

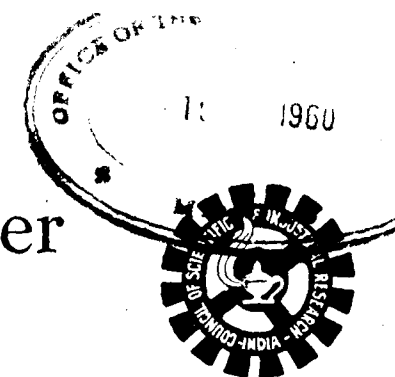
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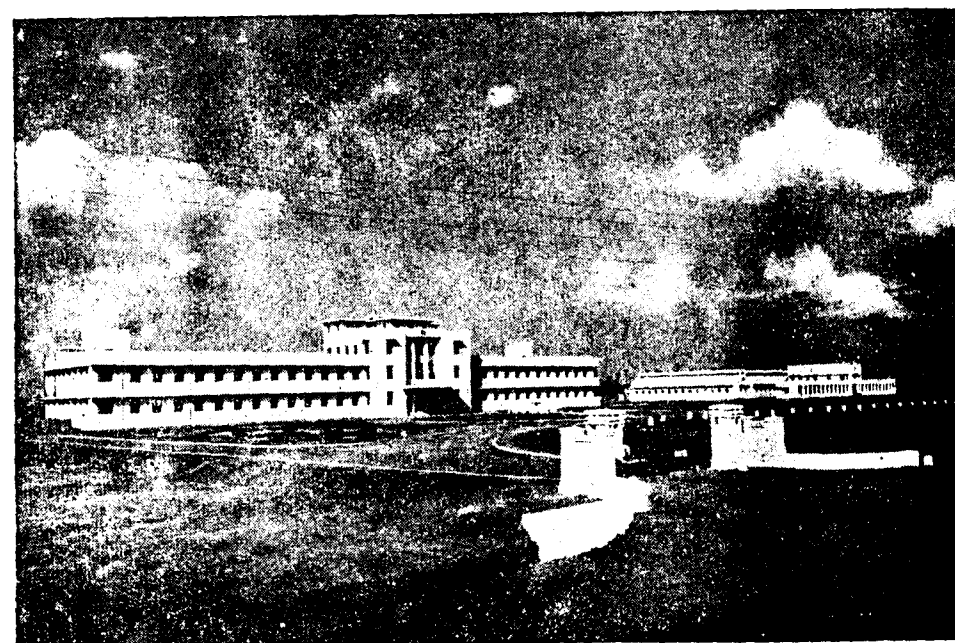


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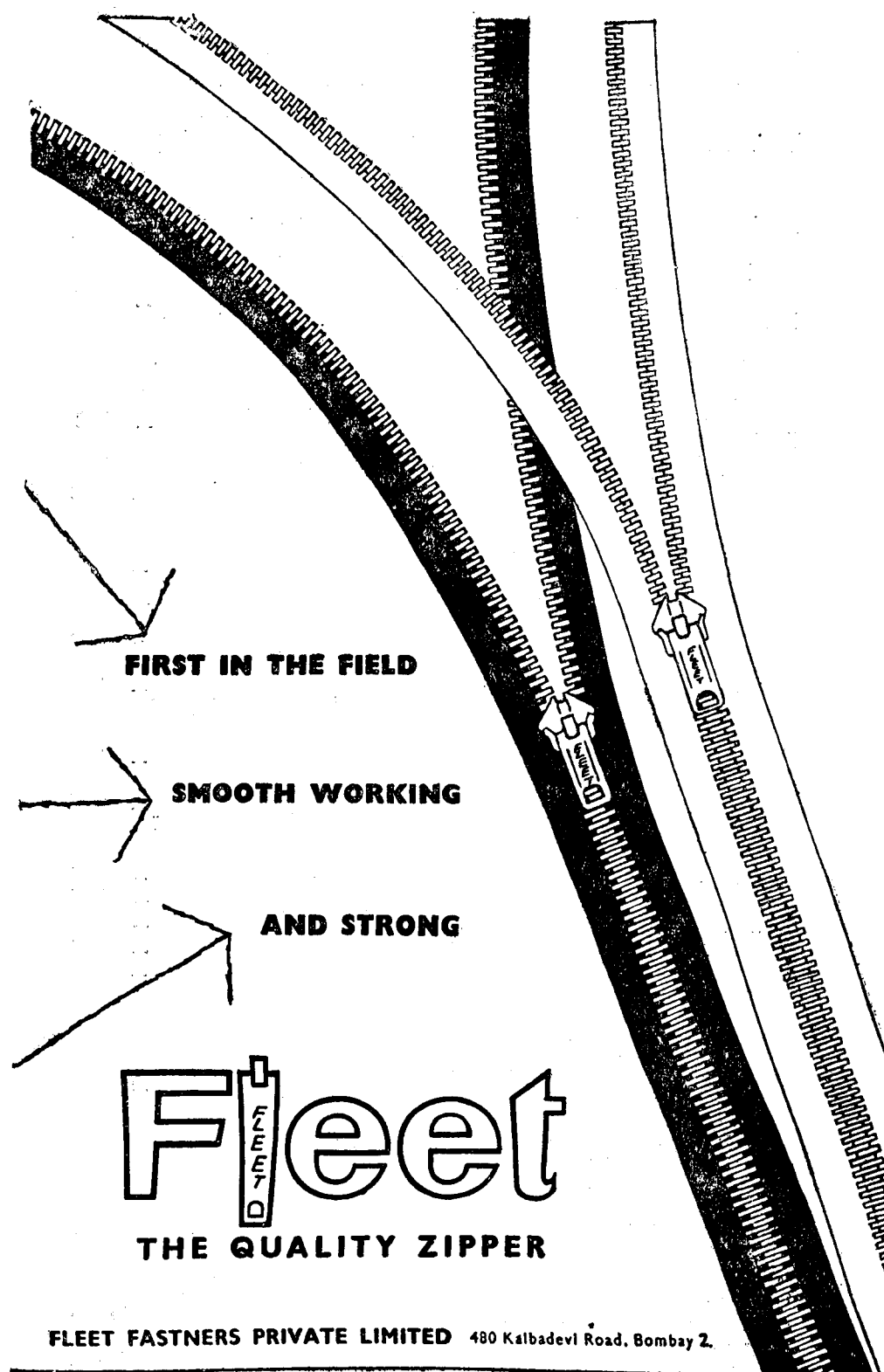
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STUDIES ON POST-MORTEM CHANGES II*

Effect of post-mortem period on the hydrothermal stability of
hide and leather

BY

S. C. NANDY & S. N. SEN

Central Leather Research Institute, Madras

Received on August 24, 1959

SUMMARY

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From the studies carried out, it would appear that post-mortem changes produced by the action of enzymes of bacterial or other sources do not affect appreciably the hydrothermal stability of raw hide stored for 72 hours or so. The T_s is, however, affected to a comparatively greater degree on increasing the post-mortem period, in case the hide undergoes some physico-chemical changes like dehydration and denaturation by sun drying or alkaline swelling. The irreversible effect of sun drying on the structure of hide is reflected by the fact that after normal soaking of fresh dried hide the T_s could not be brought back to its original level. A post-mortem period of 24 hours under identical experimental conditions does not appear to affect the hide in any way so as to lower the hydrothermal stability of raw hide, limed pelt and tanned leather.

In the earlier communication,¹ the effect of post-mortem changes on the swelling of hide and leather was dealt with. In the present paper, the effect on hydrothermal stability is reported.

The hydrothermal stability or the shrinkage temperature is a measure of the structural stability of collagen. In general, the shrinkage temperature (T_s) is raised by tanning and lowered by peptising electrolytes and by protein degradation. Some proteolytic enzymes,² e.g., collagenase, secreted by certain anaerobic bacteria, and pepsin are known to attack and hydrolyse collagen in the native condition. The action of some autolytic enzymes^{3, 4} on hides and

* Part of the thesis by Sri S. C. Nandy, partial fulfilment of the requirements for M.Sc. degree of the University of Madras.

skins during post-mortem period, being mostly hydrolytic in nature, may have some effect on the structural stability of hide collagen. The objects of the present work are to study whether the post-mortem or staling period affects the structural stability of hides cured by different methods in the raw state, as well as in the course of the different operations of leather manufacture and if so, what is the maximum post-mortem period that could be considered to have little effect on this.

Experimental procedure and results

A Theis shrinkage meter was used to determine the shrinkage temperature in this series of tests. T_s of raw and untanned pelt was determined in water and of tanned leather in glycerol medium according to the usual procedure. Soaking in the shrinkage test bath was omitted, unless otherwise mentioned, in order to note the comparative effect of dehydration caused by curing or other operations on the T_s . The results are expressed in °C.

Effect of post-mortem changes on the T_s of raw staled hide:

Freshly slaughtered cow hides were taken, fleshed and washed and pieces were cut off from the butt position of the hide and kept in a moist chamber at 30°C for staling. After different periods of staling, the test pieces were taken out and the T_s determined.

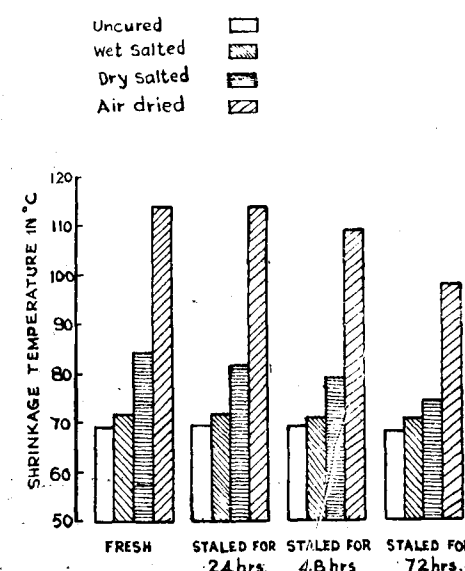
TABLE I

Staling period (hrs.)	Staled hide	T_s in °C					
		Wet salting		Dry salting		Drying	
		Initial	After soaking	Initial	After soaking	Initial	After soaking
2	69.0	71.5	69.0	84.0	69.5	114.0	71.0
24	69.5	71.5	69.0	81.5	70.0	114.0	71.0
48	69.0	70.5	68.5	79.0	69.0	109.0	69.5
72	68.0	70.5	67.5	74.0	68.0	98.0	68.5

Effect of staling on the shrinkage temperature of cured hides:

It was considered important to find out how the post-mortem period might affect T_s of hide with different processes of curing. How the T_s of the cured hides changed by subsequent soaking in water also was observed, as it could give some indication of the reversibility of the process. As before, after different periods of staling, hide pieces were taken and cured by (1) wet salting (2) dry salting and (3) simply drying. In the case of wet salting, 35% salt calculated on the green weight was applied and in the case of dry salting 30% salt was applied; the hide pieces were then dried. In simple drying, the hide pieces were dried in open air at room temperature. During soaking, the test pieces were put in 10 times their weight of distilled water for 24 hours with the addition of 1 ml. of carbon tetrachloride as a preservative and then the shrinkage temperature was determined. The results are shown in Fig. 1 and Table 1.

FIG. 1
EFFECT OF STALING ON THE SHRINKAGE
TEMPERATURE OF CURED HIDES



Effect of soaking period on the T_s of dried hide:

The hide pieces initially subjected to different post-mortem periods were soaked in distilled water for a few days and the

shrinkage temperatures were determined each day. The results obtained are given in the following table.

TABLE II

T_s of dried hide during soaking

Post-mortem period in hours	T_s in °C				
	Staled hide	Staled & dried	Soaking period in hours		
			24	48	72
2	70.0	118.0	72.5	72.5	72.5
16	70.0	117.5	71.5	71.5	71.5
24	70.0	118.0	71.5	71.0	71.0
48	70.0	113.0	68.0	68.0	67.5
72	69.0	107.0	66.0	66.0	65.5

Effect of liming on T_s of staled hide:

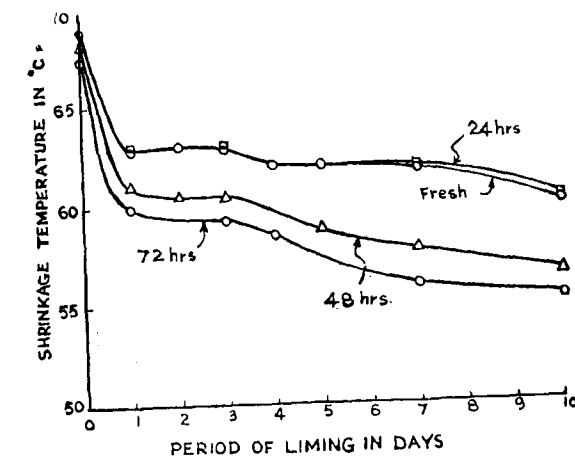
It has already been reported that after liming the T_s of the hide is lowered to a considerable extent depending upon the period of lime treatment. So, it was considered important to find out whether the post-mortem changes had any effect on the T_s of the lime treated hide. As usual the hide pieces were staled and after different periods of staling, washed well, put in 10 times their weight of saturated shell lime liquor and kept at a temperature of 20°C to avoid any alkaline hydrolysis. Carbon tetrachloride was added to prevent bacterial action, if any, in the case of highly staled hides. After different periods of liming the test pieces were taken out and the T_s determined. The results are graphically represented in Fig. 2.

Effect of post-mortem changes on the T_s of hide and leather during the process of leather manufacture:

During the previous experiments, the post-mortem effect on the T_s of hide was noted upto the liming operation. How the T_s of staled hide might be affected during the other steps of leather manufacture was then studied. The following procedure was followed:

The experimental hide pieces were subjected to post-mortem changes as before, then wet salted with 35% salt and preserved for a period of about one month. The hide pieces were washed, soaked in water, treated with sulphide-shell lime liquor, unhaired, put in new lime liquor, fleshed, washed, delimed with boric acid

FIG. 2
EFFECT OF THE PERIOD OF LIMING ON
THE SHRINKAGE TEMPERATURE OF
STALED HIDE



and then bated with Pancreol 3A. After scudding and washing, these were pickled, tanned as usual with 33% basic chrome liquor, shaved, washed, neutralised with sodium bicarbonate, washed again and dyed. Finally, these were fat liquored with Cremol F and soft soap and dried.

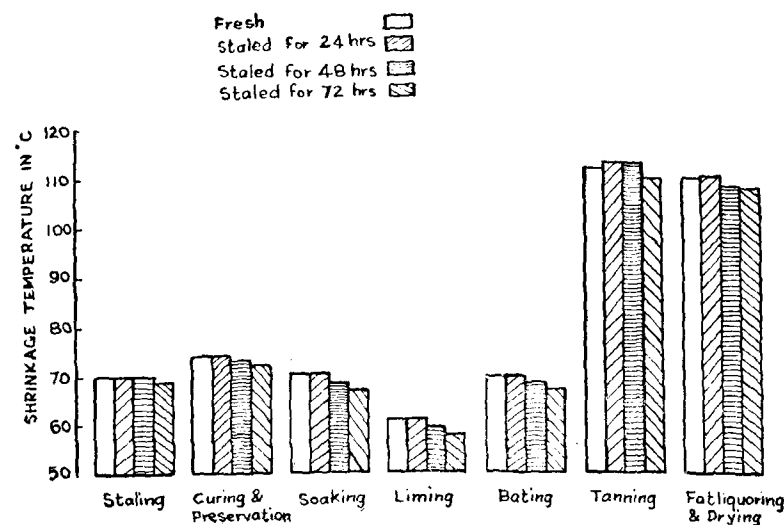
The results have been represented in Fig. 3.

Discussion

It will be observed from Table I that T_s is affected to a little extent after 48 hours and to a still less extent after 72 hours staling. This indicates that neither the action of the autolytic enzymes that may be present in hides nor bacterial action upto a post-mortem period of 72 hours appears to cause much change in the structure or cohesion of hide collagen. The slight decrease in

T_s during post-mortem changes may be due to the following reasons: (1) It has been observed during preliminary experiments that if the epidermal layer of the hide is removed mechanically, the T_s of the hide becomes lowered by about 1.5 to 2° as compared to that of the hide with hair on. The slight lowering of

FIG. 3
SHRINKAGE TEMPERATURE OF STAILED HIDE DURING
THE PROCESSES OF LEATHER MANUFACTURE



T_s may be due to the separation and removal of epidermis after 72 hours staling. (2) It is however known that the T_s of the same hide⁵ may vary by a few degrees depending upon the tightness or looseness of the structure. In the course of bacterial hydrolysis during post-mortem changes upto 72 hours, the interfibrillary proteins may be severely hydrolysed and to some extent, the fibrous proteins may be affected thus causing a loose structure which in turn may cause slight lowering in T_s .

It may be noted from Fig. 1 that T_s increases slightly on storage of wet salted hides, considerably in the case of dry salting and to a great extent with simple drying. This typical change in T_s with the nature of curing remains independent of the post-mortem changes upto 72 hours. In the case of wet salting, the hide undergoes partial dehydration and this may raise the T_s a little. In the case of dry salting, there occurs increased dehydra-

tion resulting in a further rise in T_s . During simple drying, an increased dehydration of the hide accompanied with a denaturation of the coagulable proteins results in gluing up of the fibres thus making rehydration difficult. This leads to a high value in T_s . It has also been suggested⁶ that the salt link in collagen may be converted into the -CO-NH-group resulting in a covalent crosslink. This may, however, happen only on excessive drying of hide at extreme heat. In the case of finished leather, it has been pointed out⁷ that as the moisture content of leather increases from 8-30%, the T_s drops from 170 to 75°C, the T_s remaining constant above 30% moisture. Such a relation of moisture content of leather with T_s is almost in unison with the above experimental results in connection with cured hides.

The diminution of T_s with the increase in post-mortem period is very little in the case of wet salting but appears to be quite appreciable in the case of dry salting and particularly during simple drying. The lowering of T_s is not quite prominent upto a post-mortem period of 24 hours, but it becomes significant after 48 hours. So, it can be presumed that the determination of the T_s of the dried hide will indicate on a comparative basis, the extent of bacterial attack and degradation during the post-mortem period thus helping to evaluate the quality of raw hide to certain extent.

It can be further noted from Table 1 that after 24 hours soaking, the T_s values of both the wet salted and dry salted hides become practically the same as that of uncured fresh or staled hides. But in case of dried hide, T_s values of fresh and 24-hour staled hides do not approach so closely to that of uncured fresh or staled hide. This particular point has been further investigated by increasing the soaking period. It is evident from the results in Table II that the T_s of a fresh dried hide even after 72 hours soaking in water remains higher by about few degrees than that of the fresh hide. Thus, the above results seem to point out from a different angle that drying of hide either in sun or shade may not be a completely reversible process.

Fig. 2 shows that the T_s of fresh or staled hides gradually reduces with the increase in liming period. It is interesting to note that practically the same and identical curves are obtained in the case of fresh and 24 hours staled hides. This clearly indicates that a post-mortem period of 24 hours, has no significant effect on the structural stability of the hide. On the other hand, when staled for 48 hours and 72 hours, although the nature of curves

is identical, the values of T_s decrease with the increase in post-mortem period throughout the liming period studied. It should, however, be pointed out that the composition of the lime liquor affects the T_s of hide during liming. The comparatively higher values of limed hides even after 10 days of liming is probably due to the fact that shell lime has been used for straight liming. In a separate experiment, it was noted that a shell lime liquor has much less drastic action in lowering the T_s of the hide in comparison to the sulphide-lime liquor or limestone liquor.

Fig. 3 clearly indicates the changes in T_s of staled hides throughout the tanning process. The mode of change in T_s with the tanning processes is not difficult to understand. It can be pointed out that after neutralization, dyeing and fat liquoring the T_s is found to reduce slightly which may be due to the partial stripping of the chromium during neutralization with sodium bicarbonate. A post-mortem period of 24 hours is found to have practically not the same action on the T_s of hide or leather as is, however, induced by a prolonged staling. Comparatively lower hydrothermal stability, although not great enough, indicates the harmful effect and bacterial deterioration during post-mortem changes.

Acknowledgment

Our thanks are due to Dr. Y. Nayudamma, Director, Central Leather Research Institute, for his interest in the work and for permission to publish these results.

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RESEARCH BEARS FRUIT

Practical Demonstration No. 2

(Fourth Series)

Manufacture of chamois leather by formaldehyde, sulphochlorinated oil and sardine fish oil combination tannage*

BY

J. C. DEB, E. R. SARGUNAN & Y. NAYUDAMMA

Introduction

A process for the manufacture of chamois leather was demonstrated in August 1959, using sardine fish oil. In the process demonstrated now, sulphochlorinated mineral oil produced on pilot plant scale by this Institute, is used. This oil in combination with a small quantity of sardine fish oil produces a very satisfactory leather. This chamois process will be found useful where a pale cream coloured product is desired and also when it is difficult to obtain regular supplies of fish oil.

Processing details

Raw material:—Rejection quality wet salted goat and sheep skins of average size 36" to 42" (91-107 cm.) are taken.

Soaking:—The wet salted goat and sheep skins are soaked in plain water in a paddle for 1-2 hours, taken out, broken over the beam on the flesh side by a blunt knife and washed thoroughly in running water for 30-60 minutes. The skins are then taken out, drained, weighed and ready for painting and liming.

Painting:—Unhairing is done by painting with paste of the following composition.

Sodium sulphide—1 Part, i.e., 4 lbs. (1.81 kg.) for a pack of 100 skins.

* Process demonstrated during May, 1960.

Slaked lime—15 Parts, i.e., 60 lbs. (27·22 kg.) for a pack of 100 skins.

Sodium sulphide is dissolved separately in hot water and then added to the mixture of lime and water. Care is taken to get a homogeneous paste, cooled to the room temperature. It is advisable to prepare the paste one or two days prior to application.

The prepared paste is applied on the flesh side of the skin. The skins are then piled up overnight on a platform flesh to flesh. Next day, they are taken out, unhaired and put into an old lime liquor (once used) containing 5% slaked lime on the soaked weight of the skins in a pit for two days. Hauling and replacing is done thrice a day.

Reliming:—Next day, the pelts are taken out, scudded and put into new lime liquor containing 10% slaked lime, 1% caustic soda and 300% water, for two days in a paddle. On the third day, the pelts are examined for sufficient plumpness, taken out, fleshed, scudded, weighed and washed thoroughly in running water for 15 to 20 minutes in a paddle and taken for deliming.

Deliming:—The pelts are then delimed with:

Boric acid: 1-1½% on the fleshed weight.

Water: 150-200% on the fleshed weight.

The goods and water are taken in a drum. Half the quantity of the acid is added and the drum run for 15 minutes. Then the remaining half of the acid is added and the drum run for another 45 minutes. The delimed pelts are scudded, washed, weighed and now ready for tanning.

Tanning:—Formaldehyde tanning:

The delimed pelts are pretanned with:

Formaldehyde: 3·5-4·0% on the delimed pelt weight.

Soda ash: ¾-1% do.

Water: 175-200% do.

The pelts and water are placed in the drum and the drum run. The soda ash is dissolved separately and mixed with formaldehyde in a bucket of water. The formaldehyde solution is then fed into the rotating drum through the hollow axle in three instalments at intervals of 30 minutes. The drumming is continued for 4-5 hours; this completes the formaldehyde tannage at pH 8·5.

The skins are then horsed up overnight. Next morning, they are sammed and the grain layer is removed with the splitting machine. They are then shaved on both the sides uniformly. The shaved weight is recorded and the skins are kept in cold water overnight. Next morning, the water is squeezed out and the skins are ready for oil tanning.

Oil tanning:—The formaldehyde tanned skins are then retanned with the mixture of sulphochlorinated mineral oil (C.L.R.I. made) and sardine fish oil as follows:

Sulphochlorinated oil: 10-12% on the shaved weight.

Sardine fish oil: 3-5% do.

Soda ash: ½-¾% do.

Calcium carbonate: 7-8% do.

Water: 7-8% do.

The sulphochlorinated oil and sardine (fish) oil are mixed with calcium carbonate in a wooden vat. The soda ash is separately dissolved in water and added to the oil mixture to be made into an emulsion and the pH is adjusted to 7·5. The skins are now dipped into this emulsion which is uniformly applied on both sides. The pieces with the emulsion applied on both sides are put into the drum. The drum is then run for 6 hours and the skins left in it overnight. Next morning, the drum is run for another 4-6 hours until a chamoising smell is perceived. The skins are then taken out and hung up in the air for oxidation for 7 to 10 days during which period, the skins get a yellow mustard powder like colour. Now the skins are ready for washing.

Degreasing:—The oxidised skins are then weighed and degreased with:

Soda ash: 3½-4% on the oxidised weight.

Detergent (Triton X 100): ½-1% do.

The oxidised skins are first soaked in a drum with sufficient quantity of water and half the quantity of detergent at 45°C to 50°C. The drum is then run for half an hour. The skins are washed three times with the soda ash for half an hour each time at 45°C to 50°C. Finally, the skins are washed for further half an hour with the remaining detergent at the same temperature. They are then again washed in luke warm water, taken out and hung up for drying in air.

	Shrinkage temperature		Breaking strength*		Filtration test		Sinking test**		Water absorption test**
	Parallel	Perpendicular	Parallel	Perpendicular	For Gasoline*	For Water*	Individual values	Average	
Control lot: with — 20% sardine fish oil.	72°C	72°C	140 lbs.	79 lbs.	35 secs.	5 min. & 5 secs.	30 secs. 12 secs. 15 secs.	19 secs.	301%
Expt. No. 1 with — 12% sulphochlorinated oil, 5% fish oil in goatskins.	76°C	77°C	131 lbs.	90 lbs.	37 secs.	5 min. & 13 secs.	75 secs. 50 secs. 60 secs.	62 secs.	310.6%
Expt. No. 2 with — 12% sulphochlorinated oil, 5% fish oil in sheepskins.	75°C	74°C	75 lbs.	70 lbs.	20 secs.	5 min. & 15 secs.	40 secs. 35 secs. 30 secs.	35 secs.	338.2%

* According to Federal specifications.

** According to Indian specifications.

Parallel and perpendicular are with reference to the backbone line.

Staking:—The dried skins are then staked with considerable pressure. The skins should be of light cream colour and absolutely non-greasy.

Buffing, trimming and measuring:—The staked skins are then buffed on both sides with 80 grit emery paper on a buffing machine. Finally, the skins are buffed only on the flesh side with 320 grit emery paper or by a buffing wheel. The skins are then trimmed, measured and packed up for disposing.

The physical test data of the finished products of control and demonstration are given in the table.

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LETTERS TO THE EDITOR

Isolation of sucrose from babul bark

Babul (*Acacia arabica* Willd) occurring all over India, has been an important indigenous tanning material. While some studies^{1, 2, 3} have been carried out on this tanning material, the chemistry of its tannins is not yet fully known. The present communication reports the isolation of crystalline sucrose from the inside regions of freshly cut babul bark.

The freshly cut bark from a five year old babul tree was at once separated into two portions: (1) inner bark—fissured and easily separated and (2) outer bark—thick and non-fissured. The two bark portions were extracted for two days with water at room temperature; the extract solutions were then filtered. Dry solid extracts from inner and outer barks were obtained from these extract solutions and purified through methyl and ethyl alcohols. A solution of the purified extract from inner bark (22 g.) in pure methanol (40 ml.) when allowed to stand, started depositing white crystals from the second day onwards, the crystallisation being complete after twenty days (Yield 0.9 g.). Under similar experimental conditions, the outer bark extract did not yield any solid component. The white crystalline material thus obtained from the inner bark after purification, has been identified to be sucrose by chemical characterisation.

Molecular weight (by X-ray diffraction)	..	342
$C_{12}H_{22}O_{11}$	..	342
Melting point of osazone, single and in mixture with osazone from A.R. sucrose	..	205°C

Elementary analysis:

Found	..	C 42.16; H 6.42; O 51.5
Calculated for $C_{12}H_{22}O_{11}$	..	C 42.10; H 6.43; O 51.4

Sugars have been assigned a role in building up nuclei of amino acids and tannins through quinic and shikimic acids. It has also been observed that quercetin, a polyphenol, is built up from sugars through shikimic acid.⁴ In the light of these observations, the isolation of sucrose, from the inner bark of babul, a tanstuff containing predominantly condensed type tannins is highly

significant. Further work, by which it is hoped to explain the exact role of sucrose in the biosynthesis of babul tannins, is in progress.

C.L.R.I., Madras,
August 14, 1959.

J. B. RAO & K. N. S. SASTRY.

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Isolation of a glycoside from *Anogeissus latifolia* (Dhawa leaves)

Dhawa (*Anogeissus latifolia*) is a fairly large size indigenous tannin-bearing tree, the leaves of which, constitute an important tanning material; very little is known about the chemistry of the dhawa tannins. In the present communication, the isolation of a glycoside from the solid aqueous extract of the leaves is reported.

80 g. of an aqueous extract containing 55.4% tannins, 44.1% non-tannins and 0.5% insolubles was first soxhletted with petroleum ether and then with anhydrous ethyl acetate. In the latter case a white crystalline solid was deposited on the cooler sides of the flask. (Yield 0.3 approx).

The compound was very highly soluble in water but insoluble in chloroform. M.p. 158-159°C: m.p. of acetyl derivative 120°C.

Molecular weight from X-ray diffraction: 356.

Elementary analysis:

Found	..	C 41.36; H 8.14; O 49.85
So suggested Mol. formula	..	$C_{12}H_{28}O_{11}$

The compound after hydrolysis with $N H_2SO_4$ and following the procedure of Gottschalk and Ada,¹ gave a precipitate which was identified as glucose by chromatography.² The glycosidic nature was inferred from the infra-red and ultra-violet spectral studies.

Further studies are in progress.

C.L.R.I., Madras,
August 14, 1959.

J. B. RAO & K. N. S. SASTRY.

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TECHNICAL SEMINAR

Raw hides and skins of Bihar State*

BY

R. BHASKARAN

A survey tour of Bihar State was undertaken in Dec. 1959-Jan. 1960 for collecting hide and skin samples from the different livestock normally available in the various regions of the State. Bihar State produces a variety of cow and buff hides and goat skins, but comparatively very small number of sheep skins.

Cow hides:

The cow hides from North Bihar are in general superior to those from South Bihar. The Dharbhanga hides are collected from Sitamarhi, Muzaffarpur and Dharbhanga Districts of N. Bihar. The most important breed in this area, is Bachaur, a small percentage of Harianas, graded Harianas and local Brahmini cattle* also being available. The hides, especially those from Dharbhanga District, are usually from younger animals; they are of full substance, the weight range being 20-22 lbs. These hides present usually a clean appearance on the hair side. In the Katihar and Kishanganj areas of N. Bihar, the hides are of 18 lbs. average weight, but with good substance—chrome and kip quality hides. These hides which come to the shandies, in some cases, unsalted for 24-48 hours after flaying, are salted by the *beoparis* after purchase. These hides are only a little smaller than Purnea hides. In the Savan and Chapra areas of N. Bihar, the hides are of U.P. quality—19 lbs. weight. The breeds available here are graded Harianas, Harianas (to a little extent), Desis and Bachaur.

In Patna area, the hides originate mostly from the Desi breed of cattle; a very small percentage of Harianas and Tharparkars also may be present. Recently the weight range has gone up due to older animals only being slaughtered. The Gaya hides are of 21 lbs. average weight, but mostly mediums. In Bhagalpur, the weight range is 19-20 lbs. On the Ranchi side, the hides are much smaller and of lower weight range. The small Chotanagpur cattle which produce these hides are local shrub cattle.

* Summary of talk given on 5-3-1960.

Cow hides slaughtered in the morning are usually cured in the evening; a little Khari salt is given in the rainy season. Slaughter and flaying are in the open with no facilities for hoisting. The hides bear marks of bad flaying and hammering.

Buff Hides:

In N. Bihar, only female buff hides are available. The buffaloes, here tending to be of the Murrah type are quite healthy. In Dharbhanga, the hides are of 60 lbs. weight while in Patna and Biharshariff, they are 55-60 lbs. In the Savan and Chapra areas, the hides are of medium size—45-47 lbs. In Kishanganj and Katihar, medium and heavy hides suitable for sole leather are obtained. A few extra heavy hides also are available.

In S. Bihar, the hides are mostly from the buffaloes, brought for work from N. Bihar.

The buff hides in Patna and Gaya are largely cured by *Lambi Thaiyari*, i.e., the hide is folded lengthwise so as to form ridges of 1" height, each about 2" apart. The saline fluid does not run off and adds to the weight. In Biharshariff, hides are put in the sun and then repeatedly splashed with water and salt. By this, penetration of salt is aided and greater moisture retained in the hide.

Goat skins:

Muzaffarpurs: These are dry salted skins of Muzaffarpur area, mostly from young kids. Clean variety of Khari is used and also care is taken to see that the dried skins are neat and clean.

Dinajpurs: The skins obtained from Kishanganj side are dirty cured; some amount of mud and earth also is put into the skins along with Khari salt syrup. These rectangular skins are of fine grain and good substance.

Patna: These clean Khari cured skins have longer and coarser hair when compared to Muzaffarpurs from which they are easily distinguished, through their colour and texture.

Ranchis: These skins are coarse and inferior to the other goatskins. They are both wet and dry salted; in the latter case, they are dirty cured.

From the N. E. Bihar, a few Malda quality skins of whitish colour, fine silky hair and dirty cure are available.

Sheep skins: Very few sheep skins are available: Two types—(1) plain type and (2) hilly type, are available, the skins from the latter being the better.

TECHNICAL SEMINAR

Some aspects of extension services demonstrations*

BY

A. GANESAN

The extension services wing of the Central Leather Research Institute has been functioning for the past two years and more by way of carrying out survey of the various regions of the country and practical demonstrations of processes of leather manufacture tailored to the needs and prevailing circumstances of the particular region. The programme of extension work is directed at serving the needs of all the various sections of the leather industry—the large scale, the medium and the unorganised small sections. The problems of these different sections are of different nature. Naturally the approach has to be different in each case. Humility, proper appreciation of the products of these sections, warm-hearted and sympathetic interest, a sincere understanding are some of the qualities needed. Coming down to the level of the village tanner, removing his inferiority complex—are required in the case of the cottage tanner who is by himself talented and resourceful.

The practical demonstrations are planned in collaboration with the local Government officials (of the Industries and Community Development Departments), Small Industries Service Institutes and Khadi and Village Industries Commission authorities. These demonstrations are something more than mere demonstrations of a process worked out or well known. Not only the raw and auxiliary materials, water supply, climatic conditions, but also the characteristics desired in a single end product differ from region to region.

The Extension services work has an educative aspect in the sense that several of the indigenous practices like *Sada* deliming, use of large amounts of salt in tanliquor and use of flour in deliming and bating and the various indigenous tanning materials such as *ghat behr*, *mahua*, *ashan*, etc., merit thorough study.

Adequate supply of tanning materials, recruitment of suitable personnel are some of the problems to be tackled in regard to the Extension service work. A beginning has been made and it is hoped that this Institute will be able to give a lead to the tanners.

* Summary of talk given on April 2, 1960.

TECHNICAL SEMINAR

Recent trends and techniques in biophysics of collagen*

BY

N. RAMANATHAN

Biophysical research on collagen has involved a number of techniques which are also of use in investigating the physico-chemical properties of polymers. Recent advances in this field were reviewed under the two headings: (a) techniques and (b) results.

Of the following techniques: viscosity, osmotic pressure, sedimentation velocity and sedimentation equilibrium using the ultra-centrifuge, light scattering, flow birefringence, X-ray diffraction, infra-red spectrophotometry, X-ray and electron microscopy, the first five techniques were discussed in detail with particular reference to collagen and the care to be taken in each case specified. It was also pointed out that some of the instruments not only provided information on the substance analysed, but also helped to prepare samples in a pure form for analysis by other techniques, e.g., the purification of samples by ultra-centrifugation for observation in the electron microscope. To arrive at definite conclusions, a combination of all the techniques was necessary. The construction and operation of various instruments were illustrated by means of slides.

Turning to the results obtained by the use of these techniques, figures were given for the molecular weight, length and diameter of the collagen molecule as derived from solutions of collagen. It was also possible to conclude that parent gelatin consisted of two species of molecular chains and that in a molecular unit, some ends of the chains were not rigid but were "dangling" and that the dangling chains enabled molecular units to join up end to end. The coiling energy represented the difference between the shrinkage temperature and denaturation temperature. Electron microscopy of collagen solutions led to the postulate that collagen par-

*Summary of talks given on April 22 & 29, 1960.

ticles of the dimensions determined by other techniques, existed in a random manner and that they aggregated in specific ways, depending on the chemicals added, to give various periodicities observed in the electron microscope, viz., 640-700 Å° (native collagen), 210 Å°, no periodicity, 2600 Å° (segment long spacing). (The name "tropocollagen" has been given to this collagen particle). The various aggregated forms could be redissolved to yield the particles again. Ultra-sonic radiation introduced changes in the properties of the chain ends thus depriving the chains of their ability to form linear aggregates. Continued exposure segmented the aggregated forms to yield lengths $\frac{1}{2}$ or $\frac{1}{4}$ of the original length. When these segments reaggregated, it was not the newly formed ends that joined, but the original ends. Also at the junction of two segments (the two forming one unit) a new band was observed in the e.m. This new band might correspond to the coiling of the "dangling" chains predicted from physico-chemical measurements. Also the end to end interaction of the chains might involve primarily, rather weak hydrogen bonding and this would be consistent with the finding that thermal gelation of salt solutions of collagen was inhibited by hydrogen bond breakers such as urea. In the collagens of certain kinds of connective tissue, such as those which resist acid solution, more stable bonds might also be formed between terminal chains.

A brief mention was made of the work on biosynthesis and fibrogenesis of collagen and the role of polysaccharides in collagen formation.

TECHNICAL SEMINAR

Studies in syntans*

BY

D. MUKHERJEE

The non-aqueous titration technique has been successfully applied to study the course of sulphonation and condensation in the preparation of neradol and novolak syntans. The ease of sulphonation of the different cresols and phenol was investigated; *o*-cresol and phenol were found to be sulphonated to the maximum extent, the time required for the maximum degree of sulphonation being 3 hours. In regard to the condensation of the various sulphonated phenolic type products, with formaldehyde, it was found that the introduction of methylene bridges was maximum with *o*-cresol followed by *p*-cresol. With increase in the degree of condensation, the tan content has been found to increase upto a certain limit and then decrease, the maximum being obtained with mixed cresols: HCHO (30% solution) :: 1:0.3 and at pH 2.0.

In the case of novolak syntans, on varying the molar ratio of phenol to formaldehyde and subsequent sulphonation of the product, the tan content of the product from a highly condensed resin was found to be higher than that of one prepared from a low condensed resin. With increase in degree of sulphonation, however, the tan content decreased. The optimum was found to be when 1 mole of phenol was condensed with 0.75 mole of HCHO and subsequently sulphonated with 0.5 mole H₂SO₄, the maximum tan content being obtained at pH 3.0.

These two types of syntans have been used in combination tannage both for pretanning and retanning purposes. In the case of vegetable tannin systems of both catechol and pyrogallol types, the increase in fixed tannin on retannage with syntans, the stripping of vegetable tannin and their effect on shrinkage temperatures were considered in relation to the reactive groups available in collagen and the mode of combination of syntans. In the chrome-syntan system, the effect of both pretannage and retannage with syntans on the fixation and also the stripping of chrome and the shrinkage temperatures, also was discussed.

* Summary of talks given on May 6 & 27, 1960.

TECHNICAL SEMINAR

Effect of chrome complexes on hydrothermal stability of hide powder*

BY

T. J. DEVASSY

Hide powder portions were treated for different intervals with neutral salt free chrome liquor to which sodium chloride, sodium sulphate, sodium formate, sodium oxalate, sodium citrate, sodium sulphosalicylate and a few other organic complexing salts were added in different proportions; the different complexes taken up by the hide powder were determined electrophoretically. The corresponding increase in shrinkage temperature of the hide powder sample was measured by microshrinkage apparatus. It was observed that in the presence of neutral salts—sodium chloride and sodium sulphate—the slowest moving fraction of cationic chrome in electrophoresis with possibly one positive charge might be mainly responsible for the rise in shrinkage temperature. In the case of organic complexing salts, the middle fraction with possibly two positive charges might be mainly responsible for the increase in thermal stability.

* Summary of talk given on May 13, 1960.

CLASSIFIED ABSTRACTS

Processes prior to tanning

Studies on the enzyme depilation of hides and skins. Part VI. Unhairing of goatskin with protease produced by *Bacillus megatherium* 3E.

Harukazu Toyoda and Akira Futami (The 7th Dept. of the Govt. Chemical Industrial Research Institute, Tokyo, Hiratsuka, Kanagawa, Japan). *Bull Japan Assoc. Leath. Tech.* 5, 61 (1959). From the culture filtrates of *Bacillus megatherium* 3E grown on soy bean meal extract medium, an enzyme preparation was separated in powder form by procedure of precipitation with ammonium sulphate, dialysis and then precipitation with acetone. The enzyme preparation was assayed for some enzyme activities, and was found to contain none of amylase, invertase, maltase, lactase, lipase, cellulase, hyaluronidase and pectinase, although its proteolytic activity was very strong.

Pieces of dried goat skin, after soaking and fleshing, were treated with the solutions containing the enzyme preparation and phosphate buffer under various conditions and the progress of hair loosening was followed by measurement of the depilation load at suitable intervals.

The results of these experiments may be summarised as follows: (1) When the skin pieces were treated with the enzyme solutions, there was always an initial lag period when no hair loosening occurred, followed by a period of rapid loosening and finally a period of slower loosening as the depilation load approached 1. The length of the lag period varied according to conditions, such as temperature, concentration of the enzyme or kind of skins. And when the skin pieces were left in the enzyme solution for some time, the epidermis became loose and was detached in the form of continuous sheets, bringing hairs with it. (2) The rate of depilation increased with increase in the enzyme concentration, and with 0.04% enzyme solution depilation was almost complete within 6 hours at 30°C. (3) Effective depilation took place over a pH range of 6 to 8 with the maximum action at pH 7. (4) The

rate of depilation passed through the maximum as the incubation temperature became higher and further decreased at higher temperature, but the optimum temperature varied according to concentration of the enzyme, about 30°C at 0.01% concentration and 35°C to 40°C at 0.02%, presumably due to different heat stability of the enzyme with its concentrations. (5) Addition of salts showed different effects on the rate of depilation according to the kind of salts and their concentrations. Although the protease did not require activation with a reducing agent or metal ions, addition of ammonium chloride or cobalt sulphate increased the activity of the protease slightly. This is presumably due to their effects of increasing the stability of the protease in solutions. Treatments with mercuric chloride, potassium permanganate or EDTA caused inactivation, but ascorbic acid, cystein and monoiodo-acetic acid had no effects on the protease. (6) The soaking process had a direct influence on the subsequent depilating process. Pretreatment of the skin pieces in solutions containing alkalies, such as sodium carbonate, sodium sulphide or calcium hydroxide had an effect of quickening the rate of hair-loosening in subsequent treatment with the protease. Pre-treatment with acids tended to retard the subsequent depilation, and pretreatments with sodium chloride and urea solutions gave no effect.

Studies on the enzyme depilation of hides and skins. Part VII. Properties of protease produced by *Bacillus megatherium* 3E. (II).

Harukazu Toyoda, Akira Futami and Masayoshi Kikkawa (The 7th Dept. of the Govt. Chemical Industrial Research Institute, Tokyo, Hiratsuka, Kanagawa, Japan). *Bull. Japan Assoc. Leath. Tech.* 5, 99 (1959). *Bacillus Megatherium* 3E protease was partially purified using the same procedure as that previously reported and its properties, such as pH-optimum, stability at various pH values, activity and stability at varying temperatures, effects of a variety of added substances on the activity and the stability were investigated. The estimation of its proteolytic activity was carried out by measuring the liquification of gelatin (activity I) and the liberation of free amino groups from a gelatin (activity II). Finally its specificity against such protein substrates as casein, egg albumin, gelatin, collagen and keratin was compared with that of *Bacillus subtilis* protease, trypsin and pancreatin.

Conclusions obtained from these experiments are summarised as follows: (1) The pH optima of both activity I and II are at

pH 7.0 to 7.2. (2) Although the stability of the protease at various pH values is influenced by the buffer used, the protease is comparatively stable at pH values between 6.0 and 9.0, and activity I is more stable in alkaline solution and less stable in acid solution than activity II. McIlvaine buffer partly inactivates the protease, especially its activity I. (3) Activity I reaches the maximum at 55° to 60°C whereas activity II has the optimal action at 35° to 40°C. (4) Inactivation of the protease by heat is influenced by composition of the solution. Generally, activity I is less stable against heat than activity II. Calcium ion has a marked effect of protecting the protease from inactivation by heat. (5) Activity of the protease increases slightly when Ca-, Mn-, Co-, and Mg-salts are present. This is presumably due to their effects of increasing the stability of the protease in solutions. Addition of oxalate, citrate and ethylenediamine tetraacetic acid produces partial inactivation. Cystein, monoiodoacetic acid, L-ascorbic acid and hydrazine have neither inhibitory nor activating effects towards the protease. (6) When compared at the same strength of digesting casein, the activity of *Bacillus megatherium* protease is stronger in liquefaction of gelatin and digestion of egg albumine, but weaker in digestion of collagen and keratin, and in liberation of free amino groups from a gelatin than that of trypsin, *Bacillus subtilis* protease and pancreatin.

VEGETABLE TANNING

Application of ion-exchange membrane in vegetable tannage

Eijiro Sugano and Iwao Nishiyama (the 7th Dept. of the Govt. Chemical Industrial Research Institute, Tokyo, Hiratsuka, Kanagawa, Japan). *Bull. Japan Assoc. Leath. Tech.* 5, 71 (1959). Vegetable tanning liquor was electrolyzed by using Amberplex C-1 (cation-exchange membrane) in order to change salts of the tanning liquor into acids and decrease the pH value of the liquor. Hide pieces were tanned in the vegetable tanning liquor, pH of which was controlled by the above method and another liquor pH of which was controlled by the addition of organic acids; both the tanning liquors and the leathers tanned by the liquors were analysed.

The results obtained may be summarised as follows: (1) Tannin content of vegetable tanning liquor does not change by the electrolysis. (2) In this experiment, we could not find any differences in tanning effect between a liquor, pH of which was controlled by the addition of organic acids and another, pH of which was con-

trolled by the electrolysis. This was ascertained by measuring the rate of penetration of tannin into the hide pieces and by the analytical results of the leathers tanned in the two liquors.

The results of this experiment did not give anything of practical value except that the cost of leathers can be reduced by using no organic acid. It failed to reveal anything else presumably due to the difference in salt contents being too small to affect the rate of penetration of tannin and the analytical results of the leathers. But from the results given by other reports, it is fairly certain leather of good quality may be produced by controlling the salt content of tanning liquors.

Application of ion exchange membrane in sole leather tannage.

Eijiro Sugano, Iwao Nishiyama and Nichiaki Hata (The 7th Dept. of the Govt. Chemical Industrial Research Institute, Tokyo, Hiratsuka, Kanagawa, Japan) *Bull. Japan. Assoc. Leath. Tech.* 5, 111 (1959). We separated the vegetable tanning liquor which had been taken from the pits of the sole leather tannery into two parts, and in one of them controlled its pH value by electrolysis using the cation exchange membrane which was protected by cellophane in order to change salts of the liquor into acids (C), and in the other by addition of acid (A). Hide pieces were tanned in each of them by means of sole leather tanning process, and these liquors and the leathers produced were analysed.

The results obtained may be summarised as follows: (1) The cation exchange membrane when protected with cellophane can be used for a long time changing cellophane now and again. (2) The vegetable tanning liquor (C) contains a lesser quantity of salts of strong acid in the rocker and a lesser quantity of salts of weak acid in the layer and hot pit as compared with (A). Tannin content in liquor (C) is a little larger than that in (A). It may be presumably due to the change of non-tannins into tannins and the change of insoluble matters into soluble tannins by the electrolysis. (3) The tannins/non-tannins ratio is increased by the electrolysis, but the acids/salts ratio is not always increased by it. The acids/salts ratio of liquor (C) is greater in the rocker and the hot pit but smaller in the layers than for (A). Therefore, it may be said that liquor (C) is more astringent than (A). But the astringency of the liquors in the layers could not be comparatively studied due to conflicting results obtained. (4) Increase of the thickness and the weight of the leathers during tanning treatments,

is greater in liquor (C) than in (A). (5) The leather tanned in liquor (C) contains a lesser quantity of soluble matters and a larger quantity of combined tannins than that tanned in liquor (A). (6) The leather tanned in (C) had greater tensile strength and less elongation at break, but these differences are very little.

T_g of the both leathers is almost identical, but water absorption of the leather tanned in (C) is a little larger than that of leather tanned in (A). When pH value of vegetable tanning liquor in sole leather tanning pit is controlled by electrolysis using cation exchange membrane, the astringency of the liquor generally increases. Therefore, it is certain leather of good quality may be produced by controlling the astringency of tanning liquor.

Studies on the stripping of vegetable tannins from leather.

I. Alkali acetone and urea extraction of vegetable tanned hide powder.

Yukichi Sakimoto and Nobuyoshi Kurakata (Faculty of Agri., Hokkaido University). *Bull. Japan. Assoc. Leath. Tech.* 5, 75 (1959). This paper contains the results of our following experiments as a part of the investigation of the combined tannin behaviour towards various stripping agents.

We extracted by alkali from chestnut and soluble quebracho tanned hide powder from which had been previously removed their water solubles and examined the relationship between the extracted amount of fixed tannins and the amount of dissolved collagen from tanned powder. Also we determined the amount of tannins which were extracted by urea, acetone and alkali, from the tanned powder, and examined the acid combining capacity of tanned powder before and after this extraction. Then we compared the relationship between the extraction of fixed tannins by urea, alkali and acetone and the solubility of tannins in them and examined the influence of aging, in both dry and wet states, on the degree of extraction of fixed tannins and the acid combining capacity.

The results obtained are summarised as follows: (1) When tannins were continuously extracted by alkali from chestnut and soluble quebracho tanned hide powder, the total amount of dissolved collagen from powder varied according to their degree of tannage, and the smaller the degree of tannage, the greater the total extracted amount of fixed tannins, except with the powder tanned with 4% tannin solution of chestnut. So, it seems that there is no relationship between the extracted amount of fixed

tannins and the amount of dissolved collagen from tanned powder from which the solubles were previously removed. (2) The acid combining capacity of chestnut and wattle tanned powder did not change before and after the urea extraction. But it increased after the extraction by 50% acetone more than before the extraction. (3) The amounts of fixed tannins extracted corresponded to the degrees of solubility of tannins into urea, alkali and acetone. (4) The stability of fixed tannins against urea, alkali and acetone was increased by aging. The fixed tannins were more resistant in dry aging than in wet aging. (5) The acid combining capacity was decreased by aging and the decrease in dry aging was greater than in wet aging.

OTHER TANNAGES

Studies on leather for gas meter diaphragms. (II) On the mutual reaction of coal gas-oil-leather system.

Minoru Kubota, Tokyo Univ. of Fisheries (Shiba-Kaigandori 6, Tokyo, Japan). *Bull. Japan. Assoc. Leath. Tech.* 5, 81 (1959). The leather for gas meter diaphragms is produced by permeating the special mixed oil into the leather after lightly detanning E.I. tanned sheep leather. However, during long use troubles happen to it of which loss of diaphragm oil, diaphragm-hardening and leaking are most frequent.

In order to explain the causes of the troubles, the author investigated the reaction of three components of coal gas-oil-leather system.

The results obtained are summarised as follows: (1) The chemical composition of the leather for diaphragms, now used in Japan, England and Germany, was investigated and it was observed that there are two sorts of the leather, vegetable tanned and vegetable-chrome tanned, the degree of tannage being between 45-60% in the former and Cr_2O_3 content about 1% in the latter, and fat content between 50-65% in both. (2) When the chemical composition and physical properties of the waste leathers of diaphragms are investigated, a drop of strength, a decrease of oil content and an increase of the degree of tannage were observed generally. In regard to the characteristics of oil extracted from waste leathers, an increase of acid and a decrease of iodine values were observed. (3) The influence of the components of coal tar on the physical properties of leather was investigated and it was found that only pyridine acted to weaken leather. (4) The change of characteristics of the oil, which takes place, when 10m^3 coal gas is blown into oil,

was measured. The results showed that the changes in the characteristics were not great, acid value increasing and iodine value decreasing slightly. Colour of oil was measured by Lovibond tintometer and it showed that yellow and red indexes increased generally in the case of the oil, but in the case of cod liver oil, the colour components were likely to be transferred to the vegetable tanned sheep leather. (5) In the experiment described in 4, the component change of leather immersed in the oil, was as follows: T_s value of vegetable tanned leather decreased, but the degree of tannage was not affected in the oil for diaphragms, and increased to some extent in codliver oil.

So, it may be suggested that the degree of tannage is relevant to the change of colour and an increase of the degree of tannage brings a decrease of the colour component.

Studies on the vegetable tanning Part 3. The quantities of vegetable tannins adsorbed by chrome tanned collagen and the presumption of their adsorption mechanisms.

Yoshiyuki Inoue Hiroshi Okamura and Yoshitomi Iizuka (Biochem. Lab. Dept. of Agri. Kyoto University). *Bull. Japan. Assoc. Leather. Tech.* 5, 121 (1959). When prechromed collagen is retanned by vegetable tannins, the quantities of tannins adsorbed increase proportionately with the previous chrome contents, upto 4% (Cr_2O_3). If the pH of the chrome liquor previously used was rather high, in other words, the collagen had high chrome content, the subsequent tannin adsorption drops.

From the results it is presumed that the high pH value accelerates theolation of chrome liquors and these olated large molecular compounds interfere in the subsequent adsorption of the tannins by the collagen. These facts can be assumed from the results of the sieve analyses of chrome liquors using ion exchange resins.

The displacement of sulfate ions from the chromium complexes and the dechroming phenomena from the chromed hides can often be seen in the case of the vegetable retannage.

But these phenomena may chiefly be caused by soluble non-tannins in the tannin solution, the charge distributions of basic chromium sulfates can often be changed by adding soluble non-tannins, but not by true tannins. From the facts, it is presumed that the formation of polyphenol chrome complexes cannot be a chief factor in the chrome vegetable combination tannage.

NOTES & NEWS

First Meeting of the Development Council for Leather, Leather Goods and Pickers Industries

The first meeting of the Development Council was held at New Delhi, on April 11, 1960. The chairman of the Council, Shri M. L. Khaitan welcomed Shri Manubhai Shah, Minister for Industry, members of the Council and other invitees who were present. Shri Manubhai Shah, Minister for Industry, inaugurated the Council's meeting. The following main suggestions/recommendations were made at the meeting.

(i) The need for greater co-ordination between the Development Council and the Khadi and Village Industries Commission, was felt and for this purpose, the appointment of a liaison body of the Council including representatives from Khadi and Village Industries Commission is under consideration.

(ii) The Council agreed that grading of hides was very important and decide to refer the matter to the Hides and Skins Sub-Committee of the Council to suggest necessary ways and means to introduce grading in the raw hide trade.

(iii) The council came to the conclusion that one of the main problems affecting the village and cottage workers was the marketing of the products and suggested that the Footwear and Leather-goods Sub-Committee should consider the aspect thoroughly and make recommendations for solving the problem.

(iv) The Council decided to appoint a number of Sub-Committees to study and make recommendations to the Council regarding the problems of the industry.

(v) Regarding the policy for the import of wattle extract, wattle bark and other tanning materials for the licensing period April-September 1960, two alternative recommendations were made by the Council, viz.,

(a) (i) There should be provision for the units licensed/registered under the Industries (Development and Regulation) Act, to make Actual Users applications to the Development Wing;

(ii) Since the opinion amongst the East Indian Tanners of Madras was divided it was recommended that the E. I tanners should make an agreed proposal for the consideration of the Government;

(iii) there should be Actual Users provision for units which are not covered under (i) and (ii) above;

(b) to go back to the policy in force in the previous period, viz., to fix established importers quota on 90 per cent with Actual Users provision.

The Council preferred the second alternative. (Ministry of commerce and Industry have issued public Notice No. 50-ITC (PN/)/60 dated 19-4-60 which gives effect to the second alternative suggested by the Council).

(vi) The Council took note of the announcement that there would be a 50% cut in the export quota of raw goatskins from June 1, 1960. The Council cautioned against a sudden and drastic cut in the export quota of raw goatskins. The Council decided to defer further consideration of the matter pending clarification by the Government on the number of raw goatskins involved in the proposed 50% cut.

(vii) The Council reiterated its previous recommendation that a productivity team for leather industry should be sent to foreign countries under the T.C.M. Programme at a very early date.

(viii) In order to bring to the notice of all interested, the decisions taken by the Council, it was decided that a summary of the main recommendations might be drawn up and released to the public after each meeting of the Development Council.

In his welcome speech, Shri Khaitan mentioned how Shri Manubhai Shah was instrumental in raising the Leather Panel to the status of a Development Council. The assignments of the Council, added Shri Khaitan were vast and varied; they had to advise, if asked to, on any matter relating to the leather industry, other than remuneration and conditions of employment. After surveying the various recommendations made by the Panel, Shri Khaitan laid down the following as matters which merited the special attention of the First meeting of the Council: (1) export quota in respect of raw and pickled goatskins, (2) importers quota in respect of wattle bark and extract, (3) effect of the European

trade arrangements in the shape of the Common market of the "Inner-six" and the free trade arrangement of the "Outer-seven" and (4) the suggestions made at the Symposia at Madras and at Bombay.

In his inaugural speech, Shri Shah referred to the good work done by the Panel and hoped that the Development Council also would be able to give a good account of itself. Continuing, Shri Shah said that the indigenous production of hides was inadequate to meet the demands of the tanning industry, which had been working, in certain sectors, well below its installed capacity. The country was utilising internally about 70% of the hides for the manufacture of footwear and other leather goods leaving an exportable surplus of about 30%. With prospective increase in internal demand for leather and leather goods, if the present level of exports of tanned hides was to be maintained, steps would have to be taken to collect, preserve and process all the hides available indigenously. Also the rigours of anti-slaughter policy would have to be mitigated to some extent. Shri Shah stated that greater attention would have to be given to chrome tanning since practically all the chemicals required for this were available indigenously.

Shri Shah remarked that the bulk of the production of the tanned hides and skins and footwear came from the cottage and small scale units. Reliable statistics relating to these were not available. So the matter of conducting a survey of leather and leather goods industries in all the sectors had been referred as recommended by the Panel, to the National Council for Applied Economic Research. Attention would have to be paid to the productivity and modernisation aspects of the industry. The sending of a Productivity team in leather under the T.C.M. Programme to various countries was contemplated.

Adverting to leather footwear, Shri Shah said that the export target of 2 million pairs of footwear fixed under the Second Plan had already been exceeded. The export target of 4-5 million pairs, recommended by the Panel, for the Third Plan period was being considered. If greater attention was given to improve the quality and to introduce styles and patterns which catered to the fashions of the export markets, exports during the Third Plan period might exceed the target. The production of footwear in the Third Plan period was to be increased from 102 million pairs in 1960-61 to 153 million pairs by 1965-66.

With world-wide demand for leather increasing and production remaining steady, it would be advisable to put leather to the best possible use, consistent with its special characteristics and to use the substitutes to the extent necessary.

Our export trade in tanned hides and skins and leather articles brought us a foreign exchange of Rs. 25 crores per year. The import bill towards auxiliaries worked out to Rs. 4-5 crores per year. It was therefore planned to see that during the next few years, the leather and leather goods industries would be able to obtain most of their requirements from indigenous sources.

Concluding, Mr Shah hoped that the Development Council would play a useful role in ensuring a continued growth and development of the leather and leather goods industries.

Development of Forest Wealth

The third annual conference of Forest Officers of the Madras State was inaugurated by Mr. M. Bhaktavatsalam, Home Minister in charge of forests, at the Southern Forest Rangers' College, at Coimbatore. Mr. C. A. R. Badran, Chief Conservator of Forests, welcoming the Minister and Forest Officers, surveyed the progress of forest development during the First and Second Plan periods and the targets for the Third Plan period. Mr. Badran said that during the Second Plan period, the Madras Forest Department had incurred an expenditure of Rs. 130 lakhs in implementing its development plans. In Nilgiris, waste land had been brought under wattle bark cultivation, which was most used for production of paper pulp and rayon. Their target was 45,000 acres under these crops and a considerable part had been planted in the Second Plan period. The total expenditure they proposed to incur during the Third Plan period was Rs. 3 crores.

Inaugurating the conference, Mr. Bhaktavatsalam said that trees took a long time to mature but advances in technology were rather very rapid now-a-days. The Forest Officers must, therefore, accelerate the growth and improve the quality and quantity of forest products by adopting the latest methods or utilising the latest plant hormones and other growth inducing products. "Your aim should be to induce the continued use of forest products by the public making them available in plenty and within the economic reach of the common man".

Mr. Bhaktavatsalam referred to the successful introduction of exotics like wattle, cashew, prosopis and blue gum and expressed

the hope that the Forest Officers would soon perfect a technique in raising new exotics. In this connection, he made a special reference to the suggestion of Dr. Von Monroy, F.A.O. expert on forest industries, to introduce tropical pines in the plains of the State, mainly to meet the demands of cellulose industries and for manufacturing packing cases.

The Hindu—dated May 4 & 5, 1960.

Exports to U. K. in April, 1960

The following are the details (figures in bales) of exports to U.K. during April 1960: cow hides 2,574, cow calf 236, buff hides 30, buff calf 442, goat skins 806 and sheep skins 475.

The Hindu—dated May 16, 1960.

Animal Diseases

India faced with new threat

India is now threatened with the outbreak of two animal diseases, "Horse Sickness" and "Blue Tongue" from Pakistan, where they have already taken a heavy toll. Horses, donkeys and mules are susceptible to horse-sickness, while blue-tongue affects sheep. Both are of South African origin and horse-sickness spread both in West Pakistan and Afghanistan, and the former holds that the disease was brought to Pakistan through Afghanistan.

The Hindu—dated May 26, 1960.

Rise in Indian Leather and Hide Exports

Although India's over-all trading balance shows a sharp increase in imports during the period January to October 1959, exports of leather rose by about 53 per cent over the corresponding period in 1958, and those of hides and skins by nearly 49 per cent.

Leather Trades Review—March 16, 1960.

Dutch to Equip Leather Training Centre in India

The Netherlands Government is sponsoring four projects under U.N. auspices, in India, Libya and Greece.

The projects include the supply of equipment for a training centre in India for the processing of hides and leather, including the help of three instructors for a period of three years.

Leather Trades Review—March 23, 1960.

Ceylon Lifts Restrictions on Buffalo Hide Exports

Sir Razik Fareed, Ceylon Minister of Trade and Commerce, has asked the Department of Industries to lift the export restrictions on buffalo hide exports.

Restrictions were originally imposed to protect buffaloes from mass slaughter and to retain more for the local leather industry.

Leather Trades Review—March 30, 1960.

Calcutta Shipment of Raw Goatskins, Jan.-Feb., 1960

The following were the shipments of raw goatskins from Calcutta during January and February this year, with comparative figures during the same period last year:

	1960 000's	1959 000's
United Kingdom	45	30
W. Germany	.. 276	136
Italy	.. 100	248
Other Continental Ports	.. 11	44
Russia and other Iron Curtain countries	.. 2,655	1,715
U.S.A.	.. 60	360
Total	.. 3,147	2,533

Leather Trades Review—March 30, 1960.

I.C.I. Step Up Anti-Leather Mould Agent Output

I.C.I. are stepping up production of "Topane" and "Topane WS", their brands of ortho-phenylphenol and sodium orthophenylphenate disinfectants and preservative agents.

They are, it is claimed, potent disinfectants and agents for the prevention of mould and fungal attack in a broad range of materials, including leather. It is also claimed that they are efficient at economically low concentrations and are practically odourless.

"Topane" can be applied in a practical manner by solution in organic solvents and in animal and vegetable oils.

Leather Trades Review—April 20, 1960.

New Zealand to Import More Leather

The New Zealand Customs Department has announced additional import licensing provisions for the following: Under schedule 1(b), amendments to the schedule of allocations, the revised allocations for leather, viz., crust or rough tanned, code 200-1, have been increased from 100 per cent 1959 licenses same goods to 150 per cent 1959 licenses same goods, and goat kidskin leather declared by a manufacturer, etc., code 200-25, increased 100 per cent 1959 licenses to 120 per cent 1959 licenses.

Other revised allocations include those for gloves and mittens composed wholly or principally of leather (other than work gloves), code 136-41. These increased from 100 per cent 1959 licenses to 120 per cent 1959 licenses.

Leather Trades Review—April 20, 1960.

ISI Specifications

Brushes, Paints and Varnishes, Flat

The ISI will shortly be issuing the draft specification for brushes, paints and varnishes, flat (Doc: CDC 32 (1121) (draft revision of IS:384-1954) for wide circulation to all interests concerned for eliciting technical comments. The Indian Standard Specification for brushes, paints and varnishes, flat was originally issued in 1954. It adequately covered the basic requirements of brushes manufactured at that time including the special preference of Indian Railways for brushes set in vulcanized rubber cement for which an optional clause providing for agreement between the purchaser and the supplier had been given. The revised draft standard retains all the essential features of the original specification. However, it takes into consideration all the pressing comments of indigenous manufacturers to modify certain tests for bristles; requirement for weight of bristles to be used for each size of brush; timber to be used for handles and other details of workmanship and finish; and incorporates in itself all the necessary changes. Also, with a view to making the standard more useful, the clause on terminology has been expanded.

Vegetable Tallow

The ISI is shortly issuing draft Indian Standard Specification for Vegetable tallow (Doc: CDC 4 (1034) to all interests concerned with a view to eliciting comments. In the sizing of cotton warp, mutton tallow is generally used as a softener and lubricant. Substitutes of mutton tallow of a vegetable origin have been used

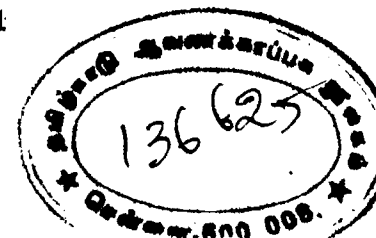
in this country for many years. Restricted imports of mutton tallow and its inadequate indigenous production of suitable quality have given further impetus to the production of vegetable substitutes. The draft specification prescribes the requirements and methods of test for only the solid type of vegetable tallow used in textile industry for sizing. It does not cover liquid vegetable products used for sizing.

Testing of Quick Lime and Hydrated Lime

The Indian Standards methods of sampling and test for quick lime and hydrated lime (IS:1514-1959), published recently by ISI, prescribes the methods of sampling and test for quick lime and hydrated lime used for softening water and in various chemical industries for the manufacture of calcium carbide, paper, glass, sugar, grease, bleaching powder and in the tanning of leather. It covers the methods of determining carbonate, volatile matter at 105°C, loss on ignition, available lime, insoluble matter, iron oxide, alumina, total calcium oxide, magnesium oxide, sulphates and dead burnt lime. Screen analysis of the material is also prescribed. This standard does not deal with materials but specifies the methods for determining whether they comply with the requirements of individual standards. Quick lime and hydrated lime are among the most widely used raw materials in the chemical industry. Owing to the diversity of sources and variations in the practice of manufacture and storage, there exists a considerable variation in the quality of lime. Since the consumption of lime has increased enormously, the industries require a standardized raw material to produce quality products. It has, therefore, been felt that a standard method of sampling and test for lime will be helpful in assessing the various types of lime for different purposes. The standard published in English is priced at Rs. 3=00.

Anti-Corrosive Paint

The Indian Standards Institution has published IS:1404-1959 Specification for Anti-corrosive paint, brushing for ships' bottoms and hulls, red, chocolate or black, as required. The standard prescribes the requirements and the methods of test for the material commercially known as anti-corrosive paint for ships' bottoms and hulls normally used as a primer over ships' steel bottoms and hulls and overpainted with a compatible anti-fouling finishing paint. Anti-corrosive paints for ships' bottom offered by the trade are of varying compositions. Government's requirements have all



along been mainly met by DGS & D Specification No. G/P-307/273 Anti-corrosive red paint for ships' bottom. With the building up of naval vessels in the country, it has been felt that an adequate and improved Indian standard has to be prescribed covering both performance and composition requirements. The standard published in English is priced at Rs. 2=00.

Classification of Dangerous Goods

The ISI has recently published IS:1446-1959 "Classification of dangerous goods" which classifies the goods according to the principal hazards involved. The category of goods which are dangerous to handle, has substantially widened in recent years owing partly to the enormously increased use of these goods and partly to a steady flow of new products to the market made available through progress in chemical research. Such dangerous goods are now of very great and increasing importance in economic activity as well as to national and international traffic. It is very necessary to regulate the transport of these goods in order to prevent them, as far as possible, from causing accidents to persons and damage to means of transport employed or to other property. The standard published in English is priced at Rs. 5=00.

Chemical Test for Industrial Water

The draft Indian standard "Methods of test (chemical) for industrial water" Part I)Doc: CDC 26(1134) has recently been prepared by the ISI, covering methods of tests for total alkalinity and alkalinity to phenolphthalein, total hardness and non-carbonate and carbonate-hardness, excess alkalinity, total acidity, mineral acidity, sulphates, phosphates, flourides, chlorides, bromides and iodides, cyanides, boron and selenium. This draft standard has been prepared to guide water testing laboratories in testing industrial water, though some of the methods prescribed may be applicable to sea water, sewage and trade effluents also; these have not been specifically covered. The draft standard is being circulated for eliciting technical comments to producers, consumers, technologists and other interests concerned. The last date for the receipt of these comments is 26th July, 1960.

Copies of the draft standards (free on request) and other priced publications are available from the office of the Indian Standards Institution, 'Manak Bhavan', 9 Mathura Road, New Delhi-1 and from its branch offices located at Bombay, Calcutta and Madras.

C. L. R. I. NEWS

Dr. Y. Nayudamma, Director, Central Leather Research Institute, held discussions with the Andhra Pradesh High Power Committee for development of leather industry at Hyderabad on May 17 & 18, 1960; attended the Selection Committee meeting at New Delhi on May 15, 1960.

Dr. S. K. Barat, Assistant Director, attended the Madras State Forest Utilisation Advisory Board Meeting at Ootacamund on May 9, 1960.

Mr. A. Ganesan, Senior Scientific Officer, attended the Leather Belting Sub-Committee meeting of the Indian Standards Institution (CDC 42:2) held at Calcutta on May 6 & 7, 1960.

RESEARCH PROGRAMME 1960-61

Central Leather Research Institute

The Central Leather Research Institute was set up in the year 1953 for the advancement and dissemination of leather science and for the elevation of the Indian Leather Industry. It concerns itself particularly with the application of science to the leather industry that exists at various levels, viz., large, small and cottage scale.

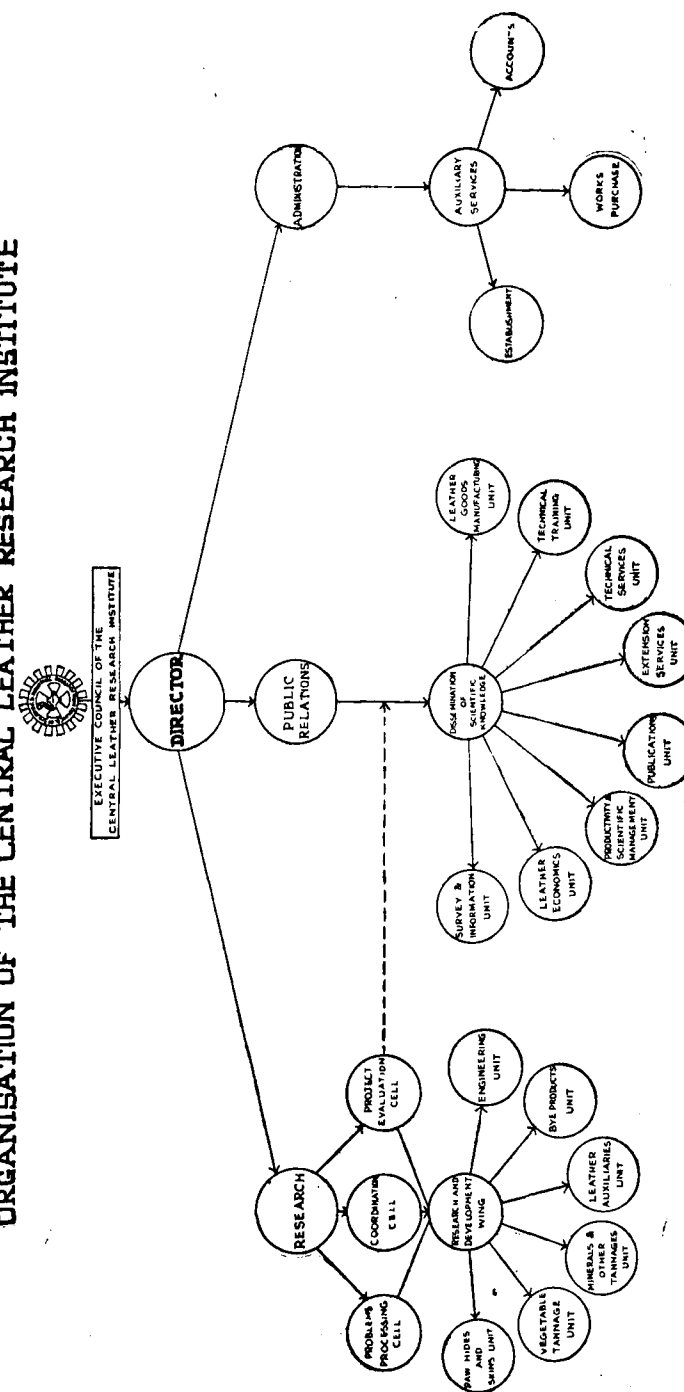
The problems that face the industry are collected from time to time through visits, enquiries and keeping in close touch with the industry and its activities. The problems are listed as they come from different sources and given an order of priority. Based on this priority, the research programme is planned for the year, to solve the problems and serve the immediate needs and demands of the industry.

The number of research problems undertaken for study is a few. Each problem is tackled by a team or teams of research workers of various schools of thought; concentrated and combined effort is put in for a speedy solution of the problem undertaken. Thus the research problems are undertaken as units and the objectives and the work of each unit are well-defined and the men, materials and money required for each unit are precisely known. Each unit is headed by a leader—by training, temperament and ability. The progress of the work of each unit is evaluated from time to time by outside experts in the field and their criticism is conveyed from time to time to the research team for their further guidance.

A good amount of collation, correlation and co-ordination of the work within the Institute and the work conducted in outside organisations is also essential for the successful and speedy implementation of the programme.

The results of the laboratory researches are to be translated and processes developed, ready for immediate commercial exploitation. The knowledge so obtained is to be effectively disseminated into the industry through the various units of the dissemination wing.

ORGANISATION OF THE CENTRAL LEATHER RESEARCH INSTITUTE



The job of the Director is thus clear. He is the director of research, a public relations man and an administrator. The research programme and the organisational set-up for the effective implementation of the Institute's programme for the year 1960-61 are detailed hereunder.

Problems Processing Cell

The problems that face the Indian Tanning Industry are first to be collected. The Information and Survey Unit, the extension staff and the tanner-visitor that come to the Institute would be in a position to offer the problems that face the industry. All the research staff are expected to transmit any problems that may be of interest to the industry, to this Cell. The problems so collected are listed together and processed by this Cell in the order of priority to be undertaken by the research teams. This Cell for this year will consist of:

Dr. S. K. Barat (*Chairman*),
Dr. S. N. Sen,
Mr. P. S. Venkatachalam,
Mr. A. Ganesan,
Dr. D. Ramaswamy,
Mr. M. A. Ghani and
Mr. N. Subramanian (*Secretary*).

Co-ordination Cell

Researches are presently being conducted at this Institute in co-operation and collaboration with the many outside organisations such as Defence Science Organisation, Forest Research Institute, Leather Export Promotion Council etc. This Cell will work directly under the Director. The problems that arise from these outside organisations will be transmitted to the team or teams of research workers.

Project Evaluation Cell

The results of the researches from the various Units and teams of research workers will be evaluated from time to time. This Cell will consist of a leading tanner as Chairman, and one tanner and one or two scientists on invitation depending upon the nature of work to be evaluated, with the Director as the Secretary. The comments of this cell will be communicated back to the research teams for further guidance.

I. Raw Hides and Skins Unit

Object:

The major problems that face the Indian tanner today are paucity of hides and deterioration in the quality of hides and skins. Researches are, therefore, geared to improve this existing position. This research unit will collect representative and reliable samples of hides and skins and also the information on the conditions and practices in the various regions of India, with a view to improve on the existing practices of preservation and drying and to develop methods for making better leather from them. Personnel from varied schools of thought will work together as a team to achieve this object and the work is distributed as follows:

Research Team:

Dr. S. N. Sen (*Leader*)
Dr. Y. Nayudamma
Dr. S. M. Bose
Mr. S. K. Mitra
Mr. P. S. Venkatachalam
Mr. S. C. Nandy
Mr. B. C. Basu
Dr. R. Bhaskaran
Dr. W. Madhavakrishna
Dr. K. T. Joseph
Dr. N. U. Rao
Mr. S. K. Sarkar
Mr. D. K. Das
Mr. S. C. Dhar
Mr. E. C. George
Mr. T. S. K. Mahadevan

Research Projects:

1. Surveying and sampling:

Survey of the existing conditions and practices in the various regions of India and collection of representative and reliable samples of hides and skins from animals, dead and slaughtered, and study of the effect on the quality of raw hides and skins, of various factors, such as feed, breed, sex, age etc. and damages due to insects, pests and diseases: it is proposed to take up Andhra Pradesh, for this year.

R. Bhaskaran.

2. Histological Studies:

2.1. Histological studies of the samples of hides and skins collected from Bihar and Andhra Pradesh.

S. K. Mitra, S. K. Sarkar & D. K. Das.

2.2. Histological studies of reptile and fish skins.

S. K. Sarkar & S. K. Mitra.

2.3. Preparation of a Histological album of hides and skins.

S. K. Mitra, S. K. Sarkar & D. K. Das.

3. Biochemical Studies:

3.1. Biochemical studies with particular reference to protein and lipid constituents of the hides and skins collected from Hyderabad and Bihar regions.

K. T. Joseph & S. M. Bose.

3.2. Studies on bio-synthesis and metabolism of collagen.

K. T. Joseph & S. M. Bose.

3.3. Structural amino acid sequence in collagen.

K. T. Joseph & S. M. Bose.

3.4. Studies on interchain linkages in collagen.

K. T. Joseph & S. M. Bose.

3.5. Specificity of certain enzymes, capable of hydrolysing collagen and other skin proteins.

S. C. Dhar & S. M. Bose.

4.0. Studies on preservation of hides and skins.

(a) Curing trials with newer antiseptics in admixture with common salt.

(b) Solvent dehydration.

S. C. Nandy, S. N. Sen & Y. Nayudamma.

5.0. Bacteriological Studies:

5.1. Bacteriological studies of hides and skins collected from Andhra Pradesh and Bihar.

S. C. Nandy, E. C. George & S. N. Sen.

5.2. Isolation and identification of microorganisms from raw hides and skins collected.

N. U. Rao.

5.3. Isolation and identification of the pigments of halophilic bacteria.

S. C. Nandy & S. N. Sen.

6.0. Defects in hides, skins and leather.

6.1. Investigations on the "rainy season defects" (Weather rot) in skins.

S. N. Sen & S. C. Nandy.

6.2. Rendering skins from animals dead of infectious diseases innocuous in handling, without affecting the leather making property.

S. N. Sen, R. Bhaskaran, S. C. Nandy & E. C. George.

6.3. Studies on insect damages to stored hides and skins and their prevention by insecticides.

R. Bhaskaran & S. N. Sen.

6.4. Prevention of mold growth in leather and testing the same for mold resistance.

R. Bhaskaran & S. N. Sen.

7. Leather making properties:

7.1. Leather making properties of the hides and skins collected from Bihar and Andhra Pradesh.

P. S. Venkatachalam & Y. Nayudamma.

7.2. Leather making properties of hides and skins not yet commercially exploited, e.g., shark skin and frog skin etc.

T. S. K. Mahadevan, P. S. Venkatachalam & Y. Nayudamma.

8.0. Aging properties of raw hides shipped from abroad vis-a-vis the lowering of their tensile strength

R. Bhaskaran & B. C. Basu.

II. Vegetable Tannage Unit

Object:

The vegetable tanning industry constitutes the major part of the Indian Leather Industry. This covers the E. I. tanning of skins and hides, sole leather manufacture by the pit and bag tannages and manufacture of some heavy and industrial leathers. The problems that face this industry are:

(a) Dependence on imports of some major tanstuffs and better utilisation of the indigenous vegetable tanning materials.

(b) Lack of fundamental knowledge and understanding about the constitutional make up of the important indigenous vegetable tanning materials.

(c) Studying the principles of vegetable tannage of heavy and light leathers.

(d) Modifying the existing processes and developing newer ones with a view to reduce the cost of tanning and improve the quality of the leathers.

(e) Finding newer uses for the tanned leathers.

For the better utilisation of indigenous tanstuffs, a systematic survey in co-operation with other organisations, of the availability and steady supply of the tanstuffs, an intensive fundamental study on the abundantly available tanning materials for making them self-sufficient tanning agents and their practical use in tannig have to be taken up in detail. Research is geared to achieve these objects as outlined above. The research personnel of various schools of thought will undertake this work as shown below:

Research Team :

Dr. S. K. Barat (*Leader*)
Dr. Y. Nayudamma
Dr. S. N. Sen
Dr. S. M. Bose
Mr. A. Ganesan
Mr. S. K. Mitra
Dr. D. Ramaswamy
Dr. K. N. S. Sastry
Dr. E. C. Mathew
Mr. P. S. Venkatachalam
Mr. J. B. Rao
Mr. J. C. Deb
Dr. R. Selvarangan
Mr. B. C. Basu
Mr. S. C. Nandy
Dr. W. Madhavakrishna
Mr. T. S. Krishnan
Mr. K. Rajabather Mudaliar
Mr. K. J. Scaria
Mr. M. A. Rama Iyer
Mr. S. Banerjee
Mr. S. P. Ghosh
Mr. V. S. Krishnamurthy
Mr. P. S. Santhanam
Mr. T. Vijayaramayya
Mr. K. Udai Bhanu
Mr. E. C. George
Mr. S. Anantanarayanan
Mr. S. Bangaruswamy
Mr. D. H. Kamath
Mr. K. Krishna Reddy
Mr. K. R. V. Thampuran
Senior Laboratory Assistant

Research Projects :

1. Survey of the availability of the tanstuffs in the various regions of India.

(a) Work is being undertaken in collaboration with the Conservators of Forests of the various states, Forest Research Institutes and other institutions for the collection and preliminary analysis of authentic indigenous samples of tanstuffs for studying the effects of various factors such as age, soil, climatic conditions, methods of collection, handling, drying, storage and transport, etc. on the quality of tannins.

Senior Laboratory Assistant, J. B. Rao & Y. Nayudamma.

(b) Assessing promising substitutes for wattle, from indigenous tanstuffs and working out suitable processes for their full utilisation.

E. C. Mathew & K. R. V. Thampuran.

(c) Microscopical examination of Indian vegetable tanning materials, babul and avaram.

S. K. Mitra.

2. Intensive studies on some of the abundantly available tanning materials so as to improve their tanning characteristics. Active research is also undertaken to make myrobalans and divi-divi, self-sufficient tan materials.

2.1. Organic chemistry of vegetable tannins: Study on the isolation, purification and constitution of tannins of dhawa, avaram, divi-divi and babul.

K. N. S. Sastry, J. B. Rao, K. Udai Bhanu, K. K. Reddy & Y. Nayudamma.

(The purified components of each system are made available to the other teams of workers).

2.2. Studies on biogenesis of vegetable tannins of myrobalan, dhawa, avaram, divi-divi and babul.

K. N. S. Sastry, J. B. Rao & Y. Nayudamma.

2.3. Effect of plant hormones on the tannin bearing plants.

K. N. S. Sastry, J. B. Rao & Y. Nayudamma.

2.4. (a) Separation of tannins and non-tannins and further fractionation of their constituents by physico-chemical methods.

(b) Studies on certain physico-chemical characteristics such as molecular size, molecular weight, degree of hydration, charge etc. of vegetable tannins and their fractions.

K. J. Scaria & S. K. Barat.

2.51. Affinity of tannins and their fractionated polyphenolic constituents for protein substrates and their stability with special reference to mechanism of tannage.

K. J. Scaria & S. K. Barat.

2.52. Studies on the nature of reaction of some of the principal Indian vegetable tannins with various forms of proteins and non-protein substrates with particular reference to the stability of the various tanned products against specific denaturing agents.

P. S. Santhanam & S. K. Barat.

2.6. Application of instrumental tools such as spectrophotometry, polarography, and non-aqueous titration technique, etc. for the study of the various fractions obtained from Project 2.1.

D. Ramaswamy, S. Anantanarayanan & Y. Nayudamma.

2.7. Nature of tannins in myrobalan and its potentiality as a self-sufficient tanning material.

P. S. Santhanam & S. K. Barat.

2.8. Studies on the enzyme system of avaram, babul, konnam, divi-divi, myrob and dhawa.

W. Madhavakrishna & S. M. Bose.

2.9. Studies on fungi in tan liquors.

2.91. (a) Isolation and identification of species of *Aspergilli* and *Penicillia* growing in vegetable tan liquors.

(b) Physiological studies—effect of pH and tannin concentration on the growth of the above fungi in myrob and wattle extract.

V. S. Krishnamurthy & S. N. Sen.

2.92. Studies on the utilisation of tannin and non-tannin phenolic constituents of the tan liquors and the corresponding growth of fungi therein.

V. S. Krishnamurthy & S. N. Sen.

2.93. Studies on the growth of *Aspergilli* in tan liquors in the presence of fungicides.

V. S. Krishnamurthy, E. C. George & S. N. Sen.

3.0. Vegetable tannin extracts:

3.1. Study on the manufacture of vegetable tannin extracts from the indigenous tanstuffs, alone or in blends. The optimum conditions for leaching and for manufacture of extracts should be studied in detail and the work to be undertaken on a pilot plant scale based on the available results.

R. Selvarangan & Y. Nayudamma.

3.2. Uses of vegetable tannin extracts for purposes other than tanning, viz., for use in boiler compounds, antirusting compounds, resins, finishes etc.

R. Selvarangan & Y. Nayudamma.

4. Nature of tannins in arecanut.

S. Banerjee & Y. Nayudamma.

5.0. Studies on principles of tannages:

5.1. Studies on the principles of heavy and light leather vegetable tannage with special reference to indigenous oak and kaphal.

P. S. Santhanam, K. Rajabather Mudaliar & S. K. Barat.

5.2. Studies in E. I. Tanning.

D. H. Kamath, R. Selvarangan & Y. Nayudamma.

6. Modification of the existing processes with a view to reducing the cost of tanning and improving the quality of leathers.

6.1. Rapid tannage of sole leather.

T. Vijayaramayya, K. Rajabather Mudaliar & Y. Nayudamma.

6.2. Trying out various indigenous tanning materials in vegetable tanning.

T. Vijayaramayya, K. Rajabather Mudaliar & Y. Nayudamma.

6.3. Improvements in bag tanning process.

S. P. Ghosh, A. Ganesan & Y. Nayudamma.

7.0. Finding newer uses for the leathers.

Dressing of E.I. leathers—kips for upper and skins for semi-chrome, semi-alum glazed kid leathers, with special reference to the use of basic aluminium sulphate.

J. C. Deb, T. S. Krishnan, M. A. Rama Iyer & P. S. Venkatachalam.

8. Effect of ageing on vegetable tanned leathers such as belting.

B. C. Basu.

9. Methods of correcting undertanning in the neck portion in vegetable tanning of dry buff hides from Singapore. Removal of defects caused by growth marks on leathers made from dry imported buff hides.

S. C. Nandy & P. S. Venkatachalam.

10. Dyeing vegetable tanned leather without bleeding.

T. S. Krishnan & P. S. Venkatachalam.

III. Mineral and Other Tannage Units

Object :

To study the complex nature of mineral and other tanning agents, to develop newer tanning agents, to study the mechanism of their tannages and to modify the existing processes for the manufacture of the same. The work is distributed as follows :

Research Team :

Dr. Y. Nayudamma (Leader)
Mr. A. Ganesan
Dr. D. Ramaswamy
Dr. N. Ramanathan
Mr. M. A. Ghani
Mr. S. K. Mitra
Dr S. M. Bose
Mr. P. S. Venkatachalam
Dr. R. B. Hajela
Dr. R. Selvarangan
Dr. T. S. Ranganathan
Mr. J. B. Rao
Mr. J. C. Deb
Mr. S. N. Bose
Mr. B. C. Basu
Dr. K. T. Joseph
Mr. K. Rajabather Mudaliar
Mr. K. S. Jayaraman
Mr. S. K. Sarkar
Mr. D. B. Mukherjee
Mr. T. J. Devassy
Mr. M. A. Rama Iyer
Mr. S. P. Ghosh
Mr. T. S. K. Mahadevan
Mr. D. K. Das
Mr. A. Parthasarathy
Mr. G. N. Hore
Mrs. V. V. Subbalakshmi
Mr. S. Anantanarayanan
Mr. C. Koteswara Rao
Mr. S. Bangaruswamy
Miss S. C. Sumathi
Mr. R. S. Ghosh.

Research Projects :

1.0. Chemistry of the complex nature of chrome, aluminium and zirconium salts.

S. C. Sumathi, C. Koteswara Rao, S. Anantanarayanan, A. Parthasarathy, T. J. Devassy, K. S. Jayaraman, T. S. Ranganathan, D. Ramaswamy & Y. Nayudamma.

2. Study on the combination tannages.

2.1. Aluminium-vegetable.

C. K. Rao & Y. Nayudamma.

2.2. Zirconium-vegetable.

T. S. Ranganathan & Y. Nayudamma.

2.3. Syntan-vegetable.

D. B. Mukherjee.

3. Study on oil tannages.

3.1. Fish oil tannage.

K. S. Jayaraman, J. C. Deb & Y. Nayudamma.

3.2. Tannages with sulphochlorinated oils.

K. S. Jayaraman, D. Ramaswamy & Y. Nayudamma.

3.3. Combination tannages using oils with vegetable tannins.

K. S. Jayaraman, S. N. Bose & Y. Nayudamma.

4.0. Study on the syntans and their manufacture on pilot plant scale.

D. B. Mukherjee & M. A. Ghani.

5.0. Study in aldehyde tannages such as dialdehyde starch, glutaraldehyde etc.

K. T. Joseph, S. M. Bose & Y. Nayudamma.

6.11. Manufacture of industrial leathers: Belting, hydraulic and oil seal leathers.

T. S. K. Mahadevan & S. N. Bose.

6.12. Effect of ageing on the properties of picking bands made from chrome retan leathers.

B. C. Basu.

6.2. Manufacture of cycle saddle leather.

T. S. K. Mahadevan.

6.3. Scientific study of leathers used for water buckets.

G. N. Hore & A. Ganesan.

7.0. Manufacture of special types of leathers.

7.1. Manufacture of light leathers, particularly gloving leathers.

J. C. Deb, M. A. Rama Iyer, T. S. Krishnan & P. S. Venkatachalam.

7.2. Manufacture of leathers meant for sports goods: football leathers.

T. S. K. Mahadevan & A. Ganesan.

7.3. Improvements in chrome and chrome retan upper leathers.

S. P. Ghosh, S. N. Bose, J. C. Deb and P. S. Venkatachalam.

7.4. Manufacture of shrunken grain kid and side leathers.

R. S. Ghosh & J. C. Deb.

8. Correlation of chemical, physical, microscopical properties of leather and drawing standard specifications for Indian Standards Institution.

8.1. Physical and microscopical data.

N. Ramanathan & B. C. Basu.

8.2. Chemical data.

S. Bangaruswamy, R. Selvarangan & J. B. Rao.

9.1. Swelling, shrinkage and optical properties (birefringence) of untanned and tanned collagen.

V. V. Subbalakshmi, B. C. Basu, N. Ramanathan & Y. Nayudamma.

9.2. Affinity of leathers from different tannages for dye-stuffs.

R. B. Hajela.

10. Use of microscopy as analytical tool for the control of the process.

(a) Determination of degree of tannage.

(b) Detecting fallen hides.

S. K. Mitra, S. K. Sarkar & D. K. Das.

11. Finishing of leathers in oriental designs and screen printing.

A. Ganesan.

12. Preparation of heat resistant chrome leather for vulcanised shoes.

S. N. Bose and S. P. Ghosh.

13. Hides and skins for musical instruments.

K. Rajabather Mudaliar & J. C. Deb.

IV. Leather Auxiliaries Unit

Object :

A variety of auxiliary materials go into the finishing of leathers. A majority of these are at present being imported at great

cost. The variety and number of auxiliaries are large and the quantity consumed by the industry in each is little which militates against their manufacture in India economically on a large scale. Suitable methods, have, therefore to be developed for their manufacture, making use of the indigenous materials.

A fundamental study is also required on the reaction of these auxiliaries with protein for better appreciation of their properties and use. The research programme has been planned keeping these in view and work is distributed as follows :

Research Team :

Mr. M. A. Ghani (*Leader*)

Dr. Y. Nayudamma

Mr. A. Ganesan

Dr. N. Ramanathan

Dr. S. M. Bose

Dr. D. Ramaswamy

Dr. K. N. S. Sastry

Mr. P. S. Venkatachalam

Mr. J. B. Rao

Mr. G. Lakshminarayana

Dr. R. Selvarangan.

Mr. J. C. Deb

Dr. W. Madhavakrishna

Mr. K. S. Jayaraman

Mr. G. S. Rama Iyer

Mr. T. J. Devassy

Mr. T. K. Parthasarathy

Mr. V. R. Kishore

Mr. V. V. Muralidhara Rao

Mr. S. C. Dhar

Mr. V. V. Subramanian

Research Projects :

1.0. Fatliquors :

1.1. Studies on the preparation and use of cationic, anionic and nonionic fatliquors from (a) indigenous vegetable oils (Pinnay oil, tobacco seed oil, cocoanut oil, cotton seed oil), (b) fish oil and (c) synthetic leather oils.

V. R. Kishore, V. V. Muralidhara Rao, M. A. Ghani & Y. Nayudamma

1.2. Pilot plant manufacture of fatliquors.

V. V. Muralidhara Rao, V. R. Kishore & G. Lakshminarayana.

1.3. Exploratory studies on suitable substitutes for sperm oil and neat's foot oil using vegetable oils.

V. R. Kishore, M. A. Ghani & Y. Nayudamma.

2. Formulation and evaluation of leather finishes.

2.1. Water based finishes.

V. V. Subramanian, & M. A. Ghani.

2.2. Resin finishes.

T. K. Parthasarathy, M. A. Ghani, A. Ganesan & Y. Nayudamma.

2.3. Glossy finishes.

M. A. Ghani, A. Ganesan, T. K. Parthasarathy & Y. Nayudamma.

3.1. Study and preparation of natural and synthetic polymers for (a) impregnation and (b) finishing.

M. A. Ghani, J. B. Rao & Y. Nayudamma.

3.2. Impregnation of upper and other leathers with resin emulsions etc. to make them fire proof and/or for electrical insulation.

T. K. Parthasarathy & J. B. Rao.

4.1. Study and preparation of shoe polishes, stains and adhesives.

G. S. Rama Iyer, M. A. Ghani & Y. Nayudamma.

4.2. Preparing and testing shoe dressings, wetting cement etc.

G. S. Rama Iyer.

4.3. Pilot plant manufacture of polishes and adhesives.

G. S. Rama Iyer, M. A. Ghani & G. Lakshminarayana.

5. Preparation of chrome aluminium stearate complexes for shower-proofing of clothing leather.

T. J. Devassy, P. S. Venkatachalam & Y. Nayudamma.

6. Preparation of detergents from soap-nuts

V. R. Kishore, V. V. Muralidhara Rao & J. B. Rao.

7.1. Biochemical and physico-chemical properties of certain bates and depilatory enzymes.

S. C. Dhar & S. M. Bose.

7.2. Specificity studies on depilatory enzymes.

W. Madhavakrishna & S. M. Bose.

7.3. Pilot plant manufacture of enzymatic bates and unhairing agents.

S. C. Dhar, S. M. Bose & G. Lakshminarayana.

8. Study and preparation of synthetic leather oils on a pilot plant scale.

D. Ramaswamy & G. Lakshminarayana.

9.0. Manufacture of hide powder on a pilot plant scale

K. S. Jayaraman & G. Lakshminarayana.

10.0. Pilot plant manufacture of basic aluminium sulphate

R. Selvarangan, M. A. Ghani & G. Lakshminarayana.

11.0. Pilot plant manufacture of vegetable tannin extracts.

J. B. Rao & G. Lakshminarayana.

12.0. Testing and standardisation of leather finishes and finished leathers.

N. Ramanathan, T. K. Parthasarathy, V. V. Subramanian & M. A. Ghani.

13.0. Trying out leather auxiliaries of the CLRI on a large scale in the tannery.

P. S. Venkatachalam *et al.*

V. Bye-Products Unit

Object:

It is generally acknowledged that the profits of a tanner depend mainly upon the better utilisation of the bye-products. The Indian tanner has been treated as an untouchable, because of the obnoxious odour and the tannery effluents. Treatment of these effluents to avoid objectionable odour and colour is thus essential. Researches are geared to tackle these problems.

Research Team:

Dr. Y. Nayudamma (*Leader*)

Dr. S. K. Barat

Dr. S. M. Bose

Mr. G. Lakshminarayana

Mr. O. S. Davood

Mr. K. Radhakrishnan

Mr. M. Natarajan

Mr. D. R. Krishnan

Mr. J. Thabaraj

Research Fellows

Research Projects:

1.1. Manufacture of leather boards: (a) from chrome leather shavings, (b) from v/t leather trimmings, (c) in admixture with rags, jute etc. and (d) with vulcanisation.

K. Radhakrishnan & Y. Nayudamma.

- 1.2. Manufacture of leather boards on a pilot plant scale.
K. Radhakrishnan & G. Lakshminarayana.
2. (a) Salvaging, acid washing and bleaching and disinfection of tannery wool and goat hair.
(b) Some physical properties of tannery wool and hair—effects of cross linking treatments.
S. K. Barat.
3. (a) Utilisation of tannery offal, fleshings and hair for the recovery of amino acids.
M. Natarajan & S. M. Bose.
(b) Gut and surgical sutures from animal intestines and fish fin rays.
Research Fellow & S. K. Barat.
(c) Manufacture of gallic and tannic acids from myrobalan wastes of extracts factories.
Research Fellow & S. K. Barat.
(d) Studies on physico-chemical properties of glue and gelatin manufactured from indigenous raw materials.
D. R. Krishnan & S. K. Barat.
(e) Standardisation of curing, processing and sterilisation of intestines of cows, buffaloes etc. for the manufacture of sausage casings.
Research Fellow & S. K. Barat.
- 4.0. Tannery effluents—their treatment and disposal.
J. Thabaraj & S. M. Bose.
5. Leather goods from fancy leathers, split leathers etc.
O. S. Davood & Y. Nayudamma.

VI. Engineering Unit

Object :

This is an auxiliary unit for the various Research Units to assist the research teams in designing, preparing, setting up and servicing analytical tools and tanning machinery.

Research Team :

Dr. N. Ramanathan (*Leader*)
Mr. A. Ganesan
Dr. D. Ramaswamy
Mr. M. Thiruvengadam
Mr. T. Gopinath.
Mr. V. Madhavan.

Projects :

1. Planning and construction of buildings and providing necessary auxiliary services like light, current etc.
V. Madhavan & M. Thiruvengadam.
2. Setting up, upkeep and maintenance of the machinery and equipment in the tannery, work-shop and laboratories.
M. Thiruvengadam.
3. Design, development and construction of :
(a) Newer tools and instruments for research.
N. Ramanathan, T. Gopinath, D. Ramaswamy & M. Thiruvengadam.
(b) Newer tools and machinery for the leather industry.
M. Thiruvengadam & A. Ganesan.

VII. Dissemination of Scientific Knowledge

The Institute concerns itself particularly with the application of Science to the industry. It is therefore not enough to conduct research, but it is essential to disseminate the results of the research into the industry effectively and within the shortest period to put the leather industry on the lap of science. This work will be undertaken by the following different units.

VII. (1) Survey and Information Unit

Object :

- (1) To obtain the necessary statistics in regard to production, consumption, imports, exports of raw materials, leathers, leather goods and leather auxiliaries and to keep the research units posted with the current trends in the industry.
- (2) To disseminate the results of researches by (a) attending to technical enquiries, (b) holding symposia, 'Open Houses' etc. (c) by maintaining a Museum and participating in Public Exhibitions.
- (3) To co-operate with the other organisations like small scale industries, tanning institutes of the various states, Leather Export Promotion Council etc. in promoting the interests of the leather industry.

Team :

Mr. N. Subramanian (*Leader*)
Mr. A. Ganesan
Mr. K. Seshaganapathy Rao
Mr. V. A. Lakshmanan
Museum Assistant.

Projects :

- 1.1. Information and statistics.
N. Subramanian & K. S. Rao.
- 1.2. Preparation of (a) Annual Plan, (b) Monthly summary to the cabinet and (c) Replies to Parliamentary questions.
N. Subramanian.
- 1.3. Symposia, Open Houses etc.
N. Subramanian *et al.*
- 1.4. Technical enquiries.
K. S. Rao.
- 1.5. Visitors to the Institute.
K. S. Rao.
2. Press release and hand-outs.
N. Subramanian.
- 3.1. Maintenance and upkeep of Museum.
Museum Assistant.
- 3.2. Public Exhibition.
K. S. Rao.
4. Seminar for tanners :
To organise a meeting of tanners quarterly or half-yearly at a central place convenient to tanners when the experts of different schools of thoughts from the Institute could answer tanners' problems.
N. Subramanian & A. Ganesan.
5. Models and charts for Exhibition purposes at different levels.
 - (i) Schools and colleges.
 - (ii) Public Exhibition.
 - (iii) Scientific Exhibitions.K. Seshaganapathy Rao & V. A. Lakshmanan.
6. Survey of the existing uses of leathers in engineering, automobile and electrical industries.
N. Subramanian & K. Seshaganapathy Rao.

VII. (2) Extension Services Unit

Object :

The Extension Services Unit will visit the tanners all over India from time to time to study the conditions and to bring back the problems of the industry to the Institute. This unit will also arrange for practical demonstrations of the various processes worked out through research at the Central Leather Research Institute

at other regional tanning institutes and tanning centres. The country is now divided into four regions, viz., East, West, North and South and each region is looked after by a Senior Scientific Officer who is well conversant with the regional languages and regional tanning processes.

This Institute has been requested by the Tanners' Federation of India, Kanpur, to set up a regional centre of C.L.R.I. at Kanpur. The establishment of such regional field stations for C.L.R.I. at other places also is under active consideration. A similar unit will be set up at Assam.

Team :

Mr. A. Ganesan (*Leader*)
Dr. Y. Nayudamma
Mr. P. S. Venkatachalam
Senior Scientific Officers
Mr. T. S. Krishnan
Mr. W. N. Pandav
Mr. I. M. Patel.
Mr. M. A. Rama Iyer
Mr. G. N. Hore
Mr. T. Vijayaramayya
Mr. S. M. De
Mr. J. K. Khanna
Mr. S. P. Ghosh
Mr. L. M. Prasad

Projects :

1. Survey of the leather industry in the various provinces.
A. Ganesan & Y. Nayudamma.
- 2.1. Demonstrations at selected centres in the Bihar, Punjab, Uttar Pradesh, Bengal and Bombay States.
A. Ganesan *et al.*
- 2.2. Practical Demonstrations at C.L.R.I.
P. S. Venkatachalam *et al.*
- 3.0. Preliminary work regarding establishment of extension service centres at Agra, Kanpur, Calcutta and Bombay.
A. Ganesan.

VII. (3) Training Unit

Object :

To implement the results of researches, technical personnel suitably trained are required. Facilities are offered at this Institute

for training students for the B.Sc. (Tech.) Degree in Leather Technology and also for advanced training towards higher degrees. Refresher courses too are offered for practical tanners.

Team:

Dr. Y. Nayudamma (*Hony. Professor*)
 Dr. E. C. Mathew (*Hony. Reader*)
 Dr. S. N. Sen
 Mr. M. A. Ghani
 Dr. D. Ramaswamy
 Mr. S. K. Mitra
 Dr. S. M. Bose
 Dr. N. Ramanathan
 Dr. R. Selvarangan
 Dr. T. S. Ranganathan
 Mr. M. Thiruvengadam
 Mr. P. S. Venkatachalam
 Mr. T. S. Krishnan
 Mr. R. S. Ghosh
 Mr. K. R. V. Thampuran

Projects :

- 1 (a) Lectures.
 Y. Nayudamma, E. C. Mathew, S. N. Sen, M. A. Ghani, D. Ramaswamy, S. K. Mitra, S. M. Bose, N. Ramanathan, R. Selvarangan, T. S. Ranganathan & M. Thiruvengadam.
- (b) Laboratory work.
 E. C. Mathew & K. R. V. Thampuran.
- (c) Tannery work.
 R. S. Ghosh, T. S. Krishnan, P. S. Venkatachalam & R. Selvarangan.
- 1.2. Refresher courses for practical tanners.
 P. S. Venkatachalam.

VII. (4) Technical Service Unit

Duties :

- (i) Analysis of samples of water etc. for the industry and to assist the Information and Extension Units, in regard to such analysis.
- (ii) Routine analyses of raw and treatment materials, stores and pilot plant products.

(iii) Analysing samples on behalf of various organisations like the Indian Standards Institution, Leather Export Promotion Council etc.

(iv) Undertaking job works in the tannery for small scale tanners.

(v) To analyse samples of leather auxiliaries as obtained in the market in India and abroad so as to advise the tanner and technologist suitably.

(vi) To test pilot plant products.

(vii) To develop newer analytical methods.

(viii) To carry out studies with a view to furnishing the processes of leather manufacture and leather auxiliaries.

(ix) Preparation of standard solutions for all laboratories of the Institute.

Team :

Dr. R. Selvarangan (*Leader*)
 Mr. J. B. Rao (*Acting Leader*)
 Mr. K. J. Kedlaya
 Mrs. M. R. Mythili
 Mr. S. Bangaruswamy
 Mr. L. Seshagiri

Projects :

1. Analysis of leather, leather auxiliaries, waters, analysis of trade products, testing of stores-purchases, analytical work connected with Indian Standards Institution, development of newer analytical techniques—Preparation of standard solutions.

S. Bangaruswamy & M. R. Mythili.

2. Analysis and standardisation of pilot plant products and similar products from the industry.

L. Seshagiri.

3. Examination of tannery water and study of the role played by the salts present, in E.I. tanning from soaking to finishing. Development of an improved method of E.I. tanning based on the above knowledge.

D. H. Kamath.

4. Analysis of tanning materials from different sources and studies on the modification of myrobalan liquors by using different chemicals with a view to utilising myrobalans as a self-tanning material.

K. J. Kedlaya.

VII. (5) Publications Unit

Object :

Running the monthly Bulletin of the Central Leather Research Institute, publishing other bulletins, brochures, technical leaflets etc., maintaining the Library and providing all help to the research workers by way of library and translation services, in order to keep the research units posted with the current trends in leather technology and industry.

Team :

Dr. V. S. Padmanabhan (*Leader*)
Miss V. Swarnakamakshi
Mr. K. A. Ramaswamy
Asst. Editor (Hindi).

Functions :

1.1. Editing research papers and other matter for the Bulletin and publishing the Bulletin and such other publications.

V. S. Padmanabhan.

1.2. Printing of Tamil and Hindi Bulletins and Process Bulletins.

K. A. Ramaswamy & Asst. Editor (Hindi).

2. Library.

V. Swarnakamakshi & V. S. Padmanabhan.

3. Abstracting service.

V. S. Padmanabhan & Research staff of the Institute.

4. Translation service.

V. S. Padmanabhan, K. A. Ramaswamy & Asst. Editor (Hindi).

5. Preparation of Reports.

V. S. Padmanabhan.

6. Technical Seminars.

V. S. Padmanabhan.

VII. (6) Leather Economics Unit

VII. (7) Productivity and Scientific Management Unit

VII. (8) Leather Goods Manufacturing Unit

(Under formation)

Work to be initiated during this year.

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