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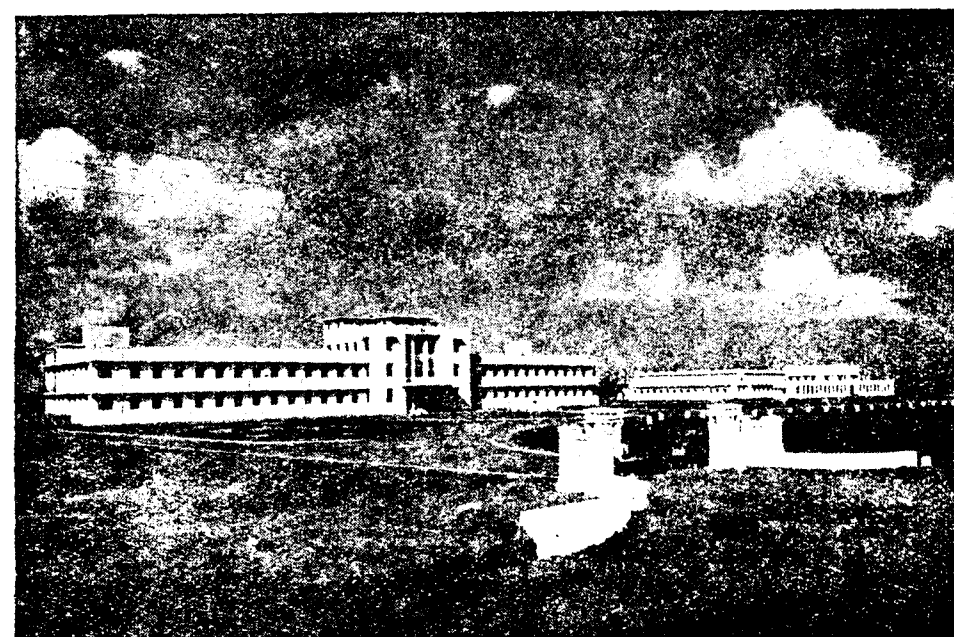


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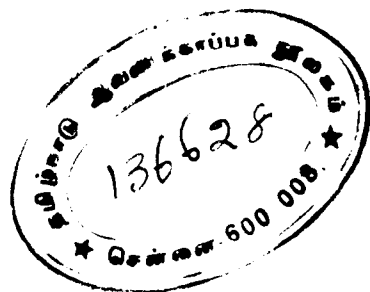
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Murrah: Rohtak, Karnal, Hissar and Gurgaon districts of the Punjab and Delhi Province. Western parts of the Uttar Pradesh and the former Jind, Nabha and Patiala States.

Nagpuri: Nagpur, Wardha and Berar districts of Maharashtra and the adjoining parts of the former Hyderabad State (Buffaloes of this breed are bred in large numbers in Central and Southern India) .

Nili: Ferozepore district of the Punjab.

Parlakimidi: The Ganjam Hills on the east coast, particularly the Parlakimidi region.

Surti: 'Charottar' tract of Gujerat, Nadiad, Anand and Bor-sad taluks in the Kaira district of Gujrat and Petland of the former Baroda State.

Tarai: Tarai area of Uttar Pradesh, particularly between Tanakpur and Ramnagar.

Toda: Plateau of the Nilgiri Hills.

Cattle:

Alambadi: Kollegal taluk of Mysore, and north Bhavani taluk of Coimbatore district, South Hosur and West and South-West Dharmapuri taluks of the Salem district (Madras State) and Kankanhalli taluk of Mysore State.

Amritmahal: Mysore State.

Bachur: Bachur Pargana of Darbhanga, Koilpur Pargana of Bhagalpur, Sitamarhi and Northern parts of Champaran district of North Bihar.

Bargur: Bargur hill forests in the Bhavani taluk of Coimbatore district in Madras State.

Dangi: Akola taluk of Ahmednagar district, Sonkhed taluk of Khandesh district, Ghats of Nasik, Thana and Kolaba district and the former states of Bansda, Dharampur, Jawhar and Dangs.

Deoni: North-Western and Western portions of the former Hyderabad.

Gaolao: Sausar Tehsil of Chindwara district, North Wardha and Nagpur districts.

Gir: Gir forest of South Kathiawar.

Hallikar: Tumkur, Hassan and Mysore district of Mysore State.

Hariana: Rohtak, Hissar and Gurgaon districts, part of Karnal and the Delhi Province.

Hissar: Hansi in Hissar district and the canal-irrigated districts of the Central Punjab.

Kangayam: South and South-east taluks of Coimbatore in Madras State.

Kenkatha: Bundelkhand, and in Banda district of the Uttar Pradesh.

Kherigarh: Tract north of Gogra between rivers Sarju and Mohan and also in Pargana Kherigarh of Lakhimpur-Kheri district in Uttar Pradesh.

Killari: Southern Maharatta regions, Sholapur and Satara districts and the Satpura range of the Maharashtra State.

Krishna Valley: Black cotton soil of the water-shed of the Krishna and the rivers in the southern portions of the former Bombay and Hyderabad States.

Malvi: Malwa tract, northern portions of the Madhya Pradesh and the north-eastern section of the former Hyderabad State.

Mehwati: Kosi tract of Muttra district and the regions of Alwar and Bharatpur in Uttar Pradesh.

Nagore: North-east of Jodhpur in Rajasthan.

Nimari: Nimar district of Madhya Pradesh and Khargaon district of the former Indore State.

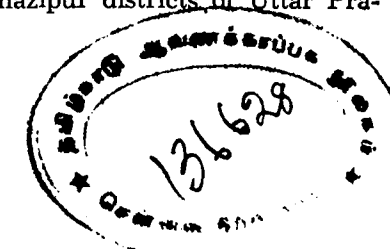
Ongole: Ongole tract comprising of Ongole, Guntur and Narasaraopet taluks and parts of Bapatla, Sathenapalli, Vinukonda and Kandukur taluks of Nellore and Guntur districts in Andhra Pradesh.

Ponwar: Puranpore Tehsil of Pilibhit district as well as in the north-western part of Lakhimpur-Kheri district in Uttar Pradesh.

Rath: North and west of Alwar region and in the adjacent territory embracing portions of Rajasthan State to the north and west of it.

Sahiwal: Punjab, Delhi, Uttar Pradesh and Bihar.

Shahabadi: Ganga Khadar area in Shahabad district and to an extent in Saran district of Bihar and the Doab between Ganga and Ghagra rivers in Ballia and Ghazipur districts of Uttar Pradesh.



Hill Bull: Certain places of Uttar Pradesh.

Siri: Darjeeling hill tract.

Sheep:

Bellary: Taluks of Bellary district and Koilkuntla, Kurnool and Nandikotkur taluks of Kurnool district, in Andhra Pradesh.

Bhadarwah (Gaddi): Jammu Province and in the tehsils of Basoli, Hiranagar, Ramnagar and Udhampur.

Bhakarwal: Jammu Province, high ranges of Pirpanchal mountains.

Bikaneri: Dry desert of the former Bikaner State, Hissar, Rohtak, Gurgaon, Ambala, parts of Ferozepur and Ludhiana district of the Punjab, and the former Patiala and Bhawalpur States. Imported by Uttar Pradesh, Madhya Pradesh and Madras States.

Deccani: Deccan, portion of Maharashtra State.

Hashtnagri: The tribal territories in between and the adjacent parts of the Punjab.

Hassan: Mysore State.

Hissar-Dale: Hissar and the Kulu Valley in Kangra district in the Punjab.

Jalauni: Jalaun district of Uttar Pradesh.

Kathiawari: Kathiawar, Cutch region, north Gujarat and Marwar.

Lohi: Punjab.

Mandya: Mysore State.

Nellore: Nellore (Andhra Pradesh) and Tinnevely and Ramnad districts (Madras State).

Goats:

Assam Hill Goats: Khasi, Naga and Lushai Hills.

Barbari: Round about Aligarh in Uttar Pradesh, in Delhi State, and in the Gurgaon and Karnal districts of the Punjab.

Bengal Goats: Bengal, North Orissa.

Cheghu: High Mountain ranges of Spiti, Yaksar and Kashmir.

Cutchi: Kutch State, Kathiawar and as far east as Ahmedabad.

Gaddi: Near about Kangra proper and the Chamba region, Simla district and Sirmoor region.

Jamnabari: Etawah district of Uttar Pradesh.

Kashmiri: Hilly tracts of Kashmir.

Malabari Goat: North Malabar, in the taluks of Kurumbra-nad, Kottayam and Chirakkal, Calicut and Ponnani in Kerala State.

Marwari: Marwar (the former Jodhpur State) in the northern Mehsana district and the attached areas.

North Gujarat Goat: Mehsana district, part of Vadhiari and in Baroda district.

Osmanabad: Osmanabad district of the former Hyderabad State.

Sirohi: Sirohi region extending upto Palanpur region, also in Gujarat.

Zalawadi: Zalawad district in Kathiawar, Vadhiar and Western Mehsana district.

Hill Goat: Uttar Pradesh.

It is thus seen that the hides and skins obtained in the different states of the Indian Union are derived from numerous breeds of livestock, bred under varying conditions and consequently differing considerably in their leather-making properties. While the general characteristics of some of these hides and skins are known, detailed information regarding their basic qualities from the tanner's point of view is not available. An attempt is now being made to obtain this information from a study of the biological characteristics of various hides and skins. The present communication confines itself to the study of hides and skins collected from Uttar Pradesh; those of the other States will be dealt with in subsequent communications.

Materials and Methods

Specimens of cattle and buffalo hides and goat and sheep skins from various centres in Uttar Pradesh, were collected during the period May-June, 1959. The specimens were from the breeds available in that state and corresponding to different sex and age. Except for the cattle hides all the others were slaughtered specimens. In the case of the fallen cattle hides, wherever possible the cause of death also was noted so as to give

TABLE I
Details of Hides and Skins Specimens Examined

No.	Type of hide or skin	Place or Origin	Breed	Sex and Age (in years)	Nature of curing	Size	Weight (in lbs.)	Disease, if any
1.	Buffalo (S)	Lucknow	Mixed Desi	Female; 4-5	Fresh	90" X 69"	51	—
2.	Buffalo (S)	-do-	-do-	Female; 10-12	-do-	74" X 70"	41	—
3.	Buffalo (S)	-do-	-do-	Male; 10	-do-	87" X 67"	46	—
4.	Buffalo (S)	Kanpur	-do-	Female; 5	-do-	75" X 72"	52	—
5.	Buffalo (S)	-do-	-do-	Female; 10	-do-	90" X 76"	62	—
6.	Buffalo (S)	-do-	-do-	Male; 1½	-do-	62" X 56"	20	—
7.	Buffalo (S)	Agra	Murrah	Female; 10	-do-	87" X 66"	46	—
8.	Buffalo (S)	-do-	Bhadawari	Female; 10	-do-	90" X 66"	50	—
9.	Buffalo (S)	Tarai Area	Tarai	Female; 10	-do-	76" X 71"	40	—
10.	Buffalo (S)	—	Mixed Desi	Male; 12	-do-	90" X 81"	103	—
11.	Cattle (F)	Kanpur	Mixed Desi	Female*	Wet-salted	63" X 54"	23	?
12.	Cattle (F)	-do-	-do-	Male*	-do-	78" X 70"	28	?
13.	Cattle (F)	Faizabad	-do-	Female; 2½	-do-	54" X 39"	9½	?
14.	Cattle (F)	-do-	Mixed-Hariana type	Male; 6	-do-	78" X 51"	22	?
15.	Cattle (F)	Mukteswar	Mixed Hill-Bull	Male; 4	Fresh	60" X 40"	—	Black quarter.
16.	Cattle (F)	-do-	-do-	Male*	-do-	60" X 45"	—	Hæmorrhagic-Septicemia
17.	Cattle (F)	-do-	-do-	Male*	-do-	65" X 40"	—	Rinderpest
18.	Goat (S)	Lucknow	Mixed Desi	Male; 3	-do-	32" X 20"	1 lb.-3 oz.	—
19.	Goat (S)	Agra	Jannapari	Male; 2½	-do-	48" X 30"	6 lb.-4 oz.	—
20.	Goat (S)	-do-	-do-	Female; 2½	-do-	49" X 31"	5	—
21.	Goat (S)	Bareilly	Mixed Desi	Female; 2	-do-	43" X 25"	4	—
22.	Goat (S)	-do-	-do-	Male; 2	-do-	43" X 23"	6	—
23.	Goat (S)	Agra	Hill Goat	Male; 2½	Fresh	49" X 30"	7	—
24.	Sheep (S)	Mukteswar	Mixed Desi	Male; 2	-do-	36" X 24"	—	—
25.	Sheep (S)	-do-	-do-	Female; 2	-do-	30" X 24"	—	—
26.	Sheep (S)	Agra	Bikaneri	Male; 2	-do-	39" X 27"	6	—
27.	Sheep (S)	-do-	-do-	Female; 2	-do-	42" X 29"	4	—

S: Slaughtered; F: Fallen; ? : Cause of Death not known; * Age not known.

an idea of the effect of diseases on the hide characteristics. Details about the specimens collected are in Table I. Samples measuring 4" X 4" in the case of hides and 3" X 2" in the case of skins were taken from four different locations as shown in Figs. 1 and 2, and fixed in 7% formol saline. The fixed samples were sectioned both vertically and parallelly to the skin surface, by the freezing method and were stained with haematoxylin, eosin, thionin, Weigert's resorcin fuchsin, Scarlet Red, Sudan IV, picric acid, iodine and Bielschowsky's silver stain. Standard histological techniques as applied to the study of hides and skins were followed throughout this investigation.

Fig. 3 illustrates the microscopic measurement of the skin thickness and of the dimensions of hair follicles and associated structures. The counts of follicles and hair density were made under the microscope at a magnification of 21 and 60 diameters, at random on transverse sections of the samples. The angulation of the fibre weave was determined by a special device attached to the eye-piece of the microscope. The natural tightness of the grain, in the case of goat and sheep skins was measured by determining the percentage shrinkage in area of the grain in relation to that of the corium, in wet state after removing the grain by splitting, in a manner similar to that described by White and Caughley.² A natural tightness of 15% implies that the area of the split grain layer is 85% that of the corium.

Results and discussion

Table II gives data regarding hair density and hair follicles in the various regions of the hides and skins collected. Table III gives data about the thickness of the hide or skin and of its component layers, for all the specimens collected. Table V deals with the characteristics of fibre structure and table VI with details of gland tissue and natural body fat in the specimens. Data about the natural tightness of grain of goat and sheep skins are given in table IV. Much variation in the texture and leather forming qualities of the hides is noticed not only from breed to breed, but also with animals of the same breed, from different places. The recorded observations are relative rather than absolute; based on these, the biological characteristics of the various breeds have been formulated and conclusions have been drawn about the leather making properties of hides and skins of the various breeds.

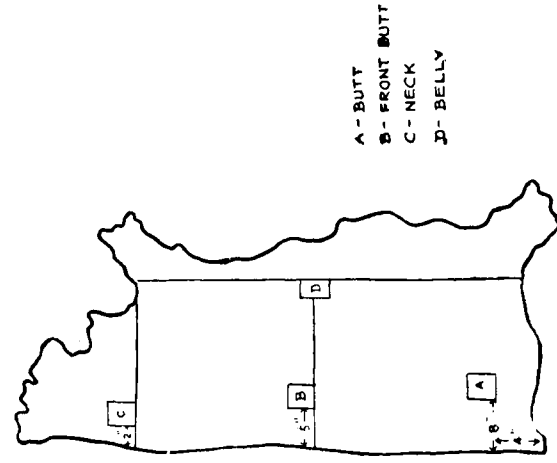


FIG. 1

Sampling position for hides.

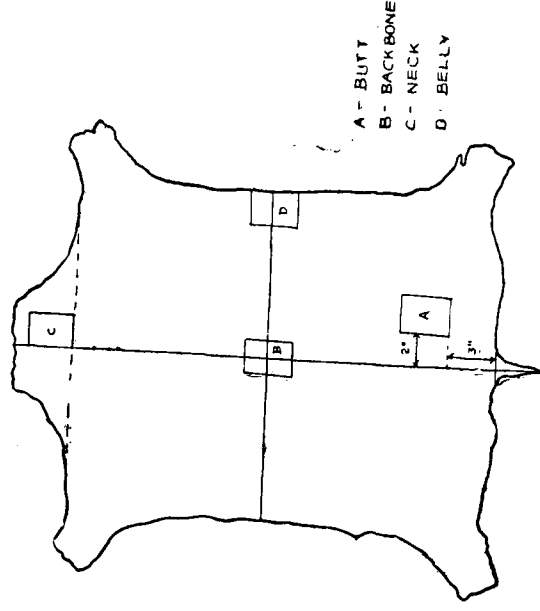


FIG. 2

Sampling position for skins.

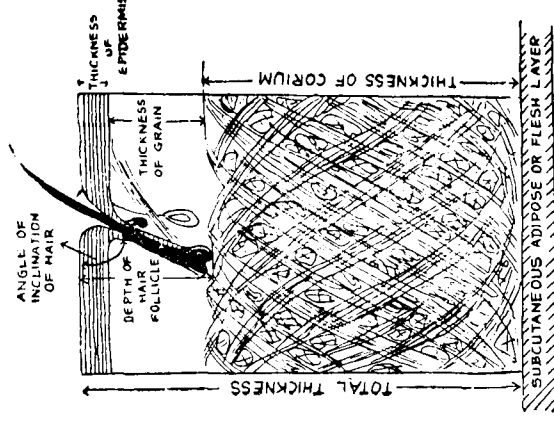


FIG. 3.

TABLE II
Details of Hair Density and Hair Follicles

Specimen No.	No. of hairs or wools per sq. inch				Hair or wool follicles		% coarse hairs
	Butt	Front-butt	Back-bone	Neck	Belly	Depth (m.m.)	Angle of inclination
1.	1170	1463	—	1268	1040	0.40 — 1.29	22° — 45°
2.	1160	1465	—	1267	1007	0.42 — 1.24	22° — 55°
3.	1202	845	—	910	850	0.45 — 1.46	22° — 55°
4.	812	715	—	965	655	0.52	18° — 45°
5.	845	726	—	877	744	0.34 — 0.94	18° — 50°
6.	2047	1917	—	2340	1462	0.34 — 0.98	27° — 55°
7.	878	747	—	845	838	0.35 — 0.73	20° — 40°
8.	747	681	—	877	790	0.34 — 0.79	17° — 55°
9.	796	818	—	1202	958	0.25 — 1.29	15° — 40°
10.	731	780	—	—	909	0.43 — 1.03	22° — 45°
11.	11700	16200	—	17400	13200	0.43 — 0.86	30° — 60°
12.	9900	16500	—	11700	13200	0.34 — 0.64	35° — 55°
13.*	16200	23700	—	22200	21300	0.43 — 0.86	35° — 55°
14.	12000	12900	—	12300	12000	0.43 — 0.73	35° — 45°
15.	15900	18000	—	20700	14400	0.55 — 0.98	32° — 70°
16.	14400	20100	—	24900	22000	0.51 — 1.11	40° — 72°
17.	17400	25800	—	26200	19500	0.51 — 1.07	45° — 85°
18.	9941	—	10000	7697	7719	0.82 — 1.35	22° — 40°
19.	7651	—	5172	1690	2862	0.92 — 1.94	22° — 45°
20.	6175	—	8197	4749	3155	0.95 — 1.72	30° — 50°
21.	12459	—	8432	9690	6152	0.86 — 1.42	22° — 50°
22.	15263	—	6879	5075	5641	0.82 — 2.15	22° — 50°
23.	8882	—	7657	3577	5063	1.12 — 2.88	24° — 55°
24.	5411	—	5097	3432	3036	1.72 — 2.80	37° — 64°
25.	6506	—	12185	9693	4000	0.86 — 2.24	20° — 70°
26.	11696	—	14995	16494	5666	0.86 — 2.36	21° — 58°
27.	7169	—	5930	8571	1890	0.39 — 1.65	22° — 65°

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*Calf skin;

S. Nos. 1-10: Buffalo hides; 11-17: Cattle hides; 18-23: Goat skins; 24-27: Sheep skins.

TABLE III
Summary of skin thickness in different locations

Specimen No.	Total thickness in mm.					Thickness in mm. of		
	Butt	Front-butt	Back-bone	Neck	Belly	Epidermis	Grain layer	corium
1.	4.62	4.65	—	4.77	4.53	0.05-0.08 (H.P.)	0.25-0.74	3.5-4.16
2.	4.40	4.75	—	5.05	4.24	0.05-0.07 (H.P.)	0.32-0.68	3.57-4.45
3.	4.48	5.56	—	5.37	4.73	0.06-0.07 (H.P.)	0.36-0.93	3.6-4.61
4.	4.42	5.01	—	6.53	3.89	0.05-0.06 (S.P.)	0.30-0.60	3.02-6.06
5.	4.63	5.16	—	4.81	4.40	0.05-0.08 (S.P.)	0.30-0.68	3.70-4.36
6.	3.59	3.23	—	2.51	2.74	0.05-0.06 (S.P.)	0.33-0.64	1.92-2.66
7.	4.20	4.25	—	5.38	5.20	0.04-0.08 (N.P.)	0.31-0.50	3.6-4.63
8.	4.69	4.98	—	5.07	4.25	0.04-0.08 (N.P.)	0.21-0.43	3.58-4.82
9.	4.59	4.84	—	5.37	3.52	0.05-0.08 (P.)	0.23-0.81	2.48-4.91
10.	6.10	6.49	—	—	5.78	0.07-0.08 (H.P.)	0.40-0.73	4.52-5.42
11.	4.07	3.47	—	2.79	3.44	0.03-0.04	0.55-0.66	1.94-3.37
12.	4.08	2.96	—	3.47	2.70	0.03-0.04	0.43-0.47	2.12-3.41
13.*	2.91	2.20	—	3.00	1.94	0.03-0.04	0.47-0.51	1.42-2.25
14.	3.30	3.09	—	5.16	—	0.03-0.04	0.38-0.60	1.73-3.84
15.	3.04	3.26	—	3.19	2.15	0.04-0.05	0.51-0.60	1.52-2.39
16.	3.22	2.48	—	3.39	2.32	0.03-0.05	0.51-0.56	1.73-2.64
17.	3.47	2.57	—	4.51	2.07	0.04-0.05	0.55-0.60	1.36-3.03
18.	1.63	—	1.63	2.06	1.46	0.03-0.04	0.52-0.86	0.79-1.07
19.	2.71	—	2.79	3.87	1.94	0.04-0.05	0.73-1.51	1.13-2.01
20.	2.66	—	2.36	2.79	1.76	0.02-0.05	0.69-1.03	1.00-1.68
21.	2.15	—	1.68	2.58	1.55	0.03-0.05	0.65-1.12	0.73-1.41
22.	2.24	—	2.15	4.30	1.85	0.03-0.05	0.64-1.50	1.14-2.76
23.	2.88	—	4.08	4.08	2.23	0.03-0.06	0.82-1.72	1.3-2.45
24.	3.59	—	4.95	6.36	3.01	0.02-0.05	1.85-2.80	1.14-3.39
25.	2.36	—	2.36	3.87	1.29	0.03-0.05	0.95-2.15	0.31-1.59
26.	2.02	—	2.36	5.38	1.93	0.03-0.04	0.90-2.36	0.90-2.94
27.	1.12	—	2.06	2.45	1.03	0.03-0.05	0.69-1.42	0.27-0.94

*Calf skin;

H. P.: Highly Papillated; S. P.: Slightly Papillated; P.: Papillated; N. P.: Not Papillated.

Buffalo hides:

Murrah, Bhadawari and Tarai are the pure breeds available in U. P. In addition, mixed Desi breeds of Lucknow, Kanpur and Agra regions have been studied. From the data given in tables II, III, V and VI, the following observations may be made:

TABLE IV
Percent natural tightness of grain of goat and sheep skins

Serial No.	Butt	Back-bone	Neck	Belly
18	15.4	11.2	9.6	7.3
19	14.8	12.4	10.2	8.6
20	14.1	11.5	9.8	6.9
21	12.3	10.6	8.2	6.8
22	—	—	—	—
23	14.1	12.3	10.5	8.6
24	7.5	11.1	6.6	5.4
25	8.7	7.3	5.7	5.3
26	9.4	9.2	7.3	6.7
27	8.8	8.0	6.5	5.7

Murrah: This hide is heavy and spready; it is the thickest of the hides collected. Thickness varies considerably over the entire hide, but is fairly uniform over the butt and front-butt portions; the maximum thickness is at the neck. The hide is very dark coloured and its epidermis is thick, highly papillated and contains much pigment. The average hair density is low being 800 hairs per square inch. The hairs are mostly short or fine, the coarse or long ones constituting about 5% of the total. The hairs are fairly deep rooted with a not very high angle of inclination. The presence of a large number of highly developed nerve papillae makes the grain surface very rough. The grain layer, about 9% of the corium thickness, is fairly compact; the grain-corium junction is fairly strong owing to the smaller number of deeply rooted coarse hairs and gland tissues. The corium proper at the butt and front-butt is compactly woven with fairly thick fibres running at angles of 45°-55°. The angulation of the hide fibres in the belly is rather low but the area is comparatively better woven with thicker fibres than in either Bhadawari or Tarai hide. The high sponginess in the neck area, with the weave rendered very loose by the horizontal fibres and the complete absence of natural

TABLE
Characteristics of

Serial No.	Angulation of fibre weave			Packing of fibres		
	Butt	Neck	Belly	Butt	Neck	Belly
Buffalo						
1.	60°—75°	35°—55°	30°—55°	C	FC	FC
2.	40°—70°	<30°	<40°	C	SL	L
3.	35°—70°	<30°	<30°	C	L	VL
4.	45°—65°	<45°	<30°	C	FC	FC
5.	45°—75°	<30°	<30°	C	L	VL
6.	40°—65°	H	<30°	C	L	L
7.	45°—65°	H—45°	<30°	C	FC	FC
8.	35°—70°	H	H	C	L	FC
9.	50°—60°	H—40°	<30°	C	SL	FC
10.	45°—65°	H	<30°	C	VL	FC
Cattle						
11.	45°—65°	<30°	30°—40°	C	L	L
12.	50°—70°	H	<30°	C	L	L
13.	45°—50°	<30°	<30°	C	SL	L
14.	45°—55°	H	<30°	C	SL	SL
15.	50°—65°	<30°	<30°	C	FC	FC
16.	45°—50°	H—40°	<30°	C	FC	FC
17.	50°—70°	<30°	<30°	C	—	SL
Goat						
18.	Low	H	H	FC	FC	FC
19.	Low	Low	H	C	C	FC
20.	Low	H	Low	C	C	SL
21.	H	H	H	L	L	VL
22.	45°	45°	Low	FC	SL	SL
23.	H	Low	H	C	FC	FC
Sheep						
24.	Low	H	H	FC	FC	L
25.	H	Low	H	L	L	L
26.	H	45°	H	FC	FC	FC
27.	H	H	H	FC	FC	SL

H: Horizontal weave; C: Compact; FC: Fairly compact

V
fibre structure

Elastic tissue	Reticular tissue
Large amount in neck and belly	Large amount in neck and belly
Very large amount in belly	Very large amount in belly
Do.	Do.
Large amount only in belly	Large amount in neck and belly
Do.	Do.
Do.	Large amount only in belly
Do.	Large amount in neck
Do.	Large amount in neck and belly
Do.	Very large amount in belly
Large amount in neck and belly	Very large amount in neck and belly
.	
Large amount	Do.
Very large amount in belly	Do.
Large amount	Large amount
Do.	Large amount in neck and belly
Do.	Do.
Do.	Do.
Do.	Do.
Medium amount in butt and neck	—
Do.	—
Medium amount	—
Small amount	—
Large amount in neck and butt	—
Large amount	—
Medium amount in belly	—
Small amount	—
Large amount in neck	—
Medium amount in neck and belly	—

L: Loose; SL: Slightly loose; VL: Very loose.

fat are two important characteristics. In the neck and belly areas, elastic tissue is present in large amounts. In contrast to other hide types, a denser network of reticular tissue is obtained.

Bhadawari: Hides of this type are medium sized and fairly uniform in thickness and texture, the maximum thickness being noticed at the neck area. The epidermis is neither very thick nor papillated. The average hair density is again only 800 hairs per sq. inch, with the coarse or long hairs constituting about 6% of the total hair population. They are more or less uniformly distributed over the hide area but are not deeply rooted and are inclined at a rather low angle. Nerve papillae are completely absent and consequently a very smooth and flat grain surface is obtained. The grain layer covers only about 8% of the thickness of the corium, but is fairly uniform in thickness over the entire area of the hide. The corium proper at the butt and front-butt is compactly woven with the sturdy fibres running at an angle between 45° and 65°. In contrast to the Murrah hide, the Bhadawari hide is characterised by well defined hide-fibre bundles and a more or less uniform texture all over the hide including the neck and belly. A considerable amount of natural fat and a fairly dense network of reticular tissue are noticed.

Tarai: Unlike Bhadawari hide, the Tarai hide is not uniform either in thickness or in texture, the belly area being considerably thinner than the other portions. The epidermis is fairly thick and papillated particularly at the neck and belly. The average hair population is greater than in Murrah or Bhadawari hide, being 1000 hairs per sq. inch; a relatively higher hair density is noticed at the neck. The coarse or long hairs constitute about 7% of the total hair population. They are deeply rooted and inclined at a rather low angle. While the grain surface is rough at the neck and belly it is quite smooth and flat at the butt and front-butt areas due to the absence of nerve papillae or projections. The grain layer is quite thin but compact at the butt, but is considerably thicker at the neck and belly areas occupying roughly about 10% of the thickness of the corium. A fairly large amount of gland tissue is found. The corium proper at the butt and front-butt is compactly woven with fairly thick fibres running at an angle between 50° and 60°. The neck and belly areas are characterised by thin fibres associated with less compact weave. A very small amount of natural fat is found. As in Bhadawari hide, a fairly dense network of reticular tissue is noticed at the neck and belly areas.

Desi (Lucknow): This type of hide is medium sized and fairly uniform in thickness. The epidermis is fairly thick and highly papillated. Hairs are more, the average hair population being 1150 hairs per sq. inch; a comparatively higher value is noticed in the female animal. The coarse hairs constitute roughly 10 to 12% of the total hair population. They are very deeply rooted and make a rather high angle with the surface. The grain layer is quite thick covering about 10 to 12% of the thickness of the corium but the grain surface is very rough due to the presence of highly developed nerve papillae or projections. The large number of sweat glands present in this hide are likely to weaken the junction of the grain and corium. The corium proper at the butt is fairly compactly woven with fairly thick fibres running at an angle between 35° and 70°. As usual, the neck and belly areas are rather loosely woven. In general, hides from the female animals show a somewhat better texture compared to those from male animals. Natural fat is practically absent and consequently, the hide is less greasy than the hides of other Desi breeds under reference. A greater development of both elastic and reticular tissues especially at the neck and belly areas, is noticed compared to the other specimens of Desi breeds.

Desi (Kanpur): This type of hide is also medium sized but not very uniform in thickness. Unlike the Desi hide of Lucknow, the epidermis is very much less papillated. Hairs are also less numerous, the average hair population being 800 hairs per sq. inch. The coarse or long hairs constitute on an average about 6% of the total hair density. They are not deeply rooted and their angle of inclination with the surface is not very high. The grain layer is fairly compact but comparatively thinner than that of Desi hide of Lucknow, covering about 10% of the corium thickness. The nerve papillae are less developed and consequently, the grain surface is considerably flat and smooth. The junction of the grain and corium is fairly strong due to the lesser number of deeply rooted hairs and sweat glands present. The fat glands are also very small. Although the hide fibres in the corium are fairly thick and run at an angle between 45° and 75° at the butt area, the corium proper is comparatively less compactly woven than that in Desi hide of Lucknow. A considerable amount of natural fat and a large amount of both elastic and reticular tissues at the neck and belly areas are noticed.

Desi (Agra): This type of hide is very similar to Desi hide of Lucknow in size and thickness. The epidermis is neither

very thick nor papillated. The average hair density is 750 hairs per sq. inch. The coarse or long hairs constitute on an average about 10% of the total hair population. They are not deeply rooted, and inclined at a comparatively low angle. Unlike the hides of other Desi breeds, the grain layer of this hide is very thin covering roughly 7% of the thickness of the corium; it is, however, fairly compact. Like the Bhadawari hide, this type of hide also is characterised by the complete absence of nerve papillae and consequently, a very smooth and flat grain surface is obtained. The corium proper is not very compactly woven, although the hide fibres in the butt area run at an angle between 35° and 75°. The neck area is loosely woven, and both the neck and belly are more or less flat. A considerable amount of natural fat is also found at the belly. The elastic and reticular tissues are more or less the same as in Desi hide of Kanpur.

Cattle hides :

From pp. 250-1, it is evident that several cattle breeds belong to U.P.; however, mixed breeds are more common. Hides of mixed Desi breed of Kanpur and Faizabad regions and of Haryana and Hill bull breeds have been collected and studied. From the data given in tables II, III, V and VI, the following observations are made :

Desi (Kanpur) : This type of hide is neither very spready nor very uniform in thickness. It is, however, comparatively thicker in substance than the other hides in this series. The epidermis is not very thick and does not contain much pigment. The hair population is denser in this breed, the average value being 14000 hairs per sq. inch; a lower value is noticed in the male animals. The hairs are not very deeply rooted and their angle of inclination is not very high. The grain layer is fairly thick accounting for about 15 to 18% of the thickness of the corium, a thicker and stronger grain layer being noticed in the hides from female animals; but in general, the fallen hides are characterised by weaker grain layer. The corium proper is compactly woven at the butt and front butt areas with fairly thick fibres running at an angle between 45° and 70°, but the neck and belly portions are loosely woven with comparatively thinner fibres. Natural fat is not found; a greater development of both elastic and reticular tissues is noticed.

Haryana (Bikapur) : Only one hide of this type has been studied; a hide of medium size and not very thick in substance excepting at the neck. The epidermis also is not very thick. Hairs are more or less uniformly distributed, but are less numerous compared to other breeds, the average population being 12000 hairs per sq. inch. They are not very deeply rooted and their angle of inclination is fairly low thus contributing to the smoothness of the grain surface. The grain layer is comparatively thin covering only about 14% of the corium thickness. The corium proper is fairly well packed at the butt with fairly thick hide fibres running at an angle between 45° and 55°. While the neck area is less compactly woven with comparatively thinner fibres, the belly is woven with thicker fibres. Natural fat is throughout absent. A fair development of both elastic and reticular tissue is noticed.

Hill Bull (Mukteswar) : Hides from the male animals only have been studied. This type of hide is usually small in size and comparatively thin in substance. The epidermis is fairly thick and contains a considerable amount of pigment. Hairs are more abundant, the average population being 19,500 hairs per sq. inch. A comparatively greater hair density is noticed at the neck than elsewhere. The hairs are quite deeply rooted and are inclined at a comparatively higher angle contributing to the roughness of the grain surface. The grain layer is thick covering about 20% of the corium thickness, but due to a great number of epidermal appendages present, this layer as a whole is less compact compared to other hides; and the grain-corium junction is somewhat weak because of a large number of well developed sweat glands. The corium proper is fairly compactly woven with high angled hide fibres (between 45° and 70°), but the fibres are comparatively thinner. This hide is, however, characterised by a more or less uniform texture at different locations. Natural fat is absent in the corium; however, a small amount is found in the subcutaneous layer. There is more or less uniform distribution of elastic tissue in the different locations.

Goat skins :

The pure breeds commonly found in U. P. are Jamnapari and Hill types. Skins of these types as well as those of mixed Desi breed of Lucknow and Bareilly regions have been studied. From the data relating to these, given in tables II to VI, the following salient features are described:

TABLE VI
Details of Gland Tissue and Natural Body-fat

Specimen No.	Number of Sweat glands (Average per sq. inch)	Size of fat glands	Amount of fat
1	862, Fairly developed	Small	Practically absent in corium.
2	828, Fairly developed	Medium	Small amount in corium.
3	725, Not well developed	Medium	Absent.
4	630	Small	Medium amount in corium.
5	514	Very small	Medium amount in corium.
6	1210, Small	Medium	Absent.
7	709, Fairly developed	Medium	Considerable amount in corium at the butt and belly.
8	635	Medium	Large amount in corium only at the belly.
9	791, Fairly developed	Medium	Very small amount in corium at the neck & front-butt.
10	595, Fairly developed	Medium	Absent.
11	—	Medium	Absent.
12	—	Medium	Absent.
13	—	Medium	Absent.
14	—	Medium	Absent.
15	*4-8, Big	Small	Small amount in subcutaneous layer.
16	*5-12, Fairly developed	Big	Small amount in subcutaneous layer.
17	*5-9, Fairly developed	Medium	Small amount in subcutaneous layer.
18	3625, Fairly developed	Big	Absent in corium. Medium amount in adipose layer at the neck.
19	1375, Not well developed	Medium	Considerable amount in corium at the neck. Medium amount in adipose layer.
20	2280, Under developed	Medium	Absent in corium. Large amount in adipose layer.
21	2821, Not well developed	Long & narrow	Absent.
22	2960, Not well developed	Medium	Absent in corium. Small amount in adipose layer at the neck.
23	1439, Under developed	Very big	Very small amount in corium at the neck and back-bone. Small amount in adipose layer.
24	1863, Fairly developed	Big	Large amount in corium and adipose layer.
25	2881, Fairly developed	Small	Small amount in corium at the neck and back-bone.
26	3963, Fairly developed	Medium	Large amount in corium and adipose layer at the neck only.
27	805, Very big.	Small	Medium amount in corium at the neck and back-bone.

*per field at $\times 60$.

S. Nos. 1-10: Buffalo hides; 11-17: Cattle hides; 18-23: Goat skins; 24-27: Sheep skins.

Jamnapari: This type of skin is quite big in size, spready and fairly thick in substance. The thickness is somewhat uniform in the skin of the female animal only. The epidermis in the he-goat skin is fairly thick. Hair population is less, the hair density varying between 1700 and 8000 hairs per sq. inch. The she-goat skin, however, has a greater hair density especially at the neck and back-bone areas. The coarse hairs constitute on an average about 46% of the total hair population. They are deeply rooted and inclined at a comparatively higher angle. Sweat glands are less developed and in the skins of male animals, they are less numerous too. The grain layer is fairly thick covering about 39% of the corium thickness and is compact, but the grain surface is somewhat coarse. Natural tightness of the grain especially in the case of he-goat skin is comparatively greater than that in the other skins of Desi breeds. A noticeable feature of the Jamnapari skin is the presence of comparatively thinner fibres at the butt and belly areas, and of fairly thick fibres at the neck and backbone. The skin fibres are, however, compactly woven, except in the belly portion of the she-goat skin. A considerable amount of natural fat is present in the he-goat skin especially at the junction of the grain and corium and also in the adipose layer. A medium amount of elastic tissue is noticed.

Hill (Agra): This type of skin is also big in size and thick in substance but lacks uniformity in thickness; the butt and belly are considerably thinner than the other locations. The epidermis is fairly thick. The hair density varies between 3500 and 8800 hairs per sq. inch. The coarse or long hairs constitute on an average about 24% of the total hair population. They are very deeply rooted, and at the neck are very stiff appearing much like bristles. The hairs are inclined at a comparatively higher angle; sweat glands are under developed and much less in number compared to other breeds of skins; the fat glands, however, are quite big. As in Jamnapari skin, the grain layer is thick covering about 38% of the thickness of the corium but the grain surface especially at the neck is very coarse. Natural tightness of the grain is also very similar to that of Jamnapari. The corium proper at the butt and back-bone is compactly packed with fairly thick fibres. Although the skin fibres at the neck are comparatively thicker, they are less compactly woven. Very small amount of natural fat is found, a little being present at the neck area as fat droplets. A large amount of elastic tissue is noticed especially at the neck.

Desi (Lucknow): This type of skin is smaller in size and

thinner in substance compared to other skins collected from U.P., but is fairly uniform in thickness and texture. The epidermis is not thick. The hair population varies between 7500 and 10,000 hairs per sq. inch. The coarse hairs constitute about 43% of the total hair density. They are not very deeply rooted and inclined at a fairly low angle. Quite a large number of sweat glands are present; the fat glands are quite big. The grain layer is not very thick and is also less compact, but the grain surface is smoother than that of either Jamnapari or Hill goat skins. Natural tightness of the grain skin at the butt is more than in the other skins examined. The corium proper is fairly compactly woven with fairly thick skin fibres but is much less than that of Jamnapari. A noticeable feature is the fairly uniform texture in different locations. Natural fat is present only in the subcutaneous layer. As in Jamnapari, only a medium amount of elastic tissue is found at the butt and back-bone areas.

Desi (Bareilly): This type of skin is bigger in size and thicker in substance than the Desi skins of Lucknow, but is not uniform in thickness. Hairs are densely populated in this breed, the hair population varies between 5000 and 15,000 hairs per sq. inch, coarse hairs constituting about 37%. They are deeply rooted especially in the he-goat skin and inclined at a fairly high angle with the surface. Sweat glands are fairly well developed but they are less numerous compared to Desi skin of Lucknow; the fat glands, on the other hand, are small and thin. The grain layer is fairly thick covering about 37% of the thickness of the corium, but is less compact; the natural tightness of the grain is also less than that of Desi skin of Lucknow. Although in the he-goat skin the corium proper is fairly compactly woven, at least in the butt area, it is quite loosely woven in the she-goat skin with thin fibres. The skin texture on the whole is less uniform compared to Desi skin of Lucknow. Natural fat is practically absent. A fairly large amount of elastic tissue is present in the he-goat skin, but very little is found in the she-goat skin.

Sheep skins:

The pure breeds found in U.P. are Jalauni and Bikaneri (imported from other places). Skins of Bikaneri and mixed Desi breeds were collected and studied. From the data in tables II to VI, the following salient features may be mentioned.

Bikaneri: This type of skin is not very thick in substance. While the skin of the female animal is thin especially at the butt and belly, the skin of the male animal like the Desi skin of Mukteswar, shows exceptional thickness at the neck. There are more wools in this breed. The wool density in the female animal is much less; the wool population in the male animal varies between 5500 and 16500 wools per sq. inch. Both coarse and fine wools are found in skins a greater percentage of coarse wool being noticed in the male, on an average about 37% of the total wool population. The wools are quite deeply rooted in the skin of the male animal but not in the case of the female one. The angle of inclination of the wools is comparatively lower than that in the Desi skins of Mukteswar. Sweat glands are bigger and are much more numerous in the skin of the male animal than in that of the female one, making the junction of the grain and corium weak. The grain layer covers approximately 50 to 64% of the corium thickness; the natural tightness of the grain is comparatively higher than that of the Desi skin of Mukteswar. The corium proper is more compactly woven with fairly thick skin fibres compared to the Desi skin of Mukteswar. A fairly large amount of natural fat is present especially at the neck. As in Desi skin of Mukteswar, a fairly large amount of elastic tissue is also noticed in the skin of the male animal.

Desi (Mukteswar): This type of skin is thicker than the Bikaneri one, but the skin of the female animal is comparatively thinner in substance. Wools are less numerous in this breed, but unlike Bikaneri breed, a greater wool density is noticed in the female animal (between 4000 and 12000 wools per sq. inch). A greater percentage of coarse wools is found especially in the female animals, about 45% of the total wool population. They are very deeply rooted especially in the skin of the male sheep and are inclined at a rather high angle. Unlike in Bikaneri skin, sweat glands are more numerous in the skin of the female animal; big fat glands are present in the skin of the male sheep. The grain layer is very thick especially in the male sheep skin. This layer at the belly covers about 75% of the thickness of the corium. Natural tightness of the grain, however, is comparatively lower than that of the skin of Bikaneri. Though the corium proper at the neck and butt in the skin of the male animal is fairly compactly packed with skin fibres, it is quite loose in the case of the female animal. A fairly large amount of natural fat is present making the skin greasy.

Conclusions

On the basis of the above histological characteristics of the various hides and skins collected, conclusions have been drawn with regard to the leather making properties. These conclusions are being tested by actual tannery trials, the results of which will be communicated at a later date.

Buffalo hides:

Murrah: This type of hide would probably produce a leather with a very rough grain surface. From the thickness and grain characteristics, this hide appears to be more suited for mechanical leathers like picking band, pickers etc., than for sole leather. The lower angulation of hide fibres, and the very loose and spongy nature of the neck area make it less suitable for firmer type of sole leather. In view of the complete absence of natural fat in this hide, introduction of sufficient fat appears to be essential, if hairy picking band leather is to be made from it. Since a greater amount of binding tissue is present in this hide, it may require slightly longer liming than the other hides, for proper opening up of the fibre structure. The neck being naturally loose, a separate treatment for the neck is likely to produce better results. The thick epidermis with a lot of pigment would probably take a longer time for removal.

Bhadawari: This type of hide would probably produce a leather with a very smooth and flat grain surface. This hide is naturally greasy, but uniform in texture. From the thickness and grain characteristics, this hide appears to be best suited for harness leather. Because of a lower angulation of hide fibres, a firmer type of sole leather should not be expected. From the texture, it appears that this hide will open up uniformly in the liming process, and may perhaps be plumped to a considerable extent without weakening the grain.

Tarai: This type of hide lacks uniformity both in thickness and texture, but is not very greasy. From the hide texture this hide appears to be unsuitable for firmer type of sole leather. While the grain surface at the neck and belly is rough, a fairly smooth surface is expected at the butt area. The grain characteristics, however, suggest that it may be used for the manufacture of light soles for chappals. The thick epidermis and deeply rooted hairs are likely to take slightly longer time for removal in the liming

process. The irregular texture of this hide may present difficulties in proper and uniform opening up.

Desi (Lucknow) : This type of hide would probably produce a leather with a very rough grain surface. From grain characteristics and uniformity of thickness, it appears to be more suited for sole leather than for any other purpose. The high angulation of hide fibres is likely to influence the firmness of the leather made, but in view of the neck and belly areas being less compact, it is imperative not to open up these areas too much in the liming process, if a compact and firm sole leather with more or less uniform structure is desired. The thick epidermis with its appendages may require a little more time for removal during liming, but care should be taken not to swell the hide too much as otherwise looseness of the grain may develop.

Desi (Kanpur) : This type of hide would probably produce a leather with a fairly smooth grain surface. It is naturally greasy, lacks uniformity in thickness and is more or less similar to the hide of Agra in other respects. From the grain characteristics and the less compact corium texture, it appears that while this hide may not be suited for firmer type of sole leather, it may be suitable for the production of medium soles with strong grain, provided the hide texture is opened to the minimum extent in liming.

Desi (Agra) : This type of hide would probably produce a leather with a very smooth and flat grain surface. This breed of hide is greasy at the belly, less compact in texture and appears to be unsuitable for firmer type of sole leather. From the grain characteristics, it appears to be suited for mechanical leathers such as pump buckets, washers etc. or for leathers requiring very smooth grain surface. In view of the less compact fibre structure, it is essential not to open up the hide texture too much in the liming process, which should be kept at its minimum. The epidermis and hairs may not take longer time for their removal. If sole leather is to be made from this hide, it should be filled up heavily during tanning.

Cattle hides :

Desi (Kanpur) : This type of hide is not greasy and would probably produce a leather with a strong, thick grain. From the fibre characteristics, it appears that this hide may be suited for

chrome retan upper leathers, and also for East India tanning. The thick grain layer and thinner fibres at the neck and belly, make this hide less suitable for the manufacture of ordinary chrome upper leather. While the epidermis with its appendages may not require longer time for removal by liming, the hide texture may not open up so readily as with the other hides, because of the greater amount of binding tissue present.

Hariana (Bikapur) : This type of hide is not greasy and would probably produce a leather with a fairly tight and smooth grain. From the grain characteristics and hide texture, it appears that this hide may be more suited for chrome upper leather than any other type. Though the fibres at the neck are comparatively thinner, it is expected that this hide will produce a fairly uniform leather if the hide texture is properly opened up in the liming process. Because of the comparatively smaller amount of binding tissue, it will probably open up more readily in the liming process than the other hides; proper control is essential if a compact and tight grained leather is required.

Hill Bull (Mukteswar) : This type of hide is not greasy and would probably produce a leather with a very rough grain surface. The weak grain and thin fibres make it unsuitable for chrome upper leather. The fairly uniform hide texture and the thick grain layer, however, suggest that this hide may be used for the manufacture of vegetable tanned case or upholstery leather preferably with embossed grain. The thick epidermis and deeply rooted hairs are likely to take considerable time for removal in the liming process. The hide texture, however, may swell uniformly because of the uniform distribution of supporting tissue.

Goat skins :

Jamnapari : This type of skin is greasy at the neck and would probably produce a thick and tight grained leather, but with a very coarse grain surface. From the grain characteristics and skin texture, this skin appears to be unsuited for leathers like glaze kid, where a very smooth and fine grain is required, but may be suitable for the manufacture of leathers like morocco, shrunken grain etc., where grain fineness is of little consideration. In view of its thinner fibres at the butt and belly, it would be necessary to plump this skin properly to obtain a fairly full butt and belly. The very deeply rooted coarse hairs will require considerable time and attention for efficient removal.

Hill Bull (Agra): This type of skin is greasy at the neck and more or less similar to Jamnapari skin, but is thicker in substance. This skin would probably produce a thick and tight grained leather, but with a coarse grain surface. The thickness and the skin texture suggest that while this type of skin may not be suitable for the manufacture of finer varieties of leather requiring fine and smooth grain with uniform substance, it may be used for the manufacture of suede and clothing leathers where fineness of grain is of little consideration. The thick and compact grain layer may also be very suitable for embossing artificial grain. The thick epidermis and the very deeply rooted hairs, especially the bristle-like hairs at the neck, may present certain difficulties for removal in the liming process. Because of a greater amount of supporting tissue, the neck area may not open up so readily as in the other skins.

Desi (Lucknow): This type of skin is not greasy but rather thinner in substance and would probably produce a fine and smooth grained leather with more or less uniform texture. The skin texture suggests that this skin will open up more readily in the liming process and swell more evenly than the other skins. Although the grain is not very strong, this skin appears in other respects to be suitable for the manufacture of glaze kid leather. In view of its thinness, a proper plumping and opening up is essential to obtain fuller substance.

Desi (Bareilly): This type of skin would probably produce a leather with less tight and less smooth grain surface. The skin of the female animal of this breed is likely to produce a loose leather with thin fibres. From the skin texture, it appears that this type of skin may be used for the manufacture of suede leathers.

Sheep skins:

Bikaneri: This type of skin is greasy at the neck and not very thick in substance. The wools are comparatively finer than in the Desi breed. Although the grain is not very strong, it is fairly tight and smooth. This skin would probably produce a comparatively fuller leather with a finer grain than that of the Desi breed of Mukteswar. From the skin texture, it appears that this type of skin may be suitable for East India tanning.

Desi (Mukteswar): This type of skin is also greasy with coarse wools, but thicker than Bikaneri skin in substance. The

grain layer is quite thick but not very tight and strong. From the grain characteristics and skin texture, it appears that this skin would probably produce a rather loose leather with a thick and very coarse grain. The skin of the female animal is likely to produce a loose and raggy leather. While the epidermis is not very thick, the wools are quite deeply rooted and may take longer time for their removal.

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LETTER TO THE EDITOR

A note on the use of Margosa bark for E. I. tanning

Melia Azadirachta, popularly known as Margosa or Neem (Veppam—Tamil, Veppa—Telugu) belonging to the *Meliaceae* family, is a very common tree found in all parts of India. The tree can be grown very easily since it needs little attention and it grows rapidly and comes to a good size within a short span of five to six years. The occurrence of tannins in margosa is known; however, the bark does not appear to have been studied as a source of tannin.

Tender bark from the branches of young trees (3-4 years) yields about 12% of tannins whereas bark from the trunk of six year old tree gives a tannin content of 14%. A typical analysis of this sample is given below:

Moisture	..	9.2%
Tannins	..	14.0%
Non-tannins	..	9.9%
Insoluble matter	..	66.9%
T/N.T.	..	1.4
Ash	..	3.3%
Colour of 0.5% solution	} Red — 3.7 Yellow — 10.0	
pH of analytical solution		.. 4.8

The tannin is of catechol type.

Tanning studies:

Tanning trials were made on goat skins. The skins were soaked, limed and delimed as for E. I. tanning and they were tanned with margosa bark. Bark corresponding to 16% tannins on pelt weight was used in two instalments and tanning was completed in 12 days. The colour of the tanned leather was found to be light though it had a slight red tinge. The skins were bleached, lightly myrobed with a 10° Bk liquor, oiled and allowed to dry.

The general appearance of the skins was quite good and they were found to compare favourably with the avaram tanned goat

skins, in lightness of colour, feel, fullness, tearing strength, etc. The yield was 35% of the fleshed weight and the leather had a shrinkage temperature of 80°C.

Leaching studies:

100 gm. of chopped bark were leached with four times their weight of water for 24 hours at room temperature. The next day the liquor was drawn and an equal volume of fresh water added. The first leaching gave a liquor of 14° Bk. Leaching was done five times and the liquors from each leaching analysed.

The total tannins extracted was 70% of the actual tannin content. Of the total, 52% was extracted on the first day itself and 89% by the end of the third day.

Further studies are in progress.

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

5-12-1960

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TECHNICAL SEMINAR

The chemical nature of goran tannin*

BY

D. GHOSH

The extractives of the bark of goran (*Ceriops roxburghiana*) have been divided into a number of fractions by means of ethyl ether, ethyl acetate, acetone and methanol respectively. Material extracted from the bark with methanol exceeds in quantity that extracted by any of the other solvent systems used; whereas, ethyl ether and ethyl acetate dissolved only chromatographically mobile constituents of the bark, acetone and methanol dissolved both mobile and immobile constituents. Ethyl acetate may be considered to be very suitable for extracting most of the mobile constituents. About 8 mobile constituents have been identified, of which ethyl ether dissolved only two, one of them being catechin.

The acetone and methanol extracts of goran bark were found to be partially soluble in water, the soluble portion being capable of good tanning action, as judged by the relatively high shrinkage temperatures.

A process has been developed to separate the fluorescent and highly mobile substances from nonfluorescent and immobile substances. This involved repeated precipitation from the methanol extract solution with ethyl ether; the soluble portion containing the mobile and fluorescent substances and the precipitated portion was considered as purified tannin. About 25 fluorescent substances were noted.

Methanol extracted tannin of goran bark when dried was found to be almost insoluble in water, but pelt treated with it showed a higher shrinkage temperature than the untreated control. Despite its water insolubility, therefore, the product is a true tannin.

*Summary of talk given on December 9, 1960.

Studies on the methylation of purified goran tannin show that the methylation is readily accomplished. Remethylation did not result in any increase in the methoxyl content.

Veratric acid in high yield was obtained after permanganate oxidation of methylated goran tannin and phloroglucinol and proto-catechuic acid were obtained in good yield after alkali fusion. β -resorcylic acid was found to be absent. Careful study of all the degradation products of goran tannin showed that two phenolic species (phloroglucinol and catechol types) constitute the bulk of the recognisable fragments.

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Aiyars HI 6

TECHNICAL SEMINAR

Grain quality of Indian goat skins and causes for coarse and fine grain*

BY

D. K. DAS

Grain quality, especially the grain fineness is an essential condition of quality skins. On the basis of the grain fineness, Indian goat skins can be classified into two groups, viz., fine grain, i.e., skins producing naturally smooth or fairly smooth grain surface, and coarse grain, i.e., skins producing naturally coarse or rough grain surface. The grain quality of the leather made from goat skins is dependent upon a number of factors. The factors which influence the fineness or coarseness of the grain are (1) hair density, (2) percentage of coarse hairs, (3) angle of inclination of hairs with the surface of the skin, (4) natural tightness of the grain layer, (5) amount of grain elastin, (6) development of gland tissue, (7) packing of corium fibres and (8) proportion and uniformity of the grain layer.

The conditions which directly influence the fineness of the break of the grain pattern are (1) greater density of hairs, (2) higher tightness of the grain and (3) compact packing of the corium fibres.

All the above conditions are inter-related. Although some of the conditions may intensify or minimise the effect of other conditions, the smoothness or roughness of the grain surface is the result of the cumulative effects of all of them.

*Summary of talk given on December 16, 1960.

TECHNICAL SEMINAR

A new approach to hide bacteria*

BY

N. U. RAO

The enumeration of bacteria by "plate counts" has some inherent anomalies. Only the bacteria that are released into the suspension from the hide sample can be counted. Of these organisms, only those that can grow on the medium used, can be counted. Even then, all the bacteria that can grow on the medium cannot be counted unless duplicate plates are made and one set is incubated aerobically in presence of oxygen and the other under anaerobic (complete absence of oxygen) conditions.

The present work is undertaken to see whether all the bacteria from the hides are brought into the suspension by the conventional method of suspending the sample in ten times its weight of water and shaking for 1-4 hours. The results show that all the bacteria present in the hide sample, are not accounted for in the counts, if the sample is shaken for 1-4 hours soon after water is added and the suspension is plated. It is observed that after soaking the hide sample in water at refrigerator temperature (approx. 15°C) for 48-72 hours and shaking it for one hour, a thousand to ten thousand fold increase in numbers of bacteria occurred. This increase is considered to be due to the release of the resident bacterial flora of the hide, generally present in the skin folds and hair follicles, into the suspension.

The results clearly indicate that this increase in bacterial population is definitely due to the numerous additional species released into the final suspension and not because of the multiplication of the few species found in the initial suspension.

*Summary of talk given on December 23, 1960.

CLASSIFIED ABSTRACTS

Raw Materials

Stratigraphic distribution of carbohydrate, hexosamine, and hydroxyproline in Cattlehides.

Edward F. Mellon, Samuel J. Viola, and J. Naghski, (Eastern Regional Research Laboratory, Philadelphia 18, Pennsylvania). *J.A.L.C.A.* 55, 622 (1960). A precision slicing technique was employed to cut consecutive slices of equal thickness parallel to the grain surface of cattle hides. Quantitative determinations of carbohydrate, hexosamine, and hydroxyproline were made on the slices. The actual weight of all three components was lower in the grain slices than in the corium. However, when calculated on a dry weight or nitrogen content basis, the carbohydrate and hexosamine appear more concentrated in the grain region. Hydroxyproline follows the distribution of dry-weight and nitrogen content more closely but indicates that a large part of the nitrogen content of the grain is not due to collagen. A steerhide and a cowhide were studied.

PROCESSES PRIOR TO TANNING

A study of pancreatic enzyme unhairing system.

Edwin G. Lindroth, (Tanners' Council Laboratory, University of Cincinnati, Cincinnati 21, Ohio). *J.A.L.C.A.* 56, 31-41 (1961). A pancreatic enzyme preparation which removes the hair from soaked, green-fleshed, brine-cured hides has been investigated. It was observed that the best unhairing results were obtained when 1.0% of the pancreatic product was used in a 10% NaCl solution maintained at a pH of 8.5. When the enzyme-unhaired stock was compared with stock unhaired in a conventional lime-sulfide treatment, the enzyme-treated stock contained more fine hair and had an objectionable drawn grain but did have higher tensile strength and less stretch than the lime-sulfide stock.

OTHER TANNAGES

Some observations on the retannage of chrome upper leathers.

H. Loewe, *J.S.L.T.C.* 44, 384 (1960). Two different types of resin tannages are described: (1) Resin tannins with binding

ability to collagen, which are drummed into the skin and subsequently condensed or polymerized, (2) Resin fillers, which are condensed before their use in tannage and drummed into leather in a condensed form. The resin tannins occupy a position intermediate between the true tannins and the pure fillers, i.e., they are compounds which possess a certain tanning property as well as the capacity to condense and polymerize. The tanning property alone would not suffice to obtain a usable tanning effect — it causes only an adsorption on the skin fibre, i.e., the subsequent condensation or polymerization process is localised on the fibre surface. The fibres are surrounded by a sheath of polymer molecules so that the individual fibres are separated from one another. The filling of the spaces between the fibres is of secondary importance.

It is shown that the usual materials used for resin tanning, e.g., acrylic acid, methacrylic acid, styrene, diisocyanates, polyisocyanate, methylol compounds of urea and thiourea, melamine and dicyandiamide, possess tanning properties which are limited according to the binding ability to collagen. This property can be reinforced by the formation of compounds which are real condensates between the methylol compounds of nitrogenous bases and true syntans. The disadvantages of resin tannage with these types can be eliminated by splitting off the methylol groups by acidification to pH 3.0 and after treatment of the leather with formaldehyde-binding agents such as nitrogen bases, amines and decomposition products of protein. A pretannage with resin-tannins causes a very rapid penetration of ordinary tannins into the skin and produces a full firm-grained leather. A retannage has the advantage that the firmness of the grain is increased and thus enables buffing of spongy material such as cattle hides.

The manufacture of shrunken grain pigskin leathers.

K. Fekete and L. Hegedus, *Bor es cipotechnika*, 5, 145 (1960). Shrunken grain pigskin leather can be finished to give an attractive upper or fancy leather of good quality, with a soft feel and good water-vapour permeability; its grain pattern does not change during lasting or in wear. In the manufacturing of shrunken grain pigskin backs the chemical degreasing after bating and the cationic pretannage before shrinking are rather important operations.

TESTING

The action of perspiration on leather: Part I. The action of lactic acid on chrome leather.

J. H. Bowes and J. A. Moss. *J.S.L.T.C.* **44**, 419 (1960). The constituents of perspiration most likely to damage chrome leather are lactic acid and sodium chloride. The factors affecting the extraction of chrome from leather by sodium lactate and sodium chloride solutions have been investigated.

The amounts of chrome extracted are dependent on the time and temperature of extraction but eventually an equilibrium is reached which is governed by the relative amounts of lactate and leather present. It is concluded that the system leather-sodium lactate solution behaves similarly to that of a cation exchange resin in a solution of metallic ions and anions capable of complexing with the metal. The effect of pH and different anions on the extraction are explained on this basis.

The distribution of chrome between leather and solution under standard conditions should serve as an indication of the relative stability of the chrome-collagen complex in different leathers and on this basis a procedure for testing the probable resistance of leathers to the detanning action of perspiration is suggested. So far little evidence has been obtained that the pH or basicity of tannage affects such resistance, though other factors may be of importance. It may be inferred that the higher the chrome content of the leather the longer will it withstand the action of the perspiration.

During stripping the shrinkage temperature of the leathers decreased progressively with the chrome content, all the chrome fixed apparently contributing equally to the hydrothermal stability.

Extraction of chromium (III) with 2-thenoyltrifluoroacetone: Direct spectrophotometric determination in the organic phase.

Santosh K. Majumdar and Anil K. De, (Department of Chemistry, Jadavpur University, Calcutta 32, India) *Anal. Chem.* **32**, 1337 (1960). A simultaneous extraction and colorimetric method for milligram amounts of chromium (III) is based on the formation of an orange chelate with 2-thenoyltrifluoroacetone, which is extractable by an organic solvent such as benzene. The resulting orange solution conforms to Beer's law at 430 m μ over the range of 8 to 200 γ of chromium (III) per ml. A single extraction by

TTA-benzene at pH 5.0 to 6.5 removes about 80% or more of chromium (III) from an aqueous solution. The colored system is stable for a week. Moderate amounts of silver, aluminium, mercury (II), and citrate do not interfere, whereas iron (II), uranium, thorium, zirconium, bismuth, tartrate, and EDTA interfere more or less seriously. However, interferences of iron (III), thorium, and zirconium can be eliminated by a preliminary extraction from fairly acidic solution. The method is accurate and reproducible to within $\pm 2\%$.

Determination of free acid in the presence of hydrolyzable cations.

Arthur Moskowitz, John Dasher, and H. W. Jamison, Jr. (Central Research Laboratory, Crucible Steel Co. of America, Pittsburgh 13, Pa.) *Anal. Chem.* **32**, 1362 (1960). A simple procedure is described for the determination of free acid in various pickle liquors and other acid solutions containing hydrolyzable cations. The method has been applied to liquors from the pickling of stainless, silicon, alloy, and carbon steels and titanium by nitric acid, sulfuric acid, and nitric-hydrofluoric acid, and also to hydrochloric acid solutions containing ferric ion. The method involves titration with base to the first appearance of a red-brown precipitate in a solution containing appropriate amounts of fluoride and ferric ions. In addition to its applications in analyzing pickling solutions, the method is easily adaptable for use in other systems in which free acid must be determined in the presence of hydrolyzable salts.

Errors in infra-red absorption analysis due to solute-solvent interactions.

W. R. Ward, *J. Appl. Chem.* **10**, 277 (1960). The $E_{1\text{ cm.}}^{1\%}$ values of infra-red absorptions of picolines in cyclohexane solution vary with the concentration of the solutes. Variation of the E values due to slit width effects is not the only factor contributing to the failure of Beer's Law; a second factor is interaction between the solute molecules. Serious errors in infra-red absorption analysis of picoline mixtures are demonstrated when such interactions are not taken into account.

Cryoscopic determination of the purity of lindane.

R. Handley, *J. Appl. Chem.* **10**, 353 (1960). A method is described which uses a simple freezing point apparatus and a mercury-in glass thermometer for the determination of the γ -benzene hexachloride content of samples of lindane.

Collaborative results from four co-operative laboratories show that the method gives reliable and reproducible results, in good agreement with those found by a differential refractro metric method.

A pure reference sample of γ -benzene hexachloride was prepared by zone-refining and values for its freezing point and cryoscopic constant measured by a platinum resistance thermometer were in good accord with the data of Toops & Riddick.

Surface-active alkylene oxide condensation products: Determination of polyethylene glycols in selected cationic ethylene oxide condensates.

J. V. Kilheffer, Jr., and Eric Jungermann (Armour Industrial Chemical Co., 1355 West 31st St., Chicago 9, Ill.) *Anal. Chem.* **32**, 1178 (1960). A method has been developed for the determination of free polyglycols in a group of cation-active ethylene oxide condensates. The polyglycols are isolated as dilute aqueous solutions by batch treatment with ion exchange resins. Both the amount and the average molecular weight of the polyglycols are then obtained from the results of two rapid and simple determinations: a spectrophotometric analysis and a dichromate total oxidation.

Colorimetric determination of phenolic materials in refinery waste waters — removal of sulfides by silver nitrate.

G. E. Gordon (Laboratory Division, Manufacturing Department, Standard Oil Co. of California, Richmond, Calif.) *Anal. Chem.* **32**, 1325, (1960). Determination of phenol, by the 4-aminoantipyrine method in water samples containing sulfides, has required distillation to separate the phenol from the sulfides. The usual procedure has been that suggested by the American petroleum institute. Another procedure, using silver nitrate to remove sulfides, is faster and believed to be more accurate because it does not involve steps where phenol might be lost. It can be easily adapted for field use to give approximate results by the use of several standardized phenol solutions. The results show good agreement with the distillation method, but in general, are slightly higher. The method is also applicable to water used in refinery processes.

Effects of splitting upon the physical characteristics of leather.

Joseph N. Orietas, (Albert Trostel & Sons Company, Milwaukee, Wisconsin). *J.A.L.C.A.* **56**, 4-30 (1961). The effects

of splitting upon the physical strength of leather, as measured by the stitch tear and Mullen burst tests, have been studied. The results obtained have been evaluated statistically, and certain conclusions have been drawn as to the possibility of estimating the strength of leather under tannery production conditions.

Statistical techniques in production — a case history.

G. A. R. Taylor, *J.S.L.T.C.* **44**, 467 (1960). An account is given of the statistical techniques used in evaluating the relative performance of two types of leather when used for the manufacture of cycle saddles.

The physical measurement of colour.

A. N. Derbyshire, *J.S.L.T.C.* **44**, 286. (1960). The effects of quality of illumination, reflectance behaviour of the object, and characteristics of the eye in determining the colour of an object are discussed and demonstrated. The C.I.E. system of colour measurement is outlined and instruments designed to measure colour on this system described. The potential value of such measurements to industrial users of colour are considered, and illustrated by an outline of recent experimental work on colour standardisation and colour match prediction.

Study of the effect of the elastic tissue of hide on the physical properties of leather.

Conrad L. Ornes and William T. Roddy, (Tanners' Council Laboratory, University of Cincinnati) and Edward F. Mellon, (Eastern Regional Research Laboratory, Philadelphia 18, Pennsylvania). *J.A.L.C.A.* **55**, 600 (1960). This paper is a report of the results of over two years of laboratory and plant work in developing a method for removing elastic tissue from cowhide under controlled conditions and studying the effects of such removal on the physical properties of the leather produced. The evidence is conclusive that removal of elastic tissue from cowhides by means of Viokase enzyme causes the leather produced from such stock to have softer temper, coarser break, and more drawn grain than the corresponding control leather. Physical tests indicate that the removal of elastic tissue from cowhide stock caused the leather produced from such stock to have higher tensile strength and higher stitch tear strength as well as a more flexible grain.

Strength increases by tension tannages.

L. Seligsberger, C. W. Mann, and H. Clayton, (Quartermaster Research and Engineering Center, Natick, Mass). *J.A.L.C.A.* **55**, 687 (1960). It is well known that tensile strength measurements calculated for equal cross sections, give much higher results for individual collagen fibres than for mammalian hide in bulk, whether or not both are tanned or both are untanned. Also, it has been shown that when hide is forcibly pulled in one direction, a realignment of the fibres occurs, and this results in an increase in the tensile strength of the hide in the direction of the realignment. A new and considerably improved techniques of increasing tensile strength by mounting and tanning hide pieces under tension has been investigated, using bated or pickled cowhide and pickled sheepskin and various methods of tanning. Most of the pieces were chrometanned in a two-step process in which the chrome concentration was varied. Tension was applied during the first or second step or during both. An aldehyde-lignosulfonate combination tannage with stretching was also carried out. Characteristics of the stretched skins were compared with those of adjacent hide pieces that had been tanned in the same vessel but in a relaxed state. All the tannages under tension produced an increase in the parallel-direction tension strength (up to 12,000 lb/in. or more) but at the expense of elongation, which was lowered by as much as 80%. It is believed that tension-tanned leather has potential military and civilian application.

The physical properties of leather finish films.

W. O. Nutt, *J.S.L.T.C.* **44**, 519 (1960). Simple test methods have been used to illustrate changes in film properties of finishes based on acrylic resins. The effect of modifying materials is illustrated by changes in test figures and the importance of film formation mechanism is revealed by comparing similar finishes with changed particle charge.

Analysis of methyl methacrylate copolymers by gas chromatography.

John Strassburger, Gerhard M. Brauer, Max Tryon, and Alphonse F. Forziati, (Dental Research Section, National Bureau of Standards, Washington 25, D.C.). *Anal. Chem.* **32**, 454 (1960). Detection, identification, and quantitative determination of copolymers of methyl methacrylate were accomplished by gas chromatographic analysis of the pyrolysis products. The procedure distin-

guishes between polymer mixtures and copolymers, and detects the presence of 0.2% of copolymer. Composition can be determined quantitatively, with a precision of $\pm 0.5\%$, from standard curves of the ratio of peak areas at known composition. The analysis takes only a few minutes, can be readily adapted to other copolymers, and is especially useful for cross-linked, insoluble materials.

Chromatographic purity of amino acids: arginine.

Max S. Dunn and Edward A. Murphy, (Chemical Laboratory, University of California, Los Angeles, Calif.), *Anal. Chem.* **32**, 461 (1960). The purity of amino acids can be gauged by chromatographic techniques. Amino acids are offered commercially in a chromatographically pure grade but without delineation required to make this term meaningful. Chromatographic methods for the determination of amino acid impurities present in limiting amounts in amino acid preparations were investigated. Data on arginine are presented and reports on other amino acids will be made subsequently.

Color complexes of catechol with molybdate.

G. P. Haight, Jr., and Wasken Paragamian (Chemistry Department, Swarthmore College, Swarthmore, Pa.). *Anal. Chem.* **32**, 642 (1960). A procedure for determining molybdate developed by Seifter and Novic, involving formation of a complex with catechol did not work when sodium sulfite was substituted for sodium bisulfite. Conditions for formation of the complex have been restudied and the need for careful control of pH has been revealed. The dependence on pH suggests a reaction mechanism and structure for molybdate ion in the region of pH 7. A new complex containing equimolar molybdate and catechol forms in acid solution. The spectra and formation constants for the two complexes have been studied at acidities in which only one or the other complex is formed.

Determination of zirconium in uranium fissium alloys.

Harold B. Evans, Alice M. Hrobar, and James H. Patterson. (Argonne National Laboratory, Lemont, Ill.), *Anal. Chem.* **32**, 481. (1960). Two methods are presented for the separation of zirconium from fissium alloy, the fuel to be used for the Experimental Breeder Reactor II. One method separates zirconium, molybdenum, and palladium from the other components by precipitation with cupferron. Zirconium is separated from molybdenum and pal-

ladium by successive precipitation with ammonium hydroxide. The other method, which is simple and adaptable to routine analysis, consists of ammonium hydroxide precipitations, followed by precipitation with *p*-chloromandelic acid. The zirconium is determined spectrophotometrically as the alizarin sulfonate lake.

Determination of free fatty acids in fat.

Irwin Hornstein, John A. Alford, L. E. Elliott, and P. F. Crowe, (Meat Laboratory, Eastern Utilization Research and Development Division, Agricultural Research Service, U. S. Department of Agriculture, Beltsville, Md.), *Anal. Chem.* **32**, 540. (1960). Naturally occurring free fatty acids may be determined in the presence of large amounts of unsaponified fat by adsorbing the free fatty acids on a strong anion base exchange resin, washing the resin free of fat with petroleum ether, and converting the free fatty acids directly on the resin to their methyl esters with anhydrous methanol-hydrochloric acid. The nature and concentration of the fatty acids are determined by gas chromatography.

A modified method for hydroxyproline determination.

Ferenc Hutterer and Edward J. Singer, (Department of Pathology, The Mount Sinai Hospital, Fifth Ave. and 100th St., New York, 29, N.Y.), *Anal. Chem.* **32**, 556 (1960). The chromogen produced by the reaction of the oxidation product of hydroxyproline with *p*-dimethylamino-benzaldehyde has been stabilized by increasing the concentration of *n*-propyl alcohol in the reaction mixture to 45.5 volume %. To eliminate nonspecific interference, differential spectrophotometry at 500 and 560 m μ has been employed, and a suitable correction formula devised. The improved reaction and measurement conditions permit precise and accurate micro-determination of hydroxyproline in complex materials, such as tissue hydrolyzates.

Determination of microgram quantities of sulfate in organic linkages.

Geraldine Zdybek, D. S. McCann, and A. J. Boyle, (Department of Chemistry, Wayne State University, Detroit 2, Mich), *Anal. Chem.* **32**, 558 (1960). Chloric acid may be used for the digestion procedure in the turbidimetric determination of micro quantities of organic sulfate. Numerous samples may be run simultaneously with a minimum of manipulation. No quantitative transfer is required for the final development of turbidity.

Design and use of a refined microelectrophoresis unit.

Benjamin W. Grunbaum, (Department of Pathology, University of California, School of Medicine, San Francisco, Calif.) and Paul L. Kirk, (School of Criminology, University of California, Berkeley, Calif.) *Anal. Chem.* **32**, 564 (1960). With the improved precise micro-electrophoresis apparatus described, eight 0.01- to 0.1- μ l. samples can be subjected to electrophoresis simultaneously. Accurate positioning of precisely cut, multistrip papers produces an unusually high degree of reproducibility between patterns. The quality of the separations is tested and illustrated with ink dye, proteins of blood serum, and ferritin solution.

Photometric titration of weak bases in nonaqueous media.

L.E.I. Hummelstedt and David N. Hume, (Department of Chemistry and Laboratory for Nuclear Science, Massachusetts Institute of Technology, Cambridge 39, Mass.). *Anal. Chem.* **32**, 576 (1960). A photometric titration technique for the determination of weak bases uses perchloric acid in acetic acid as titrant and acetic acid or acetonitrile as solvent. Differentiating titration of as many as four components in a single mixture is possible. Comparison with potentiometric titrations in the same media shows the photometric technique to be preferable in many instances where the bases to be differentiated are very similar in strength. The versatility of the photometric procedure in differentiating bases is greatly increased by changing the wave length during titration of mixtures.

Micro-EDTA titration of calcium. Magnesium interference.

J. Ch. Van Schouwenburg, (Laboratory of Soils and Fertilizers, Agricultural State University, Wageningen, and Institute for Soil Fertility, Groningen, the Netherlands), *Anal. Chem.* **32**, 709 (1960). The negative interference of magnesium in the EDTA titration of calcium when murexide is used as an indicator is probably caused by the adsorption and inactivation of calcium murexide by the magnesium hydroxide precipitate. This adsorbed dye-bound calcium is very slowly or not at all released. If Carbo-cel is used as a protective colloid, no hydroxide precipitates. This calcium determination with the proposed microtitration procedure is applicable to systems containing low calcium and high magnesium levels.

A primary standard for alkalimetry and chelometry.

Jack E. Powell, James S. Fritz, and Dean B. James, (Institute for Atomic Research and Department of Chemistry, Iowa State University, Ames, Iowa). *Anal. Chem.* **32**, 954 (1960). Cadmium acid N-hydroxyethyl-(ethylenedinitrilo)-N, N', N'-triacetate (HCdV) is shown to be an excellent reagent both for the standardization of bases and for standardization of chelating agents such as EDTA. HCdV is easily prepared and purified, is virtually nonhygroscopic, is stable, and has a high molecular weight. It is a stronger acid than most alkalimetric primary standards. For use as a chelometric standard a few minutes' boiling with aqueous persulfate is necessary to oxidize the organic portion of the molecule.

Ion exchange separation of metal cations.

James S. Fritz and Shirley K. Karraker, (Institute for Atomic Research and Department of Chemistry, Iowa State University, Ames, Iowa). *Anal. Chem.* **32**, 957 (1960). Metal cations can be conveniently separated into groups by elution of a cation exchange column with an ethylenediammonium perchlorate solution. Most divalent ions are eluted from the column with 0.1M eluent. Then trivalent metal ions (plus barium and lead) are eluted with 0.5M ethylenediammonium perchlorate. Bismuth, thorium, and zirconium remain quantitatively on the column after this treatment. The effect of temperature and of certain complexing anions on the separations was studied.

THEORIES

Turnip peroxidase I. purification and physicochemical properties of multiple components in turnip peroxidase.

Toichiro Hosoya (The Chemical Institute, College of General Education, University of Tokyo, Tokyo) *J. Biochem. (Japan)* **47**, 369 (1960). (1) It has been found by means of filter-paper electrophoresis that at least three kinds of peroxidases are present in the crude extract of turnip roots used in the present experiment. (2) These three peroxidases were isolated separately and highly purified, and designated as "turnip peroxidases A₁, A₂ and D". Turnip peroxidase D was obtained in a crystalline form (needle shape). (3) Physicochemical properties of these preparations were examined and their homogeneity was confirmed. All these peroxidases obtained had the same prosthetic group as that of horseradish peroxidase, and their molecular weights or sedimenta-

tion coefficients were found almost same to each other. They exhibited, however, different behaviour in electrophoresis. (4) The P. Z. of turnip peroxidase D was comparable to that of horseradish peroxidase II or that of Japanese-radish peroxidase *a*, while the P.Z. of turnip peroxidases A₁ and A₂, inspite of the highest R.Z. of these enzymes were considerably lower than that of turnip peroxidase D. (5) Besides the above peroxidases (TP-A₁, A₂ and D), another peroxidase having the absorption spectrum similar to that of horseradish peroxidase I was obtained. However, this peroxidase was considered to be a substance produced during the course of isolation.

The effect of urea guanidine hydrochloride on activity and optical rotation of crystalline papain.

Robert L. Hill, Herbert C. Schwartz, and Emil L. Smith (The Laboratory for the Study of Hereditary and Metabolic Disorders, and the Departments of Biological Chemistry and Medicine, University of Utah, College of Medicine, Salt Lake City, Utah.) *J. Biol. Chem.* **234**, 572, (1960). Papain is reversibly inactivated by low concentrations of urea and guanidine hydrochloride. This inactivation is not accompanied by a change in secondary structure as judged by optical rotation experiments. Although little change is found in the specific rotation of papain in 6 M urea, it is almost completely although reversibly inactivated at this concentration. Guanidine hydrochloride, 5 M, irreversibly inactivates papain, producing a maximally unfolded molecule as judged by optical rotation measurements.

Enzymes of the glyoxylate cycle in germinating peanuts and castor beans.

Abraham Marcus and James Velasco. (The Plant Industry Station, U.S. Department of Agriculture, Beltsville, Maryland.) *J. Biol. Chem.* **235**, 563 (1960). Suitable assays are described for measuring the glyoxylate cycle enzymes in germinating peanuts and castor beans. Of the enzymes, aconitase and isocitritase are easily extracted while malate synthetase and condensing enzyme adhere strongly to the particulate. Washed mitochondria retain a considerable quantity of all the glyoxylate cycle enzymes. The rates in all cases are well in excess of the physiological rate of conversion of fat to carbohydrate. A study of enzyme development showed a general increase in activity with germination. Malate synthetase and isocitritase show a lag of 24 to 48 hours. Data are also presented on triphosphopyridine nucleotide isocitric

dehydrogenase, and an explanation is offered for the apparent by-pass of α -ketoglutarate.

Cobalt activation of carboxypeptidase A.

J. E. Folk and Jules A. Gladner. (The National Institute of Dental Research and the National Institute of Arthritis and Metabolic Diseases, National Institutes of Health, United States Public Health Service, Bethesda, Maryland.) *J. Biol. Chem.* **235**, 60 (1960). As much as 100% increase in the peptidase activity of carboxypeptidase A has been effected by incubation of solutions of this enzyme in the presence of cobaltous ion. No apparent increase in esterase activity accompanies the increased peptidase activity. Preliminary studies of this reaction indicate that the extent of activation of the enzyme is dependent upon pH, metal ion concentration, enzyme concentration, and temperature and time of incubation. The increased activity is rapidly lost in the absence of substrate after dilution or removal of Co^{++} ion by dialysis. The specificity of the enzyme toward several peptide substrates is unchanged by cobalt-activation. Of the metal ions tested under the present incubation conditions, only cobaltous ion showed this enzyme-activating effect. A sensitive and convenient spectrophotometric assay procedure for carboxypeptidase A is outlined and was employed in certain of these studies.

Trypsinogen-kinase in *Aspergillus oryzae* VI. On substrate specificity as protease.

Kazuo Nakanishi (Takamine Laboratory, Sankyo Co., Ltd., Tokyo). *J. Biochem. (Japan)* **47**, 16 (1960). (1) Hydrolysis of benzoyl-Arg-NH₂ and the activity of trypsinogen-activation by the trypsinogen-kinase and other various proteases were examined. Both the trypsinogen-kinase (acid-protease from *Asp. oryzae*) and the acid-protease from *Asp. saitoi* could not hydrolyse benzoyl-Arg-NH₂ but activated trypsinogen strongly. (2) The neutral-protease from *Asp. oryzae* has also a weak activity in trypsinogen-activation. (3) The preparation of the author's acid-protease has the activities of carboxypeptidase A, B, proteinase, and of hydrolysing L-Leu-L-Arg and L-Phe-L-Arg. (4) The relation between the substrate specificity of acid-protease from *Asp. oryzae* and the mechanism of trypsinogen activation by this enzyme are discussed.

BYE-PRODUCTS

Gelatine, the current position.

A. G. Ward, *J.S.L.T.C.* **44**, 505 (1960). Recent results on the conversion of collagen to gelatin are reviewed. The conversion

involves three stages, breaking of longitudinal bonds along the chains, breaking of lateral bonds between the chains and disruption of the hydrogen bonding system. The nature of origin of impurities in gelatines is discussed. The molecular structure is considered in relation to the macroscopic physical properties of gelatine solutions and gels.

GENERAL

Some studies on silica dust and silicic acid. 1. The influence of selected polyhydroxy compounds and amino-acids on the polymerisation of silicic acid and the solubility of silica.

E. Richardson, *J. appl. Chem.* **9**, 371 (1959). The effect of selected polyhydroxy compounds and amino-acids on the rate of polymerisation of silicic acid and the equilibrium concentration of ammonium molybdate-reactive silicic acid (i.e., those acids which react completely with ammonium molybdate solution at optimum pH within 10 min.) has been examined at various pH values. The effect of the same materials on the solubility of various forms of silica has also been studied. The solubility of pure rock crystal is little affected by polyhydroxy compounds but the solubility of Loch Aline sand is depressed. Amino-acids depress the solubility of both materials. Possible reasons for these effects are discussed.

Hydrothermal reaction of alumina trihydrate.

Taichi Stao, *J. appl. Chem.* **10**, 414, (1960). Examination has been made of alumina trihydrates (hydrargillite and bayerite) after being heated with water in an autoclave. In both cases the monohydrate (boehmite) is formed after 2h. at 200°, the rate of conversion being higher for bayerite than for hydrargillite. Determination of alkali and alumina dissolved in the water during hydrothermal treatment led to the conclusion that the reaction is due to decomposition of the trihydrate in presence of water rather than its dissolution.

NOTES & NEWS

Figures for exports to U.K. during November 1960

The following are the details (figures in bales) of exports of hides and skins to U.K. during November, 1960: cow hides 2,462, cow calf 191, buff hides 59, buff calf 260, goat skins 420 and sheep skins 403.

The Hindu: December 12, 1960.

Processing of wool

Govt. Centre opened in Vinnamangalam

The wool processing centre in Vinnamangalam near Ambur was inaugurated on December 17, 1960 by Shri Bishnuram Medhi, Governor of Madras. The centre is the Madras and Mysore State Governments' joint venture, with the participation of the Union Government. It is stated to be the first of its kind in India, which is designed to meet the requirements of all the drugget manufacturers in the two States. The suggestion for the establishment of this centre was made by the Joint Drugget Industry Advisory Board for Madras and Mysore.

The Board felt that the only practical solution to the problem of ensuring quality production lay in the establishment of a central modern processing plant where tannery wool could be carded, dyed and blended on scientific lines and supplied to the cottage workers at a reasonable rate. The scheme costing about Rs. 13 lakhs was drawn up to establish this centre at Vinnamangalam which was ideally situated between Madras and Bangalore and which lay in the midst of important tannery centres of South India.

Mr. M. Bhaktavatsalam, Home Minister of Madras, welcoming the Governor and others said that the manufacture of druggets was one of the important handicrafts of Madras and Mysore and it provided employment to thousands of workers. Of the several measures taken in the recent years for the resuscitation and development of our handicraft, the programme for the establishment

of the service centre was important. The service centre was intended to undertake operation involving costly means, which small craftsmen could not afford to purchase, supply processed material of quality at a reasonable rate and introduce new designs and patterns. Under the scheme, the Madras, Mysore and the Union Governments had agreed to share the expenditure equally.

The Hindu: December 18, 1960.

Poly Ra system new leather finish

A new leather finishing system called Poly Ra system based upon polyurethane resins has been introduced by R & A Leather Finish Co. Inc. of Brooklyn. According to A. Turow, chief chemist, the new system will enable the tanner and finisher to produce leather with an unsurpassed flexibility and resistance to scuffing and abrasion.

These properties are extremely important for luggage, brief case, camera case and radio case leathers. Turow says the highly improved resistance to scuffing and abrasion may help the leather industry to recapture part of the business which leather has lost to plastics.

Splits Upgraded

Splits finished with the Poly Ra system look, feel and perform like full grain leather, says R & A. The Poly Ra system is also highly recommended for shoe leather holsters and men's and ladies' belt leathers.

Unlike the regular polyurethane finishes, the Poly Ra system produces leather with only a slightly higher gloss than conventional leather coatings. This is achieved without using dulling agents or fillers, and will produce leather with a natural (not plastered) feel or look. If a very high gloss is desirable it can be obtained very easily. Two-toned aniline effects can be achieved.

Leather and Shoes: October 8, 1960.

Leather, nylon suede combined

Marking a whole new concept for the tanning industry, General Split Corporation for the first time has combined nylon suede with leather in a single product.

The base of the new "Nyl-On-Leather" is lightweight, soft-textured split leather—the facing is sueded, 100 per cent, nylon fabric. In combination the leather and nylon make a new material, never before available for shoes or other uses. It has all of the brilliance, washability and utility of nylon fabrics and the strength, suppleness, and feel of leather. The laminating process is exclusive with General Split.

The "Nyl-On-Leather" can be used in shoes without any additional lining and makes unnecessary both the drill backing and faille lining usually found necessary in the use of the conventional nylon suede.

"Nyl-On-Leather", a tannery spokesman said, can be used for men's women's and children's slippers, casual shoes and boots. It also may be made into men's outdoor boots and into high-fashioned women's handbags.

The new "Nyl-On-Leather" will be shown in such shades as black, red, loden green, grey, and may be obtained in virtually any fashion colour.

Shoes and Views: August, 1960.

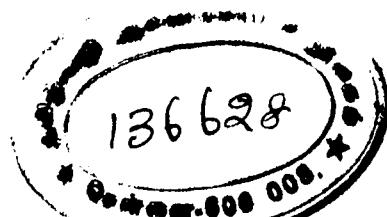
Revolution in shoe manufacture

It seems indicated that slow-process tanning, as we know it, will tend to disappear with all the attendant problems of supply while the whole of the hide industry might easily take on a more stable outlook as the demand for animal fibre, in place of animal felt, becomes the order of the day.

In the field of shoe manufacture the greatest interest is being shown in the possibilities of seamless-moulded footwear. It has always been recognised that present-day method of shoe manufacture involving the processing and treatment of pieces of upper leather, is a cumbersome and not highly efficient way of assembling uppers for shoes and boots.

In the boot industry where so much weight is added to soles and strengthening parts of uppers to give adequate protection and wear, the new reconstituted leather will be an obvious boon.

Shoes and Views: September, 1960.



Hide and skin shipments from Madras, August 1960

Destination	Td. Cow Hides	Td. Cow Calf	Td. Buff Hides	Td. Buff Calf	Td. Goat	Td. Sheep
U.K.	.. 3,019	151	98	171	505	421
U.S.A.	.. —	—	143	63	251	—
Continent	.. 41	33	—	29	811	249
Japan	.. —	—	—	—	—	3

Shoe and Leather Record: September 9, 1960.



Shri K. Kamaraj, Chief Minister, Madras, in the C.L.R.I. Stall at the All-India Industrial & Commercial Exhibition, Madras.

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

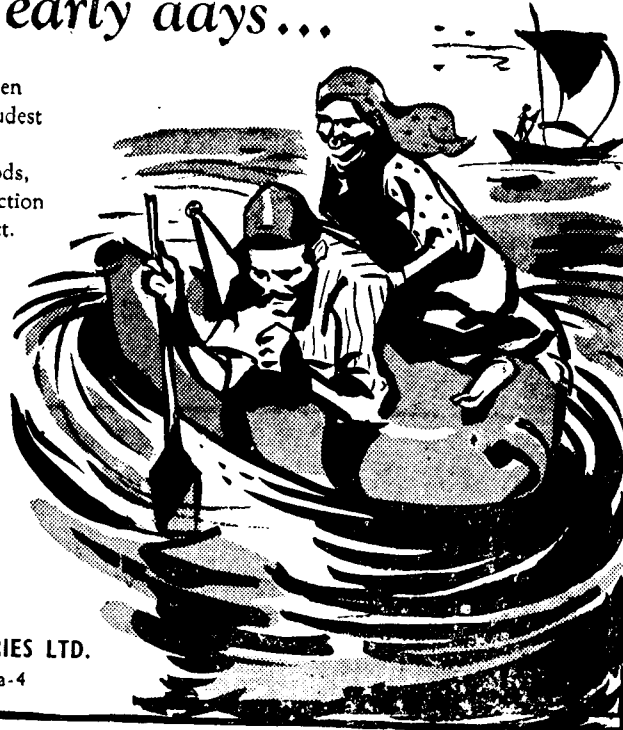
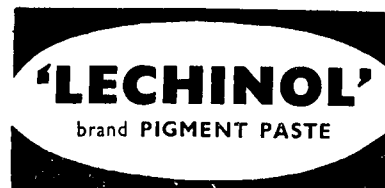
Leather in early days...

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

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- Resin Top ● Waximul 25
- Top Luster etc.

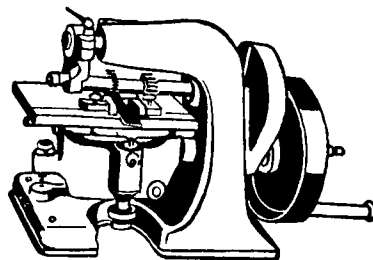
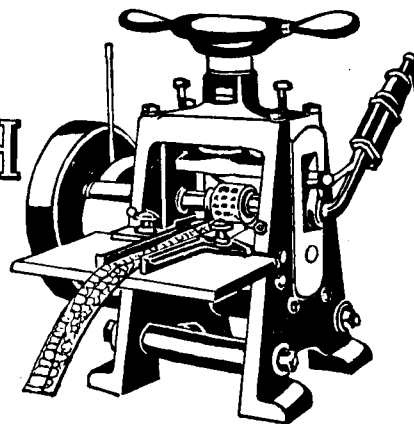
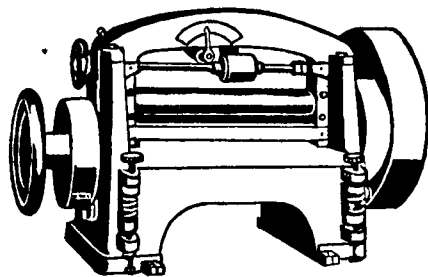


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