

361

~~Records additions~~

~~Acquisition~~ ~~libraries~~

Bulletin of the
CLRI  Madras

Ap 1962

SL
m97, dm211m, NS4
N62.8.9
136643

Bulletin of The Central Leather Research Institute

VOL. VIII

APRIL, 1962

No. 9

CONTENTS

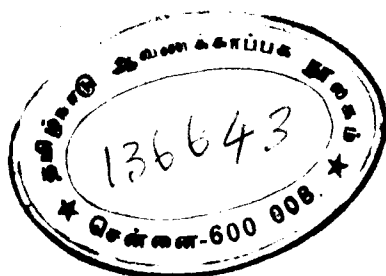
Comparative Studies on the Treatment of Tannery Effluents by Trickling Filter, Activated-sludge and oxidation pond systems	
—G. J. Thabaraĳ, S. M. Bose & Y. Nayudamma	.. 411
Research Bears Fruit: Vat tanning of white chrome sheep lining leathers by combination tannage	
—K. Rajabather, M. Mustafa & P. S. Venkatachalam	.. 431
Letter to the Editor—Tanning Materials of Afghanistan	
—K. J. Kedlaya & R. Selvarangan	.. 434
Technical Seminar: Leather Industry and Leather Research in Hungary, Yugoslavia and Czechoslovakia	
—T. J. Devassy	.. 436
Tanners' Corner	.. 441
Classified Abstracts	.. 442
Notes & News	.. 452
C.L.R.I. News	.. 458

Editorial Board :

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

Annual Subscription.—Rs. 9/- (inland); Rs. 18/- (foreign); Single Copy 75 nP.
The Bulletin of the Central Leather Research Institute is issued monthly.
Communications regarding contributions for publication in the Bulletin
books for review, subscriptions and advertisements should be made to the
Managing Editor, C. L. R. I., Madras-20.

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



LECHINOL[®] brand PIGMENT PASTE

LECHINOL[®] brand PIGMENT PASTE

LECHINOL[®] brand PIGMENT PASTE

LECHINOL[®] brand PIGMENT PASTE

USE

LECHINOL[®] brand PIGMENT PASTE

LECHINOL[®] brand PIGMENT PASTE

LECHINOL[®] brand PIGMENT PASTE

LECHINOL[®] brand PIGMENT PASTE

LECHINOL[®] brand PIGMENT PASTE

LECHINOL[®] brand PIGMENT PASTE

LECHINOL[®] brand PIGMENT PASTE

LECHINOL[®] brand PIGMENT PASTE

LECHINOL[®] brand PIGMENT PASTE

IT'S A  PRODUCT.

LECHINOL[®] brand PIGMENT PASTE

LECHINOL[®] brand PIGMENT PASTE

LECHINOL[®] brand PIGMENT PASTE

LECHINOL[®] brand PIGMENT PASTE

IMPROVE FINISH QUALITY WITH **PRIMAL**

Primal Binders. Water-soluble acrylic dispersions for pigment binding in all types of leather finishing. Clear, transparent, permanently flexible. Excellent mechanical stability and plating properties. Prevents crack in modern top finishes.

Primal Colors. Water-dispersed pigments containing no binder. Can be used with any binder formulation. Ideal for modern methods of shoe upper leather finishing.

OTHER ROHM & HAAS LEATHER CHEMICALS

Lutron—The original and standard synthetic bate.

Orotan—Complete line of acid and neutral syntans for white leather and pasted leather.

PRIMAL, LUTRON and OROTAN are trademarks, Reg. U. S. Pat Off. and in principal foreign countries.

Rohm & Haas Leather Chemicals Sold in India by:

Amritlal & Company (Pty.) Ltd.
11 Sprott Road, Ballard Estate
Box 256
Bombay 1, India

Rohm & Haas Leather Chemicals are manufactured in the U.S. by Rohm & Haas Company and in England by Charles Lennig & Company (GB) Ltd., London.

Chemicals  for Industry

**ROHM & HAAS COMPANY
PHILADELPHIA**

Washington Square, Philadelphia 5, Pa., U.S.A.



A wattle extract
of consistent
high quality
and low colour

Made from selected
Mimosa Wattle Bark

Distributed in India by

RALLIS INDIA LIMITED

BOMBAY MADRAS CALCUTTA

The India Leather Corporation Private Limited

"INDIA LEATHER MANSIONS"

G. P. O. Box No. 1516

No. 9, DAVIDSON STREET, MADRAS-1

Telegram: "TANDRIGHT"

Phone: 4491

PREMIER EXPORTERS OF E. I. TANNED SKINS & HIDES



Largest individual Foreign Exchange Earners in the Southern
Region

YEARLY EXPORTS EXCEED RUPEES TWO CRORES

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

GOAT SKINS
SHEEP SKINS

COW HIDES
BUFF HIDES

COW CALF
BUFF CALF

$\frac{P}{807}$
 $\frac{262}{}$

Bulletin of
The Central Leather
Research Institute
Madras

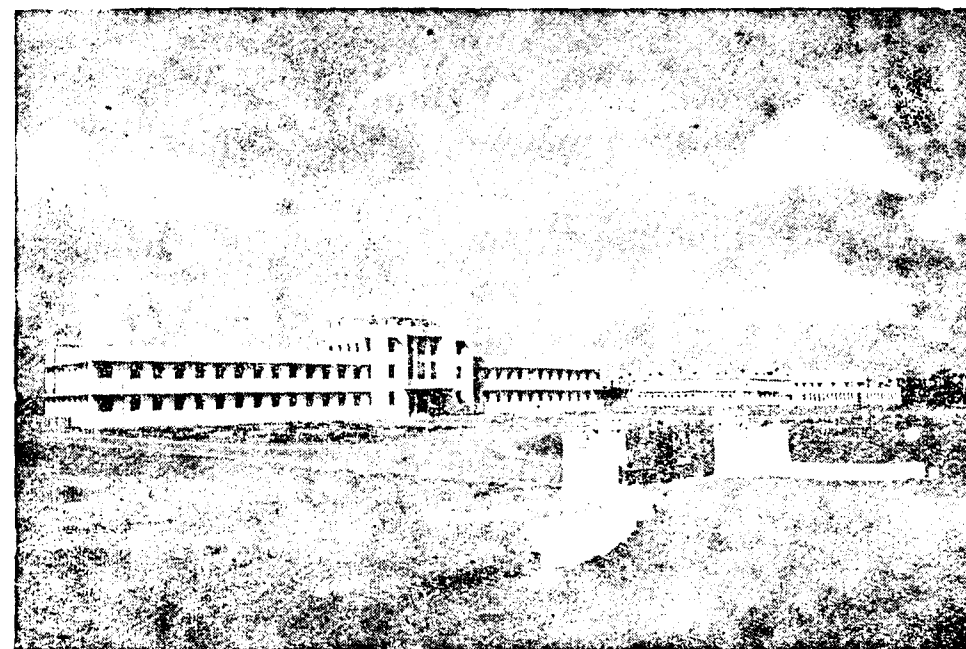


Vol. VIII

APRIL, 1962

361

No. 9



COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH
INDIA

Bull. cent. Leath. Res. Inst., Vol. 8, No. 9, Pp. 411-458, Madras, April, 1962

From Asia's Largest Tannery
Products of Distinction !



Write for free booklets to:-
 The British India Corporation Ltd.,
 COOPER ALLEN & NORTH WEST TANNERY BRANCHES, KANPUR, U. P.

CA 1/60

COMPARATIVE STUDIES ON THE TREATMENT OF TANNERY EFFLUENTS BY TRICKLING FILTER, ACTIVATED-SLUDGE AND OXIDATION POND SYSTEMS

BY

G. J. THABARAJ, S. M. BOSE AND Y. NAYUDAMMA,
 Central Leather Research Institute, Madras

Received on April 14, 1961

SUMMARY

A comparative study on the treatment of presedimented tannery wastes by trickling filter, activated sludge and oxidation pond processes has been made. The important chemical and biological characteristics were determined at different stages of the biological treatment in each case. The changes in these characteristics as affected by the biological processes are discussed in the light of the conditions under which the latter function. The results obtained indicate that all the three systems are efficient in stabilising the organics present in the tannery wastes. The choice of any system for adoption rests upon several economic and practical considerations. Oxidation pond system is the most economical, simple and ideal for tanneries having sufficient waste lands. Trickling filter process is more suitable in urban areas where sufficient land is not available and tanneries are able to meet the costs of construction.

Introduction

In tannery wastes, a predominant part of the organic impurities is in dissolved form; hence biological treatment is indispensable for their purification. For this, three alternative methods are available: trickling filter, activated sludge and oxidation pond. The first two have been tried to a greater extent than the last one. Earlier work in this direction has been on the following lines:

Trickling Filter: 1-20

The main features of the earlier studies with trickling filter are found to be (i) a combination of chemical method and trickling filter, e.g. in the treatment of sole leather beamhouse wastes,⁹ (ii) use of two stage filters for strong wastes¹² and (iii) admixture

of the tannery waste with domestic sewage.¹³⁻¹⁸ The effect of tannery waste constituents like sulphides, Cr and vegetable tannins on the efficiency of the filter, also has been studied.¹⁹ The Tannery Wastes Disposal Committee of Pennsylvania⁷ developed a simple, practicable, reasonably efficient and comparatively inexpensive type of trickling filter for treatment after settling. By this treatment, removal of 70-75% of BOD has been reported; the effluent, however, was highly coloured.⁹

Activated sludge:^{4 6, 10, 21-32}

Some of the initial studies^{4, 22} on application of activated sludge for treatment of tannery wastes reported difficulties, e.g. the organisms not developing in the tan liquor waste. However, the later investigations^{6, 10, 21, 23-32} have reported successful treatment especially after dilution of the tannery wastes with municipal sewage. The ratios employed were $\frac{1}{3}$ tannery wastes and $\frac{2}{3}$ city sewage,²³ 9 parts tannery wastes and 1 part domestic sewage,²⁴ $\frac{2}{5}$ tannery wastes and $\frac{3}{5}$ sewage²⁶ and finally 1 part of each.³⁰ The last mentioned was found by Kubelka³⁰ to be the lowest proportion of sewage necessary. A marked decrease in the alkalinity of the wastes due to oxidation of sulphides to sulphates²⁵ and an undesirable nitrification produced by the high nitrogen content in excess of that required for elimination of BOD²⁷ were some of the effects noticed.

Oxidation pond:

Very little work has been done on application of oxidation pond for treatment of tannery wastes. Appelius³³ reported stabilisation of the organic matter by the bacteria in the pond, in the case of well diluted tannery wastes. Reuning³⁴ found that the tannery waste liquors after storage in lagoons could be released to a stream only at controlled rates during high stages or floods. Eick,³⁵ however, found that lagoons did not give satisfactory effluent from tannery wastes for running to the river.

The work reported hitherto has been almost completely on the treatment of the tannery wastes by any one of the methods. The only comparative study has been by Kubelka³⁰ who laid down the principles of final biological purification of presedimented tannery effluent by means of percolating beds, lagoons, trickling filter and activated-sludge systems. According to him, final biological purification by any method requires good preliminary sedi-

mentation and freedom from arsenic, sulphide and other biologically toxic substances; perhaps the most economical procedure was to store well-sedimented tannery wastes in lagoons and to release the contents to rivers during flood periods. Since no other extensive work is reported on this specific subject, it was thought worthwhile to compare the relative merits and shortcomings of the three systems of biological treatment with reference to the same sample of tannery effluent, and to evolve an efficient method which would be simple, economical and best suited to the conditions prevailing in this country.

Experimental

In order to have an uniform basis for the comparative study, it is essential that the same pretreatment be given to the effluents before any biological treatment. In a previous communication, Bose, Muthiah and Nayudamma²⁰ found that the different types of effluents from the tannery could be mixed in suitable orders and proportions, the floc obtained could be settled down and the supernatant liquor could be treated by the trickling filter after dilution with water without any aid of chemical coagulant. The same method of pretreatment of the tannery effluents for primary sedimentation was adopted in the present investigation. In Mixture I, the soak, screened lime, bate, pickle and vegetable tan liquors were mixed in the proportions of 4 : 4 : 3 : 3 : 1 and in Mixture II, the soak, screened lime, delime, chrome tan and dyeing and fat liquors were mixed in the proportions of 4 : 4 : 1 : 1 : 1. The mixture in each case was allowed to settle for 5 hours; the supernatant liquid was siphoned off, diluted with an equal volume of water and analysed for the important chemical and biological characteristics. Hereafter, the diluted supernatant from Mixture I will be referred to as waste liquor I and that from Mixture II as waste liquor II. Waste liquor I or II was divided into three portions; the first portion was treated by the trickling filter, the second portion by the activated-sludge process and the third portion in the oxidation pond system after admixture with 25% sewage. The latter was analysed for the important chemical and biological characteristics soon after mixing.

The standard methods of analysis recommended by the American Public Health Association³⁶ were followed throughout this investigation. The use of an uniform seeding material for the

TABLE I
Treatment of diluted supernatant from mixture I or II by trickling filter
(Results expressed as ppm)

Chemical and biological characteristics	Diluted supernatant from mixture I			Diluted supernatant from mixture II		
	Untreated	Trickling filter effluent	After sedimentation of filter effluent	*Per cent reduction	Untreated	Trickling filter effluent
Suspended solids:						
Volatile	192	72	22	88.53	68	34
Fixed	12	10	6	50.00	35	32
Dissolved solids:						
Volatile	2043	770	324	84.14	1945	662
Fixed	9973	7792	6724	32.58	7460	6840
5 day BOD	988	158	56	94.32	821	129
COD	1303	302	158	87.88	—	—
Nitrogen as:						
Organic	73	42	29	60.29	133	81
Ammonia	17	18	10	41.18	68	38
Nitrite + Nitrate	Nil	10	16	—	—	15
Chlorides	4376	4106	3866	11.65	2921	2738
Total sulphides	26	Traces	Traces	—	41	18
Chromium (as Cr ₂ O ₃)	—	—	—	—	3	Traces
						Traces

*Calculated from the data obtained for the untreated and for the settled trickling filter effluent.

BOD determinations has been advocated^{37, 38} and hence the settled sewage cultured in a standard broth was used as the seeding material in the determination of the 5-day Biochemical Oxygen Demand at 20°C by the dilution method. The Chemical Oxygen Demand (COD) was estimated by the dichromate reflux method, necessary correction for the chlorides being applied to these values. Determinations of organic and ammoniacal nitrogen were carried out by the Kjeldahl method. Total oxidised nitrogen was determined by the method reported by Jenkins.³⁹ The chlorides were estimated by the Volhard method. The volatile and fixed matter in suspended and dissolved form, total sulphides and chromium were determined by the standard methods.

Trickling Filter:

The experimental trickling filter constructed according to the specifications of Sarber⁹ and described in the previous communication²⁰ was used in the present investigation also. A slime of active micro-organisms was built upon the medium of the filter by continuous feeding of a mixture of settled sewage and tannery soak liquor through the filter for a few weeks. When sufficient growth of the slime was noticed on the surface of the filter medium, waste liquor I or II was mixed in small portions with the original mixture of sewage and soak liquor and fed to the filter. The concentration of the former was gradually increased and regular BOD analyses were conducted on the untreated and treated effluents. This process of acclimatising the filter organisms to the tannery wastes was continued until the organisms showed signs of maximum removal of BOD in the case of diluted supernatants alone as feed. The actual experiments were carried out after this acclimatisation.

The portion of the waste liquor I or II intended for this treatment was adjusted to a pH 7 to 8 and passed through the filter at a hydraulic loading of 3 Mgad. The effluent from the filter was collected and examined for the important chemical and biological characteristics. The effluent was then allowed to settle for 24 hours; the supernatant liquid was siphoned off and examined for the same characteristics. The results obtained are presented in table I.

Activated-sludge:

Laboratory experiments on the activated-sludge process were carried out with a 4-litre glass vessel as the aeration chamber. The

seeding sludge used was prepared by the method of Furkert.²⁵ It was developed for a period of one month by beginning aeration with domestic sewage only and gradually increasing the proportion of the waste liquor I and II. The sewage organisms were thus acclimatised to the tannery wastes. The second portion of the waste liquor I or II was adjusted to pH 7 to 8 and mixed with 25% (by volume) of seeding sludge in the glass vessel. The mixture was thoroughly aerated and agitated by blowing excess air from an air compressor. The mixed liquor suspended solids varied between 2000 and 4000 p.p.m. during the period of aeration. Samples from the aerated mixture were drawn out at different intervals of aeration, allowed to stand for 24 hours and the clear liquid was collected and examined for the important chemical and biological characteristics. The results obtained are presented in tables II and III.

Oxidation pond:

The experiments consisted in impounding the effluents in shallow, open-surfaced and out-door ponds. Experimental oxidation ponds of standard depth of 3 feet were constructed in the open land. This smaller depth was provided for the ponds to ensure good penetration of sunlight and prevention of weed growth. The floors of the ponds were cemented to avoid losses of the liquors due to percolation and absorption. The third portion of the waste liquor I or II was adjusted to pH 7 to 8, fed into the stabilisation pond and mixed with 25% (by volume) of domestic sewage. The mixture in each case was impounded for a number of days; samples were withdrawn at different intervals and analysed for the same chemical and biological characteristics as before. Any evaporation loss of the liquor was made up by the addition of water before samples were collected. The results obtained are presented in tables IV and V.

In the above experiments with oxidation ponds, the old mixture which was impounded for 40 days and examined, was mixed with an equal volume of fresh waste liquor I or II and again impounded for a period of 20 days and analysed for the same characteristics as before at regular intervals. The results are presented in table VI.

Discussion

Waste liquor I and II satisfy the necessary conditions laid down for biological purification: the ratio of BOD using sewage

seed to COD of the waste liquor I or II is higher than 0.6; according Symons *et al.*,⁴⁰ this indicates that the wastes may be easily and completely treated by a biological process; the nutrients like nitrogen and phosphorus essential for the growth of micro-organisms are present in adequate amounts in the supernatant liquors; the pH is around neutral in both the cases so as to promote good bacterial growth; the biological toxic materials like Cr and sulphides are present only in small concentrations and may not affect the systems since the latter abound in micro-organisms already acclimatised to these toxic constituents.

The results obtained show that the biological decomposition and oxidation of the organic impurities in the waste liquor may be accomplished by any one of the three biological processes tried, provided the required period of detention is allowed and other conditions are satisfied. It has been observed that the BOD reductions of the waste liquors I and II range between 92 and 96% in all the three processes. The COD reductions with waste liquor I have been found to range between 84 and 89%; with liquor II, COD estimations were not done because of the error introduced by the chromium salts already present in the liquor. In most cases, the COD figure has been found to be much higher than the corresponding BOD figure. This may possibly be explained as due (i) to certain constituents of the effluent being resistant to biological oxidation, but not to chemical oxidation and (ii) to the 5 day BOD measuring only part of the biologically treatable organic matter in the waste.

In conformity with the observations of Thoman and Jenkins⁴¹ and Sarber,⁹ it is seen from table I that the BOD of the effluent from the trickling filter is further reduced upon allowing it to stand under quiescent conditions for 24 hours. Sarber⁹ attributed this reduction of BOD and other constituents to a further action of the micro-organisms and proteolytic enzymes washed from the filter and to the settling of the solid organic matter in the effluent. The final effluent still contains a BOD of about 50 p.p.m. These last portions are the hardest to remove because of the small amount of food remaining in solution for the micro-organisms.

It is observed that the per cent reduction in organic nitrogen of the waste liquor I or II is higher with activated-sludge process than with either trickling filter or oxidation pond system. It is also seen that nitrification occurs in the treatment by activated-sludge as also in that by trickling filter—to a greater extent in

TABLE II
Treatment of diluted supernatant from mixture I by activated-sludge process
(Results expressed as ppm)

Chemical and biological characteristics	Untreated	Period of aeration of diluted supernatant (Hours)				*Per cent reduction
		6	12	18	24	
Suspended solids:						
Volatile	192	170	102	64	30	84.37
Fixed	12	12	10	10	8	33.33
Dissolved solids:						
Volatile	2043	1582	748	402	122	94.04
Fixed	9973	9324	8218	7394	6844	31.37
5 day BOD	988	684	370	162	34	96.54
COD	1303	922	549	264	141	89.21
Nitrogen as:						
Organic	73	58	35	26	12	83.56
Ammonia	17	18	16	12	10	41.18
Nitrite + Nitrate	Nil	5	11	18	26	—
Chlorides	4376	4301	4212	3966	3872	11.52
Total sulphides	26	4	Nil	Nil	Nil	100.00

*Calculated from the data obtained for the untreated and for the 24 hours aerated and settled effluent.

TABLE III
Treatment of diluted supernatant from mixture II by activated-sludge process
(Results expressed as ppm)

Chemical and biological characteristics	Untreated	Period of aeration of diluted supernatant (Hours)				*Per cent reduction
		6	12	18	24	
Suspended solids:						
Volatile	68	58	49	36	16	76.47
Fixed	35	35	34	32	28	20.00
Dissolved solids:						
Volatile	1945	1540	842	385	98	94.95
Fixed	7460	7348	7001	6792	6319	15.30
5 day BOD	821	612	346	122	30	96.36
COD	—	—	—	—	—	—
Nitrogen as:						
Organic	133	95	72	56	26	80.44
Ammonia	68	72	52	25	23	66.18
Nitrite + Nitrate	Nil	8	20	27	35	—
Chlorides	2921	2869	2798	2742	2682	8.18
Total sulphides	41	11	Nil	Nil	Nil	100.00
Chromium (As Cr ₂ O ₃)	3	—	—	—	Traces	—

*Calculated from the data obtained for untreated and for 24 hours aerated and settled effluent.

TABLE IV
Treatment of diluted supernatant from mixture I in oxidation pond in admixture with 25% sewage
(Results expressed as ppm)

Chemical and biological characteristics	Period of detention of diluted supernatant in admixture with sewage (Days)						*Per cent reduction		
	Untreated	10		20		30		40	
		Unfiltered	Unfiltered	Unfiltered	Unfiltered	Filtered			Unfiltered
Suspended solids:									
Volatile	164	158	82	113	—	128	—	—	
Fixed	10	9	9	8	—	6	—	—	
Dissolved solids:									
Volatile	1786	1232	942	—	609	—	492	72.46	
Fixed	7512	7102	6932	—	6856	—	6626	11.80	
5 day BOD	802	542	332	226	102	218	67	91.64	
COD	1090	832	510	323	193	304	165	84.86	
Nitrogen as:									
Organic	65	42	31	34	22	32	16	75.39	
Ammonia	16	24	17	8	6	6	5	68.75	
Nitrite + Nitrate	—	—	—	—	—	—	Traces	—	
Chlorides	4176	4018	3920	—	3748	—	3684	11.79	
Total sulphides	20	29	30	—	18	—	6	70.00	

*Calculated from the data obtained for the untreated and for the 40 days impounded and filtered effluent.

TABLE V
Treatment of diluted supernatant from mixture II in oxidation pond in admixture with 25% sewage
(Results expressed as ppm)

Chemical and biological characteristics	Period of detention of diluted supernatant in admixture with sewage (Days)						*Per cent reduction			
	Untreated	10		20		30		40		
		Unfiltered	Unfiltered	Filtered	Unfiltered	Filtered		Unfiltered	Filtered	
Suspended solids:										
Volatile	61	49	—	159	—	215	—	228	—	
Fixed	32	30	—	30	—	28	—	25	—	
Dissolved solids:										
Volatile	1640	752	528	—	—	—	454	—	412	
Fixed	6418	5684	5512	—	—	—	5460	—	5324	
5 day BOD	692	382	126	172	148	86	125	—	36	
COD	—	—	—	—	—	—	—	—	—	
Nitrogen as:										
Organic	112	86	74	106	108	68	102	42	62.50	
Ammonia	58	56	17	19	9	8	6	4	93.11	
Nitrite + Nitrate	—	—	—	—	—	2	—	4	—	
Chlorides	2712	2643	2589	—	—	2512	—	2480	8.55	
Total sulphides	36	38	26	—	—	14	—	5	86.12	
Chromium (as Cr ₂ O ₃)	2	—	—	—	—	—	—	1	50.00	

*Calculated from the data obtained for the untreated and for the 40 days impounded and filtered effluent

the former treatment. Oxidised nitrogen has been found to be present only in small concentration in the oxidation pond effluent even after long detention time. The data on per cent reductions in ammonia nitrogen may not permit comparison of the efficiency of the three biological systems in view of the fact that ammonia nitrogen, a possible intermediary product in the stabilisation of organic wastes, may be not only oxidised to nitrite and nitrate nitrogen during the course of stabilisation of organic wastes, but also utilised in the synthesis of microbial cell material.

The highest reduction of organic nitrogen by the activated-sludge process may be due to much of the organic nitrogen being either converted into new cell material or oxidised to provide energy for the rapid reproduction of bacteria under the favourable conditions of high food concentration and plentiful supply of oxygen through long period of aeration. Obviously, the same degree of oxygen supply does not occur either in the trickling filter or oxidation pond systems. Subrahmanyam *et al.*⁴² reported that the activated-sludge process appeared to be quite efficient in removing the amino acids practically entirely from sewage.

Sawyer⁴³ has shown that the nitrifying ability of an activated-sludge is dependent in some degree upon the relationship between BOD and nitrogen in sewage feed, wastes with less than 16 parts of BOD for each part of nitrogen giving sludges with increasing capacity for nitrification as the proportion of nitrogen increases. As the BOD to nitrogen ratio for both the supernatants is below this level, the liquors have been found to give sludges with increased capacity for nitrification. The high nitrogen content of waste liquor II, however, has resulted in greater nitrification in this case than in the case of liquor I. It has also been observed that in the case of waste liquor II, there is less formation of sludge. Sawyer and Bradney²⁷ express the view that the constant removal of ammonia by nitrifying organisms may prevent its accumulation to such concentrations as will adversely affect the development of certain organisms and allow normal stabilisation to proceed.

In the treatment of tannery wastes by the activated-sludge process, the flotation of sludge during final settling was noticed. This phenomenon, viz., liberation of gaseous nitrogen by reduction of excess nitrates in the final settling tank was discovered by O'Shaughnessy;⁴⁴ this was seen to be more prominent in the case of waste liquor II having a low BOD to N ratio. The nitrogen bubbles lift particles of sludge which are discharged with the

final effluent, thus leading to much suspended solids in the effluent. Certain of the denitrifying organisms would appear to derive their oxygen supply from nitrates even in the presence of sufficient dissolved oxygen. As nitrification is a necessary adjunct to rapid stabilisation of organic compounds, it may not be desirable to inhibit the nitrification in order to obviate the problem of rising sludge during secondary sedimentation.

The lower degree of nitrification in the case of trickling filter as compared to the activated-sludge process may be due to the reason that surplus oxygen is not available for the nitrification of the ammonia; also there is only a small period of contact between the nitrifying organisms which abound in the lower levels of the filter and the nitrogenous wastes arriving from the upper levels of the filter where they are hydrolysed and decomposed to various products like amino acids, ammonia, hydrogen sulphide etc. However, the amount of oxidised nitrogen found in the trickling filter effluents indicates the efficiency of the filter in stabilising the tannery wastes. The process of nitrification continues even during secondary sedimentation of the trickling filter effluent as shown by the increase in oxidised nitrogen content during the settling of the treated effluent. This increase shows that nitrification is predominant during secondary settling of the trickling filter effluents, even if denitrification also occurred simultaneously.

During the course of experiments with the oxidation pond system, it has been observed (tables IV and V) that after impounding the liquor for several days, the suspended solids in the liquors gradually increase. This increase in the suspended solids is associated with the suspended algal cell material (cf. Caldwell).⁴⁵ The filtered effluents, however, have given much lower BOD and organic nitrogen as compared to the corresponding unfiltered effluents, thus showing that the major portion of the BOD and organic nitrogen are associated with the suspended algal matter present in the liquors. This portion of the organic nitrogen and BOD has also shown a tendency to increase with longer period of detention.

The micro-organisms present in the pond decompose and oxidise the complex organic compounds into simpler organic forms like CO_2 , NH_3 , SO_4^{2-} , NO_3^- , PO_4^{3-} , which serve as nutrients for the growth of algae; the latter in the presence of sunlight, liberate oxygen while utilising carbon-dioxide and water in photosynthesis. The oxygen so liberated by algae is utilised by the micro-organisms for further breakdown of the complex organic materials to

TABLE VI
Treatment of diluted supernatant from mixture I or II in oxidation ponds in admixture
with 40 days-impounded effluents,
(Results expressed as ppm)

Chemical and biological characteristics	Diluted supernatant from mixture I in admixture with 40 days-impounded effluents					Diluted supernatant from mixture II in admixture with 40 days-impounded effluents				
	Untreated	Period of detention (Days)			*Per cent reduction	Untreated	Period of detention (Days)			*Per cent reduction
		10 Unfiltered	10 Filtered	20 Unfiltered			10 Unfiltered	10 Filtered	20 Unfiltered	
Suspended solids:										
Volatile	182	106	—	129	—	122	164	—	202	—
Fixed	18	18	—	16	—	24	22	—	20	—
Dissolved solids:										
Volatile	1024	—	602	—	74.42	1212	—	594	—	86.04
Fixed	7891	—	6216	—	38.87	5091	—	4231	—	25.24
5 day BOD	738	349	206	228	92.68	541	309	196	159	91.87
COD	916	532	394	435	84.48	—	—	—	—	—
Nitrogen as:										
Organic	68	56	42	40	70.58	122	89	67	86	54.09
Ammonia	20	8	8	8	70.00	28	21	18	9	75.00
Nitrite + Nitrate	—	—	—	Traces	—	—	Traces	Traces	2	—
Chlorides	3907	—	3584	—	14.48	2911	—	2871	—	8.21
Total sulphides	17	—	8	—	82.35	26	—	14	—	100.00
Chromium (as Cr ₂ O ₃)	—	—	—	—	—	3	—	2	—	66.66

*Calculated from the data obtained for the untreated and for the 20 days impounded and filtered effluent.

simpler inorganic end products. As the effluents are already stabilised and the comparatively high BOD and suspended matter of the unfiltered effluent are only due to the development of algae, pollution and oxygen depletion of the receiving stream by the organic matter present in the treated effluents may not occur. According to Parker *et al.*,⁴⁶ the development of algae in the oxidation pond represents a reconversion of ammonia to organic nitrogen and an increase in the organic carbon content. Hence it may not be objectionable to discharge the effluents containing algae into a stream since the algae may increase rather than deplete the oxygen content of the receiving stream. However, a greenish colour and turbid appearance may be imparted to the latter.

It appears from the results obtained during oxidation pond studies (tables IV and V) that during initial stages of treatment of the diluted supernatants in admixture with domestic sewage, an anaerobic decomposition of the wastes occurs at the bottom layer of the pond where sludge is accumulated, thus resulting in a substantial reduction of BOD and organic nitrogen. The pH also has been found to fall during this period. This may be the reason for the delayed growth of algae in the ponds. Algae, however, have been found to develop subsequently and accelerate the purification of the organic wastes as indicated by the rapid progress of the aerobic phase, the increase in dissolved oxygen in the pond and the onset of nitrification. Thus the treatment of the wastes in oxidation pond may be a combination of sedimentation, aerobic liquid waste stabilisation and anaerobic sludge digestion.

The results presented in table VI indicate that the detention time in oxidation pond may be much curtailed when the diluted supernatants are treated with 40 days impounded liquors as the rate of purification is faster than in the treatment of the effluents with fresh sewage. The untreated supernatants may not contain an active mass of micro-organisms necessary for stabilisation. So, as shown in tables IV and V, effective purification of the effluents is achieved only when the waste is properly seeded with domestic sewage. In such a case, acclimatisation and growth of the suitable micro-organisms may occur simultaneously. However, the micro-organisms, adapted to domestic sewage, may require time to get acclimatized to the new environment of tannery waste before they would stabilise it. In the case of the treatment of the diluted supernatant in admixture with the 40 days impounded one, the untreated wastes serve as food for the micro-organisms already acclimatized to the new environment and thus undergo

rapid purification. Further, algal population which are already present in the treated effluent accelerate the purification process. Thus, the detention time in the oxidation ponds may be much curtailed in the long run.

The reduction in volatile solids content has been found to be uniformly high in all the three systems; but the highest reduction (95%) has been observed in the case of the activated-sludge process. The dissolved fixed solids are also reduced to some extent in all the systems. The important constituent of dissolved fixed solids, viz., chloride undergoes slight reduction during biological stabilisation. Appreciable reductions in suspended solids have been observed in trickling filter and activated-sludge effluents whereas oxidation pond effluents contain large amount of suspended material due to the algal growth.

Maximum removal of chromium is accomplished in the activated-sludge and trickling filter. Though the influent in both cases contained 3 p.p.m. of Cr_2O_3 , the final effluent has been found to contain only traces of the same. About two-third reduction of chromium content of sewage by activated-sludge treatment was reported by Stones.⁴⁷ In the oxidation pond system about 50 to 66% reduction of chromium has been achieved.

Sulphides may be oxidised to sulphates in these biological oxidation processes. Sulphides are found to be absent in trickling filter and activated-sludge effluents. During the activated-sludge treatment the sulphides are completely eliminated not only by chemical and biological oxidations, but also due to volatilization by the vigorous aeration. Even after prolonged detention time, however, the effluents from the oxidation ponds contain small amounts of sulphides. It has also been observed that in the initial impounding, there is some increase in sulphide concentration due to anaerobic decomposition of the sludge.

Although estimations of the pH of the effluents were carried out at suitable stages of the biological treatment, the data have not been presented in the tables as it was observed that the pH underwent random variations probably because of the fact that the pH of the treated effluent is dependent upon the sum total effect of the variations and reductions of the various constituents of the effluents and also of the formation of the different types of end products. In the case of trickling filter and activated-sludge processes, the general trend of the data on pH indicated that the pH of the effluents during the course of treatment was

practically within the accepted optimum range (6.5 to 7.5)⁴⁸ for the growth of micro-organisms. In these processes, CO_2 produced during the metabolism of organic matter tends to reduce the pH to some extent, but at the same time the buffering capacity of bacterial solids⁴⁹ helps to reduce the effect of pH variations. In the case of oxidation pond, the pH of the effluents was found to be lower to some extent during the first stage of the treatment because of the anaerobic decomposition of the sludge at the bottom layer. Later, the pH was found to be higher because of the growth and metabolism of algae in the ponds. Isaac and Molly Lodge⁵⁰ and Caldwell⁴⁵ stated that the increase in pH in oxidation pond effluent is an indication of the degree of algal metabolism.

It has been observed that the effluents from the activated-sludge and trickling filter are clear, odourless and almost neutral whereas the oxidation pond effluents are turbid and have a grassy algal odour which is not unpleasant. From the above mentioned discussion with respect to the final BOD and other characteristics of the treated effluents, it appears that all the three systems are efficient in stabilising the wastes though their requirements for proper functioning vary widely. Whether the method of purification involves trickling filter, activated-sludge or oxidation pond treatment, in principle, the biological system decomposing the complex organic substances to simpler and stable end products is the same. The choice of a particular system for adoption depends upon many factors, namely, volume and pollutional strength of the wastes to be treated, assimilating capacity of the receiving stream, degree of purification desired, location of the tannery and the costs of construction, maintenance and skilled operation.

Activated-sludge plants occupy small land area and construction costs are lower than for trickling filter. They may produce better results than the filters; however, they require skilled attendance and control. The cost of operation of activated-sludge plants is much higher than that of trickling filters, because of the power requirements for aeration. Francke *et al.*⁵¹ have shown that a large though not complete removal of 'anthrax' is possible in the treatment of tannery wastes by the activated-sludge process. Babbit⁵² also states that more than 90% of the bacteria is removable by activated-sludge treatment. Arden⁵³ comments that much of the nitrogen may be recovered in the form of sludge which may be useful for agricultural purposes. Activated-sludge, however, is more susceptible to interference by toxic materials than trickling filter and more sensitive to changes in composition

of influents. Trickling filter has more resistance to toxic wastes and also recovers more promptly from an overdose. In the case of activated-sludge treating tannery wastes, there is also the problem of rising sludge during secondary settling. Hence, trickling filter is more favoured for treating industrial effluents. The main disadvantage of the trickling filter is the liberation of foul odours during the spraying of untreated wastes upon the filter. Further, it may serve as a breeding ground for *Psychoda* flies.

Oxidation pond is the most economical and simple of the known forms of biological treatment with regard to construction and operation. Complete treatment of tannery wastes by oxidation pond is more suitable for small tanneries which cannot afford the heavy costs of construction, maintenance and operation of trickling filter and activated-sludge processes. However, these ponds require considerable land area and may not be suitable in the case of tanneries in urban locations. The bottom of the ponds should be sealed to prevent seepage of materials like chlorides, sulphides or pathogenic bacteria which may, otherwise, pollute the ground water. Purification of tannery wastes by oxidation pond in which algae develop by utilising the end products of bacterial oxidation holds out a bright future for its adoption in India, which abounds in bountiful sunlight throughout the major part of the year. The algae present in the treated effluent may be of value in promoting fish life in the receiving stream. Oxidation ponds having a depth of 3 feet may efficiently utilise sunlight for photosynthesis, prevent growth of water weeds and insect breeding and may not result in odour nuisance. The ponds should be so located that there would be sufficient wind circulation to aid atmospheric reaeration.

REFERENCES

1. Morrison, J. A. S., *J. Am. Leather Chemists' Assoc.* **6**, 326 (1911).
2. Veitch, F. P., *Ibid.*, **8**, 10 (1913).
3. Roth, A., *Ibid.*, **9**, 512 (1914).
4. Hommon, H. B., *Ibid.*, **12**, 307 (1917).
5. Mohlman, F. W., *Ind. Eng. Chem.* **18**, 1076 (1926).
6. Fales, A. L., *Proc. Amer. Soc. Civil Eng.* (1928) through *Hide and Leather*, **75**, No. 17, 48 (1928), via *J. Am. Leather Chemists' Assoc.* **24**, 98 (1929).
7. Report by the Tannery Waste Disposal Committee of Pennsylvania, *J. Am. Leather Chemists' Assoc.* **26**, 70 (1931).
8. Eldridge, E. F., *Mich. State Coll. Eng. Expt. Sta. Bull.* No. 82, pp. 101 (1938).

9. Sarber, R. W., *J. Am. Leather Chemists' Assoc.* **36**, 463 (1941).
10. Chase, E. S. & Kahn, P., *Wastes Eng.* **26**, 167 (1955).
11. Bruhne, A., *Limnol., Schriftenreihe*, 4 Nos. 17/18, 97 (1957), via *Water Pollution Abstr.* **31**, 2209 (1958).
12. Gurnham, C. F., "Principles of Industrial Waste Treatment" John Wiley & Sons, Inc. New York, pp. 281 (1955).
13. Parker, J. S., & Watkins, J. S., *Water Works and Sewerage*, **88**, 109 (1941).
14. Porter, W., *Sewage Works J.*, **21**, 738 (1949).
15. Vrooman, M. & Ehle, V., *Sewage and Ind. Wastes*, **23**, 94 (1950).
16. Taylor, W. H., *Sanitalk*, **1**, 4, 24 (1953).
17. Hartman, B. J., *Sewage and Ind. Wastes*, **25**, 1419 (1953).
18. Rosenthal, B. L., *Leath. Manfr.* **74**, 20 (1957).
19. Green, G. H., "Waste Treatment" Ed. Peter C. G. Isaac, Pergamon Press, Oxford, pp. 397 (1960).
20. Bose, S. M., Muthiah, P. M. & Nayudamma, Y., "Symposium on Utilisation of bye-products of leather industry" *Cent. Leath. Res. Inst.*, p. 58 (1960).
21. Eddy, H. P. and Fales, A. L., *Ind. Eng. Chem.* **8**, 648 (1916).
22. Helper, J. M., *Hide and Leather*, **71**, No. 14, 40 (1926), via *J. Am. Leather Chemists' Assoc.* **21**, 320 (1926).
23. Snock, A., *Collegium*, **703**, 612, (1928).
24. Hubbel, G. E., *Water Works and Sewage*, **82**, 331 (1935).
25. Furkert, H., *Tech. Gemeindeblatt*, **39**, 285-7 (1936); **40**, 11-16, 36-40 (1937), via *Chem. Abstr.* **31**, 5076 (1937).
26. Pauschardt, H. & Furkert, H., *Stadtereinigung*, 411-13, 427-31 (1936); *Wasser u. Abwasser*, **34**, 343-4, via *Chem. Abstr.* **31**, 4430 (1937).
27. Sawyer, C. N. & Bradney, L., *Sewage Works J.*, **17**, 1191 (1945).
28. Schlichting, *Das Leder*, **5**, 214 (1954).
29. Rosenthal, B. L., *Leath. Manfr.* **75**, No. 2, 26 (1958).
30. Kubelka, V., *Veda Vyz. Prum. Kozedelnem*, **1**, 113-36 (1956), via *J. Am. Leather Chemists' Assoc.* **52**, 11, 637, (1957).
31. Ghose, T. K., "Symposium on Utilisation of bye-products of leather industry", *Cent. Leath. Res. Inst.*, p. 16 (1960).
32. Sastry C. A. Satyanarayana Rao, S. & Pillai, S. C., *Ibid.*, p. 45 (1960).
33. Appelius, W., Report of Freiberg Tanning School for 1911-12, through *Leder Tech. Rundschau*, **4**, 105, 113 (1912), via *J. Am. Leather Chemists' Assoc.* **7**, 342 (1912).
34. Reuning, H. T., *Sewage Works J.*, **20**, 525 (1948).
35. Eick, J. F., *Industrial Wastes*, **1**, 27 (1956), via *J. Am. Leather Chemists' Assoc.* **54**, 53 (1959).
36. The American Public Health Association, American Water Works Association and Federation of Sewage and Industrial Wastes Association, "Standard methods for the examination of water, sewage and industrial wastes", 10th Edition (1955).
37. Lee, E. W. & Oswald, W. J., *Sewage and Ind. Wastes*, **26**, 1097 (1954).
38. Ettinger, M.B., *Ind. Eng. Chem.* **48**, 256 (1956).
39. Jenkins, S. H., *J. Inst. Sewage Purification*, **II**, 145, (1950).
40. Symons, J. M., McKinney, R. E. & Hassis, H. H., *J. Water Poll. Control. Fedn.* **32**, 841 (1960).

41. Thoman, J. R. & Jenkins, K. H., *Ibid.*, **32**, 482 (1960).
42. Subramanyam, P. V. R., Anandeswara Sastry, C. Prabhakara Rao, A. V. S. & Pillai, S. C., *Ibid.* **32**, 344 (1960).
43. Sawyer, C. N., *Sewage Works J.*, **12**, 3 (1940).
44. O'Shaughnessy, F. R. & Hewitt, C. H., *J. Soc. Chem. Ind.* **54**, 167 I (1935).
45. Caldwell, D. H., *Sewage Works J.*, **18**, 3, 433 (1946).
46. Parker, C. D., Jones, H. L. & Taylor, W. S., *Jour. of the Sanitary Engg. Division, Proceedings of the Am. Soc. of Civil Engrs.*, Paper 1337, **33**, (1957).
47. Stones, T., *J. Inst. Sewage Purification*, **4**, 345-7 (1955), via *Chem. Abstr.* **53**, 18347 (1959).
48. Oginsky, E. L. & Umbreit, W. W., "An Introduction to Bacterial Physiology", Freeman (San Francisco), 1954.
49. Simpson, J. R., "Waste Treatment", Ed. Peter C. G. Isaac, Pergamon Press, Oxford, pp. 27 (1960).
50. Isaac, P. C. G. & Lodge, M., "Algae and Sewage Treatment", *New Biology*, **25** (1958).
51. Francke, G., Standfuss, R. & Poll, G., *Z. Infekt. Krankh. Haustiere* **12**, 177-90 (1932); *Wasser, U. Abwasser*, **31**, 34 (1933), via *Chem. Abstr.* **27**, 4862 (1933).
52. Babbitt, H. E., "Sewerage and Sewage Treatment", John Wiley & Sons, Inc., New York, pp. 456 (1950).
53. Ardern, Proc. Assoc. of Managers of Sewage Disposal Works (1922).

RESEARCH BEARS FRUIT

Vat tanning of white chrome sheep lining leathers by combination tannage*

BY

K. RAJABATHER, M. MUSTAFA & P. S. VENKATACHALAM

Introduction

This process for vat tanning of white chrome sheep lining leathers has been specially worked out keeping in view the needs and limitations of the village tanner who is not in a position to use machines or contrivances like drums etc. for his operations. The choice of chemicals and other materials is again limited to those that are within his easy reach.

The alum tanning technique for white sheep skins is not unknown to the cottage tanner, but with the advent of readymade chrome extracts in the market, he has shown interest in producing a chrome tanned lining leather with a white surface, as this is becoming increasingly popular for shoes as well as for sandals. The present method aims at an alum-chrome-alum combination tanning in view of the tanners' familiarity with alum pretanning. Such a combination produces softer leather with a less prominent backbone and free from the damp feel usually associated with leathers tanned solely with alum. Use of imported syntans has been avoided. Neither drums nor machines are employed for this process.

Raw material:

25 wet salted sheep skins weighting 41 kg. (90 lb. approx.) are used.

The skins are soaked for about an hour (flesh side up) in plain water and cut open. Then they are washed thrice, thorough trampling being given between each change of water. They are piled to drain for about ½ hour and then weighed.

*Process demonstrated during November/December, 1961.

Unhairing:

A lime-sulphide paint is prepared using 12% lime paste, 1½% sodium sulphide and sufficient water (on soaked weight) to yield a syrupy paste. This paste is applied on the flesh side of each skin after which each skin is folded along the backbone line and piled flesh to flesh. The skins are unhaired and relimed with once used second lime liquor reinforced with 12% lime paste and sufficient water to cover the good. The skins are handled twice during that period. The next day, they are scudded and again limed in a bath consisting of 400% water, 12% lime paste and 56·7 g. (2 oz.) % of caustic soda. The skins are handled twice and left overnight in the same bath. The next day, they are handled thrice. The following day, the goods are fleshed by hand and weighed (23 kg. i.e. 50 lb. approx.). They are then scudded, washed thrice and fleshed. The sequence of operations is repeated and the pelts are now left in plain water overnight.

The next day, the skins are delimed with 170·19 g. (6 oz.) % of ammonium sulphate and 85 g. (3 oz.) % of oxalic acid and sufficient water to cover goods.

Pickling:

After the completion of deliming (the cut section is found to be neutral to phenolphthalein), they are scudded, washed, drained and pickled with:

Water	..	150%	(on pelt weight)
Common salt	..	15%	-do-
Formic acid	..	1½%	-do-

Note: In case formic acid is not found suitable for reasons of economy, a mixture of 1-1½% sulphuric acid and ½% acetic acid may also be used, though this will not produce the same bright white leather as in the other case.

The skins are trampled in the pickle bath for about ½ hour and then left overnight in the same bath. Next day, ½% formic acid is further added and the goods are trampled for about ½ hour and left overnight in the same bath. On the following day, the skins are piled grain to grain on a wooden horse and aged for a period of 3 days.

Tanning:

3% alum is added to the original pickle bath. The stock is entered into this bath and handled for about ½ hour. 1½%-2%

of B & C chrome crystals previously dissolved in sufficient quantity of water is now given approximately in six equal instalments at intervals of 30 minutes. The skins are then left overnight in this solution. After handling the goods for some time the next day, 3% alum is added and the handling continued. After 3-4 hours, 2% of soda bicarbonate dissolved in sufficient quantity of water is added slowly with constant stirring. After handling for a further period of ½ hour, the skins are left in the same bath overnight. Next day, the shrinkage temperature is found to be 95°C. The skins are piled to drain and weighed the next day. The weighed goods are then washed six times using plain water and then fatliquored for ½ hour with:

Sulphated castor oil (TRO)	..	4%	(on tanned and drained weight)
Raw coconut oil	..	1%	-do-
French chalk	..	5%	-do-
Hot water @ 50°C	..	100%	-do-

After the absorption of the fatliquor, the skins are piled grain to grain on a wooden horse and left overnight. Next day, a thick paste of kaolin and a little soap is applied uniformly on both the sides of the skins, which are then hooked to same. When they are in sammed condition, the skins are staked by hand and again hooked. This is repeated twice before the skins dry out completely. Finally they are fluffed on the flesh side, staked again, trimmed lightly and measured.

LETTER TO THE EDITOR

Tanning materials of Afghanistan

Afghanistan is a mountainous country with agriculture as the main occupation. A survey of the leather industry of the country¹ has shown that tanning is chiefly a cottage industry. The rural tanners use locally available tanning materials like pomegranate shell or rind, apricot roots, *barak* leaves and twigs, and *thoran* roots. Of these, pomegranate appears to be the only material studied as a tanning material.^{2,3,4} Hence an analysis of these materials was undertaken with the samples kindly provided by Mr. M. H. Malal, U.N. sponsored Afghan trainee. The analytical report obtained using official methods⁵ is given below:

Sample	Moisture %	Tan %	Non-tan %	Insolubles %	Colour		pH
					Yellow	Red	
1. <i>Bandak</i> twig	10.2	5.5	16.8	67.5	50.0	15.0	4.6
2. <i>Barak</i> twig	10.3	14.5	19.1	55.1	12.0	2.5	4.2
3. <i>Thoran</i> bark	15.8	15.8	9.4	59.0	11.3	5.0	4.3
4. Apricot (<i>Prunus armeniaca</i>) bark	11.8	13.2	3.6	71.4	34.0	9.0	3.8
5. Pomegranate rind (<i>Punica granatum</i>)	11.1	21.3	23.4	44.2	—	—	3.6
6. Almond (<i>Prunus amygdalus</i>)	10.0	4.9	5.6	69.5	13.7	7.0	4.2

N.B.: 1, 2 & 3 are available in the mountain regions; 4 is available in the plains and in the mountain regions; 5 & 6 are available in Kandahar.

Pomegranate being a pyrogallol tanning material is equivalent to myrobalan. Tanning tests conducted on a laboratory scale with the other five tanning materials showed that *thoran* was the best tanning material and was highly astringent to taste. Leathers obtained by tanning with *thoran* followed by pomegranate topping has good colour and feel.

C.L.R.I. Madras.

March 5, 1962.

K. J. KEDLAYA,

R. SELVARANGAN.

REFERENCES

1. "Tanning as a small scale and cottage industry"—Symposium, Central Leather Research Institute, Madras (1959).
2. Wilson, J. A., "Modern practice in leather manufacture", (Reinhold Publishing Corporation, New York), p. 277 (1941).
3. Harvey, A., "Tanning Materials", (Technical Press Ltd., London), p. 72 (1921).
4. Edwards, M. V., Badhwar, R. L. & Dey, A. C., "Vegetable tanning materials of India and Burma", (Govt. of India, New Delhi), p. 154 (1952).
5. "Official methods of analysis"—The Society of Leather Trades' Chemists, Croydon (1957).

TECHNICAL SEMINAR

Leather Industry and Leather Research in Hungary, Yugoslavia and Czechoslovakia

BY

T. J. DEVASSY

[Dr. T. J. Devassy, Senior Scientific Assistant, was deputed to undergo training in "Leather Processing" in some East European Countries, under the United Nations Technical Aid Administration Programme, from June-Dec. 1961. His training was in the tanneries and leather research institutes of Hungary, Yugoslavia and Czechoslovakia. Dr. Devassy presented in his seminar talk on Feb. 2, 1962, a comparative account of the techniques employed and the research problems tackled in the three countries.]

A survey of the leather industry in the East European countries is of special interest not only because of the different lines on which the industry is organised, but also because of the growing trade between India and these countries. In what follows, some of the impressions gathered during the visits to the leather factories and leather research institutes in Hungary, Yugoslavia and Czechoslovakia are given.

Leather Industry:

Nearly 50% of the requirements of hides and skins of each of the three countries is met by imports from all parts of the world; Argentina is one of the biggest suppliers of cow hides. However, all the three countries get the benefit of selection suited to their requirements. The quality of Indian raw goat-skins imported by them is found to be quite satisfactory but the present prices are considered to be extremely high. Also bacterial contamination and wrinkles parallel to the backbone appearing after finishing possibly due to excessive stretching during drying are some of the difficulties come across in the case of Indian skins. Tanners in these countries find it very difficult to finish the E.I. tanned kips, especially the heavier ones, into tight grained upper leathers which are essential for the European Market. It would be worthwhile for the E.I. tanning industry to modify suitably the current liming practices with this fact in view.

Curing does not present serious problems in these countries due partly to favourable atmospheric conditions and partly to modern slaughter houses. Even so, use of antibiotics along with the curing salt (1.5 mg. of chloromycetin per 1 kg. of curing salt) has been statutorily enforced in Yugoslavia; this is giving very good results.

Soaking is effected in drums, paddles or pits as the case may be and usually with no soaking agent. For unhairing, painting is preferred by some and liquor liming by others, the three alternative equipment, viz. drum, paddle and pit being employed. For calf leather, painting on the flesh side is generally resorted to. For uppers, liming is with a lime-sulphide mixture (1.5% Na_2S and 12% lime) in either a drum or paddle for 24-36 hours. Stock intended for sole leather is treated with lime and sulphide for one day and then relimed for 3 days in pits. In most cases, splitting is in the limed condition. A special process followed in Yugoslavia in the case of glove leather from goat skin is liming for 4-6 weeks, prior to chrome tanning. Generally ammonium sulphate and hydrochloric acid or ammonium chloride and hydrochloric acid are used for deliming to a pH of 8.2 to 8.4. Lactic acid is used in the case of garment leather and chrome uppers. In Czechoslovakian tanneries, deliming for sole leather is with HCl and $\text{Na}_2\text{S}_2\text{O}_4$. In the case of upper leather after bating, the stock goes to a pickle, usually of sulphuric acid and sodium chloride and in special cases of formate.

Most of the tanneries make their own chrome liquors of about 40-45% basicity using molasses as reducing agent; for tanning, fresh bath, half the pickle, or half of used chrome liquor is employed. Substitution of one fourth of the chrome liquor as chrome alum in the initial stages is preferred. Gradual raising of float, concentration, temperature and basicity is resorted to; in some cases, however, the whole of chrome liquor added in one lot to the pickle bath. In a special process, the bated pelt is treated with 1% formalin for two hours added in two instalments at an interval of one hour. Thereafter the lot is treated in a fresh bath with 5% chrome alum and 2% salt for 3 hours, then with 1% Cr_2O_3 , equivalent of 33% basic chrome liquor for 3 hours and then basified with sodium carbonate after tanning at a slightly higher temperature, the rest of operations being as usual. After chrome tanning, the good ones are finished as full chrome uppers and others retanned using 4% tannin in which case neutralisation is with syntan and there is an initial fatliquoring with anionic type

to be followed by cationic type. After drying at 50-55°C and 55% relative humidity, the moisture in leather will be about 20%. For chrome uppers, 3-4% of sulphated oil combined with free oil is used in fatliquoring. In the case of semi-chrome suedes, the fatliquor is applied on the set grain side by brush.

The two batch process is still used for glazed kid but a portion of dichromate is replaced with potassium chromate in the initial stages. During finishing operations, setting is done by hand only in the case of glazed kid, calf leather etc. For other types of leathers, machine setting including setting by table machine is resorted to. Instead of saw dusting, some tanners brush water on the grain side by a machine, allow the leather to stand for some time and then stake. The modern trend in finishing is to give aniline effect without much of pigments.

For vegetable tannage, quebracho, mimosa, chestnut and spruce extracts are used along with syntans. In most cases, the goods are suspended for one or two months in liquors of strength ranging from 1.5°Bé to 13°Bé. Only a few make sole leather by chrome-vegetable combination tannage, in some cases using products like Tannigan C.U. of Bayer's for prechroming. In the final stages, the leathers are drummed with liquor of 15°Bé for one or two days.

The softy leathers of Yugoslavia which have become very popular in European and American markets are produced as follows. After being painted with a mixture of lime, sodium sulphide and kaolin, the goods are unhaired and paddle limed with sulphide, lime, sodium chloride and calcium chloride. Deliming is with a mixture of ammonium sulphate, oropon and hydrochloric acids; the stock is given a heavy pickle with sodium chloride and sulphuric acid. For chrome tanning, molasses reduced liquor of 2% Cr_2O_3 content is used along with 2% calcium formate. After basification and ageing, rechroming with 1% Cr_2O_3 content and 1.5% sodium formate is carried out. After neutralising with sodium bicarbonate to pH 5.0, the goods retanned with 5% tannin and fatliquored with 2% wheat flour, 2% neat's foot oil and 10% sulphated neat's foot oil, followed by 2% cationic fatliquor. Pigment alone is very lightly applied during finishing.

Bye-Product Industries:

In the production of leather boards, use of chrome or vegetable shavings alone is not found to be good. The two are always mixed

in different proportions to obtain the desired quality. Both rubber latex and butadiene styrene are used as binding materials. An emulsion of tar, paraffin wax and fatliquor (total 8%) in hot water is added to the pulp. Apart from vacuum and pressure filters, centrifugal filters also are used for filtration. For production of thin boards with long fibres, filtration is done on moving belt filters. In Hungarian factories, small size splits are cemented together with latex cement, pressed, split into required thickness to be used in shoe making.

In glue and gelatin factories, animal fat forms an important by-product. Leather cuttings and splits after being cooked with lime are used to supplement animal food by about 10%.

Czechoslovakia manufactures the necessary auxiliaries and tannery machinery by itself; Hungary and Yugoslavia, on the other hand, depend on other countries for their auxiliary products and machinery especially on West European countries. In spite of not producing auxiliaries, Yugoslavia uses the best type auxiliaries imported from other countries to produce very good quality leather.

The highest degree of mechanisation is found in Czechoslovakian tanneries where all labour saving devices like cranes, spraying units with photocell attachment, pasting and drying units, continuous rolling machines and machinery for lime yard operations are employed. The tannery also is designed with this end in view; drums of 8000-10000 kg. capacity, which could be fed mechanically and from which the goods could be taken out with least effort are used. Yugoslav and Hungarian tanneries are smaller units with a good degree of mechanisation. In Czechoslovakia, a particular tannery specialises in only one type of leather; in the other two countries, different types of leathers are made in the same tannery. In one Hungarian tannery, all the solutions required in the different yards of the tannery are stored in one place in graduated vessels and sent to the required places by pipes.

The set up in these countries is such that products developed in the laboratories are tested immediately in the tanneries and taken up for further production if found good.

Leather Research Institutes:

Some of the important problems tackled in the Leather Research Institute, Budapest are: preparation of different types

of syntans based on pyrocatechin and their analysis by fractionation; production of good uppers from poor quality hides; waterproofing of flexible soles using silicones and chromium stearato-chloride; finishing of splits to give good leather; production of synthetic products based on polyvinyl and polyethylene resins for replacing leather soles; preparation and use of resins based on condensation of dicyandiamide with formalin for retannage. The preparation of chrome stearato-chloride in ethyl alcoholic solution has been successfully accomplished and now its application in the manufacture of different types of leathers is being tried out. For simultaneous chrome tanning and fatliquoring, bisulphited fish oil and sunflower oil are being tried with chrome liquors. In the process developed for tanning furs, drenching in wheat bran is considered to be very important. Shoe finishes are made by mixing nitrocellulose lacquer, polymethylmethacrylate emulsion and modified casein in different proportions. A mixture of acrylate emulsion, dense solution of casein and wax emulsion is used for covering defects in sole leather.

Standardisation of lasts for all types of shoes has been completed by the shoe department. The personnel in the control section which has got a chemical and physical testing sub-section visit the factories occasionally and give instructions on the methods to be followed for different types of leathers. Use of diamond head and continuously changing surface of emery paper as abrading material in determination of abrasion resistance is an interesting feature.

In Yugoslavian laboratories, development of process for finishing of E.I. kips without stripping, production and use of synthetic neat's foot oil are the important problems being tackled.

In the Czechoslovak Leather Research Institute, much work has been done on the production of different types of syntans based on brown coal distillation product containing 60% pyrocatechin, with polarographic control during production and with gas chromatography being used for analysis. In addition to the usual problems, work has been initiated on the regeneration of collagen.

TANNERS' CORNER

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

Q. XIV. It is essential to prevent mould growth on the pickled pelt for export. How can this be achieved?

A.: The mould growth on pickled pelts can be prevented by treatment with chemicals. The following chemicals may be successfully used:

1. Preventol ON & ON Extra .. Sodium orthophenyl-phenate.
2. Preventol PN .. Sodium penta-chloro-phenate.
3. Preventol liquid I .. Concentrated solution of sodium tri-chloro-phenate.
4. Santobrite .. Sodium penta-chloro-phenate.
5. Paranitrophenol ..

Treatment with santobrite and preventols:

Limed pelt after being washed thoroughly, is taken in a drum. The water required for pickling is added. The chemical is normally added with the proportion 8 oz./1000 lb. green stock and the drum is run for 15 minutes. The pickle salt and acid are then added and the drumming continued for some time. The uniform penetration of the chemical is ensured in the alkaline condition. Subsequently, by the addition of acid for pickle, the pentachloro-phenol is precipitated inside the pelt forming a permanent preventive against the growth of mould spores.

Treatment with paranitrophenol:

Normally 0.20-0.25% of the chemical on the weight on the pelt is taken. A concentrated solution of the same in water is swabbed on the pelt thoroughly so as to penetrate inside.

The chemicals have been tried and found to be successful in prevention of mould on chrome leather exported in the blue stage also.

CLASSIFIED ABSTRACTS

RAW MATERIALS

On the determination of lipoperoxides in animal tissues.

J. Glavind and S. Hartmann (Department of Biochemistry and Nutrition, Polytechnic Institute, Copenhagen, Denmark) *Acta Chem. Scand.* 15, 1927 (1961). The determination of lipoperoxides in animal tissues was studied through recovery experiments. Quantities of peroxides upto about 0.1μ equiv./g tissue added during the extraction of liver with chloroform disappeared during the determination. Lung and muscle destroy amounts of peroxides of the same order, whereas with blood and pancreas the recovery is better. Improved recoveries were obtained by adding large amounts of hydrogen peroxide. The principles disturbing the determination of lipoperoxides do not interfere with the thiobarbituric acid reaction.

PROCESSES PRIOR TO TANNING

Studies on the pickling. Influence of pickling on the qualities of chromed hide piece.

Keizo Wada and Hiroshi Okamura, *Bull. Jap. Assoc. Leath. Tech.* 7, 51 (1961). Although many investigations have been carried out about pickling, only a few deal with the relations between the physical properties of pickled hides and those of the chromed leathers. The authors studied the changes in length, stretching and swelling in relation to the concentrations of HCl-NaCl system used for the pickling. In this experiment, the hide pieces used, belonged to the same population and they were tanned with the cationic and anionic chromium compounds. Then it was shown that the physical qualities and chrome contents of the resulting leather were influenced by the pickling conditions, especially of anionic chrome tanned leathers. The effect of pickling on tanned leather was two or three times as great in thickness as in length.

VEGETABLE TANNAGE

Quantitative effects of eugenol on "lignin" and non-lignin fractions in leaf tissues of some woody plants.

James R. Troyer (School of Forestry, Yale University, New Haven, Connecticut) *Arch. Biochem. Biophys.* 95, 187 (1961).

Samples of leaf tissues of five species of woody plants were treated with eugenol and peroxide during 2-hour incubation periods, then analyzed for comparison with similar samples treated with peroxide but no eugenol. Eugenol treatment resulted in an increase in total dry weight, an increase in the weight of sulfuric acid "lignin," a decrease in total extractives, and an increase in non-extractive acid-solubles. High nitrogen and low methoxyl contents of the "lignin" fraction suggested that it contained non-lignin materials. In four of the five species the increase in "lignin" was much smaller than the increase in dry weight, the decrease in extractives, and the increase in acid-solubles. It is concluded that the effects of eugenol supplied to these tissues are not limited to the "lignin" fraction.

CHROME TANNAGE

Polarographic studies on the combination between chromic chloride and collagen protein. I. Polarography on the aquochromic chloride.

Hiroshi Nunoura (Bioch. Lab. Faculty of Home Economics, Kyoto Women's Univ.) *Bull. Jap. Assoc. Leath. Tech.* 7, 47 (1961). (1) $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2]^+$, $[\text{Cr}(\text{H}_2\text{O})_5\text{Cl}]^{++}$ and $[\text{Cr}(\text{H}_2\text{O})_6]^{+++}$ were reduced at half wave potential of $-0.610\text{V. vs. S.C.E.}$, $-0.890\text{V. vs. S.C.E.}$ and $-0.910\text{V. vs. S.C.E.}$ respectively. (2) The diffusion currents of $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2]^+$, $[\text{Cr}(\text{H}_2\text{O})_5\text{Cl}]^{++}$ and $[\text{Cr}(\text{H}_2\text{O})_6]^{+++}$ were exactly proportional to each ion concentration. (3) In the solution of $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2]^+$ and $[\text{Cr}(\text{H}_2\text{O})_5\text{Cl}]^{++}$ at 20°C for 1 hour after first dissolving, transition did not occur. But when allowed to age for more than 20 minutes, the chemical change took place in the solution and after 72 hours only $[\text{Cr}(\text{H}_2\text{O})_6]^{+++}$ ion was present. (4) Transition by exchanging the bound chloride for water molecules proceeded rapidly at high solution temperature. When solution temperature was kept at 70°C for 20 minutes $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2]^+$ completely changed into $[\text{Cr}(\text{H}_2\text{O})_6]^{+++}$. (5) It is possible to follow quantitatively the steps of the transition of $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2]^+$, $[\text{Cr}(\text{H}_2\text{O})_5\text{Cl}]^{++}$ and $[\text{Cr}(\text{H}_2\text{O})_6]^{+++}$ for 1 hour after first dissolving. (6) Polarographic study on such diluted chromic solution seems to contribute to some extent to chemical research of tanning process. (7) The experimental results indicated that the aquochromic chloride is unstable. It is expected that by polarographic method the composition and the equilibrium of other chrome complex ions would be made clear. And it is possible to follow the different stages for tanning.

OTHER TANNAGES

Catalysts for cerium(IV) oxidimetry. Determination of polyhydric alcohols and metal chelates of 8-quinolinol.

G. C. Guilbault (Princeton University, Princeton, N.J.) and W. H. McCurdy, Jr. (University of Delaware, Newark, Del.) *Anal. Chem.* **33**, 580 (1961). A silver (I)-manganese (II) catalyst system markedly increases the rate of oxidation of glycerol, erythritol, pentaerythritol, and 8-quinolinol by cerium(IV) sulfate in perchloric acid. Complete reaction requires only 3 to 5 minutes at 90°C., the end point being indicated by formation of the red colour of permanganate. Glycerol (3 to 50 mg.), erythritol, or pentaerythritol (3 to 16 mg.) may be determined with a standard deviation of 0.3 to 0.5%; gallium(III), indium(III), aluminium(III), or magnesium(II) (0.05 to 5.0 mg.) may be determined after dissolution of the 8-quinolinol precipitates with a standard deviation of 1.0%.

Complex formation of aluminium with 7-Iodo-8-hydroxyquinoline-5-sulphonic acid (Ferron).

F. J. Langmyhr and A. R. Storm (University of Oslo, Chemical Institute A. Blindern, Norway) *Acta Chem. Scand.* **15**, 1461 (1961). By potentiometric methods the two dissociation constants of ferron were found to be: $pK_1 = 2.50$ and $pK_2 = 7.11$ at $25.0 \pm 0.1^\circ\text{C}$ and in the presence of 0.10 M potassium chloride. Potentiometric titrations of mixtures of ferron (H_2A) and aluminium indicated the presence of the following complexes: AlA^+ , $\text{Al}(\text{OH})\text{A}$ (slightly soluble), $\text{Al}(\text{OH})_2\text{A}^-$, AlA_2^- , $\text{Al}(\text{OH})\text{A}_2^{2-}$ and AlA_3^{3-} . The stability constants of the complexes not containing hydroxyl were found to be: $\log K_{\text{MA}} = 7.6$, $\log K_{\text{MA}_2} = 7.1$ and $\log K_{\text{MA}_3} = 5.6$ at $25.0 \pm 0.1^\circ\text{C}$ and in the presence of 0.10 M potassium chloride. Under the same conditions the $\log K$ for the equilibrium $(\text{AlA}_2^-)(\text{Al}(\text{OH})\text{A}_2^{2-})(\text{H}^+)$ was calculated to 5.0.

Studies on tanning effect by Suminagashi (3). Effects of organic acids upon Sumi-film solidifying action of ferric and chromium salts.

Hitoo Hakiyama (7th Div. of the Govt. Chem. Ind. Res. Inst., Tokyo) *Bull. Jap. Assoc. Leath. Tech.* **7**, 12 (1961). When a certain carboxylic acid was added to ferric and chromium salts solution,

the Sumi-film solidifying power of these salts was weakened. On various carboxylic acids, the author observed the above effect by the expansion pattern in the Sumi-film that was described in a previous paper. The following results were obtained: (1) Monocarboxylic acids gave no effect. (2) Oxalic and malonic acids weakened remarkably the power of the salt. Succinic acid gave slight effect, but glutaric and adipic acids did not show any effect. (3) Oxymonocarboxylic acid gave slight effect. Oxydi- and tricarboxylic acids weakened remarkably the power of the salts, and increasing the number of -OH groups in acid molecule the effect became stronger.

Studies on iron tanning. V. The physical properties of iron citrate tanned leather and the influences of the tanning conditions on them.

Hideo Nihiro (Bioch. Lab. Depart. of Home Economics, Kyoto Women's Univ.) *Bull. Jap. Assoc. Leath. Tech.* **7**, 21 (1961). The influence of the tanning condition on the tensile strength, thickness and T_s of the iron-citrate tanned leather was investigated and the following results were obtained: (1) The optimum condition of the liquor for producing the strong leather is that the molar ratio of citrate/iron is 0.40-0.50 and the region of initial pH is 2.0-2.4. (2) The thickness of the leather increases with raising pH and concentration of the initial tanning liquor. (3) The final pH of the tanning liquor must be stopped in the region 2.9-3.2 for keeping the high T_s of the leather. (4) The results of comparative test with chrome sulphate tanning have shown that iron citrate tanned leather is equal to chrome tanned leather in regard to the tensile strength and elongation.

PROCESSES AFTER TANNING

Dyeing chrome-tanned leather with the aid of ethylene oxide levelling agents.

J. Herndl and W. Haldemann, *J. Soc. Dyers and Colourists*, **77**, 646 (1961). A brief description is given of the properties of leather, with particular reference to the application of dyes in presence of nonionic, anionic, and cationic auxiliary agents. Fixation of chrome complex, vegetable, and synthetic tanning agents is described. The dyeing of suede leather is considered in detail, and the effect of two "nonionic" polyoxyethylene derivatives on the absorption spectra of six sulphonated azo dyes is studied. It is concluded that, to obtain satisfactory dyeings on chrome-tanned

suede leather, the dyes used must have similar affinity, any differences in affinity must be minimised by addition of a suitable auxiliary agent, and the agent must have similar effects on the absorption spectra of all the dyes used.

TESTING

Simple quantitative test for measuring collagenase activity.

Howard Tint (Product Development Division, Wyeth Labs., Radnor, Pennsylvania) *Arch. Biochem. Biophys.* **92**, 154 (1961). A linear relationship was observed when the logarithm of collagenase concentration was plotted against per cent weight reduction of refined, undegraded collagen as substrate. The slopes for 19 regression lines were determined, based on three to six observations each. From the mean slope, a nomograph was constructed for determining the amount of collagenase required to digest 50% of a standard substrate in 30 min. at 40°C. (ED_{50}), providing an activity unit in a simplified and rapid assay of this enzyme.

The determination of hydroxyproline in tissue and protein samples containing small proportions of this imino acid.

J. F. Woessner, Jr. (Labs. of Biochem., Howard Hughes Med. Inst., Miami, Florida; and the Dept. of Biochem., Univ. of Miami School of Medicine, Miami, Florida) *Arch. Biochem. Biophys.* **93**, 440 (1961). A method is presented for the quantitative determination of hydroxyproline in biological materials containing as little as one part of hydroxyproline in 4000 parts of amino acids. This method has been applied to a study of hydroxyproline distribution in cell particulates, tissue fluids, and purified plant and animal proteins. Significant amounts of hydroxyproline were found in crystalline preparations of pepsin, elastase, and ficin.

A spectrophotometric titration for the determination of sulfhydryl groups.

Irving M. Klotz and Barbara R. Carver (Dept of Chem., Northwestern Univ., Evanston, Illinois) *Arch. Biochem. Biophys.* **95**, 540 (1961). A spectrophotometric (or colorimetric) titration for mercapto groups has been devised based on the use of a monofunctional organic mercurial, salyrganic acid, as titrant, and a mercurial-complexing dye, pyridine-2-azo-p-dimethylaniline, as an indicator of the end point. Titrations of several small-molecule mercaptans, proteins, and thiolated dextran are sharp and accurate within 1-2%.

Automatic polarograph for use with solutions of high resistance.

Paul Arthur, Phillip A. Lewis, Nelson A. Lloyd, and Richard K. Vanderkam (Department of Chemistry, Oklahoma State University, Stillwater, Okla) *Anal. Chem.* **33**, 488 (1961). A new polarograph and cell for use with solutions of high electrical resistance are described. The apparatus employs a strip-chart function plotter, the pen of which moves as a function of one potential while the chart follows another. By using the pen to trace current while the chart measures the changing potential of the microelectrode with respect to a reversible electrode through which no current is drawn, polarographic curves of current vs. effective voltage are obtained, thus eliminating iR drop. Many organic solvents not usable with conventional polarographs can be employed in polarography with this equipment. Aqueous cells with resistances as great as 500,000 ohms have been successfully employed, and organic solvents (e.g., 1-octanol) with cell resistances upto 6 megohms have given satisfactory polarograms with this apparatus.

Determination of copolymer composition by infrared analysis. Poly(vinyl acetate)-poly(methyl acrylate).

Suresh N. Chinai and Robert H. Campbell (Special Projects Department, Monsanto Chemical Co., Boston, Mass.) *Anal. Chem.* **33**, 577 (1961). A rapid and accurate absorptimetric method for analyzing poly-(methyl acrylate)-poly (vinyl acetate) mixtures or copolymers has been developed. The absorption maxima due to ester linkages in the region of 8.0 and 8.55 microns have been found useful in determining the composition of mixtures and copolymers. The developed equation is:

$$\% \text{ PVA} = 70.27 (1.92 A_{8.0\mu} - A_{8.55\mu}).$$

THEORIES

A new sulfur-containing amino acid.

Shunzi Mizuhara and Shinji Oomori (Department of Biochemistry, Okayama University Medical School, Okayama, Japan) *Arch. Biochem. Biophys.* **92**, 53 (1961). A new acidic amino acid ($C_8H_{15}O_4NS$) containing cysteine residue was isolated from the urine of an atherosclerotic patient. It melted at 213° with decomposition. Crystalline form is rhombic plate from 50% alcohol. Ninhydrin colour is blue on paper chromatogram. R_f values are 0.58-0.65 in butanol-acetic acid-water and 0.43-0.53 in

phenol-water. The isolation method consists of desalting the urine by ion exchangers, preparing acidic amino acid fraction by Amberlite CG-45, was also found in the urine of cat and of hypothyroid patients such as those having myxoedema and cretinism. Another S-containing amino acid was occasionally found in those urine samples described above and was identical on two-dimensional paper chromatogram with a synthetic sample S-(2-methyl-2-carboxyethyl) cysteine.

Formation and stabilization of the collagen-fold.

William F. Harrington (Lab. of Cellular Physiology and Metabolism, National Heart Inst., National Insts. of Health, Bethesda, Maryland) and Peter H. von Hippel (Dept. of Biochem., Dartmouth Medical School, Hanover, New Hampshire) *Arch. Biochem. Biophys.* **92**, 100 (1961). The mutarotation of ichthyocol gelatin at low temperatures has been examined over a wide range of protein concentrations in the region below the gelation level. The rates of mutarotation as well as the final values of specific rotation are shown to be independent of concentration suggesting that the configurational changes responsible for rotation depend on intramolecular events. Some type of hydrogen bonding appears to be involved in the formation and stabilization of the collagen-fold since no mutarotation is observed in concentrated aqueous solutions of urea or guanidine-HCl. Moreover, the melting profiles of chilled gelatin solutions in H_2O and D_2O reveal a significant increase in melting temperature ($3.7^\circ C$) in D_2O over that in H_2O .

Rate measurements of mutarotation reveal that (1) the process obeys second-order kinetics with respect to the amount of gelatin in the unfolded configuration; and (2) the rate of mutarotation at a fixed low temperature is much greater in D_2O than in H_2O .

A mechanism for the formation of the collagen-fold is proposed in which water molecules act to stabilize the collagen-fold configuration through formation of doubly hydrogen-bonded bridges between adjacent carbonyl groups. The kinetics are interpreted in terms of an intramolecular crystallization process originating from preformed nuclei.

A comparison of the acid-soluble collagens from the skin and swim bladder of cod.

E. Gordon Young and J. W. Lorimer (Atlantic Regional Laboratory, National Research Council of Canada, Halifax, Nova Scotia,

Canada) *Arch. Biochem. Biophys.* **92**, 183 (1961). A comparison has been made of the collagen extractable at $4^\circ C$ with $0.1M$ citrate buffer (pH 3.4) from the skin and the swim bladder of the Atlantic cod. Both collagens were recovered as microscopic needlelike fibres with characteristic transverse bands. The collagens from skin and swim bladder contained, respectively, 18.2 and 18.4% N, 8.0 and 8.3% hydroxyproline, 0.06 and 0.12% hexosamine. The distribution of amino acids and the infrared spectra were quantitatively identical. Some physical constants for one preparation from skin and two from swim bladder were, respectively $(\alpha)_D^{50} -350 \pm 40^\circ$ vs. $-378 \pm 13^\circ$ and -368° , (η) 13.4 ± 0.9 vs. 17.2 and 13.2 dl./g., s_{20w} , 3.17 ± 0.10 vs. 4.03 ± 0.05 and 3.39 ± 0.06 S, and molecular weight 2.8×10^5 vs. 4.8×10^5 and 3.2×10^5 . The molecular dimensions differed slightly. The value for T_D was identical at $13-14^\circ C$. The two soluble collagens thus appear to be similar, if not identical, both chemically and physically.

BYE-PRODUCTS

A study of the dyeing behaviour of abraded wool.

H. R. Hadfield and D. R. Lemin, *J. Soc. Dyers and Colourists*, **77**, 715 (1961). A study has been made of the effect of abrasion of wool on the characteristic properties of individual acid dyes on wool fibres. When abrasion takes place before dyeing, the abraded areas dye initially more heavily than the unabraded areas. When abrasion occurs after dyeing, the abraded areas appear to be less heavily dyed, owing to an optical effect caused by fibrillation of the fibres. Rubbing of wool against wool produces an effect identical with that obtained on abrasion by glass-paper or other abrasives. The time required to produce level dyeings on abraded wool varies widely from dye to dye, and the degree of sulphonation of the dye has an important effect. Certain cationic auxiliary agents reduce the time required to produce level dyeings. Apparently, abrasion increases the hydrophilic nature of the fibre surface.

Effect of dyeing and related processes on some physical characteristics of wool.

J. Elliott, N. Oldfield, C. B. Stevens and C. S. Whewell, *J. Soc. Dyers and Colourists*, **77**, 727 (1961). Values are given for the

percentage reduction in the work to stretch wool fibres (% RW) after various treatments similar to those likely to be encountered in preparation and dyeing. Special attention is given to the changes brought about by solvent-assisted dyeing processes. In mild acid and alkaline treatments, low values are obtained if the temperature does not exceed 70°C, but above this temperature the % RW increases rapidly. Although under the conditions recommended for solvent-assisted dyeing the % RW is small, the presence of solvent increases the % RW if fibres are treated for long time at high temperatures. This suggests that under these conditions irreversible changes are brought about by the solvent. Measurements of breaking load and extension of yarns treated under various conditions show that greater degradation is produced when yarns are treated first in an acid solution and then in alkali than when the treatments are in the reverse order. This phenomenon was not observed in successive dyeing and sodium carbonate treatments. In these cases, the total reduction in yarn tensile strength was considerably less than the sum of the reductions brought about by individual treatments, except where dyeing was carried out at pH 2.

GENERAL

The preparation and properties of two new chromogenic substrates of trypsin.

Bernard F. Erlanger, Nicholas Kokowsky and William Cohen (Dept. of Microbiology, College of Physicians and Surgeons, Columbia University, New York) *Arch. Biochem. Biophys.* **95**, 271 (1961). The synthesis and properties of L-lysine *p*-nitroanilide dihydrobromide and benzoyl DL-arginine *p*-nitroanilide hydrochloride are described. Both compounds are hydrolyzed by trypsin, the latter being a substrate at least as sensitive as benzoyl L-argininamide. Their hydrolysis can be followed conveniently by colorimetric procedures, since one of the products, *p*-nitroaniline, is yellow. Values of K_m and K_3 for their reaction with trypsin were determined, as well as the K_i of benzoyl D-arginine *p*-nitroanilide, which was isolated from a tryptic digest of the DL isomer. The pH-activity curves were also determined, that of L-LPA being in a more alkaline region than normally found for trypsin substrates. The possible significance of this shift is discussed. Preliminary studies indicate that benzoyl DL-arginine *p*-nitroanilide hydrochloride is also hydrolyzed by papain.



**HILCO
MICRON**

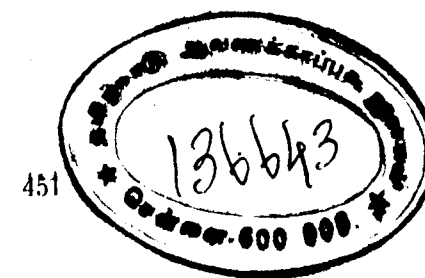
**QUALITY
LEATHER
FINISHES**

**BINDERS & AUXILIARIES
PIGMENT FINISHES
RESIN FINISHES
SOLE POLISHES**

HANDYMAN INDUSTRIES PRIVATE LTD

161 MOUNT ROAD MADRAS 2. INDIA
PHONE: 86871 GRAMS: REPTILES

Aiyars H I 10



NOTES AND NEWS

Development of temporary rust preventives

Recent study has shown that painting on rusty, dirty or wet surface is a complete waste as no paint will adhere to such surfaces. The Metallurgical and Chemical Wing of the Research, Designs and Standards Organisation has developed low cost derusting and surface treatment compositions based on the indigenous materials.

After mechanical derusting to remove loose rust and degreasing, the derusting composition is applied with a hard brush. When dry, this is followed by wire brushing to remove the friable black iron tannate. Depending upon the thickness of the rust, this operation is repeated.

To protect the derusted surface temporarily before the paint is applied and to obtain a good key for the subsequent paint coat, the surface treatment composition is applied. If the tannate film layer is not going to be painted within a reasonable time, a second coat of the temporary protective composition may be given.

It has been found that these compositions can be used for protection against corrosion and against deposition of sludge on the surface of boiler plates and tubes. For this purpose, the boiler tubes and plates can be treated before assembly with the derusting composition after degreasing and wire brushing.

The constituents of the various compositions are as follows:

Derusting composition—Karda or mangrove extract (dry) 1.0, myrobalan extract (dry) 3.0, 40% solution commercial formalin 2.0, water, Teepol 710 or Idet-10 0.5, molasses or glycerine 2.0 to 2.5 and phosphoric acid to give a pH of 2.5 to 3.0.

Surface treatment composition:—Mangrove (dry extract) 2.0, myrobalan (dry extract) 2.0, formalin 40% solution 2.0, water 50.0 and wetting agent 0.1.

Temporary protective composition—Mangrove (dry extract) 2.0, myrobalan (dry extract) 2.0, formalin 40% solution 1.75, hexamine 0.25, water 15.0 and wetting agent 0.25.

[The figures indicate the parts by weight]

Indian Railway Technical Bulletin: November, 61.

Technical advantages of using leather in footwear manufacture

Technical advantages of employing leather in footwear manufacture, coupled with the problems facing the scientist in producing synthetic materials with similar attributes, were stressed by Mr. Francis Gleason, President, J. F. McElwain Co., at the recent autumn meeting of the Tanners' Council of America, in Chicago, U.S.A.

The workability of leather was such an asset, he pointed out, when it came to wrapping a material, whose natural condition was flat, around an odd-shaped last. Its workability was such, too, that it could be formed into a triple needle toe and could withstand a lot of wiping, pinching and hot ironing along the way.

If the accuracy of putting together the upper in shoe manufacture did not substantially improve, would man-made material withstand the heat and pressures of mechanically created curvatures and such corrective measures as might be necessary? Mr. Gleason asked.

Another example of the exploitation of the unique properties of leather in footwear to which the speaker drew attention, concerned handsewing. This, he pointed out, caused a draw or puckering in leather adjacent to the stitching, a further mark of aesthetic distinction. Could a man-made material reproduce this effect?

Leather Trades Review: November 29, 1961.

Indian Sheep and Goatskins and the Common market

The Common External Tariff (C.E.T.) of the Six, due to come into full operation by 1969 at the earliest, is still being revised and adapted to meet the changing needs of industry and inside the Community. The Executive Commission has just put forward a series of alterations to the original C.E.T. which will have to be approved by the Council of Ministers.

Proposed clarification of the way the C.E.T. is to be applied to imports of Indian sheep- and goatskins, for instance, will be of considerable importance to the tanning industries of the Six. The skins are in list F of the Rome Treaty—duties fixed by mutual agreement, and not worked out as an average of the Six's former duties.

Originally list F provided that tanned Indian sheep- and goat-skins should be duty free—but the Council of Ministers last year decided that this exemption would only apply to skins tanned with vegetable products. The Commission's new proposals now make it clear that products tanned by other processes come into a group carrying 6 and 7 per cent duties. This will be widely welcomed by tanners inside the Six who finish a large number of imported skins tanned with vegetable products.

Leather Trades Review: November 29, 1961.

Du Pont may build synthetic leather plant

Du Pont is studying plans to build a large-scale plant at Old Hickory, Tenn., to make synthetic leather. The studies are preliminary; the decision to build the plant probably won't be made until early next year. About all that Du Pont is saying about its new synthetic leather is that it's a polymeric material. The product has been under development for about 10 years. It is being made now in pilot plant quantities at the Company's New Burgh, N. Y., laboratory. The biggest initial market for Du Pont's new material is shoes.

Chemical & Engineering News: December 4, 1961.

Uniform freight rates from India-Pakistan

Uniform "basis rates" of freight will be charged for shipments of individual commodities from all areas of India and Pakistan to destinations covered by various conferences serving the United Kingdom and Continent, effective from 1 March, it was announced recently by the local secretaries of the Malabar Coast, United Kingdom and Eire Conference and Continent/India-Pakistan Conference.

However, where an additional rate is quoted at present for shipments from a particular port, this will continue to be applied. The announcement explains that the move is designed to put shippers on equal footing.

—*Leather Trades Review*: December 27, 1961.

Indian hide output

Last year Indian "organised enterprises" produced some 794,000 chrome-tanned hides and 2,678,000 bark-tanned hides. This output compares with respective 1959 levels of 650,000 and 2,466,000 pieces. Exports of leather and green and pre-tanned hides and skins fell, however, from a 1959 value of 284,700,000 rupees to only 257,000,000 rupees last year.

—*Leather Trades Review*: December 27, 1961.

Accuracy of pH standards increased

The National Bureau of Standards has extended the accuracy of the seven pH standards that define the pH scale from 0 to 95°C. Whereas the pH was formerly certified to 0.01 unit, the values from 0 to 60°C are now considered accurate to within 0.005 unit. This estimate includes 0.003 unit as a limit for the extrapolation, with an allowance of 0.002 unit for possible uncertainties in the electrochemical constants. Above 60°C, the estimated uncertainty is 0.008 unit.

Measurements of the acidity or basicity of solutions, expressed on the pH scale, are of critical importance in chemical analysis, medical research, and many industrial processes. Some years ago the Bureau took the lead in establishing a standard pH scale that would meet the practical needs of industry and possess, as well, the fundamental meaning demanded by science. Although standards for the adjustment of pH measuring equipment have been issued by the Bureau for more than 15 years, until recently fundamental difficulties in the calculation of a standard pH limited the accuracy in the assignment of standard pH values to two decimal places.

In general, to assign values to the pH standards, the electromotive force of cells employing the standard solutions as electrolytes is measured. These cells utilize the highly reproducible hydrogen and silver-silver chloride electrodes. Computation of the pH has been based upon several reasonable assumed relationships between ionic activities and mean activities.

During the past year, a mutually satisfactory convention developed by the Bureau in cooperation with the British Standards Institution's pH committee, has received the endorsement of the International Union of Pure and Applied Chemistry. The convention defines uniquely the numerical value of the individual activity coefficient of chloride ion in the buffer solutions.

To extend the accuracy of the pH standards, the original emf data have now been reexamined. With the aid of the new convention, the standard reference values of pH from 0 to 95°C have been recalculated with a single consistent set of standard potentials and electrochemical constants.

American Dyestuff Reporter: December 25, 1961.

Valedictory function of footwear trainees

The valedictory function for the IV course of training in the Central Footwear Training Centre, Madras, was held on Feb. 27, 1962 at New Woodlands Hotel, Mylapore. Dr. Y. Nayudamma, Director, Central Leather Research Institute, presided over the function and distributed the medals instituted by the Development Commissioner, Small Scale Industries.

Col. E. P. Raju, Director, Small Industries Service Institute, Madras, welcomed the gathering. In his report, Shri N. R. Lodh, Deputy Director-in-charge of the Centre, pointed out that the current IV course was only for training Foremen and Managers. From the next course onwards, 75 trainees would be turned out. The Centre had so far trained 311 candidates as Foremen, Managers and Operators. In his presidential address, Dr. Nayudamma advised the trainees as to how they should conduct themselves in their future career.

The function concluded with a programme of variety entertainment.

Institute of Leather Technology, Madras

Annual Day Celebrations

The Institute of Leather Technology, Washermenpet, Madras, celebrated its Annual Day on March 26, 1962 with Dr. Y. Nayudamma, Director, Central Leather Research Institute, in the Chair. Mrs. Nayudamma distributed the prizes to the winners of the various competitions. A programme of variety entertainments also was presented on the occasion.

Earlier, Shri R. Padmanabhan welcomed the gathering and Shri K. Padmanabhan presented the Annual Report of the Institute for the year 1961-62. Dr. P. H. Rao, Development Officer,

Bata Shoe Co., delivered the valedictory address on "Modern Technologists in India". In his address, Dr. Nayudamma exhorted the technologists to work whole-heartedly for the promotion of the leather industry.

Shri S. Pillai proposed a vote of thanks.

The Institute is to be shortly shifted to new premises at Adyar near C.L.R.I.

Cattle bones and surgery

After prolonged research, Finnish doctors and the drug manufacturers, Laake Incorporated, of Turku, have invented a white powder, made from the femur-thigh-bone of cattle through various processes for removing all organic substances. Known as Ossar Bone, the powder is used for filling bone cavities, mending fractures and other similar purposes. The substance has already been used successfully in 'hundreds' of operations, it is claimed.

The Hindu: March 26, 1962.

Madras State Cattle show

The 5th State Cattle Show held at Tiruchi, concluded on March 25, 1962. The following were the prize winning animals:

The best animal of the Show—the murreh buffalo bull of Orathanad Farm and the Kangayam Cow of Chettinad Farm. The best animal as regards milk yield—the Tharparkar Cow of Chettinad Farm.

In the sheep and goats show, about 86 heads participated, representing the districts of Nilgiris, Salem, South Arcot, Ramanathapuram and Tiruchi.

Sri P. Kakkan, Minister for Agriculture, Madras State, who distributed the prizes paid a tribute to the family of a pattagar of Palayacottai for evolving the Kangayam breed.

The Hindu: March 29, 1962.

C.L.R.I. NEWS

Dr. Y. Nayudamma, Director, Mr. A. Ganesan, Senior Scientific Officer and Dr. K. Wolf, Unesco Expert, C.L.R.I. attended the Leather Belting Sub-Committee meeting EDC 42-2 of the Indian Standards Institution, at Madras on March 6, 1962.

Dr. Y. Nayudamma, Director, attended the meeting of Ad-hoc Leather Board of the Government of Andhra Pradesh at Hyderabad on March 16 & 17, 1962; visited the various tanning centres in the Punjab for an on-the-spot study of tanning problems and for evaluating the C.L.R.I. Extension Service Unit work in the State; held discussions with prominent members of the industry, Leather Advisory Chamber, Government officials and the Chief Minister Mr. Pratap Singh Kairon.

Sri P. N. Choudury, Senior Scientific Officer, toured U.P. and West Bengal from 3-3-1962 to 23-4-1962 to study the socio-economic conditions of the leather and footwear industries in those States.

Our congratulations go to the following members of the staff of this Institute who have been awarded the Degrees mentioned below against their names by the Madras University:

Sri S. C. Nandy: Thesis on "The studies on the chromogenesis of halophilic bacteria associated with salted skin"—Ph.D.

Sri E. C. George: Thesis on "Studies on the microbiology of some vegetable tanliquors"—M.Sc.

Sri S. Ananthanarayanan: Thesis on "Application of instrumental and analytical techniques in leather research"—M.Sc.

சென்ட்ரல் லெதர் ரிசர்ச் இன்ஸ்டிடியூட் புல்லட்டின்

இணைப்பு ஏடு, ஏப்ரல், 1962

“பை” முறையில் பதனிடுதல்

கொன்னம்பட்டையையும், கடுக்காயையும் 2 : 1 என்ற விகிதத்தில் கலந்து சோடியம் சல்பைடை உபயோகிக்காமல் வெறும் சுண்ணும்பை மட்டும் உபயோகித்து கபிலைத் தோல் தயாரித்தல்

எஸ். பி. கோஷ்.

கச்சாப் பொருள் :

ஒவ்வொன்றும் 6-8 ராத்தல் (2.7-3.6 கி. கிராம்) எடை கொண்ட பசு வறத்தோல்கள் உபயோகிக்கப்பட்டன.

குறிப்பு :—இம்முறையில் கொடுக்கப்பட்டுள்ள அளவுகள் 40 கி. கிராம் (1 மணங்கு) வறத் தோலுக்குக் கணக்கிடப்பட்டதாகும்.

1-ம் நாள் : நனைவு :

ஒரு குழியில் 400 லிட்டர் (9 காலன்) தண்ணீர் நிரப்பப்பட்டு, அதில் 0.45 கி. கிராம் (1 ராத்தல்) சுண்ணாம்பும், 0.37 கி. கிராம் (13 அவுன்ஸ்) சோடாக்காரமும் (சோடா ஆஷும்) கலக்கப்படுகின்றன. தோல்கள் இக்குழியில் தள்ளப்பட்டு, இரவு முழுதும் விட்டு வைக்கப்படுகின்றன.

2-ம் நாள் :

தோல்கள் வெளியே எடுக்கப்பட்டு, சல்லா சீவப்பட்டு, மறுபடி இதே குழியில் தள்ளப்பட்டு மாலை வரையில் நடு நடுவே அரக்கப்படுகின்றன. இவை போதிய அளவு மிருதுவானவுடன் கழுவுப்பட்டு, வடிய வைக்கப்பட்டு, நிறுக்கப்படுகின்றன. நனைவு எடை குறித்துக் கொள்ளப்படுகிறது.

3-ம் நாள் : சுண்ணாம்பிடுதல் :

ஒரு குழியில் போதுமான அளவு பழைய சுண்ணாம்புத் தண்ணீர் நிரப்பப்படுகிறது. (இப்பழைய சுண்ணாம்புத் தண்ணீரில் இரண்டு கட்டுத் தோல்கள் முன்பே சுண்ணாம்பிடுபட்டிருக்க வேண்டும். மேலும் இச்சுண்ணாம்புத் தண்ணீர் உபயோகப்படுத்தப்பட்டு 10 நாட்களுக்கு மேல் ஆகி இருக்கக்கூடாது.) இப்பழைய சுண்ணாம்புத் தண்ணீரில் 4.54 கி. கிராம் (10 ராத்தல்) புதிய சுண்ணாம்புத் தூள் கலக்கப்பட்டு, சுண்ணாம்புத் தண்ணீரின் காரம் அதிகமாகக் கப்படுகிறது. இச்சுண்ணாம்புத் தண்ணீரில் தோல்கள் தள்ளப்பட்டு, காஸையில் ஒரு தடவையும் மாஸையில் ஒரு தடவையும் குழி திருப்பப்படுகின்றன.

4-7 நாட்கள் :

3-ம் நாள் செய்யப்பட்டது போலவே ஒவ்வொரு நாளும் தோல்கள் குழி திருப்பப்படுகின்றன.

8-ம் நாள் : மறு சுண்ணாம்பிடுதல் (காரம்) :

தோல்கள் முடி தள்ளப்படுகின்றன. பின்னர் ஒரு குழியில் 320 லிட்டர் (7.1 காலன்) தண்ணீர் நிரப்பப்பட்டு, அதில் 6.80 கி. கிராம் (15.20 ராத்தல்) சுண்ணாம்புத் தூள் கலக்கப்படுகிறது. இப்புதிய சுண்ணாம்புத் தண்ணீரில் தோல்கள் போடப்பட்டு, மாஸையில் சுமார் 15 நிமிடங்களுக்குப் புரட்டி விடப்பட்டு இரவு முழுதும் குழியிலேயே விட்டு வைக்கப்படுகின்றன.

9-ம் நாள் :

தோல்கள் சுண்ணாம்புத் தண்ணீரில் காஸையில் 15 நிமிடங்களும் மாஸையில் 15 நிமிடங்களும் புரட்டி விடப்படுகின்றன.

10-ம் நாள் :

தோல்கள் சல்லா சீவப்பட்டு, கழுவப்பட்டு, கார் வாங்கப்படுகின்றன. பின்னர் இவை நிறுக்கப்படுகின்றன. சல்லா எடை குறித்துக் கொள்ளப்படுகிறது.

சுண்ணாம்பு நீக்கம் :

ஒரு குழியில் 120 லிட்டர் (2.6 காலன்) தண்ணீர் நிரப்பப்பட்டு அதில் 0.45 கி. கிராம் (1 ராத்தல்) அமோனியம் சல்பேட் கரைக்கப்படுகிறது. இக்குழியில் கார் வாங்கப்பட்ட தோல்கள் போடப்பட்டு, ½ மணி நேரத்திற்குப் புரட்டிவிடப்படுகின்றன. பின்னர் இரவு முழுதும் இக்குழியிலேயே விட்டு வைக்கப்படுகின்றன.

முதல் பட்டைத் தண்ணீர் (நெழுட்டும் மாஸ்னி) தயாரித்தல் :

கொன்னம்பட்டையும் கடுக்காயும் 2 : 1 என்ற விகிதத்தில் கலக்கப்பட்டு இக்கலவையில் 90 கி. கிராம் (180 ராத்தல்) எடுத்துக் கொள்ளப்படுகிறது. அநேகமாகத் தோல்களின் சல்லா எடைக்குச் சரியான அளவு இக்கலவை தேவைப்படும். இக்கலவையில் ½ பாகம் தண்ணீரில் ஊற வைக்கப்படுகிறது. மீதி ¾ பாகம் பதனிடுவதற்கு உபயோகப்படுத்தப்படுகிறது.

11-ம் நாள் :

காஸையில் சுண்ணாம்பு நீக்கக்குழியில் தோல்கள் ½ மணி நேரத்திற்குப் புரட்டி விடப்படுகின்றன. சுண்ணாம்பு நீக்கம் பின்புதலின் அல்லது மஞ்சளாக் கொண்டு பரிசோதிக்கப்படுகிறது. கனமான தோலின் கனமான பகுதியிலிருந்து ஒரு சிறு துண்டு வெட்டி எடுத்துப் பரிசோதித்துப் பார்த்தால் சுண்ணாம்பு முற்றிலும் நீக்கப்பட்டிருக்க வேண்டும். இவ்வாறு சுண்ணாம்பு நீக்கப்பட்ட தோல்கள் கார் வாங்கப்பட்டு, கழுவப்பட்டு, முதல் பட்டைத் தண்ணீர் கொண்ட குழிக்கு மாற்றப்படுகின்றன.

முதல் பட்டை (நெழுட்டுதல்-மாஸ்னி) :

தோல்கள் 2 மணி நேரத்திற்கு இப்பட்டைத் தண்ணீரில் புரட்டி விடப்படுகின்றன. பின்னர் இரவு முழுதும் இப்பட்டைத் தண்ணீரிலேயே விட்டு வைக்கப்படுகின்றன. முதல் பட்டைத் தண்ணீர் தயாரிக்கப் பயன்படுத்தப்பட்ட கொன்னம்பட்டை-கடுக்காய்க்கலவையின் சக்கை குழியின் மேலாகத் தூவப்படுகிறது.

12-ம் நாள் :

தோல்கள் இக்குழியில் 1½ மணி நேரத்திற்குப் புரட்டி விடப்பட்டு, 11-ம் நாள் போலவே இரவு முழுதும் இக்குழியில் விட்டு வைக்கப்படுகின்றன.

13-ம் நாள் :

12-ம் நாள் செய்தது போலவே தோல்கள் புரட்டிவிடப்படுகின்றன.

14-ம் நாள் : பையாகத் தைத்துப் பதனிட்தல் :

தோல்கள் பையாகத் தைக்கப்படுகின்றன. பின்னர் இப்பைகளில் கொன்னம் பட்டை-கடுக்காய் கலவையில் மீதி இருக்கும் ¾ பாகம் நிரப்பப்பட்டு, பைகள் குழிக்கு மேலாகத் தொங்கவிடப்படுகின்றன. பின்னர் பையில்

தண்ணீரும் நிரப்பப்படுகிறது. அவ்வப்போது குழியில் வடியும் திரவம் பைகளில் எடுத்து நிரப்பப்படுகிறது.

15-ம் நாள் :

குழியில் வடியும் திரவம் பைகளில் எடுத்து நிரப்பப்பட்டுப் பதனிடு வேலை தொடர்ந்து செய்யப்படுகிறது.

16-ம் நாள் :

பைகள் தலைகீழாக மாற்றப்பட்டு, பதனிடும் வேலை தொடர்ந்து செய்யப்படுகிறது.

17-ம் நாள் :

குழியில் வடியும் திரவம் பைகளில் எடுத்து நிரப்பப்பட்டு, பதனிடு வேலை தொடர்ந்து செய்யப்படுகிறது.

18-ம் நாள் :

மாலையில் பைகள் பிரிக்கப்பட்டு குழியிலுள்ள திரவத்தில் இரவு முழுதும் விட்டு வைக்கப்படுகின்றன.

19-ம் நாள் : எண்ணெய் போடுதல் :

தோல்கள் நன்கு தேய்த்துக் கழுவப்பட்டுச் சில மணி நேரங்களுக்குப் பட்டறையாக விடப்படுகின்றன. பிறகு 1.81 கி. கிராம் (4 ராத்தல்) கடலை எண்ணெய் தோல்களின் மேல் தடவப்படுகிறது. மாலையில் இவை காய்வதற்காகத் தொங்கவிடப்படுகின்றன.

இம்முறையில் கிடைத்த ஒப்பனைத் தோல் சல்லா எடையில் 43.7% ஆகும். இத்தோல்கள் கிராமப் புறங்களில் செய்யப்படும் காலணிகளுக்குக் கப்புத் தோலாகவும் (uppers) பயன்படுத்தப்படலாம்.

(ஓரிஸ்ஸாவில் 'பார்பலி' என்ற இடத்தில் 1961-ம் ஆண்டு, மே மாதம் நேரில் செய்து காட்டப்பட்டது.)

செய்திக் கதிர்

ஆராய்ச்சி யூனிட்களைத் தொழில் நிலையங்களே அமைத்துக் கொள்ளுதல்

தொழில் நிலையங்கள் தங்கள் தங்கள் தொழிலுக்கேற்ற ஆராய்ச்சிசாலைகளைத் தாங்களாக அமைத்துக் கொள்வதற்கு வேண்டிய ஊக்கமளிப்பதில் விஞ்ஞான தொழில் ஆராய்ச்சிக் கழகம் (Council of Scientific & Industrial Research) முழுமுயற்சியுடன் ஈடுபட்டுள்ளது. இத்துடன் தன்னால் நிறுவப்பட்டுள்ள ஒவ்வொரு ஆராய்ச்சி நிலையத்திலும் ஆராய்ச்சியால் பெறப்படும் முடிவுகளைத் தொழில் நிறுவனங்களுக்குப் பரப்புவதிலும் இக்கழகம் சிறந்த ஊக்கம் காட்டி வருகிறது.

தொழில் நிறுவனங்கள் தங்களுக்கென ஆராய்ச்சிசாலைகளை அமைத்துக் கொள்வதில் ஆர்வம் கொள்ளுமாறு செய்வதற்கான வழிதுறைகளைக் காணுவதற்காக, ஒரு கமிட்டி அமைக்கப்பட்டுள்ளது. இக்கமிட்டியின் தலைவர் பேராசிரியர் எம். எஸ். தாகர் அவர்கள் ஆவார். இக்கமிட்டியில் தொழில் அதிபர்களுக்கும் போதிய பங்கு அளிக்கப்பட்டுள்ளது. திறமை மிக்க நிபுணர்களைக் கொண்ட ஆலோசனைக்குழு ஒன்றை அமைப்பது இக்கமிட்டியின் நோக்கமாகும்.

பத்திரிகை நிருபர்களுடன் பேசுகையில் பேராசிரியர் தாகர் அவர்கள் கூறியதாவது : “விஞ்ஞான - தொழில் ஆராய்ச்சிக்கழகம் விஞ்ஞான - தொழில் முன்னேற்றத்தில் முக்கியமான பங்கு கொண்டு வருகிறது. இதற்கென 27 தேசிய ஆராய்ச்சி நிலையங்களை அமைத்ததோடு நில்லாமல் விஞ்ஞானத்தையும், விஞ்ஞான முடிவுகளையும் நாடெங்கும் பரப்பவேண்டிய பணி செய்து வருகிறது. இக்கழகம் சென்ற ஆறு ஆண்டுகளில் நாலு மடங்கு விருத்தியாகி உள்ளது. இன்னும் சில ஆண்டுகளில், பெயர் பெற்ற விஞ்ஞானிகளை இந்தியா உலகிற்கு அளிக்கும்”.

கூட்டுறவு முறையில் ஆராய்ச்சி மேற்கொள்ளுதல் பற்றி வலியுறுத்துகையில் இந்த யோசனை கொஞ்சங் கொஞ்சமாக வலுவுற்று வருகிறது என்றும், சென்ற 3 ஆண்டுகளில் திருப்தி அளிக்கும் வகையில் முன்னேற்றம்

யில், தான் பல தொழில் அதிபர்களுடன் பேச்சு நடத்திய தாயும், துணிமணிக்கான ஆராய்ச்சி நிலையம் ஒன்று ஏற்படப்போவதாகவும், ஆட்டோமோபைல் தொழிலில் ஈடுபட்டுள்ளோரும் தங்களுக்கென ஒரு ஆராய்ச்சி நிலையத்தைத் தொடங்கப் போவதாகவும், ரப்பர் தொழிலுக்கான ஆராய்ச்சியும் மேற்கொள்ளப்பட்டிருப்பதாகவும் கூறினார். மேலும் ஆராய்ச்சி நிலையங்களை ஏற்படுத்திக் கொண்டிருக்கும் தொழில்களுக்கு, வரிவிலக்குகள் மூலமும், இன்னும் பலவழிகளிலும் போதிய ஊக்கம் அளிக்கப்படும் என்றும் தெரிவித்தார்.

தேசிய ஆராய்ச்சி நிலையங்களில் வகுக்கப்பட்ட புதிய முறைகளையும், வழிகளையும் தொழில்களில் புகுத்துவது பற்றிக் குறிப்பிடுகையில் பேராசிரியர் தாகர் அவர்கள் கூறிய தாவது : “முன்பெல்லாம் புதிய முறைகள் வகுக்கப்பட்டவுடன் நேராக அவை தொழிலில் புகுத்தப்பட்டன. இப்போது இதற்குமாறாக ‘முன்னோடி இயந்திரங்கள்’ (பைலட் பிளாண்ட்) அமைத்து இம்முறைகளை அங்கு மேற்கொண்டு, பலனை அறிவது உபயோகமாக இருக்கிறதென்று தெரிகிறது. உதாரணமாக ‘நான்மெடலர்ஜிகல் நிலக்கரியை’ ‘லோஷாப்ட் பர்னசில்’ உபயோகித்து, சிறு தொழில் நிலையில் எஃகு தயாரிப்பதற்கான சில பரிசோதனைகள் செய்யப்பட்டுள்ளன. எனவே ஒரு குறிப்பிட்ட முறையைப் பரிசோதித்துப் பார்ப்பதற்கு பைலட் பிளாண்டுகள் நிறுவ தொழில் அதிபர்கள் முன் வந்தால் விஞ்ஞான-தொழில் ஆராய்ச்சிக் கழகம் அம்முயற்சியில் பாதி பொறுப்பை ஏற்கத் தயாராக இருக்கிறது என்றும் கூறினார்.

விஞ்ஞான-தொழில் ஆராய்ச்சிக் கழகம் அடிப்படை விஞ்ஞான ஆராய்ச்சிக்கும், தொழிலில் ஈடுபடுத்தப்பட வேண்டிய விஞ்ஞான ஆராய்ச்சிக்கும் வேறுபாடு காட்டிப் பின்னதை ஆதரிப்பதாகக் கூறப்படும் குற்றச்சாட்டை மறுத்துப் பேசுகையில் முதலில் அடிப்படை விஞ்ஞான ஆராய்ச்சி இல்லாமல் தொழில்களில் ஈடுபடுத்தப்பட வேண்டிய விஞ்ஞான ஆராய்ச்சிகள் செய்வது பெரும் பாலும் முடியாது. எனவே ஆராய்ச்சியாளர்கள் சுதந்திரமாக ஆராய்ச்சி செய்ய வேண்டிய வாய்ப்புகள் அளிக்கப்பட்டுள்ளன. எனினும் சிறந்த விஞ்ஞானிகளைத் தேர்ந்து விப்பது பல்கலைக் கழகங்கள்தான். பல்கலைக் கழகங்களில் ஊக்கமும், ஆக்கமும் பெற்றுச் சிறந்த விஞ்ஞானிகளாக வெளி வருவோருக்கு உபகாரப் பணம் கொடுத்து மேலும் ஊக்குவிக்கிறது இக்கழகம் என்றும் கூறினார். அவர் மேலும் பேசுகையில் தன்வசம் ஆராய்ச்சிக்கு வேண்டிய

திட்டம் வைத்துள்ள எந்த விஞ்ஞானியும் இக்கழகத்தின் உதவியை நாடலாம். இக்கழகம் ஓய்வு பெற்ற விஞ்ஞானிகளுக்கு உதவுவதற்குக்கூட திட்டம் வரைந்துள்ளது.

கல்லூரியிலிருந்தோ, பல்கலைக் கழகத்திலிருந்தோ ஓய்வு பெற்று வெளிவரும் விஞ்ஞானி மேலும் ஆராய்ச்சியில் ஈடுபட விரும்பினால் அன்னாருக்குத் தேவையான பண உதவி, ஆராய்ச்சிக்கான கருவிகள் வாங்கப் பண உதவி முதலியன செய்ய இக்கழகம் தயாராக உள்ளது. அன்னார் தாங்கள் வேலை செய்த அதே இடத்தில் மேலும் ஆராய்ச்சி செய்ய முடியாவிட்டால் அவர்கள் ஆராய்ச்சி மேற்கொள்வதற்கேற்ற நிலையங்களில் அவர்களுக்கு வசதிகள் செய்து தரப்படும். தற்போது 30 ஓய்வு பெற்ற விஞ்ஞானிகள் இத்தகைய உதவி பெற்று வருகின்றனர். இக்கழகம் மொத்தம் 480 ஆராய்ச்சித் திட்டங்களை மேற்கொண்டுள்ளது. மொத்தம் 760 பேருக்கு ஆராய்ச்சிக்கான உபகாரப் பணம் கொடுத்து வருகிறது.

பேராசிரியர் தாகர் மேலும் பேசுகையில் சாதாரண மக்களும் தேசிய ஆராய்ச்சி நிலையங்களில் நடைபெறும் ஆராய்ச்சிகள், அவற்றின் பயன் முதலியவைபற்றி அறிந்து கொள்ள வேண்டுமென்று தான் விரும்புவதாகக் கூறினார். இக்கழகம் ‘இந்தியாவின் செல்வம்’ என்ற புத்தகம் ஒன்றை வெளியிடும் என்றும் அதில் இரண்டு பாகங்கள் முடிவடைந்துள்ளன என்றும் கூறினார்.

ஐக்கிய நாட்டு விஞ்ஞானக் கூட்டம்

உலகத்தில் விஞ்ஞான, தொழில் துறையில் அதிக முன்னேற்றம் அடையாத நாடுகளுக்கு விஞ்ஞானம், தொழில் நுட்பம் ஆகியவை மூலம் உதவி செய்வது பற்றி விவாதிப்பதற்காக, ஐக்கிய நாடுகள் விஞ்ஞானக் கூட்டம் ஒன்று 1962-ம் ஆண்டு பிப்ரவரி கடைசியிலிருந்து மார்ச் முதல் வாரம் வரை ஜெனிவாவில் நடைபெறும்.

இக்கூட்டத்திற்கு பேராசிரியர் எம். எஸ். தாகர் அவர்கள் தலைமை தாங்குவார்கள். பிரேஸில் நாட்டைச் சேர்ந்த பேராசிரியர் கார்லஸ் சகோல் அவர்கள் பொதுக் காரியதரிசியாக விளங்குவார்.

ரஷ்யாவைச் சேர்ந்த ஸ்ரீ எம். சொலோட்னிகோவ் என்பவர் திட்டங்கள் வகுப்பது, நிகழ்ச்சிகள் தயாரிப்பது போன்றவற்றுக்கு உதவி டைரக்டராக இருப்பார். ஐ. நா. அண்டர் செகரட்டரி ஸ்ரீ ஏ. ஜி. காட்ஸின் என்பவர் செயலாளராக இருப்பார்.

ஆதாரம் : ‘எகனமிக் டைம்ஸ்,’ பிப்ரவரி 23, 62

யில் 1960-ம் ஆண்டில் 16 பேர்கள் பதனிடும் முறைகளிலும், 15 பேர்கள் காலனிகளுக்கான தோல்களை உபயோகிக்கும் முறைகளிலும் பயிற்சி பெற்றுள்ளனர் என்றும் இவர்களில் ஒருவர் வடக்கு நைஜீரியாவிலிருந்தும், 8 பேர் இந்தியாவின் பிற பாகங்களிலிருந்தும் வந்தவர் என்றும், இந்நிலையத்தில் உணவு-விவசாயக் கழகத்தைச் சார்ந்த 3 ஆசிரியர்கள் வேலை பார்த்து வருவதாகவும் எடுத்துரைத்தார்.

கால்நடை வளர்ச்சி டைரக்டர் ஸ்ரீ. எம். ஆர். மஹாஜன் பேசுகையில் தோல் தொழிலுக்குத் தேவையான அரிய இயந்திரங்கள் ஏற்கனவே நம் நாட்டில் உற்பத்தி செய்யப்பட்டு வருகின்றன என்றும், இயந்திர உற்பத்தித் துறையில் நாட்டம் செலுத்துவதற்காக பொறியாளர்களுக்கும், தொழில் அதிபர்களுக்கும் பல்வேறு துறையிலும் ஊக்கம் அளிப்பதே சர்க்காரின் கொள்கை என்றும் தெரிவித்தார்.

ஆதாரம் : “ஹிண்டு, ஜனவரி 13, 1962”

உலக வெள்ளாட்டுத் தோல் வியாபார நிலை

இங்கிலாந்துக்கான இறக்குமதி விவரம்

1961-ம் ஆண்டு ஏப்ரல்-ஜூன் மாதங்களுக்கான இறக்குமதி 1960-ம் ஆண்டில் இதே மாதங்களுக்கான இறக்குமதியைவிட அதிகமாயிற்று. இதனால் 1961-ம் ஆண்டு ஜனவரி-மார்ச் மாதங்களுக்கான இறக்குமதியில் ஏற்பட்ட குறைவு ஈடு செய்யப்பட்டது. இந்தியாவிலிருந்து 1961ம் ஆண்டு ஜனவரி-மார்ச்சு, ஏப்ரல்-ஜூன் மாதங்களில் இறக்குமதி செய்யப்பட்ட தோல்களின் அளவு குறிப்பிடத்தக்க அளவில் அதிகமாயிற்று. கென்யா, உகண்டா, தங்கனீகா ஆகிய நாடுகளிலிருந்து 1961-ம் ஆண்டு ஏப்ரல்-ஜூன் மாதங்களுக்கான இறக்குமதி 1960-ம் ஆண்டு இதே மாதங்களில் இருந்ததைவிட ஏறக்குறைய இருமடங்காயிற்று. இதன் மூலம் 1961-ம் ஆண்டு ஜனவரி-மார்ச்சு மாதங்களில் ஏற்பட்ட குறைவு ஈடு செய்யப்பட்டது.

1961-ம் ஆண்டு ஜனவரி-ஜூன் மாதங்களில் நைஜீரியாவிலிருந்து இறக்குமதி செய்யப்பட்ட தோல்களின் அளவு முந்தைய ஆண்டு இதே மாதங்களில் இருந்ததைவிட கொஞ்சம் கூடுதலாயிற்று. ஆனால் பாகிஸ்தானிலிருந்து இறக்குமதி குறைந்தது.

ஆதாரம் : ‘டேனர், டிசம்பர், 1961’

இங்கிலாந்துக்கான வெள்ளாட்டுத் தோல் இறக்குமதி

நாடுகள்	1959				1960				1961			
	ஜனவரி- டிசம்பர்	ஜனவரி- மார்ச்	ஏப்ரல்- ஜூன்	ஜூலை- டிசம்பர்	மொத்தம்	ஜனவரி- மார்ச்	ஏப்ரல்- ஜூன்	ஜூலை- டிசம்பர்	மொத்தம்	ஜனவரி- மார்ச்	ஏப்ரல்- ஜூன்	ஜூலை- டிசம்பர்
ஏடன்	66	18	9	8	35	2	—	—	35	2	—	2
இந்தியா	362	14	41	220	275	74	83	157	275	74	83	157
கென்யா,	..	..	..	..	..	..	..	..	..	..	..	..
உகண்டா,	1,020	157	87	147	391	122	166	288	391	122	166	288
தங்கனீகா	31	18	—	29	47	1	—	1	47	1	—	1
நைஜீரியா	1,337	215	233	424	872	221	293	514	872	221	293	514
பாகிஸ்தான்	821	267	168	339	774	187	142	329	774	187	142	329
இதர காமன்	34	8	2	11	21	4	6	10	21	4	6	10
வெல்த்	..	..	..	..	..	..	..	..	..	..	..	..
நாடுகள்	130	11	11	19	41	12	8	19	41	12	8	19
தென் ஆப்பிரிக்கா	212	26	13	14	53	6	2	9	53	6	2	9
மற்ற நாடுகள்	..	..	..	..	..	..	..	..	..	..	..	..
	4,013	734	564	1,211	2,509	629	700	1,329	2,509	629	700	1,329

அமெரிக்காவில் காலணிகள் உற்பத்தி

புள்ளி விவரங்களின்படி 1962-ம் ஆண்டில் அமெரிக்காவில் (U. S. A.) சில்லறையில் விற்பனை செய்யப்படும் பலவகையான காலணிகளின் மொத்த மதிப்பு 5 பில்லியன் டாலர்களாக இருக்கும் என்றும், ஒவ்வொரு ஆண்டு, பெண், குழந்தைக்கும் சராசரி 4.5 ஜதை காலணிகள் கிடைக்கும் என்றும் தெரிய வருகிறது. அங்கு 300 ஜதை காலணிகள் வைத்திருப்பவரும் உண்டு.

நாடாக்கள் கொண்ட காலணிகள் அணிவதால் ஏற்படும் காலவிரயம்

குழந்தைப் பருவத்திலிருந்து ஸூ, பூட்ஸ் முதலிய காலணிகள் அணிபவர்கள் தமது 70வது காலத்தில் சுமார் 5 மாதங்களை பூட்ஸ் முதலியவற்றின் நாடாக்களைக் கட்டும் வேலையில் செலவிடுவதாக அமெரிக்க ஆண்களின் காலணி ஆராய்ச்சி நிலையம் எடுத்துக்காட்டியுள்ளது. இதனால் நாடாக்கள் இல்லாத காலணிகளை அணிவது சிறந்தது என்று அங்கு விளம்பரம் செய்யப்படுகிறது.

அயல்நாட்டுக் கால்நடை வளர்ப்புப் பண்ணை

பங்களுருக்கு 12 மைல் அருகேயுள்ள 'ஹெசரகட்டா, என்னுமிடத்தில் அயல்நாட்டுக் கால்நடை வளர்ப்புப் பண்ணை ஒன்று துவக்குவதாக இந்திய சர்க்கார் முடிவு செய்துள்ளது.

இந்திய சர்க்காரின் உதவி விவசாய அமைச்சர் ஸ்ரீ. எம். வி. கிருஷ்ணப்பா அவர்கள் பத்திரிகை நிருபர்களிடையே பேசுகையில் அமெரிக்காவிலுள்ள ஜெர்ஸி என்ற மாகாணத் தைச் சார்ந்த 100 காளைகளும் கன்றுகளும் 'ஹெய்பர்' திட்டத்தின் கீழ் இந்தப் பண்ணையில் வளர்க்கப்படும் என்றும், அவற்றில் ஒரு பாதி ஏற்கனவே டில்லிக்கு வந்து சேர்ந்துள்ளது என்றும், மற்றொரு பாதி அடுத்த மாதம் வந்து சேரும் என்று எதிர்பார்க்கப்படுவதாகவும் கூறினார்.

ஸ்ரீ கிருஷ்ணப்பா அவர்கள் மேலும் பேசுகையில் பங்களுரின் சீதோஷ்ண நிலையைக் கருத்தில் கொண்டு இப்பண்ணை அங்கு அமைக்கப்பட்டதென்றும், இப்பண்ணைக் காக சுமார் 300 ஏக்கர் நிலம் முதலில் வாங்கப்படும் என்றும் பண்ணை அபிவிருத்தி அடைந்ததும் மைசூர் சர்க்கார் வசம் ஒப்படைக்கப்படும் என்றும் தெரிவித்தார்.

ஆதாரம்: ஹிண்டு, ஜனவரி 18, 62.

தோல் சாமான்கள் தயாரிக்கும் தொழில்

வக்னோவிலுள்ள மாதிரிநிலையம் விஸ்தரிக்கப்படும்

'கால்நடைச் சடலங்களின் பல்வேறு உறுப்புக்களையும் உபயோகிப்பது—அதற்கான பயிற்சி அளிப்பது' என்ற நோக்கத்துடன் வக்னோவுக்கு அருகில் பக்ஷிகா - தாலாப் என்ற இடத்தில் துவக்கப்பட்ட மாதிரி நிலையம் வரும் மாதங்களில் விஸ்தரிக்கப்படும். இதற்கான இயந்திரங்களின் மற்றொரு தொகுதி ஹாலந்து நாட்டிலிருந்து இறக்குமதி செய்யப்படும்.

இந்திய சர்க்காரும்-ஐக்கிய நாடுகளின் பிரிவான உணவு விவசாயக் கழகமும் (Food and Agricultural Organisation of the U. N.) கூட்டாகத் தொடங்கியுள்ள இம்மாதிரி நிலையத்திற்கு மொத்தம் 22.50 லட்ச ரூபாய் செலவாகும்.

இந்நிலையத்தின் வருடாந்திரப் பட்டமளிப்பு விழாவில் பேசுகையில் உத்திரபிரதேசத்தின் உதவி உள்துறை அமைச்சர் ஸ்ரீ நாவல் கிஷோர் அவர்கள், ஆண்டுதோறும் 2.60 கோடி ரூபாய் மதிப்புள்ள கால்நடைச் சடலங்கள் அங்கு வீணாவதாகவும், எனவே இந்த நிலையம் உத்திரப் பிரதேசத்திற்கு மிகவும் முக்கியமானதென்றும் கூறினார். அவர் மேலும் பேசுகையில் இந்நிலையம் உலக நாடுகளின் ஒத்துழைப்புக்கும், கூட்டுறவுக்கும் சிறந்ததோர் எடுத்துக் காட்டாக விளங்குகிறது என்றும் தெரிவித்தார். இந்நிலையம் வருங்காலத்தில் இந்தியாவிலிருந்து மட்டுமின்றி இதர நாடுகளிலிருந்தும் பயிற்சியாளர்களை ஈர்க்கும் என்றும் நம்பிக்கை தெரிவித்தார்.

உணவு - விவசாயக் கழகத்தின் (FAO) நிபுணர் ஸ்ரீ. எப். ஹெச். ஹோக் அவர்கள் பேசுகையில் இந்நிலையம் இப்போது நன்கு வளர்ச்சி பெற்ற பயிற்சி நிலையமாகவும், உற்பத்தி நிலையமாகவும் விளங்குகிறது என்றும், புதிய இயந்திர சாதனங்கள் பொறுத்தப்பட்டவுடன், காலணிகள் தயாரிக்கும் தொழிலில் புதிய ஊக்கம் பிறக்கும் என்றும் தெரிவித்தார்.

இந்நிலையத்தின் தலைவர் ஸ்ரீ. கே. ஏ. ராசா பேசுகையில் இந்நிலையம் துவக்கப்பட்ட 1952-ம் ஆண்டிலிருந்து 1960-ம் ஆண்டு வரை சுமார் 381 தொழிலாளர்களும், பயிற்சியளிப்போரும், அபிவிருத்தி செய்யப்பட்ட முறையில் தோல் உறித்தல், தோல்களைப் பக்குவப்படுத்துதல், கால்நடைச் சடலங்களைப் பயன்படுத்துதல் ஆகிய துறைகளில் பயிற்சி பெற்றுள்ளனர் என்று தெரிவித்தார். அவர் மேலும் பேசுகை

நிலையச் செய்திகள்

இந்தியத் தரக்கணிப்பு நிலையத்தின் ஆதரவில் நடைபெற்ற 'தோல் பெல்டிங்' குக்கான உபகமிட்டியின் கூட்டத்தில், இந்நிலைய டைரக்டர் டாக்டர் ஓய். நாயுடம்மா, ஐ.நா. நிபுணர் டாக்டர் ஷல்ப், ஸ்ரீ. ஏ. கணேசன் ஆகிய மூவரும் சென்ற மார்ச் மாதம் 6ம் தேதி கலந்து கொண்டனர்.

டாக்டர் நாயுடம்மா அவர்கள் பஞ்சாபில் பல பதனிடும் நிலையங்களையும் பார்வையிட்டு, முதன் மந்திரி பிரதாப் சிங் கெய்ராணையும் சந்தித்துப் பேசினார்.

பாராட்டுக்கள்

டாக்டர் பட்டம் பெற்ற ஸ்ரீ எஸ். சி. நந்தியையும், எம். எஸ்ஸி. பட்டம் பெற்ற ஸ்ரீ இ. சி. ஜார்ஜ், ஸ்ரீ எஸ். அனந்தநாராயணன் ஆகியோரையும் பாராட்டுகிறோம்.

