A quantitative study on the combination of dialdehyde starch with collagen was made and the possible reaction mechanisms discussed. The effects of (a) pH, (b) salts, (c) temperature, (d) modification of collagen, (e) modification of dialdehyde starch and (f) pretanning and retanning with other tanning agents on the fixation of dialdehyde starch with collagen were studied. Free carbonyl groups in dialdehyde starch tanned collagen were detected and estimated at different pH values and the nature of the free carbonyl groups was investigated by degradation studies of dialdehyde starch tanned collagen. Treatment of amino acids with dialdehyde starch at neutrality and room temperature caused browning within a few hours. The rate of browning with several amino acids was compared and the properties of the reaction product of glycine and dialdehyde starch were studied chromatographically and by infra-red analysis. The structure of dialdehyde starch and the existence of complex equilibria in aqueous solutions of dialdehyde starch and the possible mechanism of tannage were discussed.

Tanning with glutaraldehyde combined with chrome

E. M. Filachione, E. H. Harris, J. Naghski and M. L. Fein (Eastern Regional Research Laboratory, Department of Agriculture, Philadelphia 18, Pennsylvania, U.S.A.). Previous studies have demonstrated the versatile tanning power of glutaraldehyde and reported some quantitative aspects of the tannage. This paper reports a similar quantitative study of combination tannage of this aldehyde with chrome. These experiments were carried out on a scale of one or two cabretta skins per test.

Chrome-tanned cabretta skins were retanned with glutaraldehyde in the pH range of 2.5 to 7.0. The rate of uptake and the amount of glutaraldehyde fixed increased with pH. In an eight-hour retannage, 50 and 90 per cent of the glutaraldehyde in the feed was fixed at pH values of 4 and 7, respectively. Only at the latter pH was equilibrium reached within 8 hours.

The simultaneous tannage of pickled cabretta skins with chrome and glutaraldehyde in the same tanning bath was studied in the pH range of 1.5 to 4.5. The data showed that uptake of chrome and glutaraldehyde occurred independently of each other. At low pH (about 2.5) glutaraldehyde was taken up more rapidly than chrome. At pH of 3.5 to 4.5 (acetate buffer) uptake of chrome and glutaraldehyde occurred at very nearly the same rate. In an 8-hour tannage, fixation of both chrome and glutaraldehyde amounted to 80-85 per cent of the feed. When pH was controlled with bicarbonate instead of acetate, fixation of chrome (pH 4.6) was more rapid and more complete than that of glutaraldehyde.

The skins from the above combination tannages were processed with commercial regular packs into finished garment leather. All of the leathers were judged to be mellow and of good quality. The shrinkage temperatures of the glutaraldehyde-chrome combination tanned leathers were only slightly higher than the corresponding chrome leathers. In comparison to the corresponding chrome-tanned leathers, the combination-tanned leathers showed improved resistance to deterioration from a synthetic perspiration and from hot soap solutions. These properties were imparted to the leather given the combination tannage either simultaneously or consecutively by retannage of glutaraldehyde leather with chrome or retannage of chrome leather with glutaraldehyde.

Contribution to the study of urea formaldehyde tannage

R. Lasserre (Institut de Recherches pour les Industries du Cuir, Llyon, France). After focusing on the present state of knowledge concerning the chemistry of dilute aqueous solutions of urea-formaldehyde, the author studied the changes in such solutions with time and their action on collagen. This study was restricted to solutions of molecular ratio urea : formaldehyde of 1 to 1, 1 to 1.5, and 1 to 2.

The role played by formaldehyde in the first phase of tanning (in slightly alkaline environment) has been studied particularly. An effort has also been made to show that during the acid phase of tanning it is primarily low molecular weight urea-formaldehyde condensation products that are fixed in the skin.

Tanning action of low molecular weight polyhydroxyphenols

Horst Endres (Max-Planck Institut für Eiweiss- und Lederforschung, München, Germany). Piceatannol, dihydropiceatannol and their glucosides, monomolecular polyhydroxyphenols obtained from the cambium of spruce bark, were examined as to their character.

The affinity to collagen and the tanning potential of the two aglucones were excellent while the opposite was the case for the corresponding monoglucosides. Piceatannol deglucoside has hardly any affinity for hide substance. Samples tanned with piceatannol were tanned through and gave a full leather while that obtained with monoglucoside was cracky and partially gelatinized.

The picture was very different when the study was extended to an investigation of the role of oxygen from the air in the tannage. In the absence of oxygen piceatannol and its monoglucoside penetrate into the skin without producing a tanning effect. After drying a raw and cracky gelatinized piece of leather was obtained.

By oxidizing the skin pieces, after being penetrated with piceatannol, their leather character is enhanced. The leather is tanned through and has a very good feel. It may be concluded from the experiments that the tannage with condensed polyhydroxyphenols is not caused by hydrogen bonding only, but is essentially the consequence of the formation of higher molecular, partially quinoid compounds.

Vegetable retanning of chrome tanned leathers

Robert Stubbings (Milwaukee School of Engineering, Milwaukee, Wisconsin, U.S.A.) and Charles A. Eisenfelder (Goldsmith Leather Company, Inc., Newark, New Jersey, U.S.A.). The effects of various variables of vegetable retanning of chrome side leather on the leather qualities of break, temper, and fullness are shown. The important variables are shown to be: type of chrome tannage (acid or buffered); degree of neutralization; type of fatliquor; quantity of vegetable tannin; type of vegetable tannin. The relatively minor variables are shown to be: number of feeds; temperature; float ratio; time of drumming; amount of fat; use of syntan with vegetable; use of dye with vegetable tan.

PROCESSES AFTER TANNING

The studies of fatliquoring III. The influence of oil level, neutralization and vegetable mordanting on some physical properties of shoe upper leather

Conrad L. Ornes (Tanners' Council Research Laboratory, Cincinnati 21, Ohio, U.S.A.). The third in a series of papers on fatliquoring presents the results of a laboratory study of the effects of oil level, degree of vegetable mordanting and degree of neutralization of the stock on the physical properties of chrome

side upper leather. The concept of an "average side" to minimize the inherent variability between and within hides was again used as a sampling base in designing a factorial experiment. It was found that the oil level significantly influenced the temper, tongue tear strength and mellowness of the leather. Degree of vegetable mordanting influenced the tongue tear strength and mellowness. No difference in effects on physical properties was found between neutralization levels.

TESTING

Wear durabilities and abrasion resistance of sole leathers

R. G. Mitton, M. Millar and F. R. Morgan (British Leather Manufacturers' Research Association, Egham, England). The relative durabilities of soles of vegetable tanned leather from different hide locations have been measured in wear trials and by tests with an abrasion machine. Wear durability per unit thickness is fairly uniform over most of the normal bend area, and about 93% of the area has a durability within 20% of the mean durability of the whole bend area.

If the ratio of the durabilities of two soles worn simultaneously by a wearer is taken as one variable, and the ratio of the durabilities in abrasion of samples cut adjacent to the soles is taken as a second variable, the correlation between them is poor. This does not mean, however, that different properties are measured in wear trials and abrasion tests, because the poor correlation is due principally to fluctuations of random sampling and similar causes of error in both sets of measurements. If the durabilities in wear and in abrasion are based on sufficient samples to reduce sampling errors, high correlation coefficients for wear versus abrasion are obtained (e.g. for wear versus wet abrasion, $r = +0.83$). Even higher values would presumably be obtained if more samples were measured. The agreement between wear trials and abrasion tests of non-impregnated leathers seems to be as close as the agreement between separate wear trials, and as close as the natural piece-to-piece variation in leather permits.

Leather testing in a shoe factory

E. Baumann (Bally's Shoe Factories Ltd., Schoenwerd, Switzerland). The aim of this lecture is to demonstrate how the physical testing of leather can successfully be introduced into shoe industry. It is important that with a minimum amount of testing time and expense the factory may receive all the information,

which is necessary for making the proper decisions concerning the use of leather for different articles.

This lecture is limited to shoe upper leather. The behaviour of the finish is one of the most important factors in evaluating these leathers and is becoming more and more important. The many reasons for failures and the methods which may be used for their detection are discussed. Methods should be chosen that closely imitate the conditions, to which the leather may be subjected during manufacturing or wear. Such methods are most commonly dynamic.

The leather as a whole, not only its finish, should be tested. Of the many important properties, which could be considered, the following are chosen; tear resistance as typical for structural strength, two-dimensional stretch, and the behaviour under continuous flexing. Because waterproofness is required of only a limited number of shoe upper leathers, the dynamic tests used to measure this property are merely mentioned.

A new system for evaluation of shoe upper leathers by dimensional attributes

Milton Bailly (U. S. Naval Supply Research and Development Facility, Brooklyn, New York, U.S.A.). The current method of scoring visual leather defects by personal opinion often results in the acceptance of undesirable, non-uniform, poor quality leather. Indefinite criteria based on personal standards defeat the purpose of statistical quality control and compromise inspection procedures. Consequently, a system was developed that labelled defects and assigned quantitative linear or surface measurements to replace prevailing subjective standards. The system permits objective scoring and verification of poor leather characteristics and may be used by anyone, including inexperienced personnel. Cut shoe parts (vamps, quarters, etc.) rather than skins or sides are used as units of inspection.

THEORIES

Structure of the collagen fibril and its importance for the theory of the tanning process

W. Grassmann (President, I.U.L.C.S., Max-Planck Institut für Eiweiss- und Lederforschung, München, Germany). Sometime ago two hypotheses were developed for the purpose of explaining the crossbanding of the collagen fibrils: (1) the light bands would be orderly regions, the dark parts would be less orderly, (2) the light

bands would be light-weight, primarily non-polar amino acids, the dark bands would contain heavy and principally polar amino acids. By investigating numerous peptides isolated after degradation of heat-denatured collagen with trypsin, it has been possible to show that both hypotheses are correct: There are some regions in the peptide chains with large accumulations of polar amino acids, mainly acidic or basic ones, and there are other regions composed almost exclusively of glycine, proline, hypro and some alanine and serine. The question as to which sequence of the amino acids prevails in the non-polar regions was cleared up by digestion with collagenase and subsequent Edman-degradation. The sequence found —gly-pro-X— corresponds to the structural models developed for the crystalline regions by Ramachandran and by Rich and Crick on the basis of X-ray data. In many instances X is again glycine, or instead mostly a light-weight amino acid, for example serine or alanine. 42% of all the amino acids in the collagen and 74% of all its proline are present as the sequence gly-pro-X; 25% of all proline occurs as gly-pro-gly. Evidently no such periodicities and also in general no reappearance of glycine at every third position are found in the polar regions; thus they cannot be orderly in the sense this term is applied to the structural models quoted above. Surprisingly hypro could not be found in second or third place after digestion with pure collagenase, a result which will be discussed by the author. Since trypsin does not sever about 40% of the bonds in which the carboxyl groups of arginine and lysine participate, a part of the hypro is believed to be fixed by the carboxyl groups of these two amino acids; such bonds cannot be severed by trypsin, according to experiments on similar synthetic peptides.

According to the statements of American authors the length of the molecule of dissolved collagen (tropocollagen) is 2,600-3,000 Angstrom; it consists of three polypeptide chains and has a molecular weight of about 360,000. Heat denaturation reduces the optical rotation, the viscosity and the molecular weight, all caused by "decoiling" of the tropocollagen molecule. Since statements concerning the molecular weight and quantity of the degradation products formed thereby are contradictory, a very careful technique was used in repeating the experiments. Apart from small amounts of a material of the same molecular weight as the original tropocollagen, alpha-collagen with the molecular weight of $110,000 \pm 10\%$ and beta-collagen with the molecular weight of $215,000 \pm 10\%$ were found in the exact molecular ratio of 1 to 1. Whereas mole-

cular weight, viscosity and rotation, change almost proportionally with time, the change is much faster if observed by X-ray diffraction, indicating a loss of the rod-like structure. During the first phase of denaturation the tropocollagen is believed to suffer multiple breaks, presumably in the disorderly regions, followed by the decoiling of the helices.

In the electron-microscopic pictures of the various forms of collagen accumulations of basic or acidic amino acids can be localized by staining with phosphotungstic acid and uranyl salts respectively and thus can be photometrically evaluated. The distribution pattern of positive and negative charges found in this manner in the segment long spacings (SLS) corresponds to the distribution pattern in the tropocollagen molecule. By sliding over each other and adding up the photometer curves of SLS it was possible to confirm fully the thesis of F.O. Schmitt and co-workers, which says that these segments are parallel bundles of tropocollagen molecules and that the reason for the 650 Angstrom periodicity of the normal collagen fibrils is the shifting of neighbouring molecules by one quarter of their length. This shift agrees with the distribution of charges in the tropocollagen molecules and must be expected when within a fibril positive charges in one molecule are located opposite negative charges in another molecule.

In addition to electrostatic forces occasional covalent crosslinks are responsible for holding the fibre together. These are at least in part ester bridges in which carbohydrates participate. The quantity of hypro which according to Gustavson has a connection with the shrinkage temperature has nothing to do with the crosslinking of tropocollagen molecules among each other, but is essential for the inner stability of a single molecule; for according to Doty the denaturation temperature of dissolved tropocollagen is in the same way connected with the hypro content as the shrinkage temperature of the fibre.

Tanning generally causes an increase in the shrinkage temperature and a reduction of the hydrophilic properties, for example, of the ability to swell. Frequently, but not always, both go parallel. If a tannage causes an increase in shrinkage temperature, it adds more crosslinks to the tropocollagen molecules of the fibril. It will be shown in particular how this crosslinking is achieved by different means, like covalent bonds (tannage with aldehydes, epichlorohydrin, quinone, etc.), complex formation (chrome tannage), electrostatic forces (tannage by poly-

valent anions) or hydrogen bonds (vegetable tans). The fact that the tannage takes place on the fibrils and has nothing to do with the cohesion of fibrils in a fibre can be proven in three different ways: (1) the order of the fibrils is improved by the first three types of tannage only, resulting in sharper cross-bands. This effect is neither to be expected nor found with vegetable tanning agents, (2) the deposition within the fibril of sufficiently heavy tanning agents can be directly observed by photometric measurement, (3) in the tanning of single fibrils the temperature of denaturation is the same as in the tanning of fibres.

Whereas in general tannins are fixed within the fibrils, there are exceptions where compact deposits surrounding the fibrils can be seen in the electron microscope. Essentially tanning is believed to take place in the disorderly regions of the fibrils, while in the orderly regions all hydrogen bonds are saturated and other suitable groups are either lacking or very scarce. Since larger cavities do not exist within the fibrils and the distance from one to the next tropocollagen molecule (in the wet state) does not exceed 17 Angstroms, only molecules of a low or fairly low molecular weight can truly tan. Larger ones are able to surround the fibrils on the outside or to settle between the fibrils and even between the fibres, acting as fillers, but without causing a true tanning action.

The preparation and properties of solubilized collagen

A. G. Ward, N.T. Crosby, D. G. Higgs, R. Reed, G. Stainsby (Department of Leather Industries, Leeds University, Leeds, England). Previous work on the preparation of a solubilized form of collagen (eu collagen), involving alkaline pretreatment of demineralized bone, is discussed. The application of this technique to skin is described, and a tentative picture of the major changes in the collagen during the stages of the process is given. The properties of soluble eu collagen are parallel in many respects to those of soluble collagens investigated by Schmitt, Highberger, Doty and others, although there are important points of difference. The range of conditions within which the eu collagen solution is stable has been examined, using change of viscosity or the formation of a visible precipitate as criterion of instability. A preliminary examination of the precipitate has shown an absence of the characteristic collagen bands in the electron microscope, using precipitation conditions where banded fibrils would be readily formed from soluble collagen.

Some effects of electrolytes on dissolved collagen

L. P. Witnauer and L. D. Kahn (Eastern Regional Research Laboratory, Department of Agriculture, Philadelphia, Pennsylvania, U.S.A.). An investigation of the effects of inorganic ions on collagen in solution was carried out to provide information which might lead to improved methods of solubilization and fractionation.

Salting-out curves of solutions of collagen in various inorganic buffer systems were prepared. These showed the expected solubility peak at an optimum concentration of electrolyte. However, when collagen, reconstituted from a solution of definite buffer composition, was placed in contact with a fresh portion of the same buffer, all of the collagen did not redissolve, and this effect became more and more pronounced as the ionic strength of the buffer was increased.

Collagen solutions were dialyzed against solutions of various electrolyte salts and then the collagen was reconstituted by exhaustive dialysis or removal of solvent or shift in pH. The precipitated collagen fibrils showed different solubility characteristics and a variety of fibrillar forms. These results are related to the solution history of the collagen, and are explained as the consequences of inorganic ions binding to the collagen molecules in solution.

On the question of cross-linkages of collagen

Helmut Hörmann (Max-Planck Institut für Eiweiss- und Lederforschung, München, Germany). Mature collagen does not, like tropocollagen, dissolve in warm water or in cold solutions of compounds able to break hydrogen bonds; instead it shrinks to a rubber-like material, a behaviour suggesting covalent cross-links. When periodic acid in the acid pH range or hydroxylamine in the weakly alkaline range is employed together with compounds that rupture hydrogen bonds, mature collagen goes into solution as a material of high molecular weight, these agents apparently attacking its crosslinks. Upon oxidation with periodate the hexoses of the collagen are destroyed to a large extent. By the action of hydroxylamine hydroxamic acids are formed from ester groups, as shown on the basis of their kinetics and pH dependence. In collagen their number is two to three times higher, but in tropocollagen their number is only slightly higher than the number of hexoses. The conclusion is that the cross-links of collagen consist of hexoses whose two hydroxyl groups form ester links between

the different peptide chains while the hexoses in tropocollagen are only bound to a single ester group. After digestion of denatured collagen with trypsin, the small residue contains mainly a part of the hexoses and the hydroxylamine-sensitive portions of collagen, in the molar ratio of one to two. The reducing group of the hexoses is believed to be attached to a hydroxyl side chain of one of two cross-linked collagen spirals by a glucoside-like oxygen bridge. These ideas are discussed in connection with the results of other authors.

Particular emphasis is placed upon the differences between the citrate-insoluble fractions of collagen from younger and older animals. The citrate-insoluble fraction of calf collagen partly dissolves after being denatured, but steer collagen remains insoluble. The differences in the contraction and relaxation of collagen fibres from younger and older animals also point to differences in the rigidity of the collagen molecule.

On the end-to-end linkage of the tropocollagen molecule

Klaus Kühn (Heidelberg University, Heidelberg, Germany). According to the theory of Hodge and Schmitt on the end-to-end-polymerization of TC-molecules, tyrosin-containing peptide appendages project from both ends of the individual TC-molecules. The polymerization takes place through coiling of the peptide appendages to peptide helices which are reinforced by means of hydrogen bonding. Neither end-to-end-polymerization nor fibril formation should be possible, therefore, after the splitting off of these peptide appendages by the proteolytic enzymes, trypsin and pepsin.

The author was able to so purify collagen that the tyrosin content returned to zero. When fibrils of the native and long-spacing type were formed no changes in the properties of the TC-molecule were observed. Also, after intensive treatment of TC-solutions with trypsin (whereupon the tyrosin content again returned to zero) it was possible to observe the formation of fibrils. The properties of the collagen molecule as well as chemical analysis indicate that only natural impurities of collagen are decomposed by the action of enzymes. The TC itself remains unchanged.

Electron microscope investigations have shown that the end-to-end-polymerization of the long-spacing segments (SLS) and the polymerization of the TC can be changed characteristically by the presence of polyanions, e.g., chondroitin sulfate. In the fib-

riils of the long-spacing type the TC-molecules have a kind of end-polymerization other than that in the native fibrils. When the native fibrils are polymerized, the ends of the TC-molecules overlap to the extent of 40-50A, so that the last dark striation of the segment is covered by the first dark striation of the following segment. Only one striation common to both segments is therefore visible. In the fibrils of the long-spacing type the ends of the molecules overlap in the same way, but to an extent of 250-300A. Here all the dark striations (changed regions) of the end of a molecule come into register with those of the end of the following molecule. These results indicate that the end-to-end-polymerization is to be attributed, principally, to electrostatic forces.

The influence of bacterial enzymes on the stability of collagen

J. W. Giffie, Jean G. Firch, J. N. Campbell, Joanna S. Kirvaitis (American Meat Institute Foundation, the University of Chicago, Chicago, Illinois, U.S.A.). Earlier studies in this laboratory and elsewhere have revealed that the lyotropic agent, CaCl_2 , exhibits a dispersing effect upon skin collagen. Reconstitution by dialysis *vs.* water was possible when the extractions were performed below the shrinkage temperature and the hypersharp peak typical of dissolved collagen was apparent during ultracentrifugation of the extracts. Dispersion of purified calfskin centre corium at 2°C increases from approximately 5 per cent in ionic strength two CaCl_2 to more than 50 per cent with increasing strength of CaCl_2 . The end product is gelatin. Steerhide collagen, however, is only about 15 per cent soluble at the higher concentration of CaCl_2 .

In the course of conditioning experiments intended to increase the solubility of steerhide collagen a preservative was omitted and moderate bacterial growth occurred. The exposed tissue was completely soluble at 30°C in strong solutions of CaCl_2 while untreated tissue is only 10 to 15 per cent soluble under the same conditions. The bacteria caused no detectable release of nitrogenous substance to the growth medium and the shrinkage temperatures of isolated fibres from treated and control tissues were identical in CaCl_2 solutions of various ionic strengths.

Three apparently different strains of the genus *Pseudomonas* exhibiting the ability to alter sterilized collagen have been isolated. One of these has been used as a source of enzyme. The bacteria were grown in a 3.5 per cent trypticase soy broth fraction obtained by dialysis of one volume of a 45 per cent broth suspension against ten volumes of water at 2°C. Following a 24 hour incu-

bation at 30°C during which the medium was constantly shaken the bacteria were removed by centrifugation. The cell-free system exhibited considerable activity in one hour at 35°C at pH 7.5 in the presence of 1600 ppm. benzalkonium chloride. The exposed collagen was completely soluble in one half hour at 55°C in 0.34M CaCl₂ or at 65°C in water. Partial purification of the enzyme has been achieved through dialysis, chromatography and electrophoresis.

Trypsin, chymotrypsin and papain exhibited an effect comparable to that of the bacterial enzyme indicating that endopeptidase action is involved.

BY-PRODUCTS

The isolation and characterization of the gamma component of gelatin

Arthur Veis and Joan Anesey (Biochemistry Department, Northwestern University Medical School, Chicago, Illinois, U.S.A.) and Jerome Cohen (Research Laboratory, Armour Leather Company, Chicago, Illinois, U.S.A.). Native collagen fibres have been reconstituted from gelatins extracted from bovine corium collagen under mild acid or neutral conditions. In sharp contrast to commercial gelatins, the gelatin extracted by these mild procedures could not be represented by a continuous molecular weight distribution function. The reconstitutable gelatin was shown to contain three ultracentrifugally distinct components α , γ and δ . Subsequent investigation showed that collagen fibres could be reconstituted only from γ and δ and not from α . The fractionation procedure used could not separate α , γ and δ into pure component fractions but studies indicated that γ was equivalent to tropo-collagen (TC) in molecular weight while δ was about 4 times TC in weight.

Before beginning detailed studies of the kinetics of the gelatin collagen renaturation transition it was thought to be important to isolate and characterize pure γ and δ . This paper describes a modified alcohol fractionation procedure which yields pure γ . The γ isolated was characterized by light scattering, viscosity and equilibrium sedimentation techniques in both the gelatin and renatured acid solution collagen forms. The data confirm the previous finding that γ is close to TC in molecular weight. The behaviour of TC and γ are compared.

NOTES AND NEWS

Fifth Meeting of the Leather Development Council

The fifth meeting of the Development Council for Leather, Leather Goods and Pickers Industries was held on July 14, 1961.

In his welcome address, Shri M. L. Khaitan, Chairman of the Council, expressed the view that the Development Council should be reconstituted after the expiry of 2 years' term; in this context, he stressed the need for early finalisation of the reports of the various Sub-Committees. He next referred to the representation of the small fabricators regarding export orders for shoes and the role of the State Trading Corporation in it and mentioned the action taken with regard to it. The advisability of sending out a delegation of four or five footwear exporters to foreign countries this year was also pointed out.

The Chairman said that it would be worthwhile to set up retanning and finishing units for the semi-tanned and unfinished leathers being produced in large quantities by the village tanners, in addition to those in existence already. In course of time, this would help in exporting more and more finished leathers. Simultaneously and supplementary to the above, ways and means should be found to improve the lot of the small fabricator and those engaged in the small scale sector. Labour conditions also should receive due attention and consideration.

The following recommendations were made at this meeting:

1. Suggestion for the establishment of a separate corporation to look after the marketing of footwear and other leather goods in the internal market be referred to the National Small Industries Corporation, the Development Commissioners (S.S.I.) and the Khadi and Village Industries Commission.

2. Suggestion that "the Government be moved to lift sales tax from the small scale and cottage units or societies engaged in the production of leather goods" be forwarded to the State Governments for their consideration.

3. The footwear sub-committee might collect the necessary data regarding the facilities available at present for training of technical persons for the footwear industry.

4. A country-wide survey should be made regarding the size and fittings of feet of the people.

5. The scheme regarding common village tanning centre be forwarded to the Development Commissioner (S.S.I.), Khadi and Village Industries Commission and to the State Government with the suggestion that such centres may be set up wherever possible.

6. The schemes for the establishment of glazed kid leather factory, a leather board factory, hydraulic leather unit, fancy leather unit, upholstery leather unit and glue/gelatine unit be forwarded to the Development Wing for making the information available to entrepreneurs.

7. The scheme regarding re-tanning and finishing centres be forwarded to the Development Commissioner (S.S.I.), Khadi and Village Industries Commission and State Governments with the recommendation that such centres be set up at suitable places.

8. The Council expressed the view that unless an All India Federation of tanners which can speak on behalf of all tanners in the country is set up, it would not be possible to undertake co-operative research as suggested by the Council of Scientific and Industrial Research.

9. The communication received from the Director, Commercial Publicity be forwarded to the Leather Export Promotion Council for necessary action and the Director, Commercial Publicity be informed of the same.

10. The Development Council unanimously approved that a target of 140 million pairs of leather footwear may be fixed during the Third Plan.

11. A small delegation of about four persons should visit European countries, specially of Western Europe, with the specific purpose of finding ways and means of increasing exports of footwear.

12. The Council suggested that another delegation may be sent later to foreign countries to explore the possibilities of export of finished leathers from the country.

ICAR prizes for outstanding contribution in the field of production of Agricultural implements

The Indian Council of Agricultural Research has sanctioned a scheme for award of prizes for outstanding contribution in the field of production of agricultural implements. The first prize will be the President's Gold Medal and a cash award of Rs. 3000/- and the second prize will be a cash award of Rs. 2000/-. The last date for receipt of entries is October 22, 1961. The entries are to be submitted to the State Directors of Agriculture in quadruplicate.

Copies of the rules and entries can be had from the respective State Director of Agriculture on request for further details.

Shipments of hides and skins during June and July, 1961

Shipments during June, 1961 were as follows (in bales): 3,700 tanned cow hides, 206 calfskins, 50 buff hides, 272 calfskins, 658 goatskins, 424 sheepskins to the U.K.; 63 cow hides, 147 calfskins, 15 buff calfskins, 820 goatskins, 371 sheep-skins to the Continent; 107 buff hides, 105 buff calfskins, 141 goatskins to the U.S.A.; 6 goatskins, 217 sheepskins to Japan; 1 goatskin, 2 sheepskins to New Zealand; 10 cow hides to Aden. Total 7,415 bales.

The Mail: July 9, 1961.

Shipments during July 1961 were as follows (in bales): 2049 tanned cow hides, 158 calfskins, 39 buff hides, 108 calfskins, 407 goatskins, 237 sheepskins to the U.K.; 21 cow hides, 79 calfskins, 12 buff calfskins, 791 goatskins, 267 sheepskins to the Continent; 92 buff hides, 128 calfskins, 215 goatskins to the U.S.A.; 4 goat-skins, 89 sheepskins to Japan; 40 cow hides to Berbera. Total 4,736 bales.

The Mail: August 6, 1961.

Leather Industry

Govt. aid for development

The Khadi and Village Industries Commission (Amendment) Bill which, among other things, seeks to enable the Commission to purchase and market handicraft products through its emporia, was passed by the Rajya Sabha on August 17, 1961.

Replying to the discussion Mr. Manubhai Shah, Industries Minister, expressed himself against a suggestion for creating a

separate board for the development of the leather industry. He also did not favour the setting up of a board for each village industry. He assured the House that the Government would provide the necessary finance for any scheme for the development of the leather industry.

The Bill had already been passed by the Lok Sabha.

The Hindu: August 18, 1961.

Agricultural Fair in Madras City

Accent on Cattle Wealth Exhibition

The second National Agricultural Fair, organised by the Bharat Krishak Samaj, will be held in Madras at the Island Grounds from January 14 to February 20, 1962.

Like the first Fair held in Calcutta, the second would also be a National Food, Agricultural and Rural Industries Exhibition. It would display details of the progress made in all fields of agriculture, including animal husbandry, horticulture, forestry, co-operation etc. An improvement in the Fair at Madras would be that importance would be given to the exhibition of cattle wealth.

The Hindu: August 28, 1961.

Livestock figures for three states

The results of the livestock census taken in April 1961 for three more States—Uttar Pradesh, Maharashtra and Madras—now released by the Directorate of Economics and Statistics, Ministry of Food and Agriculture, show an increase in their livestock population during the last five years, says P.T.I.

In Uttar Pradesh, the total livestock population has risen by 15.7%, in Maharashtra by 10.9% and in Madras by 6.3% since the census in 1956.

While in the Union territory of Laccadive, Minicoy and Amin-divi group of islands, it has increased by 96% and in Andaman and Nicobar by 37.8%, in Delhi it has fallen by 12.6%.

The Statesman: August 30, 1961.

C.L.R.I. NEWS

Technical Publications in Tamil for the leather industry

The Process Bulletin in Tamil on "Rapid Tannage of Sole Leather" and the supplement in Tamil to the monthly "Bulletin of the Central Leather Research Institute" were released at a function held at the Leather Export Promotion Council Hall, Madras, on Thursday August 17, 1961. Shri R. Venkataraman, Minister for Industries and Labour, Madras State released the publications and Janab M. J. Jamal Mohideen Sahib, M.L.A., Chairman, Leather Export Promotion Council presided over the function. Prominent tanners and representatives of the various associations connected with the leather industry were present on the occasion.

Welcoming the gathering Shri Mohideen referred to his association with the Institute since its inception.

Releasing the publications, Shri Venkataraman made a reference to the gap between technical information gathered by research and utilisation of the same by the industry and to the need for disseminating technical knowledge in a form easily understood by representatives of the industry. The Minister was glad to find that the Tamil publications newly released were written in a language which could be easily understood by a layman.

Shri Venkataraman next mentioned about the materials now being taken out of India and being processed elsewhere into high quality finished products. He hoped that the tanners in this country would fully utilise the results of research disseminated through such publications so as to be in a position to produce for foreign markets finished products of good quality. In conclusion, he wished all success to the endeavours of the Institute in bringing out such publications.

Dr. V. S. Padmanabhan proposed a vote of thanks.

The Tamil supplement to the Bulletin of the Central Leather Research Institute is available at no extra cost to such of the subscribers who are interested in it. The Tamil Process Bulletin on "Rapid Tannage of Sole Leather" costs Re. 1/- (postage extra). Copies can be had per V.P.P. from the Director, Central Leather Research Institute, Adyar, Madras-20.

The 11th meeting of the Executive Council of the Institute was held at the University Buildings, Chepauk, on Aug. 9, 1961 with Dr. A. Lakshmanaswamy Mudaliar in the chair.

Dr. Y. Nayudamma, Director, attended the 32nd meeting of the Committee of Administration of the Leather Export Promotion Council on Aug. 10, 1961.

Dr. Y. Nayudamma, Director, has been re-elected as a member of the Technological Research Sub-Committee of the Indian Central Arecanut Committee.

Dr. S. K. Barat, Assistant Director, attended the 9th meeting of the Research Committee of the Khadi and Village Industries Commission at Mistry Bhavan, Fort, Bombay, on Aug. 28, 1961.

Editor Y. Nayudamma, Published by N. Subramaniam, on behalf of the Central Leather Research Institute, Adyar, Madras-20. Printed by S. Ramaswami, at The G. S. Press, 21, Narasingapuram Street, Mount Road, Madras.

WOODROFFE

is the name for LEATHER!

Industrial leathers and leather belting for mills and factories ... fine leathers for footwear and hundreds of other everyday articles ... are vital to the growing economy of a developing country. The Gordon Woodroffe group of Companies is helping in the development of the leather trade and industry in India, and maintaining a flow of exports to foreign countries.



**GORDON, WOODROFFE
LEATHER MANUFACTURING CO. PRIVATE LTD.,**

For finished leathers

TULLIS, WOODROFFE & CO. PRIVATE LTD.,

For industrial leathers

GORDON, WOODROFFE & CO. (MADRAS) PRIVATE LTD.,

For East India tanned leathers

FENNER, WOODROFFE & CO. PRIVATE LTD.,

For leather transmission belts

WOODROFFE is the name for LEATHER!

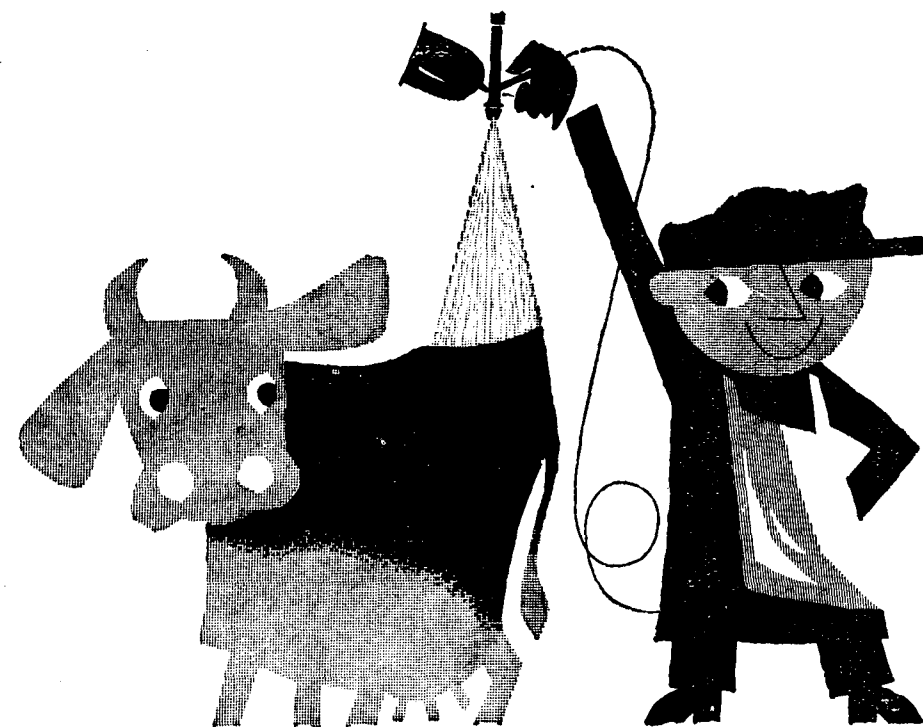
**HILCO
MICRON**

**QUALITY
LEATHER
FINISHES**

PIGMENT FINISHES
RESIN FINISHES
SOLE POLISHES
BINDERS & AUXILIARIES

HANDYMEN INDUSTRIES PRIVATE LTD
PHONE: 86871 161 MOUNT ROAD MADRAS-2 INDIA GRAMS: REPTILES

Aiyars



Excellent covering effect

obtained with the new binder type
EUKANOL-BINDER CD

no foaming,
simple application
at low cost.



BAYER LEVERKUSEN GERMANY

For technical assistance, literature and samples
please contact 'Chika Limited', Bombay,
Calcutta, Madras, Delhi, Ahmedabad.
Sub-distributors: Amritsar, Alleppey, Bangalore,
Cochin, Coimbatore, Shrinagar, Trivandrum and Kanpur.

Fortuna

Unsurpassed in leather industry

BATLIBOI

BHOGILAL LEHERCHAND PRIVATE LTD
Proprietors of
BATLIBOI & COMPANY
Forbes Street, Bombay I
Branches all over India

SISTA'S-B-179

**A BINNY product is your guarantee of
quality and consistent results**

Buy

BINNYS

Sodium Bichromate
Chrome Oxide Green
Sodium Chromate

Basic Chrome Tan
Chromic Acid
Ammonium Bichromate

Manufactured by:

The Buckingham & Carnatic Co. Ltd., Madras
(A BINNY COMPANY)

Selling Agents:

M/s T. T. Krishnamachari & Co.,
Madras :: Bombay :: Delhi

M/s Chemicals & Solvents (P) Ltd.,
Calcutta

The India Leather Corporation Private Limited

"INDIA LEATHER MANSIONS"

G. P. O. Box No. 1516

No. 9, DAVIDSON STREET, MADRAS-1

Telegram: "TANDRIGHT"

Phone: 4491

PREMIER EXPORTERS OF E. I. TANNED SKINS & HIDES

Largest individual Foreign Exchange Earners in the Southern
Region

YEARLY EXPORTS EXCEED RUPEES TWO CRORES

Enquiries invited from all parts of the world for East India Tanned

GOAT SKINS
SHEEP SKINS

COW HIDES
BUFF HIDES

COW CALF
BUFF CALF

சென்ட்ரல் லெதர் ரிசர்ச் இன்ஸ்டிடியூட் புல்லட்டின்

இணைப்பு ஏடு, செப்டம்பர், 1961.

**படிக்கார மறுபதனிடப்பட்ட (Semi-alum)
மெத்தை மூடு தோல் (அப்ஹோல்ஸ்டரி)
தயாரித்தல்**

ஆர். செல்வரங்கன், எம். ஏ. கனி, ஏம். காயுடம்மா,
காலஞ்சேன்ற பி. எம். தாஸ்

முன்னுரை

மெத்தை மூடுதோல், நாற்காலிகள், ஸோபாக்கள், கார் ஆகியவற்றின் மெத்தைகளை மூடுவதற்கு மட்டுமல்லாமல் இப்போது பெட்டிகள், பிரயாணிகள் பை, இருமடி அட்டைகள் (folio cases) ஆகியவை தயாரிப்பதற்கும் உபயோகப்படுகிறது. இதற்கான தோல் மிருதுவானதாகவும், வளைந்து கொடுக்கும் தன்மை உடையதாகவும், வலிவுள்ளதாகவும் இழுபடும் தன்மையற்றதாகவும் (non-stretchy), கெட்டிச் சாயம் கொண்டதாகவும் இருக்கவேண்டும். இத்தோலின் ஒப்பனை (finish) செய்யப்பட்ட பக்கம் நாளடைவில் எளிதில் உடையக்கூடியதாகவும் (brittle) பிளந்து போகக் கூடியதாகவும் இருத்தல் கூடாது. காற்றிலும் வெளிச்சத்திலும் பல காலம் உழைத்தாலும் குறையாத வலிமையும், மங்காத நிறமும் கொண்டதாக இருக்க வேண்டும். ஐரோப்பாவிலும், அமெரிக்காவிலும் கனமானதும், அதிகப்பரப்புக் கொண்டதுமான மாட்டுத் தோலின் மேனிப்பிளவு (grain split), நடுப்பிளவுத்தோல் (middle layer split) ஆகியவைகளை குரோம் பதனிட்டோ, தாவரப்பதனிட்டோ, குரோம்-தாவரப் பதனிட்டோ இத்தகைய தோல்கள் தயாரிக்கின்றனர். இத்தகைய கனமான, பரப்பளவு அதிகம் கொண்ட கச்சாத் தோல்கள் இந்தியாவில் கிடைப்பதில்லை. சிறியதும் நடுத்தரமுமான மாடுகளின் தோல்கள் தாவரப்பதனிட்டவை யாகவே கிடைக்கின்றன. இவற்றிலிருந்து ஊட்டமுள்ளதும், எளிதில் வளைந்து கொடுக்கும் தன்மையும் கொண்ட மெத்தை மூடு தோல்கள் தயாரிக்க வேண்டுமானால் இவை

களை மறுபதனிட வேண்டும். இத்தோல்களை தாவர மறுபதனிட்டாலோ, குரோம் மறுபதனிட்டாலோ திருப்தி அளிக்கும் தோல்கள் கிடைப்பதில்லை. இந்நிலையத்தில் செய்த பரிசோதனைகளிலிருந்து தாவரப்பதனிட்ட தோல்களை பேசிக் அலுமினியம் உப்புக்களில் மறுபதனிடுவதன் மூலம் முற்றிலும் திருப்தி அளிக்கும் மெத்தை மூடு தோல் தயாரிக்கலாம் என்பது நிரூபிக்கப்பட்டுள்ளது. இருநிறமுள்ள (two-tone) மெத்தை மூடு தோல் தயாரிக்கும் முறை கீழே தரப்பட்டுள்ளது.

கச்சாப் பொருள் :

பட்டை பதனிடப்பட்டதும், 5-ம் தரத்தைச் சேர்ந்ததும், மொத்தம் 508 ராத்தல் (230.4 கி. கிராம்) எடை கொண்டது மான மாட்டுத் தோல்கள் 45 எடுத்துக்கொள்ளப்பட்டன.

மறுபதனிட தயார் செய்தல், பிளத்தல் (Splitting) :

பதனிடப்பட்ட இம்மாட்டுத் தோல்கள் முதலில் சுற்றுப் பார்க்கப்பட்டு (trimmed) ஒவ்வொரு தோலும் ஒவ்வொரு 1 நிமிடத்திற்குத் தண்ணீரில் நனைக்கப்பட்டு, மரக்குதிரையின் மீது பட்டையாக விடப்படுகிறது. [சுற்றுப்பார்த்த கழிவின் எடை 28 ராத்தல் (12.7 கி. கிராம்).] பிறகு ஒரு காலிப்பீப்பாயில் இவை போடப்பட்டு, பீப்பாய் 3 மணி நேரத்திற்கு இயக்கப்படுகிறது. இதன் பின்னர் இவை 2.0 மி. மீடர் கனத்திற்குப் பிளக்கப்படுகிறது. [கவனமாகப் பிளந்ததால் சீவும் வேலை தவிர்க்கப்பட்டது. 50% ஈரமுள்ள மேனிப் பிளவுத் தோல்களின் (grain splits) எடை 486 ராத்தலும் (220.44 கி. கிராம்), சவ்வுப் பிளவுத் தோல்களின் (flesh splits) எடை 354 ராத்தலும் (160.6 கி. கிராம்) இருந்தன.]

தோலில் உள்ள பதனிடு பொருளைச் சிறிதளவு வெளி எடுத்தலும் (Stripping), வெளுத்தலும் (Bleaching) :

மறுநாள் காலை இம்மேனிப் பிளவுகள் 200% தண்ணீர் கொண்ட பீப்பாயில் 10 நிமிடங்களுக்குக் கழுவப்படுகின்றன. பிறகு 150% தண்ணீர் நிறைந்த பீப்பாயில் 2½ ராத்தல் (1134 கிராம்) சலவை சோடா (சோடாவின் சுத்தம் 83.6%; எடுத்துக் கொள்ளப்பட்ட கச்சாப் பொருளின் எடையில் 0.5%க்குச் சமமானது) கலக்கப்பட்டு, தோல்கள் பீப்பாயில் போடப்பட்ட பின் பீப்பாய் 10 நிமிடங்களுக்கு இயக்கப்படுகிறது. மறுபடி இவை ஒரு தடவை 200% தண்ணீர் உள்ள பீப்பாயில் 10 நிமிடங்களுக்கும் மற்றொரு தடவை 150% தண்ணீர் கொண்ட பீப்பாயில் 5 நிமிடங்களுக்கும் கழுவப்படுகின்றன. பிறகு 150% தண்ணீர் நிரம்பிய மற்றொரு பீப்பாயில் 2½ ராத்தல் (1134 கிராம்) ஆக்சாலிக் அமிலமும், 2½ ராத்தல்

(1134 கிராம்) கந்தகிகா அமிலமும் கலக்கப்பட்டு, தோல்கள் இத்திரவத்தில் போடப்பட்டு, பீப்பாய் 15 நிமிடங்களுக்கு இயக்கப்பட்டு இவை வெளுக்கப்படுகின்றன. இவ்வாறு வெளுக்கப்பட்ட பின் இவை தண்ணீரில் கழுவப்படுகின்றன.

பேசிக் அலுமினியம் சல்பேட் தயாரித்தல் :

பின்வரும் ரசாயனப் பொருள்களை உபயோகித்து முந்தைய நாளே பேசிக் அலுமினியம் சல்பேட் தயாரிக்கப்படுகிறது.

அலுமினியம் சல்பேட்	...	70 ராத்தல் (31.8 கி. கி.)
சோடியம் சிட்ரேட்	...	5 ,, (2.3 கி. கி.)
சலவை சோடா	...	17½ ,, (7.9 ,,)

சல்பேட்டும், சிட்ரேட்டும் ஒரு தொட்டியில் 15 காலன் (68.2 லிட்டர்) தண்ணீரில் கரைக்கப்படுகின்றன. சலவை சோடா தனியாக 5 காலன் (22.7 லிட்டர்) தண்ணீரில் கரைத்துக் கொள்ளப்படுகிறது. சல்பேட்-சிட்ரேட் கரைசலை நன்றாகக் கலக்கியபடியே சோடா கரைசல் 1 மணி நேரத்தில் 2-3 தவணைகளில் அதில் சேர்க்கப்படுகிறது. இதன் பின் இக்கரைசல் இரவு முழுதும் முதிர வைக்கப்படுகிறது. தெளிந்த இத்திரவத்தின் அமிலவலிமை எண் 3.4 ஆகும்.

மறுபதனிடுதல் (Retanning) :

வெளுக்கப்பட்ட தோல்கள் இருக்கும் பீப்பாயில் புதிதாக 40 காலன் (181.8 லிட்டர்) தண்ணீர் நிரப்பப்படுகிறது. இத்துடன் பதனிடு திரவம் முழுவதும் பீப்பாய் 1 நிமிடத்திற்கு 4 சுற்றுக்கள் வீதம் இயங்கிக் கொண்டிருக்கும்போதே வாளி வாளியாக எடுத்துக் கலக்கப்படுகிறது. பீப்பாய் பின்னர் 45 நிமிடங்களுக்கு இயக்கப்படுகிறது. பிறகு 17½ ராத்தல் (7.9 கி. கிராம்) சலவை சோடா 10 காலன் (45.5 லிட்டர்) தண்ணீரில் தனியாகக் கரைக்கப்பட்டு, 3 தவணைகளில் ஒரு மணிக்குள்ளாக பீப்பாயில் கலக்கப்பட்டு, பீப்பாய் மேலும் 1 மணி நேரத்திற்கு இயக்கப்படுகிறது. பதனிட்ட தோலின் கனமான பாகத்திலிருந்து கனமான ஒரு துண்டு வெட்டி எடுக்கப்பட்டு கொதி நீர் பரிசோதனை (boiling test) செய்து பார்க்கப்படுகிறது. இச்சோதனையில் தோல் சுருங்காது. இப்பதனிட்ட தோல்களின் சுருக்க உஷ்ணம் (shrinkage temperature) 112° செ. கி. ஆகும். உபயோகப்பட்ட பதனிடு திரவத்தின் அமில வலிமை எண் 4.3 ஆக இருக்கும். பதனிடப்பட்ட இத்தோல்கள் முதலில் 200% தண்ணீரில் 10 நிமிடங்களுக்கும், 150% தண்ணீரில் 10 நிமிடங்களுக்கும் கழுவப்படுகின்றன.

எண்ணெய் திரவம் ஊட்டல் (Fat-lacquering) :

பின் வரும் அளவில் எண்ணெய்த் திரவம் தயாரிக்கப் படுகிறது.

ஆமணக்கெண்ணெய்	15 ராத்தல் (6.8 கி. கிராம்) (கச்சாப் பொருள் எடையில் 3%)
சல்பேட் செய்யப்பட்ட மீன் எண்ணெய்	7½ ராத்தல் (3.4 கி. கிராம்) (கச்சாப் பொருள் எடையில் 1½%)
சல்பேட் செய்யப்பட்ட புங்க எண்ணெய்	2½ ராத்தல் (1134 கிராம்) (கச்சாப் பொருள் எடையில் ½%)
மிருதுவான சோப்	1½ ராத்தல் (567 கிராம்) (கச்சாப் பொருள் எடையில் ½%)
போரக்ஸ் (Borax)	5 அவுன்ஸ் (141.8 கிராம்) (கச்சாப்பொருள் எடையில் 06%)
கலவை மொத்தம்	10 காலன் (45.5 லிட்டர்) ஆகும் அளவு தண்ணீர்

தோல்கள் இருக்கும் பீப்பாயில் 30 காலன் (136.4 லிட்டர்) தண்ணீர் சேர்க்கப்படுகிறது. பின்னர் பீப்பாய் இயங்கிக் கொண்டிருக்கும்போதே எண்ணெய்த் திரவம் முழுதும் பீப்பாயில் சேர்க்கப்படுகிறது. பிறகு பீப்பாய் மேலும் ½ மணி நேரத்திற்கு இயக்கப்படுகிறது. இதன் பிறகு பார்த்தால் பீப்பாயிலுள்ள திரவம் தண்ணீர் போலவே இருக்கும். இத் திரவம் காலி செய்யப்பட்ட பின்னர் இத்தோல்கள் காலிப் பீப்பாயில் 30 நிமிடங்களுக்கு இயக்கப்பட்டு வெளியே எடுக்கப்படுகின்றன.

சுருக்கம் (தாணு) தள்ளுதலும், மிருதுவாக்கலும் (Setting and staking)

இவை பின்னர் இயந்திரத்தில் சுருக்கம் (தாணு) தள்ளப் பட்டு, உலர்வதற்காகத் தொங்க விடப்படுகின்றன. மறுநாள் இரண்டாவது தடவையாக இவை சுருக்கம் (தாணு) தள்ளப் பட்டு உலர்வதற்காகத் தொங்க விடப்படுகின்றன. இவை ஈரமாக இருக்கும்போதே, காய்ந்த பகுதிகள் பிரஷினால் தண்ணீர் தடவி நனைக்கப்பட்டு ஒரு மணி நேரத்திற்கு பட்டறையாக விடப்படுகின்றன. பின்னர் மிருதுவாக்கப் படுகின்றன.

கல்ஷித்தல், சுற்றுப்பார்த்தல் (Buffing and trimming) :

மிருதுவாக்கப்பட்ட இத்தோல்கள் மறுநாள் சவ்வுப் பக்கம் 80 எண் உப்புத்தாளால் கல்லடிக்கப்பட்டு, மேனிப் பக்கம் 320 எண் உப்புத்தாளால் கல்லடிக்கப்படுகிறது. பின்னர் இவை துடைத்து சுத்தம் செய்யப்பட்டு, சுற்றுப் பார்க்கப்படுகின்றன.

ஒப்பனை (Finishing) :

வேளுத்த நீல நிற அடித்தளச் சாயம்
(Bottom coat of light blue shade)

கலவை	
வெள்ளை வண்ணம் (33% திடப்பொருள்)	8 ராத்தல் 12 அவுன்ஸ் (3.97 கி.கி.)
நீலவண்ணம் (Earnshaw)	2 ராத்தல் 14 அவுன்ஸ் (1.3 கி.கி.)
மஞ்சள் வண்ணம்	6 அவுன்ஸ் (170.1 கிராம்)
பெடாக்ரில் 138-ஏ (Bedacryl) (ஐ.சி.ஐ.)	12 ராத்தல் (5.4 கி.கி.)
தண்ணீர்	12 ராத்தல் (5.4 கி.கி.)

இந்த அடித்தளச் சாயம் தோலின் மேனிப்பக்கத்தில் இருமுறை வெல்வெட் மூடிய மரக்கட்டையால் (pad) தடவப் பட்டுக் காய வைக்கப்படுகிறது.

உறுதிப்படுத்தும் பூச்சு (Fixing coat) :

கலவை	
கேசின்	12 அவுன்ஸ் (340.2 கிராம்)
போரக்ஸ் (Borax)	3 அவுன்ஸ் (85.1 கிராம்)
40% பார்மலின் (Formalin)	30 அவுன்ஸ் (850.5 கிராம்)

போரக்ஸ் கலந்த கேசின் கரைசல் 5%-க்கு நீர்க்கப்பட்டு, 10%-க்கு நீர்க்கப்பட்ட பார்மலினுடன் நன்றாகக் கலக்கப் பட்டு, தோலின்மேல் இருமுறை இயந்திரத்தினால் தெளிக்கப் படுகிறது.

அடித்தள அரக்குப் பூச்சு (Bottom clear lacquering) :

தோலின் மீது கீழ்க்கண்ட அளவில் தயாரிக்கப்பட்ட நிறமற்ற அரக்குக் கலவை இருமுறை பூசப்படுகிறது.

ஸ்பார்டன் நிறமற்ற அரக்கு (Spartan clear lacquer)	1.2 காலன் (5.5 லிட்டர்)
ஸ்பார்டன் தின்னர் (Spartan thinner)	3.6 காலன் (16.9 லிட்டர்)
	4.8 காலன் (21.7 லிட்டர்)

இக்கலவையில் 1.2 காலன் (5.5 லிட்டர்) முதலில் உபயோகப்படுத்தப்படுகிறது. மீதி மேல் பூச்சின் போது உபயோகப்படுத்தப்படுகிறது. (இத்தோல்களை உலர்ந்த துணி கொண்டு துடைத்த போது கொஞ்சமும் சாயம் போக வில்லை. ஈரத் துணி கொண்டு துடைத்தபோதும் அநேகமாகச் சாயம் போக வில்லை.)

வண்ண மேல் பூச்சு (Pigment top coat) :

கருப்பு வண்ணம்	கலவை
நீல வண்ணம்	1 ராத்தல் (454 கிராம்)
	1 " " "

மொத்தம் 2 காலன் (9 லிட்டர்) ஆகும் அளவு தண்ணீர்.

மேற்கூறிய மேல் பூச்சு இருமுறை தோல்களின் மீது கவனமாக இயந்திரத்தினால் தெளிக்கப்பட்ட பின் காய வைக்கப்படுகிறது.

வேண்டிய வடிவ அமைப்பை (டிசைன்) அழுத்தி இரு நிறங்கள் உண்டாக்குதல் :

தோல்களின் மீது ஆண்டிக் மேனி (Antique grain) டிசைன் அழுத்தப்படுகிறது. வண்ண மேல் பூச்சு ஒரு ஈரத் துணியால் மிக கவனத்துடன் துடைக்கப்படுவதால் இரு நிறம் உண்டாக்கப்படுகிறது. பின்னர் தோல்கள் காய வைக்கப்படுகின்றன.

உறுதிப்படுத்தும் பூச்சு (fixing) :

பார்மலின் கலந்த உறுதிப்படுத்தும் பூச்சு இருமுறை இவற்றின் மீது பூசப்படுகிறது.

முன்னம் தயாரிக்கப்பட்ட அரக்குக் கலவையில் மீதி இருப்பதும் தெளிக்கப்படுகிறது. இதனால் தோல்களின் சாயம் உலர்ந்த துணியால் அழித்தாலும், ஈரத்துணியால் அழித்தாலும் கொஞ்சமும் போவதில்லை.

பரப்பளவு கணக்கிடல்

தோல்களின் பரப்பளவு கணக்கிடப்பட்டு, தோற்றம் எடுப்பாக இருக்கும் பொருட்டு இவை ஹைட்ராலிக் அழுத்தியில் (Hydraulic Press) அழுத்தப்பட்டு, வழவழப்பாக்கப்படுகின்றன.

இவ்வாறு ஒப்பனை செய்யப்பட்ட தோல்கள் 1.5 மி. மீட்டர் கனம் கொண்டவையாகும். மெத்தை மூடு தோலுக்கு வேண்டிய எல்லா குணங்களும் பெற்றவையாகும் இருக்கும். குறிப்பு :—மேலே விளக்கப்பட்ட முறையின் உரிமை 23-11-54-ல் ஸ்ரீ ஆர். செல்வரங்கன், பி. எம். தாஸ் அன்னார்களின் பெயரில் பதிவு செய்யப்பட்டது. பின்னர் பதனிட வோரின் உபயோகத்துக்கென இலவசமாக ஆங்கிலத்தில் வெளியிடப்பட்டது.

செய்திக் கதூர்

கால்நடைகளை இன்ஷூர் செய்தல்

தமிழ் நாட்டுக்கான 'முன்னோடித் திட்டம்' (Pilot Scheme)

தமிழ் நாட்டில் கால்நடைகளை இன்ஷூர் செய்வதற்கான 'முன்னோடித் திட்டம்' ஒன்றைத் துவக்க சென்னை அரசாங்கம் முடிவு செய்துள்ளது. இதற்காக மூன்றாவது ஐந்தாண்டுத் திட்ட காலத்தில் ரூ. 1 லட்சத்திற்கு வகை செய்யப்பட்டிருக்கிறது.

தமிழ் நாட்டில் இத்திட்டம் அமுல் செய்யப்பட வேண்டும் என்று மத்திய அரசாங்கம் அளித்த ஆலோசனைக்கிணங்கவே இத்திட்டத்தைத் துவக்குவதென்று முடிவு செய்யப்பட்டிருக்கிறது.

மத்திய அரசாங்கம் இத்திட்டத்தைச் சிபாரிசு செய்து சென்னை அரசாங்கத்துக்கு எழுதிய குறிப்பில் கூறுவதாவது: கொள்ளை நோய்களும் தொற்று நோய்களும் அடிக்கடி பரந்த அளவில் ஏற்படுவதால் கால்நடைகள் பெருத்த அளவில் மடிந்து போகின்றன, அல்லது தகுதியற்றவையாகி விடுகின்றன. இந்திய விவசாயிகள் கடனாளிகளாயிருப்பதற்கு இது ஒரு முக்கியக் காரணமாகும். கால்நடைகள் மறித்தல், விளைச்சல் குறைவது போன்றவற்றால் ஏற்படும் நஷ்டத்தைத் தாங்கிக் கொள்வதற்கு வசதியாக இன்ஷூரன்ஸ் வசதிகள் செய்து கொடுக்கப்படாவிட்டால் விவசாயிகளைக் கடனாளிகளாக ஆவதிலிருந்து மீட்க முடியாது.

இந்த அறிக்கையில் மேலும் கூறப்படுவதாவது: கால்நடைகளை இன்ஷூர் செய்வதால் அவைகள் மரணமடைவதால் ஏற்படும் நஷ்டத்திற்கு ஈடு செய்ய வழி ஏற்படுவதுடன், கால்நடைகளின் மரணத்தையும் இது குறைக்க வழி செய்யும். கால்நடை மரணத்தால் விவசாயிகளுக்கு ஏற்படும் நஷ்டம், கால்நடை நோய்களால் அவர்களுக்கு ஏற்படும் நஷ்டத்தில் ஒரு சிறு பாகமேயாகும். எனவே கால்நடை இன்ஷூரன்சால், கால்நடை நோய் மருத்துவ இலாகாவுக்கும், விவசாயிகளுக்கும் இடையே கால்நடை நோய்களைக் கட்டுப்படுத்துவதில் தீவிரமான ஒத்துழைப்பு ஏற்படவும் வழி ஏற்படுகிறது.

மத்திய அரசாங்கத்தால் சிபாரிசு செய்யப்படும் இன்ஷூரன்ஸ் திட்டம் கால் வரையறுக்கப்பட்டதாகும். அதாவது இந்தத் திட்டத்தின் கீழ் ஒரு குறிப்பிட்ட காலத்திற்கு (6 மாதம் அல்லது 1 வருடம்) இன்ஷூர் செய்யப்படும் மிருகம் அக்காலத்துக்குள் இறந்தால் அதற்கு நஷ்ட ஈடு கொடுக்க வழி செய்யப்படுகிறது. கால்நடைகளை இன்ஷூர்

செய்யும் போது தீர்மானிக்கப்படும் விலையில் 2 பாகத்திற்கு மேல் இன்ஷூரன்ஸ் பணம் அளிக்கப்படமாட்டாது. இன்ஷூர் செய்யும் தொகையில் 7½ சதவீதம் தொகையை வரூட் 'ப்ரீமியமாக' உடைமையாளர் கட்டி வர வேண்டும். 3 முதல் 10 வயது வரை உள்ள மாடுகளே இன்ஷூர் செய்யப்படும். இன்ஷூரன்சுக்கான காலம் ஒரு ஆண்டுக்கதிகமாக நீடிக் காது. ஒவ்வொரு ஆண்டு முடிவிலும் கால்நடைகளின் விலை மறுமதிப்பிடப்படும். அத்துடன் அவற்றின் உடல் நலம் ஊறுபடாமல் இருக்கிறதா என்பதும் பரிசோதித்து அறியப்படும்.

இன்ஷூர் செய்யப்பட்ட மிருகங்களைத் தொற்று நோய்கள் அணுகா வண்ணம் பாதுகாக்கப்படும். இதற்கென உடைமையாளர் பொருள் ஏதும் செலவழிக்க வேண்டுவதில்லை. இன்ஷூர் செய்யப்பட்ட மிருகங்கள் விற்கப்படும்போது அல்லது அவற்றின் உடைமை கை மாறும் போது அதுவரை கட்டப்பட்ட ப்ரீமியம் திருப்பித் தரப்படும். எண்டோமெண்ட் இன்ஷூரன்ஸ் பாஸிசி எடுத்துக் கொள்வதற்கும் இத்திட்டத்தில் வழி வகுக்கப்பட்டிருக்கிறது.

'கூட்டுறவுக் கால்நடை இன்ஷூரன்ஸ் சொசைடிகளை' நிறுவி, அதன் மூலம் இத்திட்டத்தை அமுலாக்க அரசாங்கம் கருதுகிறது. இந்தத் திட்டத்தை அமுலாக்குவதற்கென்று ஏற்படுத்தப்படும் நிர்வாகத்தில் பல மதிப்பீட்டுக் குழுக்கள் ஏற்படுத்தப்படும். இக்குழுவின் கால் நடைகளின் விலையை மதிப்பிடுவர். இக்குழுவிற்கு உதவுவதற்கென கால்நடைகளின் இருப்பை மேற்பார்வையிடும் அதிகாரி ஒருவர் நியமிக்கப்படுவார். இவர் பல கிராமங்கள் கொண்ட பல தொகுதிகளுக்கு அதிகாரியாக இருப்பார்.

இத்திட்டத்திற்கான விவரங்கள் வகுக்கப்பட்டு வருகின்றன என்று சர்க்காரால் அறிவிக்கப்பட்டிருக்கிறது. தமிழ் நாட்டில் அமுலாக்கப்படும் திட்டம் அடிப்படையில் பெரும்பாலும் மத்திய அரசாங்கத்தாரால் வகுக்கப்பட்டது போன்றே இருப்பினும் தமிழ் நாட்டின் தேவைகளுக்கேற்றவாறு மாற்றியமைக்கப்படும். மூன்றாவது திட்டத்தில் இதற்கென்று ஒதுக்கப்பட்டுள்ள 1 லட்ச ரூபாயும், இத்திட்டத்தை அமுலாக்குவதற்கென்று அமர்த்தப்படும் ஊழியர்களின் சம்பளம் முதலியவற்றிற்குப் பயன்படுத்தப்படும். முதற்படியாக, இத்திட்டத்தில் ரூ. 500-ம் அதற்கு அதிகமாகவும் விலை பெறும் உயர்ந்த ஜாதிக் கால்நடைகளையும், விலைமதிப்பான மிருகங்களையும் சேர்த்துக் கொள்வதே நோக்கமாகும். கால்நடைகளின் உடைமையாளர் அளிக்கும் ஒத்துழைப்பைப் பொறுத்தே இத்திட்டத்தின் வெற்றி அமையும் என்பது கூருமலே விளங்கும்.

பதவித் தொழிற்சாலையில் காற்றை கருமணமாக்குதல்

உலகெங்கிலுமுள்ள தொழிற்சாலைகளிலும் வியாபார நிலையங்களிலும் 'அசுத்தக் காற்று' ஒரு பெரிய பிரச்சினையாக இருந்து வருகிறது. காற்றை சுத்தப்படுத்துவதற்கென பல்வேறு விதமான வழிகள் தற்போது கையாளப்பட்டு வருகின்றன. தொழிலாளர், நாற்றமில்லாத சுத்தமான புதிய காற்றைச் சுவாசிப்பதற்கான வசதி அண்மையில் ஏற்பட்டுள்ளது. இவ்வசதிக்குக் காரணமானது 'ப்யூம்-ஓ-டார்' என அழைக்கப்படும் தானியங்கிக் காற்றுப் பரப்பியாகும். (Fume-O-Dor Automatic Diffuser.)

மூன்று ஆண்டுகளாகச் செய்யப்பட்ட விரிவான ஆராய்ச்சிகளாலும் பல இடையூறுகளை வெற்றியுடன் கடந்ததாலும் மூன்று முக்கிய சாதனங்களை ஒன்றாக்கியதன் மூலம் காற்றைப் புதியதாகவும் சுத்தமாகவும் ஆக்குவது சாத்தியமாகியுள்ளது. அச்சாதனங்களாவன: 1. காற்றைத் திரும்பத் திரும்பச் சுழலச் செய்யும் விசிறி; 2. முன்னேற்பாட்டிற்கிணங்க ஒரு குறிப்பிட்ட அளவு, அணுபோன்ற திரவத் திவலைகளைக் காற்றில் கலக்கும் ஒரு இயந்திரச் சாதனம்; 3. இந்த திரவத்தைக் குறிப்பிட்ட இடை வெளியில் காற்றில் பரப்புவதற்கான கட்டுப்பாட்டைச் செய்யும் இயந்திரம்.

இம்மூன்று இயந்திரங்களையும் ஒன்றாக்கியதன் மூலமாகவே மேற்கூறிய தானியங்கிக் காற்றுப் பரப்பி ஆக்கப்பட்டுள்ளது.

மேற்கூறிய காற்றுப் பரப்பி மின்சாரத்தால் இயக்கப்படுகிறது. இதை உபயோகிப்பதற்குச் செலவும் மிகக் குறைவே ஆகிறது. இதை மேல் தளத்திலோ அல்லது சுவற்றிலோ எளிதில் பொறுத்தலாம். அழகான ஒரு பெட்டியில் இது அமைக்கப்பட்டுள்ளது. தேவையான திரவத்தை அணுத்திவலைகளாக, முன் கூட்டியே ஏற்பாடு செய்யப்பட்ட இடை வெளிகளில் பரப்புவதுடன், அதைக் காற்றில் நீடித்து நிற்கச் செய்து, மறுபடி மறுபடி காற்றில் சுழன்று கொண்டே இருக்குமாறும் செய்கிறது. இதில் உபயோகிப்பதற்கென, வெவ்வேறு திரவங்கள் விற்கப்படுகின்றன.

இக்காற்றுப் பரப்பி பலவழிகளில் உபயோகிக்கப்படும் தொழிற்சாலைகளிலும் மற்ற இடங்களிலும் இது சிறந்த பணியாற்றுகிறது. சளிப்பிடிப்பதனால் பல மணி 'வேலை நேரம்' வீணாவதுடன் உற்பத்தியின் வேகமும் குறைகின்றதென்பதைப் புள்ளி விவரங்கள் தெள்ளென அறிவிக்கின்றன. சளிப்பிடிப்பதைத் தடுப்பதற்கென பல ஆராய்ச்சிகள் பல ஆண்டு

களாக மேற்கொள்ளப்பட்டுள்ளன. இப்போது இந்தக் காற்றுப் பரப்பியின் மூலம் விஞ்ஞான அடிப்படையில் காற்றைச் சுத்தம் செய்ய முடிவதோடு, காற்றில் உலவும் கிருமிகளைத் தாக்கி அவை மேலும் காற்றில் பரவாமல் தடை செய்யவும் முடிகிறது. இவ்விதமாக இக்காற்றுப் பரப்பி நாட்டின் உற்பத்தித் திறமையை அதிகரிப்பதில் ஓர் முக்கியத் தொண்டாற்றுகிறது. மேலும் மனதுக்குவாத நாற்றங்களை இரவுபகல் எந்நேரத்திலும் இக்காற்றுப் பரப்பியால் கட்டுப்படுத்தலாம்.

‘லேதர் ட்ரேட்ஸ் ரிவ்யூ’

நிலையச் செய்திகள்

எருமைத் தோல்களுக்குப் புதிய உபயோகம்

எருமைத் தோலிலிருந்து பல்வேறு விதமான தோல்கள் தயாரிப்பதற்கான முறைகளை இந்நிலையம் கூடிய விரைவில் வெளியிடவிருக்கிறது. இது பதனிடுவோர்களுக்கு மகிழ்ச்சியளிக்கும் ஓர் செய்தி என்பதில் ஐயமில்லை.

சாதாரணமாக எருமைத் தோல்கள், காலணிகளுக்கான அடித்தோல் (Sole Leather) தயாரிப்பதற்கும், தொழிற்சாலைகளுக்குத் தேவையான தோல்கள் (industrial Leathers) தயாரிப்பதற்கும்தான் பயன்படுத்தப்படுகின்றன. ஆனால் இவைகளைத் தவிரப் பல்வேறு விதமான தோல்கள் தயாரிப்பதற்கான கச்சாப்பொருளாக எருமைத் தோல்களைப் பயன்படுத்துவதன் மூலம் நல்ல லாபம் அடையலாம்.

கடந்த ஆறு மாதங்களாகச் செய்யப்பட்ட தீவிரமான ஆராய்ச்சிகளின் பலனாக எருமைத் தோல்களைப் பிளந்து (split), அப்பிளவுகளைப் பலவிதமான தோல்கள் தயாரிக்கப் பயன்படுத்தலாம் என்பது அறியப்பட்டது.

மேனிப்பிளவுத் தோல்களிலிருந்து (grain splits) சுருக்கப்பட்ட மேனி கொண்ட கப்புத் தோல்களும் (shrunk grain upper), கப்புத் தோல்களும் (Shoe upper), ‘லக்கேஜ்’ தோல்களும் (luggage leather) தயாரிக்கலாம். சவ்வுப் பிளவுகளிலிருந்து ‘ஷமாயிஸ்’ (Chamois) தோல்களும், ஆடைத் தோல்களும், மெத்தை மூடு தோல்களும் (upholstery) தயாரிக்கலாம்.

எருமைத் தோலின் மேனிப்பிளவுகள் ஒரே சீரான சுருக்கப்பட்ட மேனி கொண்ட கப்புத் தோல்கள் தயாரிப்பதற்கேற்ற தனித்தன்மை வாய்ந்தவையாகும். இவை இவ்வேலைக்குத் தற்போது உபயோகப்படும் பசுத்தோல்களை விடச் சிறந்தவையாகும்.

எருமைத் தோல்களிலிருந்து இத்தகைய தோல்கள் தயாரிப்பதில் உள்ள பொருளாதார அனுகூலங்களைப் பல சோதனைகளின் மூலம் இந்நிலையம் கூர்ந்து ஆராய்ந்து வருகிறது. இம்முறைகள் இவ்வாண்டு முடிவில் வெளியிடப்படும்.

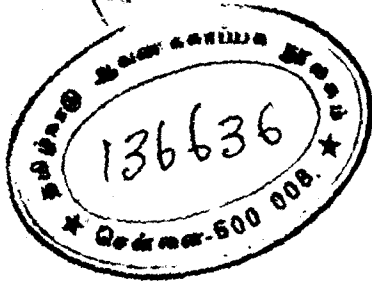
இந்நிலையத்தின் நிர்வாகக் குழுவின் 11-வது கூட்டம் சென்ற மாதம் 9-ந் தேதி சென்னைப் பல்கலைக் கழகக் கட்டடத்தில் டாக்டர் ஆ. லட்சுமணசாமி முதலியார் அவர்கள் தலைமையில் நடைபெற்றது.

இந்நிலையத்தின் டைரக்டர் டாக்டர் ஓய். நாயுடம்மா அவர்கள் அமெரிக்காவின் தலைநகரான வாஷிங்டனில் நடைபெறும் 'அகில' உலகத் தோல் ரசாயன ஆராய்ச்சியாளர் ஸொசைடிகளின் யூனியனின் 7-வது கூட்டத்தில் கலந்து கொள்வதற்காக ஆகஸ்டு மாதம் 19-ந்தேதி சென்னையை விட்டுப் புறப்பட்டார். இக்கூட்டத்தில் கலந்து கொள்வதற்காக இந்திய அரசாங்கத்தால் நியமிக்கப்பட்ட 4 பேர் கொண்ட தூதுக் குழுவில் டாக்டர் நாயுடம்மாவும் ஒருவராவார்.

ஆகஸ்டு மாதம் 10-ம் தேதி நடைபெற்ற 'ஸெதர் எக்ஸ் போர்ட் பிரமோஷன் கௌன்சிலின்' நிர்வாகக் கமிட்டியின் 32-வது கூட்டத்தில் டாக்டர் நாயுடம்மா அவர்கள் கலந்து கொண்டார்கள்.

பம்பாய் மிஸ்திரி பவனில் ஆகஸ்டு 28-ம் தேதி நடைபெற்ற 'கதர் கிராமத் தொழில் கமிஷனது' ஆராய்ச்சிக் குழுவின் 9-வது கூட்டத்தில் இந்நிலையத்தின் உதவி டைரக்டர் டாக்டர் எஸ். கே. பரத் அவர்கள் கலந்து கொண்டார்கள்.

'இந்தியாவின் மத்தியக் கொட்டைப் பாக்குக் கமிட்டி' யினது நுட்ப ஆராய்ச்சி உப கமிட்டியின் அங்கத்தினராக டாக்டர் நாயுடம்மா அவர்கள் மறுபடியும் தேர்ந்தெடுக்கப்பட்டுள்ளார்கள்.



"Registered No. M. 7050."

CLRI Publications

PROCESS BULLETIN No. 1: Adapted processes for manufacture of box and willow sides—Re. 1/- per copy. age extra.

PROCESS BULLETIN No. 2: Processes for the manufacture of Glazed kid. Re. 1/- per copy. Postage extra.

PROCESS BULLETIN No. 3: Manufacture of Roller
Re. 1/- per copy. Postage extra.

PROCESS BULLETIN No. 4: Fish Oil of the West
for the Indian Leather Industry. Re. 1/- per copy. Po
extra.

PROCESS BULLETIN No. 5: Rapid Tannage of
Leather. Re. 1/- per copy. Postage extra.

2 SYMPOSIUM ON EAST INDIA TANNING INDUSTRIES AND TANNING AGENTS (1955): Proceedings, discussions and papers presented. Re. 1/- per copy. Postage extra.

SYMPOSIUM ON "RAW HIDES & SKINS"—Curing
Preservation (1957): Proceedings and Papers. Re. 1/
copy. Postage extra.

SYMPOSIUM ON "LEATHER AUXILIARIES" (1964)
 Proceedings and Papers. Re. 1/- per copy. Postage extra.

SYMPOSIUM ON "TANNING AS A SMALL SCALE COTTAGE SCALE INDUSTRY" (1959): Proceedings Papers. Re. 1/- per copy. Postage extra.

Re. 1/- per copy. Postage extra.

For further information please contact
Director

CENTRAL LEATHER RESEARCH INSTITUTE
Adyar, Madras-20, India