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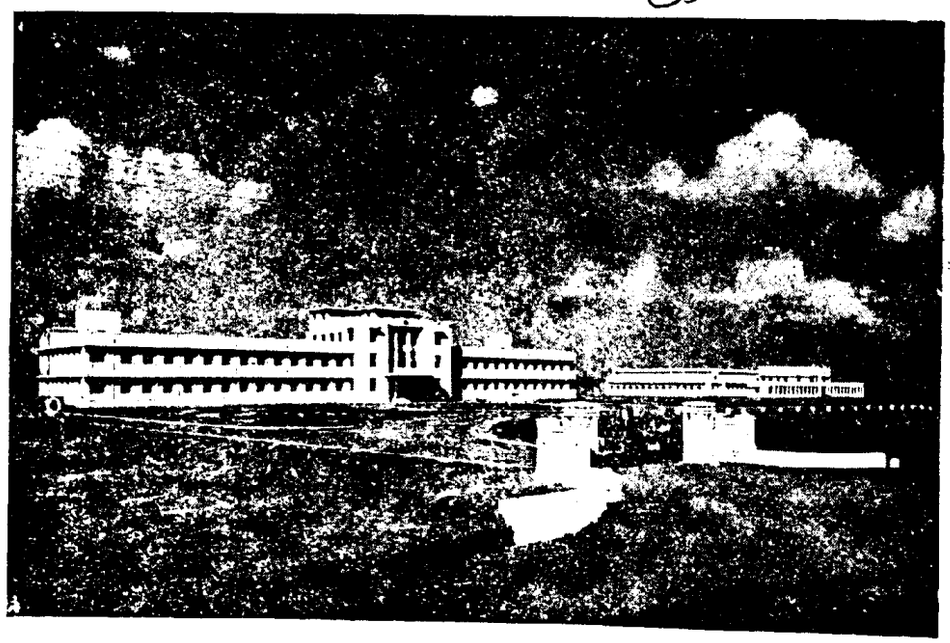

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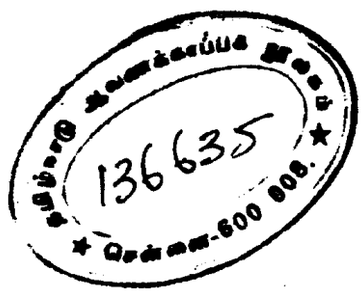

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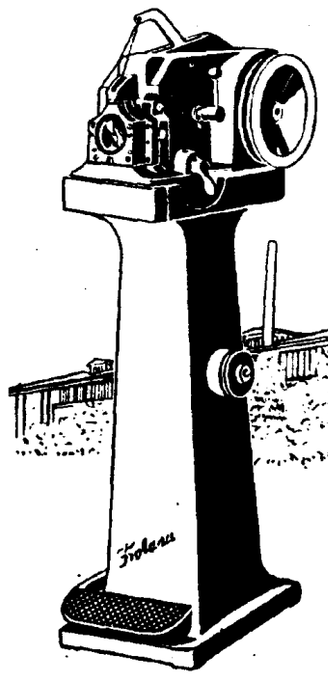

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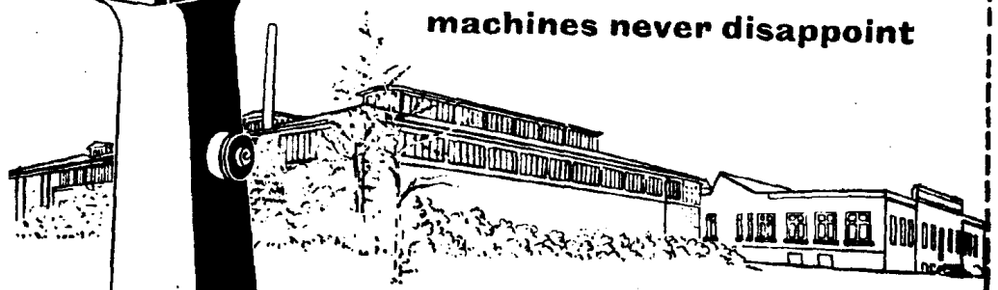

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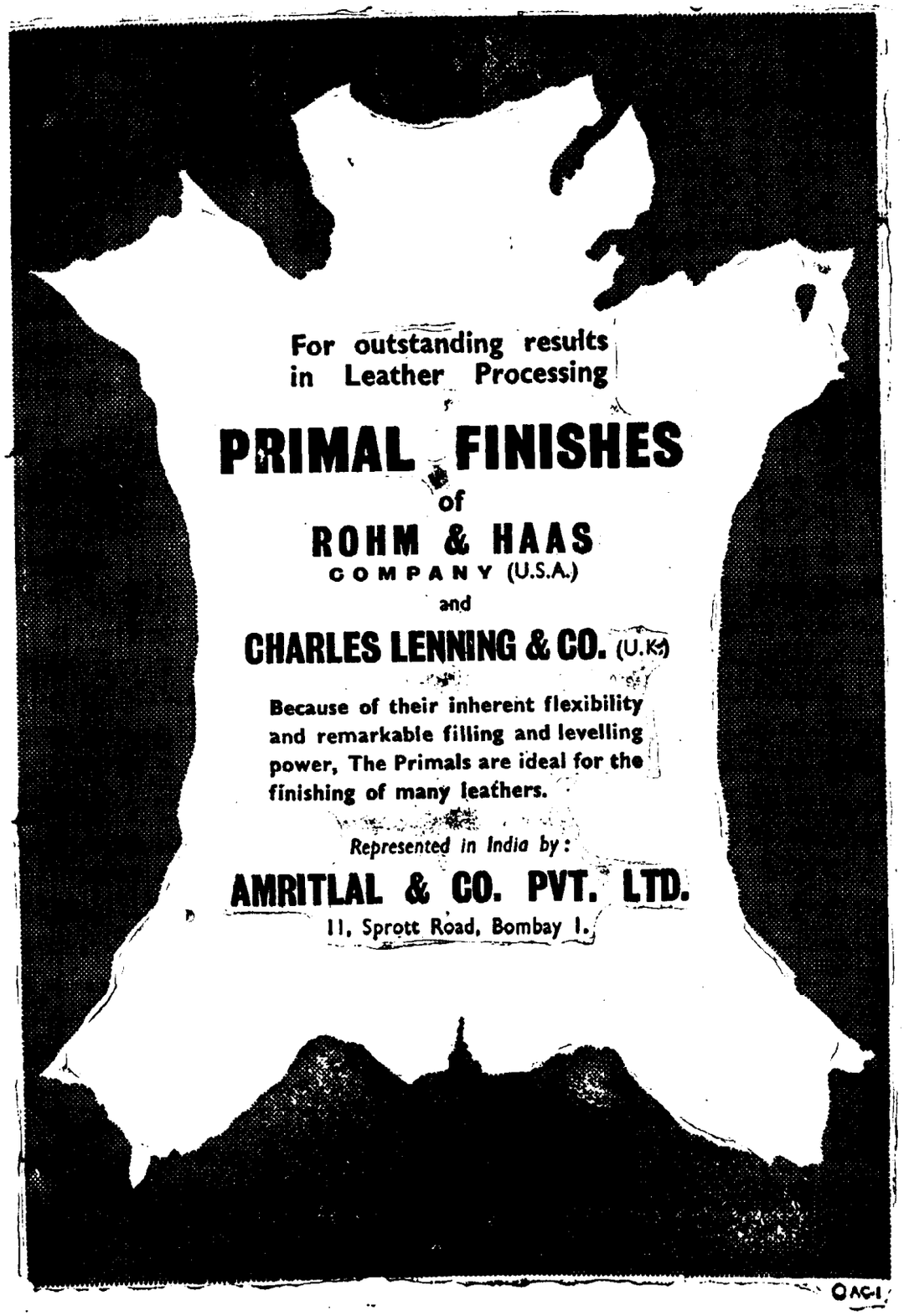

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AMINO ACID COMPOSITION AND N- AND C-TERMINAL AMINO ACIDS OF CRYSTALLINE TRYPSIN, PEPSIN AND PROTEASE OF ASPERGILLUS PARASITICUS

BY

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Central Leather Research Institute, Madras

Received on January 30, 1961.

SUMMARY

The amino acid compositions of crystalline trypsin, pepsin and protease of *A. parasiticus* have been determined by two-dimensional paper chromatography. The N-terminal amino acids of these crystalline enzymes have been quantitatively estimated by two methods, viz., DNP-technique and PTC-technique. The C-terminal amino acids of the three enzymes have been quantitatively estimated by adopting two independent methods, viz., thiohydantoin method and hydrazinolysis method. The C-terminal amino acids have been found to be aspartic acid and serine in the case of trypsin and aspartic acid and glycine in the case of both pepsin and protease of *A. parasiticus*; the N-terminal amino acids are isoleucine only in the case of trypsin, isoleucine and valine in the case of pepsin and aspartic acid and valine in the case of the *A. parasiticus* protease.

Introduction

A few studies have been made on the amino acid composition and N- and C-terminal amino acids of crystalline trypsin and pepsin. Work[1] identified the important amino acid constituents of crystalline trypsin by following single dimension paper chromatographic technique. The quantitative estimation of the amino acids of crystalline trypsin was carried out by Block.[2] Viswanatha *et al.*[3] studied the amino acid composition of trypsin and oxidised trypsin making use of the automatic amino acid analyser developed by Spackman *et al.*[4] Brand[5] studied the amino acid composition of crystalline pepsin by estimating different amino acids by chemical methods. Recently the amino acid constituents of crystalline pepsin have been quantitatively estimated by Blumenfeld and Perlmann[6] following column chromatographic technique.

Rovery *et al.*[7, 8] reported isoleucine as the N-terminal amino acid of trypsin by adopting two techniques (DNP and PTC). Yama-

shina[9] also identified isoleucine as the only N-terminal amino acid of trypsin by PTC-method. Recently Smillie and Neurath[10] found isoleucine and serine as the N-terminal amino acids of crystalline trypsin by the DNP-technique. Williamson and Passmann[11, 12] identified leucine as the N-terminal amino acid of crystalline pepsin both by DNP- and PTC-techniques. This finding was contradicted by von Vunakis and Herriott,[13] Heirwegh and Edman[14] and Orekhovich *et al.*[15] who found isoleucine as the N-terminal amino acid of pepsin.

Davie and Neurath[16] who used carboxypeptidase method and Niu and Fraenkel-Conrat[17] who employed hydrazinolysis technique could not detect any C-terminal amino acid in crystalline trypsin. Folk *et al.*[18] reported that lysine was liberated from DIP-trypsin by carboxypeptidase B. Chapelle and Luck[19], however, found one terminal carboxyl group in trypsin by the N-bromosuccinimide method of Barakat *et al.*[20]. Williamson and Passmann[21] by following reduction method reported that pepsin had two terminal free carboxyl groups, both of which were alanine.

These studies on amino acid composition and terminal amino acids of trypsin and pepsin, however, do not appear to be complete in all respects. In certain cases, all the amino acids have not been identified or quantitatively estimated. There are also discrepancies in the results reported by different workers. For example, alanine was not detected in pepsin by Brand[5] whereas Block[2] reported the presence of alanine in pepsin. Recently alanine has been found[21] to be a C-terminal amino acid of pepsin. As mentioned before, there is also controversy regarding the fact whether leucine or isoleucine is the N-terminal amino acid of pepsin. Most of these studies have been made by adopting only one technique. So far, no work has been done on the amino acid composition or terminal amino acids of crystalline protease of *Aspergillus parasiticus*. In a previous communication,[22] it was reported that there were certain similarities between the physico-chemical properties of crystalline trypsin and those of the protease of *A. parasiticus*. In view of the above, it was felt interesting to make a systematic investigation on the amino acid composition and N- and C-terminal amino acids of crystalline trypsin, pepsin and protease of *A. parasiticus* by adopting recent techniques.

Experimental

The required quantity of twice crystalline protease of *A. parasiticus* was prepared by the method described in the previous communication;[22] examination of the enzyme by the paper electrophoretic method of Durrum[23] showed that the enzyme contained only one component. This crystalline enzyme and samples of twice crystalline trypsin and pepsin which were obtained from the Nutritional Biochemical Corporation, U.S.A. and Worthington Biochemical Corporation, U.S.A. respectively were used in the present investigation.

Amino acid composition:

50 mgm. of the crystalline enzyme was dissolved in the minimum quantity of distilled water and dialysed against distilled water at 4°C for 24 hours. The dialysed enzyme solution was dried to constant weight in a vacuum desiccator over P_2O_5 and hydrolysed with 15 ml. of 6*N* HCl in an evacuated sealed tube at 110°C for 24 hours. Any insoluble humin in the hydrolysate was removed by centrifugation. The excess acid also was removed and the hydrolysate was made upto 5 ml. with distilled water. The solution was then analysed for its component amino acids by the two-dimensional paper chromatographic technique of Levy and Chung[24] using Whatman No. 1 paper and *n*-butanol-acetic acid-water (4:1:5) as the first solvent and phenol-*m*-cresol-borate buffer of pH 9·3 (25 g.: 25 g.: 7 ml.) as the second solvent. All the solvents were freshly distilled before use. The quantitative estimation of the amino acid spots in the paper chromatogram was carried out according to the method of Cassel[25] using Beckman Spectrophotometer (DU) set at 570 mμ except in the case of proline which was estimated at 440 mμ.

It was, however, observed that leucine, isoleucine and phenylalanine and, valine and methionine overlapped in the two-dimensional chromatograms. After conducting experiments with a number of solvent-combinations commonly used, a method was developed for separation of these overlapping amino acids. It was noticed that these overlapping amino acids were separated from all the other amino acids in the first dimension itself; the position of these overlapping amino acids was fixed by developing the chromatogram as usual. The developed chromatogram was superimposed over an undeveloped duplicate chromatogram of the mixture run under identical conditions; the corresponding spots were cut out from the duplicate chromatogram, eluted with slightly acidic water and the solution was chromatographed on Whatman No. 1 paper in the long direction with *n*-butanol-acetic acid-water (77:6:17) mixture, the same mixture being placed at the bottom of the chro-

matographic cabinet. The chromatogram was dried in a current of air, rotated through 90° and run in the second dimension with pyridine-isoamyl alcohol-water (10:10:7) mixture. The paper was air-dried and the amino acid spots were developed, cut out, eluted and quantitatively estimated[25] as before. Tryptophane is known[26] to be completely destroyed during the acid hydrolysis of a protein. So it was independently estimated by the method of Spies.[27]

Blumenfeld and Perlmann[6] reported that all the four different preparations of twice crystalline pepsin analysed by them by column chromatography contained small but constant amount of hydroxyproline, corresponding to about 0·1 residue/mole. It is seen from Block's unpublished data[2] that trypsin also contains 1·7 gm. of hydroxyproline per 16 gm. of nitrogen. In the present investigation, however, no distinct or separate spot for hydroxyproline could be detected in the chromatogram for pepsin or trypsin and hence it was thought desirable to check up the presence of hydroxyproline in these enzymes by a suitable chemical method. The method of Newman and Logan[28] was followed to determine hydroxyproline in all the three enzyme samples. In view of the interference of tyrosine in the colour-forming reaction of hydroxyproline in this method, the same was removed by treatment with activated charcoal. No hydroxyproline, however, could be detected in crystalline pepsin, trypsin or protease of *A. parasiticus.*

The results obtained on the amino acid composition of the enzymes are presented in table I.

N-terminal amino acids:

The N-terminal amino acids of the three enzymes were quantitatively estimated by following two independent methods, viz., the DNP-technique and PTC-technique.

DNP-technique: The method of Sanger[29] as modified by Porter[30] was followed. A solution of 50 mgm. of the dialysed enzyme in 10 ml. distilled water was mixed with 20 ml. absolute alcohol and allowed to stand at 20°C for 24 hours at the end of which the denatured enzyme was collected after centrifugation, washed and dissolved in 10 per cent sodium bicarbonate solution. The enzyme solution was mixed with twice its volume of 5% solution of 1-fluoro-2,4-dinitrobenzene (FDNB) in ethanol, shaken for 2 hours at room temperature and then acidified with dilute hydrochloric acid to pH 2·0. The insoluble DNP-enzyme was

washed successively with distilled water, anhydrous ethanol and peroxide-free ether and then hydrolysed with 12*N* HCl under gentle reflux for 3 hours. The hydrolysate was extracted with ether and after evaporating off the ether and moisture from the extract, the dinitrophenols present were removed by the cold finger sublimation technique of Mills.[31] The DNP-amino acids were dissolved in acetone and spotted on Whatman No. 1 paper (22·5″ × 18·25″)

TABLE I

Amino acid composition of crystalline trypsin, pepsin and protease of *A. parasiticus.*

(Results expressed as gm. amino acid per 100 gm. dry enzyme)

Amino acids	Trypsin	Pepsin	Protease of *A. parasiticus*
Arginine ..	3·0	0·7	4·4
Histidine ..	2·9	1·6	trace
Lysine ..	6·7	1·3	6·7
Aspartic acid ..	17·2	17·8	17·3
Glutamic acid ..	9·7	10·7	16·0
Glycine ..	9·1	6·5	4·9
Alanine ..	5·6	4·3	6·8
Serine* ..	14·1	11·3	8·1
Threonine* ..	4·9	8·4	6·4
Valine ..	3·5	6·6	3·9
Methionine ..	0·5	1·9	3·8
Leucine ..	5·9	9·7	10·1
Isoleucine ..	4·4	11·1	4·4
Phenylalanine ..	0·8	6·8	4·7
Tyrosine ..	9·5	9·0	10·2
Tryptophane ..	1·9	1·8	2·1
Proline ..	7·4	4·1	3·3
Cystine and/or cysteine (expressed as cystine) ..	10·3	3·5	3·8
Total ..	117·4	117·1	116·9

* The data are uncorrected for losses of serine and threonine during the acid hydrolysis.

which was uniformly sprayed with phthalate buffer of pH 6·0 and air-dried. The DNP-amino acids were separated by following the single dimensional paper chromatographic method of Joseph and Bose[32] using the upper phase of a mixture containing *n*-butanol-isoamyl alcohol (2:1) together with 10% (V/V) of ethanol saturated with an equal volume of phthalate buffer of pH 6·0 as the sol-

vent. The quantitative estimation of the DNP-amino acids was carried out according to the method of Fraenkel-Conrat *et al.*[33] making use of Beckman Spectrophotometer (DU) set at 360 mμ. The amounts of DNP-amino acids were calculated by the method of Shore[34] assuming the molar extinction coefficient of DNP-amino acids at 360 mμ to be 17,000. The aqueous solution after extraction of the ether soluble DNP-amino acids was dried and extracted with *n*-butanol and was examined by the paper chromatographic method of Blackburn and Lowther.[35] But no DNP-arginine could be detected in any of the three enzymes examined. The results are presented in table II.

PTC-technique : The PTC-method as described by Edman[36] was followed with suitable modifications. A solution of 25 mgm. of the dialysed enzyme in 10 ml. of pyridine-water (1:1) was made alkaline with $NaHCO_3$ and 0·1 ml. of phenyl-isothiocyanate was added. The mixture was kept at 37°C for 2 hours and then extracted three times with equal volumes of ethyl acetate. The PTC-enzyme was precipitated from the aqueous solution with 9 volumes of acetone and dried. The dry product was mixed with 2 ml. of *N* HCl and kept at 100°C for one hour. It was then extracted three times with equal volumes of ethyl acetate. The solvent was evaporated from the combined extract and the dry residue containing the thiohydantoins was hydrolysed with 5 ml. of 6*N* HCl (A.R.) in an evacuated sealed glass tube at 150°C for 16 hours. The regenerated amino acids were quantitatively estimated by paper chromatography as mentioned under amino-acid composition. The results are presented in table II.

C- terminal amino acids :

The C-terminal amino acids of the three enzymes were quantitatively estimated by following two independent methods, viz., the thiohydantoin method and the hydrazinolysis method.

Thiohydantoin method: The modified thiohydantoin method of Baptist and Bull[37] as adopted by Deasy[38] was followed. To 100 mgm. of the dialysed enzyme 3 ml. of acetic anhydride-glacial acetic acid mixture (9:1 v/v) and then 30 mgm. of ammonium thiocyanate were added. The mixture was allowed to stand at room temperature for 24 hours at the end of which it was heated with 4 ml. of 20% HCl under reflux for two hours on a waterbath, evaporated to dryness and the excess acid was removed. The residue was taken up in phosphate buffer (pH 6·5) and extracted three times with ethyl acetate. The combined ethyl acetate extracts

TABLE II

N-terminal amino acids of crystalline trypsin, pepsin and protease of *A. parasiticus*.

(Results are uncorrected for losses and are expressed as millimoles per 100 gm. enzyme)

N-terminal amino acids	Trypsin		Pepsin		Protease of *A. parasiticus*	
	DNP-method	PTC-method	DNP-method	PTC-method	DNP-method	PTC-method
Isoleucine ..	4·01	4·92	2·08	2·91	—	—
Glycine ..	trace	trace	—	—	trace	trace
Valine ..	—	—	1·96	2·72	3·05	3·88
Aspartic acid ..	trace	—	—	—	3·24	4·17
Glutamic acid ..	trace	—	—	—	—	—
Phenylalanine ..	trace	—	—	—	—	—
Alanine ..	—	—	trace	—	trace	—
Threonine ..	—	—	—	—	trace	—

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were washed with water and evaporated to dryness. The residue was hydrolysed with saturated barium hydroxide solution over a waterbath for six hours. The cooled hydrolysate was neutralised with carbon dioxide and the resulting suspension was heated for 10 minutes over a steambath to remove any carbonic acid formed. The barium carbonate was centrifuged off, the supernatant solution and washings were concentrated and quantitatively analysed for the amino acids by paper chromatography as mentioned before.

The thiohydantoin method when applied to the original protein fails to identify cysteine or cystine as the C-terminal amino acid because the usual method for the preparation of thiohydantoins from amino acids is not directly applicable to cysteine or cystine[39] and because it has been found[40] that alkaline hydrolysis of the thiohydantoins of these amino acids yields polymerised products which are distinctly different from any normal thiohydantoin. It has also been observed that cysteic acid readily formed the thiohydantoin and when the cysteic acid thiohydantoin was subjected to alkaline hydrolysis, the cysteic acid could be regenerated and quantitatively estimated by the usual paper chromatographic technique. Hence the enzyme was first oxidised with performic acid by the method of Li[41] and then examined for the C-terminal amino acid by following the usual thiohydantoin procedure. Cysteic acid, however, could not be detected as the C-terminal amino acid in any of the three enzymes examined. The results are presented in table III.

Hydrazinolysis method:—The method of Akabori *et al.*[42] as modified by Bradbury[43] was followed. 25 mgm. of the enzyme and 65 mgm. of hydrazine sulphate were dried in a vacuum desiccator for about three hours and then treated with 0·5 ml. of 100% anhydrous hydrazine. The mixture was heated under an atmosphere of nitrogen in a sealed glass tube at 60°C for 16 hours and the excess hydrazine was evaporated off over concentrated H_2SO_4 under vacuum. The residue was dissolved in 3 ml. of dilute HCl, shaken with 1 ml. of benzaldehyde for two hours and the aqueous solution containing the C-terminal amino acids was separated by centrifugation. The amino acids were quantitatively estimated by paper chromatography as mentioned before. The results are presented in table III.

Discussion

Certain similarities have been observed in the amino acid composition (table I) of crystalline trypsin, pepsin and protease

TABLE III

C-terminal amino acids of crystalline trypsin, pepsin and protease of *A. parasiticus*

(Results are uncorrected for losses and are expressed as millimoles per 100 gm. enzyme)

C-terminal amino acids	Trypsin		Pepsin		Protease of *A. parasiticus*	
	Thiohydantoin method	Hydrazinolysis method	Thiohydantoin method	Hydrazinolysis method	Thiohydantoin method	Hydrazinolysis method
Aspartic acid ..	—	4·18	—	3·01	—	3·92
Serine ..	—	5·33	—	trace	—	—
Glycine ..	1·41*	trace	2·15	2·54	3·25	4·20
Alanine ..	1·30*	—	trace	trace	trace	trace
Lysine ..	—	trace	—	—	—	—

*These are not real C-terminal amino acids but are derived from serine.

of *A. parasiticus*. In all the three enzymes acidic amino acids are present in much higher concentration than the basic ones. Blumenfeld and Perlmann[6] also found a great predominance of acidic amino acids over basic ones in pepsin. All the three enzymes have been found to contain the same eighteen amino acids. In trypsin, aspartic acid, serine, cystine and/or cysteine, glutamic acid, tyrosine and glycine are present in quite high concentration and methionine and phenylalanine in very low concentration. Work[1] also observed very low content of methionine and phenylalanine in crystalline trypsin. Viswanatha and Irreverre[44] found the presence of hydroxylysine in a number of trypsin preparations by adopting the column chromatographic method of Spackman *et al.*[4] In the present investigation, however, no spot for hydroxylysine could be detected in the paper chromatogram. In pepsin, aspartic acid, serine, isoleucine, glutamic acid, leucine and tyrosine are found to be the major constituent amino acids; arginine is present in very low concentration. Brand[5] also observed a high content of serine, aspartic and glutamic acids and low content of basic amino acids in pepsin. The presence of alanine in pepsin has also been confirmed by the present investigation on amino acid composition as well as N- and C-terminal amino acids of pepsin. In the case of the mold protease, aspartic acid, glutamic acid, tyrosine and leucine have been found to be present in very high concentration and histidine only as trace. The total values for the amino acid contents of trypsin, pepsin and protease of *A. parasiticus* have been found to be 117·4, 117·1 and 116·9 respectively which indicate that practically the entire protein has been accounted for and that its hydrolysis is completed after 24 hours under the hydrolytic conditions employed in the present investigation.

It may be seen from table II that by adopting two independent techniques (DNP and PTC), only one N-terminal amino acid, viz., isoleucine has been detected in trypsin, two N-terminal amino acids, viz., isoleucine and valine in pepsin and two N-terminal amino acids, viz., valine and aspartic acid in the protease of *A. parasiticus*. Matsubara and Nishimura[45] found alanine as the only N-terminal amino acid of crystalline proteinase obtained from *B. subtilis N* by the DNP-technique. In the case of the DNP-technique, it is known that partial destruction of the amino acids takes place during the acid hydrolysis of the DNP-protein. Probably because of the losses of DNP-amino acids, the values obtained by DNP-method are lower than those obtained by PTC-method. Similar observations have been made by Levy and Li[46] who determined the N-terminal amino acids of hypophyseal growth hormone by the DNP- and PTC-techniques and recently by Madhavakrishna and Bose[47] in their studies on the N-terminal amino acids of calotropain and papain by these two techniques. It is, however, known that the PTC-technique also has its limitations as it fails to identify serine, threonine and cystine as N-terminal amino acids because these three amino acids are not regenerated from the PTH's by the acid hydrolysis. In view of these limitations of the methods, it was felt essential to make use of both the DNP- and PTC-techniques in order to identify correctly the N-terminal amino acids in the three enzymes.

As DNP-leucine and DNP-isoleucine have almost the same R_f values in the case of most of the solvents used for paper chromatography of DNP-amino acids, the separation of DNP-leucine and DNP-isoleucine has not been successful so far. Williamson and Passmann[11] identified leucine as the N-terminal amino acid of pepsin by using *m*-cresol- 0·3% NH_4OH and collidine as the solvents for the separation of leucine and isoleucine by two dimensional paper chromatography. There is, however, some question as to whether this solvent combination has the power[48] of resolving the leucine isomers. von Vunakis and Herriott[13] identified isoleucine as the N-terminal amino acid of pepsin by employing alkaline hydrolysis of the DNP-amino acids and separating the free amino acids by paper chromatography using butyl alcohol-water-acetic acid (4:5:1) and phenol saturated with water as the solvents. Blackburn and Lowther[35] also reported that DNP-leucine and DNP-isoleucine could be hydrolysed by $Ba(OH)_2$ or ammonia and that the regenerated amino acids could be seperated. In the present investigation, however, alkaline hydrolysis of DNP-amino acids has not been adopted and the N-terminal amino acids of trypsin and pepsin have been confirmed by the PTC-technique which has shown unambiguously isoleucine as the N-terminal amino acid of both trypsin and pepsin.

In addition to the two N-terminal amino acids of both pepsin and protease of *A. parasiticus* and one N-terminal amino acid of trypsin, only traces of α-DNP-glycine, α-DNP-aspartic acid, α-DNP-glutamic acid and α-DNP-phenylalanine have been detected in the hydrolysate of DNP-trypsin, traces of α-DNP-alanine in the hydrolysate of DNP-pepsin and traces of α-DNP-glycine, α-DNP-alanine and α-DNP-threonine in the hydrolysate of the DNP-protease of *A. parasiticus*. Smillie and Neurath[10] too found in addition to isoleucine and serine only traces of valine, aspartic

and glutamic acids as the N-terminal amino acids of trypsin by the DNP-technique. By adopting the PTC-technique, however, no other amino acid could be detected even in traces as the N-terminal amino acid of pepsin except the two which were found by the DNP-technique. In the cases of trypsin and protease of *A. parasiticus*, only a trace of glycine has been detected as the N-terminal amino acid by the PTC-technique. The N-terminal amino acids present in traces in the three enzymes examined by the DNP-technique may be due to the contamination with traces of some other protein or due to the slight autolysis of the enzyme during its isolation, purification and crystallisation or due to the slight degradation of the enzyme during the dinitrophenylation. The first two possibilities may be ruled out in view of the fact that by the PTC-technique, even traces of these amino acids (except only one) could not be detected as the N-terminal amino acid of these enzymes. Moreover, paper electrophoretic studies with the crystalline protease of *A. parasiticus* showed only one component. It seems, therefore, more probable that the traces of the N-terminal amino acids which were detected by the DNP-technique might have arisen due to the slight degradation during dinitrophenylation. Other investigators also have shown that in the cases of old yellow enzyme,[49] carboxypeptidase,[50] pepsin and pepsinogen,[13] the bicarbonate solution of FDNB brings about partial cleavage of certain very labile peptide bonds resulting in slight degradation.

The results in table III show that two C-terminal amino acids, viz., aspartic acid and serine in trypsin and two C-terminal amino-acids, viz., aspartic acid and glycine in both pepsin and protease of *A. parasiticus* have been detected by the hydrazinolysis method. In addition to these C-terminal amino acids, only traces of glycine and lysine in trypsin, traces of serine and alanine in pepsin and trace of alanine in the protease of *A. parasiticus* have been found by the same method. One disadvantage of the hydrazinolysis technique is that any free amino acid if already present or liberated during the procedure will occur as the C-terminal amino acid also. In order to identify the C-terminal amino acids with certainty, another method, viz., the thiohydantoin method was followed. The results obtained by the thiohydantoin method indicate two C-terminal amino acids, viz., glycine and alanine in trypsin and only one C-terminal amino acid, glycine, in both pepsin and the protease of *A. parasiticus*. Besides these C-terminal amino acids, only trace of alanine has been detected both in pepsin and protease of *A. parasiticus* by the thiohydantoin method.

The thiohydantoin method, however, is unable to detect lysine, arginine, aspartic and glutamic acids when they occur as C-terminal amino acids. Hence aspartic acid which was identified by the hydrazinolysis method to be the C-terminal amino acid of each of the three enzymes could not be detected by the thiohydantoin method. Another disadvantage of the latter method is that the alkaline hydrolysis which is used to convert the thiohydantoins to the free amino acids converts serine into alanine, glycine, pyruvic acid and ammonia and threonine into glycine and α-amino-*n*-butyric acid[37,38]. As α-amino-*n*-butyric acid could not be detected in the alkaline hydrolysate from any of the three enzymes by the paper chromatographic method of Dent[51] and as threonine has not been found as the C-terminal amino acid of these three enzymes by the hydrazinolysis method, it may be concluded that threonine does not occur as a C-terminal amino acid of these three enzymes. As serine has been detected as the C-terminal amino acid of trypsin by the hydrazinolysis method, it is possible that the glycine and alanine which have been found to occur in much lower concentration as C-terminal amino acids of trypsin by the thiohydantoin method might have been formed during the alkaline hydrolysis from serine and that the original C-terminal amino acid is actually serine. However, since only trace of serine in pepsin and no serine in protease of *A. parasiticus* could be detected as the C-terminal amino acid by the hydrazinolysis method, glycine which has been found by the thiohydantoin as well as hydrazinolysis methods is the real C-terminal amino acid of both pepsin and protease of *A. parasiticus*.

It may, therefore, be seen that trypsin contains two C-terminal amino acids, viz., aspartic acid and serine and only one N-terminal amino acid isoleucine. The presence of more C-terminal than N-terminal residues may be interpreted as indicating a branching of the peptide chain of trypsin from the free carboxyl group of aspartic or glutamic acid. A few other proteins, viz., tobacco mosaic virus protein,[52] actin,[53] tropomyosin[54] and papain[47] were also found to have more of C-terminal than N-terminal amino acids and the results were explained by assuming that the N-terminal residues of the chains are bound through the ω-carboxyl group of aspartic or glutamic acid to the chain, yielding either true α-peptide rings with one or two radial appendages or 6-shaped chain rings containing one ω-linkage and C-terminal residue. However, two N-terminal amino acids, viz., isoleucine and valine in pepsin and aspartic acid and valine in protease of *A. parasiticus* and two C-terminal amino acids, viz., aspartic acid and glycine in both the

enzymes have been detected, which suggests that both pepsin and protease of *A. parasiticus* are built up of two unbranched peptide chains.

The results obtained on N- and C- terminal amino acids of trypsin and pepsin, however, show that they are not in full agreement with those reported by previous workers.. It appears possible that these discrepancies may be due to the species differences, since the trypsin and pepsin used in the present investigation might have been originated from different species. Variations of terminal amino acids due to species difference in collagen,[38] haemoglobin[55] and serum albumin[56, 57] have been reported. In bovine serum albumin, alanine was detected as the C- terminal amino acid while in human and turkey serum albumin leucine and valine respectively were detected as C- terminal amino acids.[57] Sanger[58] recently reported that pig insulin contained threonine whereas insulins from several other species did not.

The average molecular weight of protease of *A. parasiticus* as calculated from the values obtained by the PTC and hydrazinolysis methods for the N- and C- terminal amino acids is of the order of 25,000. The average molecular weights of trypsin and pepsin similarly calculated from the end group analyses are 21,000 and 36,000 respectively, which values are in good agreement with the values of 20,000 and 35,500 reported for trypsin and pepsin respectively. Since the values obtained by DNP and thiohydantoin methods for the N- and C- terminal amino acids are lower than the corresponding ones by PTC and hydrazinolysis methods due to losses during the procedures, the molecular weight of each of the three enzymes has been calculated from the values obtained by PTC and hydrazinolysis methods only.

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RESEARCH BEARS FRUIT

The manufacture of chrome crust and mordanted crust from wet salted goat skin*

BY

J. C. Deb, K. Venkataraman, P. S. Venkatachalam & Y. Nayudamma

Introduction

India produces about 32 million pieces of goatskins annually. About 16·0 million pieces are exported in the raw, dry and dry salted conditions. Since the necessary technical know-how is now made available, the Indian tanner is in a position to convert these raw goatskins into high quality glace kid and other finished leathers which would fetch better returns. But for reasons more than one, it is difficult under present conditions, to sell such finished leathers in the local or foreign market.

The only alternative then is to process them at least upto the crust stage and export the crust instead of raw goatskins. About 11·7 million pieces of goatskins are already being exported every year in the form of vegetable E.I. tanned crust. E.I. vegetable tanners probably have a capacity to tan more goatskins but the uses for the vegetable tanned goatskins are limited and finishing them into different types of leather is difficult particularly for high class leathers like glazed kid, suede kid etc. If Indian tanners process these skins as chrome crust or mordanted crust for export purposes instead of exporting them in dry and dry salted stages, it would be more profitable and beneficial to both the exporters and importers and this will enable India to earn more foreign exchange.

Chrome tanned leathers could be exported in (a) blue, packed in barrels along with chrome liquor, (b) chrome tanned, sammed to remove excess water and packed in polyethylene covers to avoid complete drying and (c) chrome tanned and mordanted with a small amount of vegetable tanning material and dried. It is known that straight chrome tanned leather when dried is not readily wet-

* Process demonstrated at C.L.R.I. during May, 1961.

table and will present problems in further finishing. The chrome mordanted leathers while readily wettable cannot be readily used for finishing into pastel shades. Exporting the chrome leathers in blue condition may not only mean excess freightage but may also lead to non-uniform chrome fixation. In view of the growing demand and developing market for chrome crust leathers and in response to a number of enquiries received from the industry, a suitable process for the manufacture of chrome crust and mordanted crust was worked out and demonstrated at the Central Leather Research Institute, Madras. The details of this process are described below:

DETAILS OF PROCESS

Raw materials:

50 pieces wet salted Erode quality goatskins of average size 32-34" (81-86 cm.) are taken.

Soaking:

The skins are soaked in a paddle in plain water to remove the salt; the paddle is run for one to two hours. They are then taken out, trimmed, broken over the beam with a blunt knife and put again in fresh water in a paddle and washed thoroughly for one hour. The skins are taken out, drained and weighed for liming (soaked weight).

Liming: (By flooding method)

The unhairing is effected through a depilating paste of the following composition:

Sodium sulphide	..	1 part, i.e., 4 lb. (1·8 kg.) per 100 skins.
Sodium chloride	..	5 parts, i.e., 20 lb. (9 kg.) per 100 skins.
Slaked lime	..	15 parts, i.e., 60 lb. (27·2 kg.) per 100 skins.

Sodium sulphide and common salt are dissolved separately in water. The two solutions are then added to the mixture of lime and water. Care is taken to get a homogeneous paste which is cooled to room temperature. It is better to prepare the paste two days prior to its application on the skins.

The paste is applied on the flesh side. The skins are then piled up in a pit flesh to flesh. The pile is flooded with water and kept

undisturbed for 5 days. On the 6th day, the skins are taken out, unhaired and put into new lime liquor containing 5-7½ per cent slaked lime (on the soaked weight of the skins) in a paddle for one to two days. Next day, they are examined for sufficient plumpness, taken out, fleshed, scudded and weighed (fleshed weight). The pelts are washed thoroughly in a paddle for ½ hour. They are now ready for deliming.

Deliming:

Ammonium chloride	..	½-¾ per cent on the fleshed wt.
Water ..	..	200-250 per cent -do-

The skins are delimed with this bath in a drum for 30 minutes. On testing a cut section with phenolphthalein, the middle one-third portion alone will give the red colour indicating presence of alkali, i.e., the pelts are two-third delimed. They are then washed and bated.

Bating: (Overnight bating method is followed)

The washed skins are bated in a covered paddle using 1 to 1·5 per cent C.L.R.I. bate No. 1 (on the fleshed weight). The bath is made up with half the quantity of bate using one paddleful of water (300% water at normal temperature) and the skins are paddled for one hour. Next, 2 oz. sodium flouride per 100 gallon of liquor (i.e., 8 gm. per litre), dissolved in one pint (600 ml.) of water at 40°C is added to the bath and the paddle is run for 5 minutes. The pelts are left in the bath overnight.

Next morning, the remaining half of the bate is added and the temperature of the bath is raised to 38-40°C by passing steam. The pelts are paddled in the bath maintaining the temperature of the bath at 38-40°C until the goods are satisfactorily bated. The pH of the bate liquor before unloading should be 7·8-8·0, if not, it should be adjusted to that pH.

The exact stage when the bating can be regarded to have been satisfactorily completed is generally judged by the following indications:

(1) The pelts should be thoroughly delimed; phenolphthalein applied to the edge of a cut piece of bated pelt should not show a red colouration.

(2) The bated pelts should be absolutely fallen and flaccid and should lie in the position in which they are kept. They should

not show any tendency to spring back. The absence of the tendency to spring back is generally tested by pressing the grain of the skin with the thumb; the thumb impression should remain.

(3) When bated pelts are scratched on the grain by the thumb nail, the scud consisting of broken hair roots, other epidermal remnants, dirt etc. should easily come out showing that the scud has been thoroughly loosened and rendered easily removable.

(4) When air is enclosed by folding the bated pelt in the form of a pouch and the pouch squeezed by the hand, then the enclosed air should come out producing air bubbles on the surface of the pouch. This shows that the pores of the skin have been thoroughly opened up.

(5) When the flesh side is scratched with the thumb nail, the adhering flesh should be removable when some pressure is applied but the flesh should not be too easily removable as in the case of over bating.

After the completion of bating, the pelts are taken out, scudded well, washed in cold water and put to the pickling process.

Pickling:

The pelts are pickled overnight in a drum using the following composition:

Common salt	.. 10-12	per cent on the fleshed wt.
Sulphuric acid	.. 1¼-1½	-do-
Water	.. 75-100	-do-

Salt is first dissolved in water and the skins are put in the drum which is run for 5 minutes. Sulphuric acid is then diluted and added to the revolving drum through the hollow axle and the pelts are drummed for one hour and left in the pickle bath overnight.

Next morning, the pelts are drummed for 30 minutes to one hour and the pH is adjusted to 2·4-2·8. After pickling, the pelts are taken out and the bath is drained. They are now ready for chrome tanning.

Tanning:

Tanning is done in a drum by one bath chrome tanning process.

Chrome extract powder manufactured by Buckingham & Carnatic Mills, may be used for chrome tanning. This powder contains 25 per cent Cr_2O_3 and the chrome liquor prepared by dissolving one part of the powder in 3 parts of hot water and left overnight will have a basicity of 33⅓ per cent and pH 3·3. Liquor obtained by dissolving 10 per cent B & C chrome extract powder (i.e., 5 per cent bichromate on the fleshed weight) in 10 per cent water on the fleshed weight may be used for tanning.

5 per cent salt and 100 per cent water are taken in a drum which is started. The pickled goods are put in and the drum is run for 5-10 minutes. The dissolved chrome liquor is then added in three instalments. First instalment of the liquor is added to the drum which is run for 30 minutes. The second instalment is then added and the drum run for 45 minutes. The third instalment is then added and the drum run for 2 hours. Then the goods are left well immersed in liquor overnight. Molasses-reduced chrome liquor of 33⅓ per cent basicity and pH 3·3 also may be used for tanning.

Next morning, the drum is run for 30 minutes to 1 hour and 10 per cent hypo on the fleshed weight, dissolved in a small quantity of water is added to the running drum in two instalments at an interval of 30 minutes. The drum is run for two hours more. The pH of the leathers should be 3·6-4·0. Shrinkage temperature will be 100-104°C. The skins are then washed by diluting the chrome bath 5-10 minutes and piled up on a platform for 2-3 days to drain off the excess of moisture.

The skins are then sammed, shaved uniformly and the shaved weight is noted. The shaved leathers are well soaked back, washed in two changes of water and neutralised with ½ per cent sodium bicarbonate and 300 per cent water (on the shaved weight) for 15-20 minutes and then washed in two changes of water. They are now ready for the subsequent operations. The operation following varies depending upon whether chrome crust or mordanted crust is required.

Chrome crust:

For chrome crust leathers, the neutralised goods are drummed with ¼-½ per cent sodium lauryl sulphate (or any other similar type of sulphated alcohol) and 200-250 per cent water for 30 minutes to 45 minutes. The goods are then taken out and fat liquored in a separate bath with sulphated fish oil (0·5-1·0 per

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cent) and water at 50°C (200-250 per cent) for 30-45 minutes. The goods are then horsed up.

Mordanted crust:

For mordanted crust leathers, the neutralised goods are treated with 0·75-1·0 per cent sulphated fish oil and 200-250 per cent water at 50°C for 30-45 minutes. Then 4 per cent cutch extract dissolved in a small quantity of water is added and the drum run for 10-15 minutes. The goods are then taken out and horsed up.

Putting out, samming, setting, drying, etc.:

Next day, the goods (chrome crust as well as mordanted crust) are put out in the putting out machine, oiled up with 2 parts kid finishing oil and 1 part fish oil, sammed, set out by machine and hung up for complete drying for two days. Then they are kept in pile for 2-3 days.

Staking, buffing, etc.:

The dried goods are now saw-dusted, staked lightly by a staking machine. They are then buffed on the flesh side, trimmed and ready for packing.

The crust leathers so obtained could be dyed and finished into a wide variety of leathers that could ordinarily be obtained from wet or dry salted goatskins.

Note:—It may however be noted that each tanner has his own specific methods of tanning and finishing depending upon the end use and the customer. The Indian exporter may do well to first ascertain from the foreign buyer as to his requirements in regard to the quantity of chrome, oil, vegetable tan and wetting agent that may be incorporated in the chrome crust.

LETTERS TO THE EDITOR

Studies on biosynthesis of tannins in indigenous plants Part I: Isolation of rutin from avaram leaves

Studies have been undertaken on the biosynthesis of tannins in indigenous plants like avaram, babul and dhawa with a view to utilise better, the tanning materials from them. In studying the polyphenolics and other materials in the various parts of these plants, the leaves, being the seats of metabolic activity, have been taken up first. The present communication reports the isolation of rutin (quercetin-3-rhamnoglucoside) from avaram (*Cassia auriculata*) leaves.

The isolation and characterisation of rutin was effected as follows: The leaves were crushed in a stone mortar, taken up in acetone and allowed to stand for four days at room temperature. The acetone solution was filtered and concentrated to a small volume *in vacuo* (60°C, N_2 atmosphere). The concentrate containing the polyphenols and chlorophyll was diluted with a little distilled water, heated on a boiling water bath for five minutes and filtered hot to remove chlorophyll and resinous materials. The filtrate was then repeatedly extracted with ether in a separatory funnel. The aqueous solution left after ether extraction was allowed to stand at room temperature for 24 hours during which period, yellow laminates separated out; these were crystallised from ethanol, m.p. 188°C (decomp.).

The compound gave positive test with Mg/HCl reagent. Unidimensional paper chromatographic studies were carried out using the following solvent systems:

(1) *n*-butanol : acetic acid : water (4 : 1 : 5)[1] (R_f value : 0·46);

(2) phenol : water (73 : 27 w/w)[2] (R_f value : 0·48).

The R_f values were found to be identical with that for rutin (quercetin-3-rhamnoglucoside) reported[2] earlier. In the U.V., the compound showed three maxima at 258 (log ε : 4·37), 310 (log ε : 3·98), 361 (log ε : 4·29) mμ; these are identical with those reported[2] for rutin.

Hydrolysis of the compound with 5% sulphuric acid:

The yellow compound was hydrolysed by treating it with 5% H_2SO_4 at 100°C for 20 minutes and filtered. The filtrate was concentrated to a small volume *in vacuo* and tested by single way ascending paper chromatography for sugars using the solvent system *n*-propanol : ethyl acetate : water (7 : 1 : 2).[3] The chromatogram was run for 48 hours and was then sprayed with a 3% solution of *p*-anisidine hydrochloride in *n*-butanol and heated at 90°C for ½ hour, in an air oven. Two spots, one yellow and the other brown developed; the R_f values of these were found to be identical with the values for authentic rhamnose and glucose run under identical experimental conditions.

The yellow solid residue obtained after hydrolysis was crystallised from 70% ethanol (m.p. 313°C). It gave a crystalline pentaacetyl derivative (from ethanol, m.p. 194°C) which was found to be identical with authentic acetyl derivative of quercetin (through m.p.). The yellow compound was put in single way ascending chromatography using the solvent system: *n*-butanol : acetic acid : water (4 : 1 : 5); the R_f value was found to be identical with that of authentic quercetin run under identical experimental conditions (R_f value 0·60). In U.V., it showed two maxima at 258 (log ε : 4·37) and 370 (log ε : 4·33) mμ, characteristic of quercetin.

July 20, 1961
C.L.R.I., Madras-20.

K. U. Bhanu,
K. N. S. Sastry.
S. Rajadurai,
Y. Nayudamma,

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Studies on biosynthesis of tannins in indigenous plants
Part II: Isolation of quercetin from babul leaves

In the previous communication, isolation of rutin from leaves of avaram, a tanning material of the condensed type has been reported. The present study is concerned with leaves of babul (*Acacia arabica*), a tanning material containing mixed tannins.

From the leaves, a yellow crystalline mass identified and characterised as 5,7,3′,4′, tetrahydroxy flavonol has been isolated.

The actual isolation and characterisation was carried out as follows: The leaves were crushed and taken up in methanol and allowed to stand at room temperature for three days. The methanol extract was decanted off and concentrated to a small volume *in vacuo* (50°C, N_2 atmosphere). A little water was then added, heated to 80°C on a water bath and filtered to remove chlorophyll and gummy materials. The filtrate was then repeatedly extracted with ether. The ether solution on evaporation gave a semi-solid mass which was crystallised from 70% ethanol as yellow crystalline solid, m.p. 313°C (decomp.).

Analysis:

Found : C 59·4; H 3·6.
Required: C 59·6; H 3·3%.

The yellow solid gave a positive test with Mg/HCl reagent. Unidimensional ascending paper chromatographic studies of the compound were carried out using the solvent systems: *n*-butanol : acetic acid : water (4:1:5)[1]. The R_f value of the compound was identical with that for authentic quercetin (0·60). In the U.V., it showed two maxima at 258 (log ε : 4·32) and 370 (log ε : 4·33) mμ and the infra-red spectrum was identical with that of authentic quercetin. On acetylation (with pyridine + acetic anhydride), it gave a crystalline acetyl derivative (from alcohol, m.p. 194°C). A mixed melting point of the acetyl derivative of the yellow compound with that of authentic quercetin showed no depression. On methylation (with dimethyl sulphate + potassium carbonate), it gave a pentamethyl derivative (m.p. 150-51°C) which on subsequent permanganate oxidation gave veratric acid (m.p. 179°C).

Quercetin has been found to be present in all the parts of babul and expected to play an important part in the biogenesis of the tannins in this plant.

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REFERENCE

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TECHNICAL SEMINAR

Survey of Gujarat State*

BY

A. GANESAN

Gujarat state has an area of about 72,000 sq. miles and a population of 1·6 crores. The northern, north-western and central regions of the state are dry and hot and so not quite suited for development of tanning industry. The Cutch area produces a good deal of hides and skins; however, it does not have a good concentration of tanners. The southern and central Kathiawar regions and the eastern and southern regions of the state are more fertile with good possibilities for development of tanning industry. Actually the districts of Kathiawar, Broach, Baroda and Surat have adequate supply of potable water and favourable climate also.

Two main breeds of cattle are found in the state. *Kankrej,* the hides of which are heavy (30-40 lb.) and fairly thick are found mainly in the hot, dry and sandy northern districts. No good hides are available from this breed due to restrictions on slaughter. The *Gir* breed is found mainly in Kathiawar and the neighbouring districts of central Gujarat and yields hides of about 25 lb. The *Kutchi* breed animals are small in stature and yield hides of about 15-18 lb. The *Desi* breeds are non-descript cattle in other areas yielding hides of about 10 lb. Since there is practically no slaughter except in certain places, the availability of hides is very low; a few hides of slaughtered origin are available in urban areas. On the other hand, there are about 78 pinjrapoles for old and sick animals. The flaying, curing as well as preparation for market are far from satisfactory. Skins are available in plenty from the shandies as well as from the slaughter houses.

Tanning materials like avaram, babul and behada are available mostly from within the state and can be obtained from the adjoining districts of Madhya Pradesh also.

There is only a small number of organised tanning units: a few processing textile leathers at Ahmedabad, one at Rajkot and another at Sherbaug. The rural sector of the industry in this state produces approximately 2 lakhs of hides, the value of which may be estimated around Rs. 50 lakhs. This is very small in comparison with the quantity of the leathers produced either in Punjab or in Rajasthan. Even the market for the tanned country hides is limited and the big co-operatives have to find the market for the products mainly in Rajasthan. Most of the skins produced go out of the state especially to Bombay. Hides are also exported out of the state particularly from the southern districts of Bombay. Selected hides are purchased by the dealers from Madras and Kanpur. The skins from Cutch and Kathiawar areas as also from Ahmedabad district ultimately find their way into Madras tanneries near Bombay. The State Government has organised a number of co-operatives of village tanners and it is reported that about 257 co-operatives have been established throughout the State.

The village tanner produces primarily for manufacture of leathers for village footwear and also for "Khos" (water buckets). The demand for khos is restricted to certain specific areas like Saurashtra. The important rural tanning centres are Idar, Godhra Patan, Rajkot, Navagadh etc. The Idar Co-operative Society has been running very successfully for the past ten years. The annual production is estimated at about 5,000 crores of hides and valued at Rs. 2 lakhs. The society depends on hides obtained from Rajkot side. The tanning materials are taken from Rajkot side and the leathers are also taken back to Rajkot as the local consumption is very limited. The society produces only the country type of leathers for footwear and khos purposes.

There is scope for development of the industry in certain parts of the State. Market for certain types of the leathers is fairly good and with increased assistance from various governmental agencies, chances for a new life for the tanning industry seem to be very bright.

* Summary of the talks given on June 2 & 9, 1961.

TANNERS' CORNER

The Central Leather Research Institute has been since its inception rendering technical aid to the leather industry through answering technical enquiries on specific problems. The number of such enquiries has been increasing year by year. In order that the information contained in the replies to the technical enquiries may be made available to all those who have similar problems, this new feature "Tanners' Corner" is being 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. I. How can the difficulty of alum tanned skins (generally with hair on) becoming moist during rainy season be overcome?

Answer: A combination aluminium-formaldehyde tannage can be used with advantage. After the usual soaking and scouring processes, the skins are treated as indicated below:

(N.B. All percentages given are on drained weight)

Pickling: is with

Sulphuric acid	..	1½%
Salt	..	10%
Water	..	100%

The pickle bath is well mixed and the skins are left overnight in it after handling.

Tanning: is with

Basic aluminium sulphate	..	20%
Water	..	300%

The above materials are well mixed in a tub and the skins are handled in this bath for about 4-5 days. ¼% Sodium bicarbonate is now added to raise the pH to 4·2 (T_s will be 81°C). Next, the tanned skins are thoroughly washed and then taken to formaldehyde tannage which is carried out with:

Formaldehyde (commercial quality)	..	3%
Water	..	300%

The above are well mixed and the skins are handled in this for one day. Next day, 10% sodium bicarbonate is added to raise

the pH of the bath and the skins are handled in this bath for one day (T_s will be about 84°C).

Next day, they are taken out, drained well and piled. The skins are thoroughly washed in three changes of water overnight and then fatliquored with:

Sulphated castor oil (Turkey Red Oil)	..	5%
Coconut oil	..	2%
Hot water	..	200%

The above are mixed well and emulsified. The skins are then put in and handled for about an hour. They are then taken out, set and toggled in the usual manner.

Note: Basic aluminium sulphate may be prepared from the following:

Aluminium sulphate	..	1 part
Soda citrate	..	½ part
Soda ash		½ part

Sodium citrate and aluminium sulphate are well mixed and dissolved in 2½ parts of hot water. To this solution, soda ash dissolved in three times its weight of water is added and stirred well. This liquor is kept overnight before using for tanning.

Q. II. A sample of black bristle intended for use in the manufacture of paint brushes is sent herewith. (1) How to impart greater shine to the bristle when it is dyed? (2) How to bleach it to a pure white shade?

Answer: 1. The bristles should be first cleansed successively in warm water, soap water, 1% H_2SO_4 solution and in a solution of a surface active agent like Triton-X-100 (0·5% solution) and then washed in several changes of plain water.

2. They are then soaked in 1% NaOH solution till the desired softness is achieved, washed free of alkali and treated with 1% solution of sulphated castor oil (T.R.O.) overnight.

The treated bristles are amenable to glazing by rubbing against a piece of warm cloth. By subjecting the samples to further treatment, the effect can be increased.

CLASSIFIED ABSTRACTS

VEGETABLE TANNING

Condensed tannins. 6. Biochemical and stereochemical interrelationships of (+)-fustin from black-wattle heartwood (Acacia mollissima).

D. G. Roux and E. Paulus (Leather Industries Research Institute, Rhodes University, Grahamstown, South Africa), *Biochem. J.* **77**, 315 (1960). (+)-Fustin and fisetin have been isolated from the heartwood of *Acacia mollissima*. (+)-Fustin has been shown to be enantiomorphous with (−)-fustin from *Rhus cotinus*, whereas *Rhus glabra, Rhus succedanea* and *Rhus vernicifera* contain racemic mixtures of these enantiomorphs. The stereochemistry of these fustins is inferred from previous work. (+)-Fustin was converted into (+)-7:3′:4′-trihydroxyflavan-3:4-diol [(+)-mollisacacidin] by hydrogenation. The radial distributions of (+)-mollisacacidin, (+)-fustin and fisetin in wattle heartwood were estimated. The findings suggest that (+)-mollisacacidin is the primary precursor from which (+)-fustin and fisetin are formed by dehydrogenation.

X. A method for the measurement of astringency of vegetable tan-liquors.

S. K. Mitra and D. K. Das (Central Leather Research Institute, Madras) *J. Roy. Microscop. Soc.* 77 142 (1957). A microscopic technique for measuring astringency of vegetable tan-liquors is described and the relative astringencies of some of the well-known Indian vegetable tanning materials determined by the method are presented.

OTHER TANNAGES

Developments in combination tannages—Part III. The stability of chrome retan leather under warm humid conditions.

D. A. Williams-Wynn and R. L. Sykes, *J. Soc. Leather Trades' Chemists* **45**, 214 (1961). The deterioration of chrome retan leather prepared under a variety of conditions has been studied under storage conditions of high temperature and high humidity. This deterioration has been related to that obtained under normal storage conditions (21°C and 65% R.H.), in the hope that exposure to warm humid conditions would constitute a satisfactory accelerated

ageing test. It has been shown that ageing at 45°C and 95 + % R. H. for three weeks corresponds to about nine months natural ageing when the leathers contain little or no organic acid. A true reflection of the amount of deterioration is not obtained from the accelerated ageing test on leathers which contain appreciable quantities of organic acids, or which have been retanned with blends of syntans and vegetable extracts.

Deterioration seems to be a result of hydrolysis under the acid conditions prevailing in the leather, and the importance of moisture in the deterioration process has been strikingly demonstrated. A considerable reduction in the deterioration obtained under warm humid conditions is achieved by excluding the moisture.

Tanning studies with dialdehyde starch. Preliminary evaluation of the leather.

E. M. Filachione, I. D. Clarke, E. H. Harris, Jr., J. Fee, L. P. Witnauer, and J. Naghski (Eastern Regional Research Laboratory, Philadelphia 18, Pennsylvania) and J. N. Boyd (Biometrical Services, ARS, Beltsville, Md.) *J. Am. Leather Chemists' Assoc.* **56**, 200 (1961). Calfskin (acetone-dehydrated) was tanned with dialdehyde starch under various conditions. Four tanning variables were investigated. These were: (a) dialdehyde starch of three oxidation levels i.e. 33, 67 and 96%; (b two pH levels, i.e., 8 and 10; (c) two methods for dissolving the dialdehyde starch; and (d) oiling the leather. The experiments were designed statistically. Tanning with dialdehyde starch oxidized to the 96% level, at pH 10 and oiling the leather in general resulted in the optimum leather properties and characteristics for the tannage.

PROCESSES AFTER TANNING

Improvement of some of the properties of sole leathers by impregnation with polymers.

Joseph R. Kanagy (Leather Section, National Bureau of Standards, Washington 25, D.C.) *J. Am. Leather Chemists' Assoc.*, **56**, 322 (1961). A review of the work on the improvement of the wear of sole leather by impregnation with polymers is presented. Emphasis is placed on the characteristics of leather that promote ease of treatment and produce the greatest improvements in properties. Methods of evaluation of the treated leathers are discussed critically, and a mechanism for abrasion resistance improvement of leather is suggested.

TESTING

The effect of pH on solubilization of weak acids and bases.

Denzel L. Dyer, *J. Colloid Sci.*, **14**, 640 (1959). Recent studies of the nature of surface-active agents in solution indicate that micelles formed in such solutions behave somewhat as a separate phase. Solubility measurements were made on o-phenylphenol, pentachlorophenol, and *p*-dimethylaminoazobenzene in solutions with and without surfactant over a wide pH range. The ratio of solubility in a surfactant solution to solubility in a similar solution without surfactant is defined as relative solubilization. This varies with solution pH and solute pK, being at a maximum for non-jonized solute and at half-maximum when pH is equal to pK. The variation of relative solubilization with pH is that which is predicted from treatment of micelles as a separate phase.

Paper chromatography of synthetic dyes.

J. C. Brown, *J. Soc. Dyers Colourists*, **76**, 536 (1960). The general techniques of paper chromatography are outlined and specific examples of suitable methods for disperse, acid, direct and metal-complex dyes are given. Methods of extracting dyes from various textile fibres are given. The complex nature of many commercial dyes is discussed in relation to methods of manufacture.

Application of gas-liquid partition chromatography to the quantitative estimation of monoglycerides.

A. G. McInnes, N. H. Tattrie, and M. Kates, (Division of Applied Biology, National Research Council, Ottawa, Canada) *J. Am Oil Chemists' Soc.*, **37**, 7 (1960). A procedure has been developed for the quantitative estimation of monoglycerides in terms of their constituent fatty acids. The monoglyceride mixture is mesylated with mesyl chloride in the presence of pyridine, and the resulting dimesyl derivatives are converted to allyl esters of the constituent fatty acids by treatment with sodium iodide in anhydrous acetone at 100°C. The allyl esters are then analyzed quantitatively by gas-liquid partition chromatography at 240°C on a column of Apiezon M-Celite. Both alpha and beta-monoglycerides are quantitatively converted to allyl esters by this procedure. Beta-monoglycerides in a mixture of alpha- and beta-isomers may be determined separately after removal of the alpha-isomers by oxidation with periodic acid. The analytical procedure is also applicable to monoglycerides in the presence of free fatty acids, diglycerides, and triglycerides.

Calculation of the distribution of the saturated and unsaturated acyl groups in fats from pancreatic lipase hydrolysis data.

R. J. Vander Wal, (Armour and Company, Chicago, Illinois) *J. Am. Oil Chemists' Soc.* **37**, 18 (1960). Evidence has been presented that the proportions of the glyceride types and isomeric forms in some fats in which C_{16}-C_{18} chains are greatly in excess can be determined by calculations based on (a) the percentage of saturated acyl groups in the whole fat, (b) the percentage of saturated groups in the 2-monoglycerides which can be derived from the fats by hydrolysis, (c) the assumption that all the saturated and unsaturated acyl groups (S and U) present in each of the three positions in the molecules are dispersed therein at random, and (d) the assumption that the proportions of S and U in the 1-positions are identical with those in the 3-positions. The method may apply to all predominantly C_{16}-C_{18} fats and to other fats as well.

Infrared spectroscopic characterization of glycerides.

Dennis Chapman (Research Department, Unilever Ltd., Port Sunlight, Cheshire, England), *J. Am. Oil Chemists' Soc.*, **37**, 73 (1960). The infrared spectra of a number of glycerides of different types, tri-, di-, and monoglycerides in their crystalline forms have been obtained, and the wealth of information present in these spectra has been discussed. In particular, polymorphic form, chain length, type of unsaturation, and configuration are all revealed by the spectra.

Analysis of fats and oils by gas-liqud chromatography (GLC) and by ultraviolet spectrophotometry.

S. F. Herb, Paul Magidman, and R. W. Riemenschneider (Eastern Regional Research Laboratory, Philadelphia, Pennsylvania), *J. Am. Oil Chemists' Soc.* **37**, 127 (1960). Known mixtures of pure fatty acid methyl esters and a number of fats and oils as their methyl esters have been analyzed by conventional GLC with thermal conductivity detectors. Percentage of fatty acid distribution determined by GLC agreed well with known percentages in model mixtures and with analysis by the spectrophotometric method for fats and oils. Determination of very small amounts of arachidonic and pentaenoic acids in lard by GLC was not successful.

Analysis of surfactant mixtures.

Lloyd E. Weeks and John T. Lewis (Monsanto Chemical Company, St. Louis, Missouri) *J. Am. Oil Chemists' Soc.* **37**, 138 (1960).

A scheme has been presented for the separation of active ingredients from built detergent compositions and subsequent analysis of active components. Active components investigated are those commonly encountered in practice. Data obtained are in good agreement with expected values. The main difficulty encountered was the characterization of a fatty alcohol-EO sulfate which gave higher than expected values for its analyzed content. It was also difficult completely to characterize this fatty alcohol-EO sulfate.

The formation of polarographically reducible substances in autoxidizing lard.

E. J. Kuta and F. W. Quackenbush (Department of Biochemistry, Purdue University, Lafayette, Indiana) *J. Am. Oil Chemists' Soc.* **37**, 148 (1960). In a polarographic study of lard during the early stages of autoxidation at 55° and 100°C three reduction potentials were observed, and curves were plotted from the diffusion current values at the corresponding half-wave potential to show the changes in concentration of each of the reducible substances with time. All three curves followed the general pattern of the peroxide value, determined titrimetrically. However, Curve A ($E^{1/2} = -0{\cdot}15$ v.) reached a maximum much earlier than either Curve B ($E^{1/2} = -0{\cdot}68$ v.) or Curve C ($E^{1/2} = -1{\cdot}10$ v.). Prooxidants steepened the curves; antioxidants introduced a lag phase. Although the relative heights shifted somewhat, three curves persisted under all conditions. It is concluded that autoxidizing lard contains at least three types of primary "peroxidic" compounds and that these are not changed qualitatively by the presence of prooxidants and antioxidants.

XVI. The complementary nature of light and electron microscopy.

R. Barer (Department of Human Anatomy, University of Oxford), *J. Roy. Microscop. Soc.* **79**, 181 (1960). Some aspects of recent progress in microscopy are reviewed. The widespread development of histology at the electron microscope level has been made possible by technical advances such as the design of microtomes capable of cutting very thin sections, the development of suitable methods of fixation and embedding, and the invention of the glass knife.

Some basic principles of microscopy are discussed and the origin of contrast is considered. It is shown that in many cases microscopic methods reveal the distribution of mass per unit area. This mass may be specific, as in the case of certain staining or

absorption methods, or non-specific, (i.e. total) as in the case of refractile objects and in electron microscopy. It is emphasized that no single method is capable of revealing all the physical and chemical properties of a specimen, and an examination under the microscope must be regarded as one of many possible experiments.

XIX. The examination of surfaces.

D. H. Page (British Paper & Board Industry Research Association, Kenley, Surrey) *J. Roy. Microsp. Soc.* **79**, 233 (1960). Attention is drawn to the inadequacy of the standard methods of qualitative assessment of surfaces, particularly for translucent specimens in the magnification range intermediate between the light and electron microscopes. The advantages of certain unconventional methods, namely, metal shadowing for light microscopy, reflection electron microscopy, and scanning electron microscopy are discussed.

XXII. Some applications of the ultra-violet and interference microscopes in electron microscopy.

Anna Cosslett (Cavendish Lab., Univ. of Cambridge, Cambridge) *J. Roy. Microsp. Soc.* **79**, 263 (1960). An ultra-violet microscope of high resolution, using radiation of wavelength 2570 A, is described. This makes it useful to the electron microscopist for giving information about the concentration of nucleic acids in different parts of an organism. Three different types of application are described. Firstly, a comparison of ultra-violet pictures with electron micrographs of identical bacteria (*Mycobacterium phlei*); secondly, a comparison of light microscope pictures of Feulgen-stained organisms (*Streptomyces coelicolor*) with ultra-violet pictures as well as with electron micrographs of these bacteria at the same stage of growth. The third application concerns a comparative study in the ultra-violet and electron microscopes of locust testis in order to assist in interpreting the electron microscope picture of the nucleus in these cells.

The interference microscope was used for measuring accurately the thickness and refractive index of thin sections. A special grid for mounting thin sections to be measured in the interference microscope was designed. The method was used to investigate the effect of the electron beam on thin sections of four different embedding materials (Methacrylate, Araldite, Vestopal, Aquon). It was found that all sections become thinner, the loss of thickness ranging from 25-60 per cent according to the nature of the material and the amount of irradiation.

THEORIES

I. Morphological variants in mammalian tissue fibres.

A. J. Cruise (4 Raymond Way, Fetcham, Surrey), *J. Roy. Microscop. Soc.* **77**, 1 (1957). The behaviour of microscopic collagen fibres under pressures applied radially to the bundles has shown that distinct morphological differences exist between them. Four types have been observed and defined by their structural differences and their related optical, chemical, and mechanical properties. Resistance to acid swelling, birefringence, and the elastic and plastic deformation under pressure all vary with the structure, and it is suggested that in these variant types the molecular chains may be in a state of "closer packing".

The variant types have been observed in a wide range of tissues from many species but there are marked variations between the proportions present in specimens from the same species. There is some evidence that the proportion of variant types is associated with the age of the specimen.

In addition two other fibrous types have been observed, which may be of a keratinous nature but which are always closely associated with normal collagen bundles. These possessed pointed or segmented structures which under extreme pressures exhibit complex fibrillar structures which appear to run from one joint to another. The presence of these in otherwise normal tissue suggests that their origin may involve several orders of control over the fibrogenesis to produce the alternating parallel and swollen sections.

Aggregation of colloidal suspensions by fibrous surfaces

I. The influence of the fiber surface.

G. T. Barnes and A. E. Alexander, *J. Colloid Sci.* **14**, 91 (1959). In an earlier paper it was shown that the aggregation of a commercial D.D.T. formulation was accelerated by the addition of fibres, and that hydrophobic fibre surfaces were much more effective than hydrophilic ones. This investigation has now been repeated and extended using a simple D.D.T. suspension containing only pure materials. The earlier assumption that the phenomenon is an aggregation process has been confirmed and the rate of aggregation has again been shown to depend on the wetting properties of the fibre surface. Some possible mechanisms are discussed.

Aggregation of colloidal suspensions by fibrous surfaces.

II. The effects of added salts and soaps.

G. T. Barnes and A. E. Alexander, *J. Colloid Sci.* **14**, 101 (1959). The addition of soaps or simple salts changes the stability of the D.D.T. suspension and also the rate of aggregation by fibrous surfaces. Low salt concentrations cause an immediate partial coagulation of the suspension, but further coagulation is generally very slow. The same salt concentrations produce very marked increase in the rate of aggregation of D.D.T. by hydrophobic fiber surfaces. This is attributed to decreases in the electrical repulsive forces around the fibers and the particles. Added soaps usually lower the stability of the suspension (without added fibers), the lowering being much more marked at soap concentrations above the c.m.c. This observation and the formation of large D.D.T. crystals suggest a process of crystal growth by transport of D.D.T. in the soap micelles. When fibers are also present the soaps are shown to be adsorbed on the fibers, rendering them more hydrophobic, and hence increasing the rate of aggregation of the D.D.T. by the fiber surfaces.

BY-PRODUCTS

The binding of dyes by soluble wool keratin derivatives.

B. S. Harrap (Biochem. Unit, Wool Textile Research Labs., C.S.I.R.O., Parkville N. 2, Melbourne, Victoria, Australia), *J. Colloid Sci.* **14**, 300 (1959). The binding of three acid dyes of slightly differing composition to a soluble wool keratin derivative has been measured by the dialysis-equilibrium method. The data satisfy the Klotz-Scatchard equation for the binding of small ions to proteins but the maximum amount of dye bound is much less than that equivalent to the number of basic chains on the protein, given by amino acid analysis. It seems likely that the guanidino groups of the arginine residues are not able to bind dye anions, and it is suggested that this occurs because they are more firmly bound to other groups on the protein. Intermolecular binding of this type would account for the high degree of aggregation shown by the soluble wool protein. The influence of pH and ionic strength on the binding of the three dyes is discussed in relation to their chemical structure.

NOTES & NEWS

Washington Session of I.U.L.C.S.

The 7th Biennial Congress of the International Union of Leather Chemists Societies, will be held in Washington, U.S.A. between August 19 and 25, 1961. The official opening ceremony will take place on Monday, August 21, 1961. Papers will be submitted in the morning and afternoon sessions from August 22 to 25. The following is the list of papers proposed to be presented at these sessions.

Tuesday—August 22:

(1) John Arthur Wilson Memorial Lecture — "How to protect the leather industry"—M. Riviere.

(2) "The fatty acid composition of lipids from different layers of fresh steerhide"—Edward F. Mellon, S. F. Herb, R. A. Barford, Samuel J. Viola and Francis E. Luddy.

(3) "Studies of fatliquoring: III. The influence of oil level" —C.L. Ornes.

(4) "Salt stain investigation"—Jean J. Tancous.

(5) "The influence of various factors on shape retention of shoe upper leather"—Malcolm Hill.

(6) "Wear durabilities and abrasion resistance of sole leathers"—R. G. Mitton, M. Miller and F. R. Morgan.

(7) "Properties of shoe leathers"—E. Baumann.

(8) "A new system for evaluation of shoe upper leathers by dimensional attributes"—Milton Bailey.

(9) "5-6-Dichlorobenzoxazolinone as a leather fungicide"—Sverre Dahl and A. M. Kaplan.

Wednesday—August 23:

(1) "The structure of collagen fibres and their significance in the theory of the tanning process"—W. Grassmann.

(2) "The isolation and characterisation of the gamma component of gelatin"—Arthur Veis, Joan Anesey and Jerome Cohen.

(3) "The preparation and properties of solubilised collagen"—A. G. Ward.

(4) "Effect of electrolytes on dissolved collagen"—Leo D. Kahn and Lee P. Witnauer.

(5) "On the question of cross-linking of collagen"—H. Hörmann.

(6) "The influence of bacterial enzymes on the stability of collagen"—J. W. Giffe, Jean G. Firch, J. N. Campbell and Joanna S. Kirvaitis.

(7) "Vegetable retannage of chrome tanned leather"—Robert Stubbings and Charles A. Eisenfelder, Jr.

(8) "Preservation of calfskins by salting"—M.I. Jullien.

(9) "Vegetable one-bath pretanning in buffered solutions"—E. Mezei.

(10) "A study of tanning precipitation by dialdehyde starch/urea"—A. Simoncini.

(11) "Mechanism of tanning with dialdehyde starch"—Y. Nayudamma, K. Thomas Joseph and S. M. Bose.

Thursday—August 24:

(1) "Modern methods of chrome tanning of upper leather"—P. J. van Vlimmeren.

(2) "Reducing power of various products against chrome"—Manuel Portavella.

(3) "Basicity of chrome tanning compounds and solutions"—W. H. Hartford.

(4) "Reaction of chrome salts with synthetic polypeptides"—E. Heidemann.

(5) "Tanning with glutaraldehyde combined with chrome"—E. M. Filachione, E. H. Harris, Jr., J. Naghski and M. L. Fein.

(6) "Contribution to the study of urea formaldehyde tannage" —R. Lasserre.

(7) "On the correlation between weight, swelling and plumpness of animal hide as influenced by liming chemicals"—H. Herfeld.

(8) "Tanning action of low-molecular-weight poly-hydroxy-phenols"—H. Endres.

Friday—August 25:

(1) "Vegetable leather—An example of common problems in the leather industry"—E. Komarke, W. Luck and G. Mauthe.

(2) "Disadvantages of the pickling process and how to avoid them"—G. Otto.

(3) "Recent developments in brine cure"—Fred O'Flaherty.

(4) "Latest concept of wet stock drying and conditioning"—J. W. Aulson.

(5) "American and European leather manufacture"—H. G. Turley.

Dr. Y. Nayudamma, Director, Central Leather Research Institute, is attending the conference as the delegate from C.L.R.I.

Fourth Annual General Meeting of the Leather Export Promotion Council

The Fourth Annual General Meeting of the Leather Export Promotion Council was held on July 13, 1961 with Janab M. J. Jamal Mohideen Sahib, M.L.A. in the chair. At this meeting, Janab M. J. Jamal Mohideen Sahib, M.L.A. and Sri A. Nagappa Chettiar were unanimously elected as the Chairman and Vice-Chairman of the Council respectively for the year 1961-62.

In his opening remarks, the Chairman said that although the exports during the year 1960 did not rise to the level achieved in the year 1959, the tanning industry had contributed to the foreign exchange earning of the nation a sum of Rs. 282.26 millions, of which Rs. 235.9 millions was the export value of E.I. vegetable tanned hides and skins, Rs. 17.9 millions, of finished leathers and Rs. 28.5 millions, of leather goods including footwear. He was hopeful that the trades' performance during the current year would be better.

The Chairman next made mention of the scheme for enrolment of exporters to be operated by the Council.

Referring to the various export promotional activities, the Chairman said the Council popularised Indian leathers and leather goods in foreign markets by participating in International Fairs and Exhibitions and making arrangements for preparing albums containing the leathers produced in the country for being distributed to the foreign visitors and trade missions.

Referring to the proposed entry of U.K. into the European Common Market, he expressed the fear that this entry would affect our exports to U.K. especially of tanned kips, finished leathers and leather goods, because of possible levies.

In conclusion, he appealed to the Government of India to permit the import of raw hides and skins from all permissible origins without a licence and to subsidise the exports of top class finished leathers and leather goods in order to offset the disadvantages they faced in the consuming countries by import tariffs.

Kenya Game Department to open up new source of skins

A possible new source of skins is disclosed in a letter received from Dr. I. Mann, Kenya Department of Veterinary Services. This states:

"The Game Department intends to crop game animals regularly in certain areas, beginning this year, to preserve grazing. We have been asked by them to help find a market for products derived from the carcasses. The purpose of this letter is to give you advance notice that between March and May, this year, about 1,500 game skins will be offered for sale, out of which from 1,000 to 1,200 will be zebra, the remainder wild-beest. It is intended to make this an annual cropping so that similar numbers will be available each year at this time. Every effort will be made to ensure that these skins are presented in better condition than any appearing on the market at present. The quantity and quality will no doubt attract buyers from overseas, and we should therefore be glad to hear whether you or your associate importers would be interested in purchasing these skins. In order to produce skins of the highest quality, the following procedure will be adopt[illegible]:—Every care will be taken to restrict the damage caused by shooting. Experienced staff will flay the carcass immediately, to avoid knife damage or 'taint'. Prompt transport to a shed will be arranged to avoid any risk of hair slip or putrefaction. On reaching the shed, the skins will be washed, fleshed and trimmed. Depending on the market requirements, the skins will be either suspension dried or wet salted. Wet salting would be combined with brining, and insecticides could be added if required. After the skins have been dried or cured, they will be graded, branded with a Game Department brand, and bundled. It is proposed to divide the skins into three grades, as, even without man-made damage, some blemishes may occur on the skins as a result of disease or fighting. The grades will be as follows:—

Grade I: Completely flawless skins without blemishes.
Grade II: Skins showing a few scars or marks.
Grade III: All skins not falling into Grades I or II."

Leather Trades Review: Feb. 1, 1961.

New Leather Dyeing Process

A new process for dyeing leather which, says the newspaper *Nepszava*, results in a considerable saving of dye, has been evolved in Hungary. With the previous method of application by spraygun, dye rebounded from the leather and was lost through the cabinet extractors.

The new method involves charging the dye with an 80,000 volt current, which makes it bind immediately to the leather. There is no "rebound" and less dye is required to achieve a good finish.

Leather Trades Review: Feb. 15, 1961.

Effect of mechanical action during tanning

In the tanning process, the tanner can adjust his level of chrome, the float ratio, the time of drumming, the speed of drumming, the temperature, the chrome feed rate, and the rate of basification. For example, if a change is made in the float ratio there will probably be an accompanying change in the temperature. If the time of drumming is changed, the chrome take-up will also be changed.

Dr. Robert Stubbings, of Lehigh University in Bethlehem, Pennsylvania, in a series of tests has evaluated the effects of mechanical action during the tanning of leather.

As long as the temperature was not allowed to rise too rapidly in the tests in the first hour of drumming, final temperatures ranging from 90 deg. F. to 130 deg. F. had little, if any, effect on the character, temper or break of the leather, according to Dr. Stubbings' observations. When testing the effect of time of drumming (with an accompanying increasing in chrome take-up), the results showed that increased time produced softer leather with only a slight effect on the break. These tests indicated that either mechanical action or increased chrome content was responsible for this softness.

In order to determine the order of magnitude of the increased time on the temper, a test was run using 2 per cent and 8 per cent fat respectively. This change in fat content produced a softening of temper about twice as great as the long running time did. Also, however, increasing the fat to the 8 per cent level had a large effect on the break producing loose leather. Other tests indicated that about half of the softening was caused by an increase in chrome take-up and the other half due to the increased mechanical action or time of tannage. At the present time, further tests are being run at various rates of mechanical action corresponding to different drum speeds.

Leather Trades Review: Feb. 15, 1961.

Machines to utilize leather scrap

The latest developments in the field of processing and upgrading equipment in the utilization of leather scrap form always an important feature of news for the leather industry.

We have recently received interesting details from Ludwig Pallmann Ltd., Zweibrucken, Germany, of their patented Turbo Mills and Knife granulator equipment.

Two fundamental Pallmann fibreizing types for converting leather wastes into leather fibres are type PP (double-engined) only for wet-fibreizing, and type REF (single-engined) only for dry-fibreizing.

The wet-grinding-system, which in the past has generally been employed, has, however, certain disadvantages, which have induced the firm to develop the dry grinding process, the advantages of which—contrary to the wet-grinding method are outlined as follows:

The main reason for a change-over from wet-grinding to dry-grinding is less electric power consumption, for example: In the event of wet-grinding tanned leather, the power-requirement would be approximately 70 to 75 kW. for 100 kg., while in the event of dry-grinding, the same quantity would require only approximately 35 to 37 kW. Furthermore, the fibre resulting from the wet-grinding process, especially if chrome leather is concernd, is very long and will require, subsequently, a regrinding operation of at least one hour in the pulp-engine. This retreatment in the pulp-engine would only take half an hour in case of dry-grinding.

Another reason is that so-called "upper leather" cannot be wet-ground, but dry-ground without difficulty. This is of greatest importance in view of the fact that the percentage of upper leather wastes is increasing daily, because sole leather is more and more being displaced by imitation leather.

A further reason is that the prime cost arising is by far not so high, because only one granulator and one single-engined mill is required for dry-grinding, while wet-grinding would require one granulator and two double-engined mills, and the dry-ground material does not require immediate further treatment, but can be taken on stock.

Leather Trades Review: April 12, 1961.

No danger of leather being displaced

According to the Director of the South African Leather Industries Research Institute, Grahamstown, there is no danger of leather being displaced by synthetic shoe materials. Dr. S. G. Shuttleworth recently returned from a protracted visit to the United States, Argentina, Australia and New Zealand as a member of a three-man mission sponsored by the South African Meat Board to investigate the best methods of curing sheepskins. He said

he had found tanners abroad worried about the threat of synthetic materials being used for shoe soles. These synthetic materials, he added, were being used only in the cheaper lines. Dr. Shuttleworth said no material had been developed yet to rival leather for the manufacture of shoes. "It continues to be the only satisfactory material for uppers due to its ability to conform to shape and to hold its shape".

Doctors say "Leather"

"Today's Health", the official magazine of the American Medical Association is advising the American public that leather is still best for shoes because it provides more support for the feet.

The magazine, which has a circulation of millions, made the following recommendations for selecting healthy shoes:

For children: Shoes, preferably made of leather, should be pliable and interfere as little as possible with free action of the feet.... Canvas shoes are suitable for play, but should not be worn constantly.

For infants: His first shoes should have a flexible leather sole thick enough to protect his feet.

For bunion sufferers: Soft all-leather shoes help.

Leather Trades Review: April 19, 1961.

New Leather Technology Society

A Society of Leather Technologists has been formed under the name of Pakistan Society of Leather Technologists (P.S.L.T.) with its head office in Karachi, and branch offices at Lahore and Dacca. The aims and objects of the Society are:

1. To encourage and assist the study and research of Leather Technology.

2. To establish an up-to-date library with Technical Books and a Free Reading Room with Technical Journals, for its members and to offer advice to member-technicians and to Leather Industry in general.

3. To disseminate information relating to the new processes and research carried out in Pakistan and abroad for the advancement of leather technology and to publish those articles of research and general reports regarding raw hides and tanned leathers in Pakistan and abroad through a monthly magazine, lectures and films for information of its members and to private subscribers.

4. To arrange frequent "Seminars" on the important subjects of common interest in leather industry as well as to organize exhibitions, film shows of leather and allied industry.

5. To arrange meetings and discussions to impart scientific knowledge to local and foreign qualified persons in Tanneries and to guide young qualified persons/technologists to join the trade, for the benefit of members with the local and foreign visitors (Leather Technologists Chemists) visiting the particular city.

6. To assist and develop the cottage and Small Scale Industries connected with leather and Allied Trade.

7. To impart knowledge through literature and other media (Films shows, etc.) for improvement of flaying to get better Hides and Skins from Slaughter Houses.

8. To establish recreation centre at headquarters as well as in the branches.

9. To undertake management of movable or immovable properties donated to or purchased by the Society and to make all arrangements for safe custody and maintenance thereof.

10. To raise funds by procuring loans and donations for any particular enterprise as well as to collect contributions in the form of admission fee, annual or monthly subscription or otherwise.

11. To do all such other lawful things as are incidental or conducive to the attainment of above subjects.

Leather Manufacturer: March, 1961.

C.L.R.I. NEWS

Newer uses for Buffalo Hides

The tanners may be interested to note that soon the Central Leather Research Institute will be releasing processes for the manufacture of a variety of leathers from buffalo hides. Ordinarily, buffalo hide is used for the manufacture of sole leather and certain industrial leathers. But better values may be realised if buffalo hide is used as a raw material for other types of leathers. Intensive research conducted at the C.L.R.I. for the past six months has shown that buffalo hide could be conveniently split and the grain split used for shrunken grain upper, shoe upper, luggage leathers etc. and the splits for chamois, clothing and upholstery leathers. Buffalo split is unique for giving a very

uniform shrunken grain upper and appears to be superior to cow hide. Semi-commercial trials are undertaken at present to study more closely the economics of these varied types of leathers from the same raw buff hide; the processes will be released towards the end of 1961.

Dr. Y. Nayudamma, Director, will be leaving Madras on August 19, 1961 to participate in the Seventh Biennial Conference of the International Union of Leather Chemists Societies, to be held at Washington, U.S.A. from August 19 to 25, 1961. He will be presenting a paper on "The mechanism of interaction of dialdehyde starch with collagen". During his stay in U.S.A., Dr. Nayudamma will be visiting several tanning institutes and the tanneries. On his way back to India, he will attend the 19th Semaine du Cuir at Paris.

Dr. Nayudamma attended the 5th meeting of the Development Council for the Leather, Leather Goods and Pickers' Industries, held at New Delhi on July 14, 1961; he visited Coimbatore on July 10-11, 1961 to hold discussions with the South Indian Textile Research Association on mutual collaboration; he participated in the meeting of the Board of Directors of the Mysore Chrome Tanning Co. held at Mysore on July 31, 1961.

Dr. Nayudamma has been re-elected as a member of the Leather Export Promotion Council for the year 1961-62.

After returning to India, he worked in the Government Tannery at Allahabad for 2 years. In 1920, he floated the Western India Tanneries in Bombay which today is a well-established unit, manufacturing a full range of civilian, textile and industrial leather of some 100 different types. He started the manufacture of chrome leather from as early as 1924 and has been a pioneer in developing the manufacture of industrial and textile leathers. It may be said that till his death, he was the oldest leather technologist in the country having devoted his life to the leather industry.

Shri Pandit was a member of Managing Committee of the Tanners' Federation of India for a number of years. He was a member of the Panel on Leather and Leather Goods appointed by the Government of India under the chairmanship of late Prof. B. M. Das, which toured the whole country and published the first exhaustive report on the leather industry in 1947.

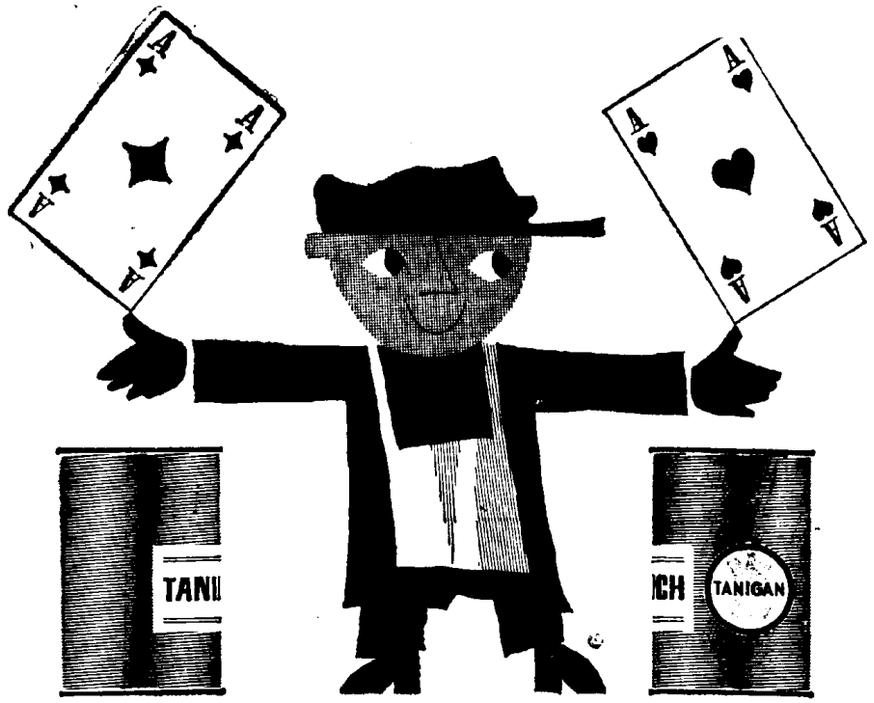
OBITUARY

We regret to record the sudden demise of Shri Pratap S. Pandit, Director and Managing Agent of Western India Tanneries Ltd., Dharavi, Bombay on July 7, 1961 at the age of 71 years.

Shri P. S. Pandit

Born in 1860 in Rajkot, he had his college education in Bombay. In 1910, he went to London to study Law and was called to the Bar in due course. He also got a diploma in leather manufacture from the "Leather Sellers College", London in 1912.

(*Continued on p. 46*)



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சென்ட்ரல் லெதர் ரிசர்ச் இன்ஸ்டிட்யூட் புல்லட்டின்

இணைப்பு ஏடு. ஆகஸ்டு. 1961.

கிழக்கிந்திய முறைப்படி பதனிடப்பட்ட அல்லது தாவரப் பதனிடப்பட்ட ஆட்டுத் தோல், மாட்டுத் தோல்களிலிருந்து இயற்கை நிறமும், நிறம் ஊட்டப்பட்டதுமான 'ஷேனிங்' தோல்கள் தயாரித்தல்.

பி. எஸ். வெங்கடாசலம், டி. எஸ். கிருஷ்ணன்

கச்சாப் பொருள்கள் :

இம்முறைக்குத் தேவையான கச்சாப் பொருள், கப்புத் தோல் (Upper), 'ஸ்வேடு' போன்ற தோல்கள் தயார் செய்ய முடியாத அளவு குறைகள் கொண்ட, கீழ்த்தரமான, தள்ளு ரகத்தைச் சேர்ந்த தாவரப்பதனிட்ட ஆட்டுத் தோலும், பசுங் கன்றுகளின் தோல்களும், பசு மாட்டுத் தோலும் ஆகும்.

பசுமாட்டுத் தோலிலிருந்து 'ஷேனிங்' தோல் தயாரித்தல் :

தாவரப்பதனிட்ட மாட்டுத்தோல்களின் பாளங்கள் எடுத்துக் கொள்ளப்படுகின்றன. காய்ந்த பாளங்களின் எடையில் 800% தண்ணீர் ஒரு பீப்பாயில் நிரப்பப்பட்டு, இப்பீப்பாயில் இத்தோல்கள் போடப்பட்டு, பீப்பாய் 15 நிமிடங்களுக்கு இயக்கப்படுகிறது. பிறகு இயந்திரத்தில் தண்ணீர் வாங்கப்பட்டு, அவுல் பதமாக்கப்பட்டு, பிளக்கப் பட்டு, 0.9 முதல் 1 மி. மீடர் கனம் கொண்டதாக இருக்கு மாறு சீவப்படுகின்றன. சீவப்பட்ட இப்பாளங்கள் நிறுத்துக் கொள்ளப்படுகின்றன. பின்னர் 400% தண்ணீர் கொண்ட பீப்பாயில் 20 நிமிடங்களுக்குக் கழுவப்படுகின்றன. பின் மறுபடியும் 400% தண்ணீர் பீப்பாயில் நிரப்பப்பட்டு, 10 நிமிடங்களுக்கு இயக்கப்பட்டுக் கழுவப்படுகின்றன. பீப் பாயிலுள்ள தண்ணீர் காலி செய்யப்படுகிறது. பின்னர் இவை கீழ்க்கண்டவாறு வெளுக்கப்படுகின்றன.

வெளுத்தல் :

கீழ்க்கண்ட அளவில் வெளுக்கும் திரவம் தயாரிக்கப் படுகிறது.

ஆக்சாலிக் அமிலம்	½%
கால்கான் (ஐ. சி. ஐ.)	½%
பிளீச்சிங் சின்டான்	1%
தண்ணீர்	200%

இத்திரவம் ஒரு பீப்பாயில் நிரப்பப்பட்டு, தோல்கள் அதில் போடப்பட்ட பின் 20 முதல் 30 நிமிடங்களுக்குப் பீப்பாய் இயக்கப்படுகிறது. இதன் பின் 400% தண்ணீர் ஒரு பீப்பாயில் நிரப்பப்பட்டு 10 நிமிடங்களுக்குப் பீப்பாய் இயக்கப்பட்டு, தோல்கள் கழுவப்படுகின்றன. பின்னர் இவை மரக்குதிரைமீது போடப்பட்டு, வடிய வைக்கப்படு கின்றன.

மறுபதனிடுதல் :

வெள்ளை நாகமரத்தின் (தாவா) இலைகள் அல்லது கடுக் காய்க் கொட்டைகளை உபயோகித்து இத்தோல்களை மறுபத னிடலாம்.

30% (காய்ந்த தோல்களின் எடையில்) வெள்ளை நாக மரத்தின் (தாவா) இலைகள் நன்றுகப் பொடியாக்கப்பட்டு 50° முதல் 55° சென்டிகிரேடு உள்ள வெந்நீரில் இரவு முழுதும் ஊறவைக்கப்பட்டு, மறுநாள் இக்கூழ் ஒரு பீப்பாயில் ஊற்றப் பட்டு, தோல்கள் இப்பீப்பாயில் போடப்படுகின்றன. 2 மணி நேரத்திற்குப் பீப்பாய் இயக்கப்பட்ட பின் இவை வெளியே எடுக்கப்பட்டு, தண்ணீரில் அலசப்பட்டு, பட்டறையாக இரவு முழுதும் விடப்படுகின்றன.

கடுக்காய் உபயோகித்து மறுபதனிட வேண்டுமானால் 15% கடுக்காய்த் தூள் (காய்ந்த தோல்களின் எடையில்) 50° முதல் 55° சென்டிகிரேடு உள்ள வெந்நீரில் இரவு முழுதும் ஊற வைக்கப்படுகிறது. பிறகு நிறையத் தண்ணீர் சேர்க்கப் பட்டு, இக்கொட்டைகளிலிருந்து அதிகமாகப் பதனிடு பொருளைப் பெறுவதற்காக நன்றுக மிதிக்கப்பட்டபின், சக்கை அகற்றப்படுகிறது. தோலின் எடையில் 100% இத்திரவம் இருக்குமாறு தண்ணீர் சேர்க்கப்படுகிறது. இக்கடுக்காய் திரவம் பீப்பாயில் ஊற்றப்பட்டு, தோல்கள் பீப்பாயில் போடப்பட்டு, 2 மணி நேரத்திற்குப் பீப்பாய் இயக்கப்படு கிறது. பிறகு தோல்கள் வெளியே எடுக்கப்பட்டு, தண்ணீரில் அலசப்பட்டு மரக்குதிரைகளின் மேல் வடிவதற்காக இரவு முழுதும் பட்டறையாக விடப்படுகின்றன.

எண்ணெய் ஊட்டுதல் :

இப்பாளங்கள் பிறகு 45° செ. கி. உள்ள 200% வெந்நீர் கொண்ட பீப்பாயில் போடப்பட்டு, பீப்பாய் 10 நிமிடங் களுக்கு இயக்கப்படுகிறது. பிறகு தண்ணீர் மட்டும் காலி செய்யப்படுகிறது. பின்னர் 45° செ. கி. உள்ள 150% வெந்நீர் பீப்பாயில் ஊற்றப்படுகிறது. பின்னர் டார்க்கிரெட் ஆயில் 2½%-ம், ஆமணக்கெண்ணெய் ¾%-ம், சைனுகளிமண் 2%-ம் சிறிதளவு வெந்நீரில் நன்றுகக் கலக்கப்பட்டுக் குழம்பாக்கப் படுகிறது. இந்த எண்ணெய்க் குழம்பு 2 தவணைகளில் 10 நிமிடங்களுக்கு ஒருமுறை சேர்க்கப்பட்டு, பீப்பாய் 30 நிமிடங் களுக்கு இயக்கப்படுகிறது. பின்னர் ½% பார்மிக் அமிலம் தேவையான தண்ணீரில் நீர்க்கப்பட்டு மெதுவாகப் பீப்பா யில் சேர்க்கப்படுகிறது. மறுபடியும் 15 நிமிடங்களுக்கு பீப்பாய் இயக்கப்பட்ட பின் தோல்கள் வெளியே எடுக்கப் பட்டு மரக்குதிரைகளின் மேல் பட்டறையாக விடப்படு கின்றன. அதிக அளவு மிருதுத் தன்மை தேவையாய் இருந்தால் எண்ணெய்க் குழம்பின் அளவை 1% அதிகரித்துக் கொள்ள வேண்டும். ஆனால் எண்ணெய்க் குழம்புக்கான பொருள்கள் அதே அளவில்தான் சேர்க்கப்பட வேண்டும்.

மறுநாள் இத்தோல்கள் இயந்திரத்தில் தண்ணீர் வாங் கப்பட்டு, அவுல்பதமாக்கப்பட்டு, கையாலோ இயந்திரத் தாலோ சுருக்கம் (தாணை) தள்ளப்பட்டு இழுத்துப் பிடிக்கும் கிடுக்கிகள் கொண்ட சட்டத்தில் தளர்வான நிலையில் காய வைக்கப்படுகின்றன (Toggled). காய வைத்தபின் இவை 3 அல்லது 4 நாட்களுக்குப் பட்டறையாக விடப்படுகின்றன. பின்னர் இவை பதப்படுத்தப்பட்டு, மிருதுவாக்கப்பட்டு, காற் றில் உலரவைக்கப்பட்டு, சுற்றுப் பார்க்கப்படுகின்றன. இவை பின்னர் மேனிப்பக்கத்திலும் சவ்வுப் பக்கத்திலும் முறையே கரடுமுரடான உப்புத்தாளாலும் நயமான உப்புத்தாளாலும் கல்லடிக்கப்படுகின்றன.

இயற்கை நிறங்கொண்ட கூலிங் தோல்கள் :

இப்பாளங்கள் பின்னர் நன்றுக பிரஷினால் கல்லடித் தூள் போகச் சுத்தம் செய்யப்பட்டு, இரும்புத்தகடால் ஹைட்ராலிக் அழுத்தியில் அழுத்தப்பட்டு, இரு பக்கங்களி லும் பிரெஞ்சு சாக் பொடி தடவப்படுகிறது.

நிறம் ஊட்டப்பட்ட கூலிங் தோல்கள் :

சாதாரணமாக இவ்வித கூலிங் தோல்கள் வெளுத்த நிறத்திலேயே ஒப்படை செய்யப்படுகின்றன. இப்பாளங் களின் மேனிப்பக்கத்தில் 4% ஆளிவிதைப் பிசின் கரைசல்

தடவி, தட்டப்பட்டு, காய வைக்கப்பட்டு, இரும்புத் தகடால் ஹைட்ராலிக் அழுத்தியில் அழுத்தப்படுகின்றன. பின்னர் இவற்றின் மேல் எல்லாப் பகுதிகளிலும் சாயம் பரவுமாறு கீழ்க்கண்ட அளவில் தயாரிக்கப்பட்ட வண்ணப்பூச்சு இயந்திரத்தால் தெளிக்கப்படுகிறது.

வண்ணப்பூச்சு :

வண்ணப்பூச்சு கீழ்க்கண்ட அளவில் தயாரிக்கப்படுகிறது.

தேவையான நிறத்திற்குச் சரிப்படுத்தப்பட்ட பொருத்தமான வண்ணப்பூச்சு	1 பாகம்
செயற்கை ரெசின் குழம்பு	1 பாகம்
10% கேசின் கரைசல்	½ பாகம்
10% கார்னேபா மெழுகுக் குழம்பு	⅛ பாகம்
தண்ணீர்	2 பாகம்

மேல்பூச்சு :

இப்பூச்சு கீழ்க்கண்ட அளவில் தயாரிக்கப்பட்டுத் தெளிக்கப்படுகிறது.

5% கேசின் கரைசல்	1 பாகம்
10% பார்மலின்	1 பாகம்

பின்னர் இப்பாளங்கள் காய வைக்கப்பட்டு, பரப்பளவு கணக்கிடப்பட்டு, ஹைட்ராலிக் அழுத்தியில் சூடான தகடால் (65·5° செ.கி. அதாவது 150° பா. ஹீ.) அழுத்தப்பட்டு தரவாரியாகப் பிரிக்கப்படுகின்றன.

பின் குறிப்பு :

(அ) எல்லாக் கலவை முறைகளும் (தனியாகக் குறிப்பிடப்பட்டிருந்தால் தவிர) சீவிய தோல்களின் எடைக்கே கணக்கிடப்பட்டவையாகும்.

(ஆ) இம்முறையிலேயே கிழக்கிந்திய முறைப்படி பதனிடப்பட்ட வெள்ளாட்டுத் தோல்களிலிருந்தும் செம்மறியாட்டுத் தோல்களிலிருந்தும் கூனிங் தோல்கள் தயாரிக்கப்படுகின்றன.

செய்திக் கதிர்

கைவண்டி இழுப்போருக்குக் காலணிகள்

கோணி சுற்றிய பாதங்களுடன், உடலெங்கும் வியர்வை சொட்ட, தார் உருகி ஓடும் நடுப்பகல் வெயிலிலும், சென்னை நகரத்தின் முக்கிய சாலைகளிலுங்கூட பாரமான கைவண்டிகளை மனிதர் இழுத்துச் செல்லும் காட்சி காண்போர் நெஞ்சைக் கரைக்கும் ஓர் காட்சியாகும். கடுமையான குளிர், வெப்பம், மழை ஆகியவற்றால் பாதிக்கப்படுவதாலும், அதிகமாகத் தேய்வு படுவதாலும் சாதாரணமாகப் பாதசாரிகள் அணியும் காலணிகள் இவர்களுக்கு உபயோகப்படுவதில்லை. மாடாக உழைக்கும் இம்மனிதர்களுக்குத் தகுந்த விதத்தில் உபயோகப்படும் காலணிகள் தயாரிப்பதற்கான ஆராய்ச்சி இந்நிலையத்தில் சில மாதங்களுக்கு முன் மேற்கொள்ளப்பட்டது.

இதன் விளைவாக, இவ்வுழைப்பாளிகளுக்கு உதவத் தக்க காலணிகள் இந்நிலையத்தில் பதனிடப்பட்ட தோலிலிருந்து தயாரிக்கப்பட்டன. இவை கைவண்டி இழுப்போர் சிலருக்கு 1961-ம் ஆண்டு ஜூன் மாதம் 22-ம் தேதி, பெரியமேட்டுக் காவல் நிலையத்தில் சென்னை நகரப் போலீஸ் இலாகாவின் சட்டம், ஒழுங்கு முறைக்கான டெபுடி கமிஷனர் ஸ்ரீ எஸ். கிருஷ்ணராஜ் அவர்களால் அளிக்கப்பட்டன.

இக்காலணிகள் பெற்ற கைவண்டி இழுப்போர், ஸ்ரீ கிருஷ்ணராஜ், ஆகியோருடைய ஒத்துழைப்பின் மூலம் இவற்றின் தேய்மானம் ஆகியவை அவ்வப்போது சோதிக்கப்படும்.

தொழிலாளர்களின் துயர் துடைக்கவென மேற்கொள்ளப்பட்ட இவ்வாராய்ச்சி வெற்றியாக மலரும் என்று நம்பப்படுகிறது. மேலும் நாட்டிலுள்ள சமூக நலக் குழுக்கள் காலணியற்ற காலுடன் பார வண்டி இழுக்கும் இவர்களுக்கு உதவ முன் வரும் என்று எதிர்பார்க்கப்படுகிறது.

கால்நடை அபிவிருத்திக்கு மூன்றாவது திட்டத்தில் ஏற்பாடு

சென்னை மாதவரம் பால் பண்ணையில் நடைபெற்ற தமிழ்நாடு கால்நடை அபிவிருத்திக் கழகத்தின் 44-வது கூட்டத்தில் பேசுகையில், சென்னை விவசாய அமைச்சர்

ஸ்ரீ எம். பக்தவத்சலம், 3-வது திட்டத்தில் கால்நடை பராமரிப்புக்கான திட்டங்களைப் பற்றி எடுத்துக் கூறி, கால்நடை பராமரிப்புக்கென ரூ. 352.25 லட்சமும், பால்பண்ணை, பால் வழங்கு திட்டங்களுக்காக ரூ. 275 லட்சமும், மூன்றுவது திட்ட காலத்தில் ஒதுக்கப் பட்டுள்ளதென்று தெரிவித்தார். ஹோசூரில் சென்ற தடவை நடைபெற்ற கூட்டத்திற்குப் பிறகு கால்நடை வளர்ச்சிக்கான திட்டத்தில் குறிப்பிட்ட முன்னேற்றம் ஏற்பட்டுள்ளது. இரண்டாவது திட்ட காலத்தில் இதற்கென ஒதுக்கப்பட்ட 217.48 லட்ச ரூபாயில் 190 லட்ச ரூபாய் சர்க்காரால் செலவிடப்பட்டது. கால்நடை வளர்ச்சி, பால்பண்ணை ஆகியவைகளில் நாம் எதிர்பார்க்கும் அபிவிருத்தி ஏற்படுவதற்கு இன்னும் பலகாலம் பிடிக்கலாம் என்றும் எடுத்துரைத்தார்.

மூன்றுவது திட்ட காலத்திற்கான ஏற்பாடுகள் பற்றிக் குறிப்பிடுகையில் இத்திட்டத்தின் நோக்கம் இரண்டாவது திட்ட காலத்தில் துவக்கப்பட்ட கால்நடை அபிவிருத்தி ஏற்பாடுகளை நிலையாக்கி, முன்னைவிட அதிக ஊக்கத்துடன் இதில் ஈடுபடுவதேயாகும். இத்திட்ட ஏற்பாட்டில் ஆடு, மாடு, பன்றி, கோழி ஆகியவைகளின் அபிவிருத்தி அடங்கியுள்ளது. கால்நடை மருத்துவத்திற்கான படிப்புக்கும், ஆராய்ச்சிகளுக்கும், கால்நடை வளர்ச்சிக்கான புள்ளி விவரங்கள் சேகரிப்பதற்கும் வேண்டிய வசதிகள் இத்திட்டத்தில் ஏற்பாடு செய்யப்பட்டிருக்கின்றன. கிராமப் புறங்களில் கால்நடை நோய்களைத் தடுப்பதற்கென மருத்துவ உதவிக்கும் ஏற்பாடு செய்யப்பட்டுள்ளது என்றும் கூறினார்.

'முக்கிய கிராம' ஏற்பாட்டைப் பற்றிக் குறிப்பிடுகையில் இவ்வேற்பாடு அகில இந்திய அடிப்படையில் கால்நடை அபிவிருத்திக்கான சிறந்த தொண்டாற்றி வருகிறது என்று கூறினார். மூன்றுவது திட்ட காலத்தில் ஒவ்வொரு முக்கிய கிராம வட்டாரத்தையும் 6 கிராமங்களிலிருந்து 10 கிராமங்கள் கொண்டதாகச் செய்வதன் மூலம் 500 கறவைப்பசு, எருமைகளுக்கு பதிலாக, 10,000 கறவைப் பசு, எருமைகளைப் பராமரிப்பதற்கான ஏற்பாடு செய்ய அரசாங்கம் எண்ணியுள்ளது. இது போன்று 20 வட்டாரங்கள் மூன்றும் திட்ட காலத்தில் அமைக்கப்படும். ஏற்கனவே இருந்துவரும் 10 வட்டாரங்களும் புதிய திட்டப்படி விஸ்தரிக்கப்படும். இத்துடன் 50 முக்கிய கிராம விஸ்தரிப்பு நிலையங்களும், ஒரு எருமைப் பண்ணையும், 2 கால்நடைப் பண்ணையும், 20 கோசாலைகளும், ஒரு செம்மறியாட்டுப் பண்ணையும், 12 செம்மறியாடு, ஆட்டுரோம விஸ்தரிப்பு நிலையங்களும், 20 கோழி விஸ்தரிப்பு நிலையங்களும் அமைக்க இத்திட்டத்தில் வகை செய்யப்பட்டிருக்கிறது. கோழிகள் குறுகிய காலத்தில் அதிக

அளவில் பெருக்கமடைவதாலும் சத்தான உணவுப் பொருள்களை அளிப்பதாலும், கோழி வளர்ச்சிக்கான ஏற்பாடுகளுக்குத் தனியிடம் தரப்பட்டுளது. அரசாங்கத்துறையில் கோழி வளர்ச்சிக்கெனச் செய்யப்படும் ஏற்பாடுகளைத் தவிர, தனிப்பட்டோர் கோழிப்பண்ணை வைத்து நடத்துவதற்கான ஊக்கமும் உதவியும் அளிக்கவும் ஏற்பாடு செய்யப்பட்டிருக்கிறது என்றும் கூறினர்.

மேலும் ராணிப்பேட்டையிலுள்ள கால்நடை நோய்த் தடுப்பு மருந்து நிலையத்தை மேலும் அபிவிருத்தி செய்வதுடன் இத்திட்ட காலத்தில் கால்நடைகளின் வாய், கால் ஆகியவற்றின் நோய் சம்பந்தமான ஆராய்ச்சிக் கூடமொன்றும் நிறுவப்படும் என்றும் கலப்புப் பண்ணை முறைக்கும் 50 லட்ச ரூபாய் ஒதுக்கப்பட்டுள்ளது என்றும் எடுத்துரைத்தார்.

ஸ்ரீ பக்தவத்சலம் மேலும் பேசுகையில் கூறியதாவது, கால்நடை வளர்ப்போரிடையே ஆக்கமான போட்டி உண்டாக்குவதெற்கென மாவட்டங்களிலும். ராஜ்யத்துறையிலும் கால்நடைக் கண்காட்சிகள் நடத்தப்படும். தாழ்ந்த ஜாதியைச் சேர்ந்த மாடுகளுக்கெல்லாம் விதை (காய்) அடிப்பதற்கான பிரசாரம் அதிக அளவில் செய்யப்படும். கிராமப்புறங்களில் கால்நடை மருத்துவ வசதி கிடைப்பதற்கென இத்திட்ட காலத்தில் வட்டார நிலையில் 150 கால்நடை மருத்துவ விடுதிகள் துவக்கப்படும். கோழிகளின் உயிரைக் கொள்ளை கொள்ளும் 'ரானிகெட்' என்ற வியாதியைத் தடுப்பதற்கும் அதிக அளவில் பிரசாரம் செய்யப்படும். ஆடு மாடுகளை 'இன்ஷ்யூர்' செய்வதற்கான முன்னேடித் திட்டம் (Pilot Scheme) ஒன்றும் துவக்கப்படும். கால் நடைகளின் பிறப்பு, மரபு, ஆகாரம் இவைபற்றித் தனிப்பட்ட ஆராய்ச்சிகள் மேற்கொள்வதற்காக 'கால்நடை ஆராய்ச்சி நிலையம்' ஒன்றும் அமைக்கப்படும். கால்நடைகளைக் கொல்லும் நிலையங்களின் அபிவிருத்திக்கும் திட்டத்தில் இடமளிக்கப்பட்டுளது. தோலை உறிப்பதற்கும், பக்குவப்படுத்துவதற்குமென ஒரு நிலையம் அமைக்கப்படுவதுடன், எலும்புத்தூள் தயாரிக்கும் 'நடமாடும் யூனிட்' ஒன்றும் நிறுவப்படும்.

நிலையச் செய்திகள்

இந்நிலையத்தின் டைரக்டர் டாக்டர் ஒய். நாயுடம்மா அவர்கள் அமெரிக்காவின் தலைநகர் வாஷிங்டனில், அமெரிக்கத் தோல் ரசாயன ஆராய்ச்சியாளர்களின் அசோசியேஷனின் ஆதரவில், ஆகஸ்டு மாதம் 19 முதல் 25 முடிய நடைபெறவிருக்கும் அகில உலகத் தோல் ரசாயன ஆராய்ச்சி

யாளர் குழு யூனியனின் இரு ஆண்டுக்கு ஒரு முறை நடை பெறும் 9வது கூட்டத்தில் கலந்து கொள்வதற்காக ஆகஸ்டு மாதம் 19-ம் தேதி அமெரிக்காவுக்குப் புறப்படுவார். அன்னார் அங்கு 'டையால்டிஹைடு ஸ்டார்ச்சை உபயோகித்துப் பதனிடுவதன் நுட்பங்கள்' என்பது பற்றி ஓர் ஆராய்ச்சிக் கட்டுரையை 23ம் தேதி சமர்ப்பிப்பார். இக்கூட்டம் முடிவுற்ற பின்னர் அமெரிக்காவில் உள்ள தோல் ஆராய்ச்சி நிலையங்களுக்கும், பதனிடு நிலையங்களுக்கும் விஜயம் செய்வார். திரும்புங்கால் அன்னார் பாரிஸ் நகரத்தில் நடைபெறும் 19-வது அகில உலகத் தோல் வாரத்தில் கலந்து கொள்வார்.

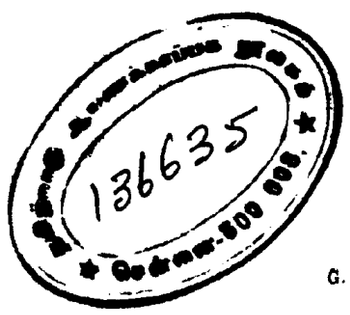
டாக்டர் ஒய். நாயுடம்மா அவர்கள் சென்ற ஜூலை 14-ம் தேதி புது டில்லியில் நடை பெற்ற தோல், தோல் பொருள், நூல், நெசவு ஆலைகளுக்கான தோல்கள் தயாரிக்கும் தொழில்களின் அபிவிருத்திக் கவுன்சிலின் 5-வது கூட்டத்தில் கலந்துகொண்டார்.

அன்னார் ஜூலை 10-11 ம் தேதிகளில் கோயம்புத்தூருக்கு விஜயம் செய்து, தென்னிந்திய துணிமணிகள் ஆராய்ச்சிக் கழகத்துடன், இந்நிலையமும், மேற்படி கழகமும் எங்ஙனம் இணைந்து வேலை செய்ய இயலும் என்பது பற்றிப் பேச்சு வார்த்தைகள் நடத்தினார்.

அன்னார் சென்ற ஜூலை 31-ம் தேதி மைசூரில் நடை பெற்ற, மைசூர் குரோம் பதனிடும் கம்பெனியின் போர்டு ஆப் டைரக்டர்களின் கூட்டத்தில் கலந்து கொண்டார்.

உத்திரப்பிரதேச சர்க்காரால் தோல் தொழில், அதனுடன் இணைந்த தொழிலுக்காக அமைக்கப்பட்டுள்ள வேலைக் குழுவில் பணியாற்ற இந்நிலையத்தின் டைரக்டர் அல்லது அவரது பிரதிநிதி நியமிக்கப்பட்டுள்ளார்.

லெதர் எக்ஸ்போர்ட் பிரமோஷன் கவுன்சிலின் 1961-62ம் ஆண்டுக்கான நிர்வாகக் குழுவின் அங்கத்தினராக டாக்டர் ஒய். நாயுடம்மா அவர்கள் மறுபடியும் தேர்ந்தெடுக்கப்பட்டுள்ளார்.



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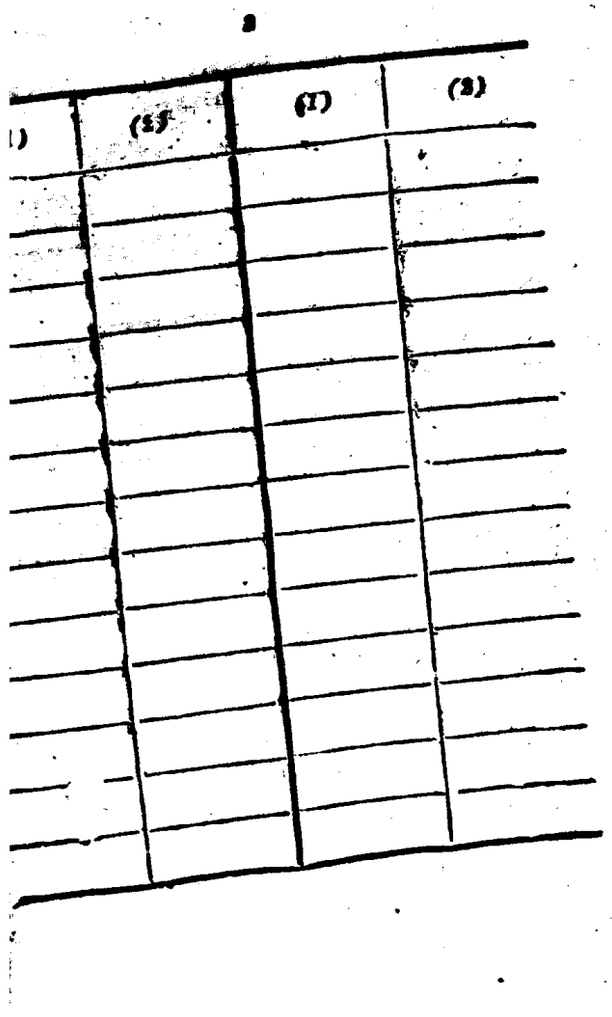
Director

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