Nottingham Section.

Meeting held at Nottingham, on Wednesday,
January 27th, 1915.

MR. J. T. WOOD IN THE CHAIR.

NOTE ON THE ADDITION OF FAT TO TANNIN EXTRACTS.

BY PURAN SINGH

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Some of the cheaper tannin extracts, such as mangrove, have two great defects, viz., their deep red colour and harsh tannage. The best way to overcome the colour difficulty lies in the judicious mixture of pure, unadulterated extracts with light-coloured tanning materials in the tan-yard. But very little seems to have been done by the tannin extract manufacturers to overcome the defect of harsh tannage. The last portion of this paper embodies the results of experiments carried out to overcome this defect. The suggestion came from the work carried out in connection with the fat content in tan barks which forms the first part of this paper.

The probable rôle of fat in tan barks.

It has been noticed that well-known tanning materials giving soft tannage contain naturally more fat than others giving harsh tannage, as is shown in the following table. The air-dried barks were finely powdered and extracted with hot petroleum spirit till they were free from fat. The following were the results obtained :—

Name.	Moisture.	Tannin.	Total petroleum spirit extract.
	%	%	%
Materials giving harsh tannage—			
Sal bark (<i>Shorea robusta</i>)	10.60	6.55	0.14
<i>Terminalia tomentosa</i> bark	6.70	10.76	0.18
Mangrove extract	13.43	70.20	0.03
Materials giving soft tannage—			
Mangrove (<i>Rhizophora mucronata</i>) bark	10.31	23.42	0.26
Gambier, 1st sample	12.42	*42.48	0.82
Gambier, 2nd sample	13.0	—	1.58
Oak (<i>Quercus incana</i>) bark	9.3	13.94	0.26
Babul (<i>Acacia arabica</i>) bark	10.20	11.17	0.26
Do. do. pods	9.80	16.96	0.42
<i>Cassia auriculata</i>	10.8	16.86	1.08
Myrobalans	8.75	51.69	0.25

* Catechin.

† Tannin.

It is thus seen that the tan barks which are known to give harsh tannage contain less fatty matter than those giving soft tannage, nevertheless the ability of certain tanning materials to give soft tannage may be influenced by several factors, of which fat may be only one. Whether the fat in the bark has any influence on the hide during tanning can be gathered by observing whether the fat emulsified into the tan liquor gets absorbed by the leather, and whether the hide when partially tanned and kept in prolonged contact with bark actually absorbs fat from the finely powdered tanning materials in contact. Repeated extraction with water does not remove fat from the bark. The following table gives the fat contents of the materials mentioned above when their tannin has been removed by repeated extraction with water, and after drying the residue and extracting it with petroleum spirit. The results are in fair agreement with those obtained

by direct extraction with petroleum spirit, but in some cases there is a slight increase, which may be due to the elimination of tannin. It seems that the fat occurring in the barks is not emulsified with water and so there is no likelihood of its being absorbed from the water extract by the hide. An additional proof is afforded by the mangrove extract. It gave to petroleum spirit only 0.03%, which shows that in the process of tannin extraction, the fat is not extracted by water from the barks.

No.	Name.	Moisture.	Fat.
		%	%
1	Sal bark	10.60	0.19
2	<i>Terminalia tomentosa</i> bark	6.70	0.20
3	Mangrove bark	11.70	0.30
4	Oak bark	9.30	0.39
5	Myrobalans	0.40	0.19
6	Babul bark	10.20	0.32
7	<i>Cassia auriculata</i>	10.80	0.82

The absorption of the fat by the hide during tanning is quite evident in the case of gambier. The fat in the gambier becomes suspended in water when the material is dissolved, and is absorbed by the hide along with tannin. This fact is supported by the experiments of Garelli and Apostolo (see this J., 1913, 877), showing that insoluble fatty acids simply suspended in water are fixed by skin and tan just as efficiently as when dissolved in alcohol or emulsified in water with ammonium soaps.

The fact that gambier yields soft tannage may be due to its fat content. Experiments were made to see if fat is similarly absorbed by the hide from various other materials. Small pieces of hide (8 grms.) were freed as far as possible from superficial fat by repeated extraction with petroleum spirit and then kept for about forty days in contact with fine powder of different tanning materials in quantities calculated to contain 2 grms. of tannin. The results are tabulated below :—

Material.	Quantity of the tanning material taken, grms.	Petroleum spirit soluble in the tanning materials taken, %	Total fat in the leather obtained, %	Net amount of fat absorbed, %	Percentage of fat absorbed out of total petroleum spirit extract.
Mangrove extract	3	0.0009	0.017	NH	NH
Sal bark	12	0.0024	0.017	NH	NH
<i>Terminalia tomentosa</i>	18	0.0324	0.018	0.001	2.7
Oak bark	14	0.0368	0.020	0.003	8.3
Babul bark	16	0.0576	0.027	0.010	17.1
Babul pods	10	0.0420	0.020	0.003	7.1
<i>Cassia auriculata</i>	11	0.1188	0.022	0.005	4.2
Mangrove bark	5	0.013	0.023	0.006	46.0
Control: pure tannic acid	2	—	0.017	—	—

These small scale experiments cannot be said to be conclusive, as a certain amount of experimental error is unavoidable. It will be seen, however, that the leathers absorbed more fat from the materials giving soft tannage than from those tanning harsh. The percentage of absorbed fat indicates the quality of the fats so far as their absorption by hide is concerned. These results indicate that the hide might in the prolonged process of tanning absorb fat direct from the barks, but it is difficult to say to what extent this absorption really takes place in the tan-pit. In the old process of tanning by contact with barks for several months, it is possible that the fat might have a softening action on the resulting leather. Whether the fat-content of the bark

plays any part in the tan-pit or not, the co-occurrence of fat with such tanning materials as give soft tannage suggests that, possibly as the results of certain metabolic processes in the tree, the tannin accompanied by a certain quantity of fat has the property of giving soft tannage. On the other hand, myrobalans do not contain much fat and yet they tan soft.

Suggested addition of fat to tannin extracts.

The above results suggested the addition of fat to tannin extracts of all kinds in order to reduce the harshness of tannage. Experiments were therefore carried out to see whether the addition of fat to tan-liquors made from solid tan extracts does actually influence the result. The simultaneous absorption of traces of fat along with tannin by hide cannot but be useful in giving soft leather of better texture, if the presence of fat does not retard the tanning process.

Six pieces of hide well-limed, washed, and cut into equal sizes of 12 in. by 6 in., were put in stoppered bottles together with 1 litre each of the tan liquors (2% tannin) made from the solid tan extract of mangrove, sal bark, and myrobalans. In three bottles no fat was added, and in the other three 10% of fat (oil of the seeds of *Schleichera trijuga*) calculated on the tannin content, was added, and all the six pieces were tanned under similar conditions. All the pieces took the same time to be struck through. They were then taken out, thoroughly washed till free from excess of tannin, dried in the shade, equally stretched, and finished off. They were not fat-liquored.

The results obtained are tabulated below:—

No.	Name.	Description of the leather obtained
1	Mangrove with fat ...	Softer and with better texture than No. 2.
2	Do. without fat	Hard though not cracky
3	Sal with fat.....	Distinctly softer and with better texture than No. 4.
4	Do. without fat	Hard though not cracky
5	Myrobalans with fat ..	Soft, hardly distinguishable from No. 6. Texture and surface feel better.
6	Do. without fat	Soft leather.

It will be seen that an addition of fat to the tan-liquors made from the extract improves the leather without retarding the process of tanning, and that the simultaneous absorption of traces of fat, along with tannin, by the hide softens the resulting leather; this effect on the texture of the leather cannot be produced by subsequent fat-liquoring. It seems that the property of tannin extracts which give harsh tannage is somewhat mellowed down. Moreover, the addition of fat would have a protective action on tannin and thus avoid to a great extent the loss of tannin that takes place in tannin extracts on storage. It is therefore suggested that trials should be made in this direction by manufacturers of tannin extracts. Even in case of extracts of such materials as myrobalans, it is preferable to add fat which will have a protective action on tannin, irrespective of the question of the softening action.

The oils and fats ordinarily used for fat-liquoring could be used for the purpose, but it is preferable to have a mixture of oil and fat of the consistence of treacle. About 10% of fat calculated on the tannin content should be added to the vacuum pan, where it should get thoroughly emulsified with the tan-liquors. This fat will be available in a partly emulsified form when the solid extract is made into liquor in the tan-pit or the tanning drum.

DISCUSSION.

In reply to questions, the CHAIRMAN said that hitherto fat had always been applied to thick leathers, such as hides, by currying; in this process the dry skin was immersed in melted fat, or the fat was put on the surface of the moist leather and allowed to penetrate slowly. "Fat-liquoring" was applied to light leathers immediately after tanning: neatsfoot oil was used for the purpose. The addition of fat to the extract in the drum during the tanning process was practised already in certain cases.

Professor PROCTER wrote that the paper was interesting and the idea of using oil appeared practical, though not quite new, especially in drum tannage. He thought drumming with a fat emulsion (sulphated oils) and an extract might also give a very good "raw hide" leather.

Scottish Section.

Meeting held at Glasgow on Tuesday, 27th October, 1914.

MR. ROBERT HAMILTON IN THE CHAIR.

METHOD OF ESTIMATING THE VOLUME OF SOLID MATTER IN MUDS.

BY W. H. COLEMAN.

Some time ago the author was confronted with the following problem: Cyanogen was being recovered from coal gas by passing the gas through a mud obtained by adding ferrous sulphate to gas liquor. The cyanogen liquor obtained consisted of a muddy liquid in which some of the cyanogen was present in the solution as ammonium ferrocyanide and some in the solid form as a complex double ferrocyanide of iron and ammonia. This was contaminated by ferrous sulphide, tarry matter, and other bodies. It became necessary to know how much of the total cyanogen was in the soluble and how much in the insoluble form, and as it was found impossible to filter off and dry the mud without altering its composition, it was not at first quite easy to do this. Finally the following method was adopted and was found to give fairly concordant results. The muddy liquid was well shaken, measured out, and allowed to settle, and the ammonium ferrocyanide determined in the clear liquid: this was called A. To another equal portion of muddy liquid 50 c.c. of water was added, the mixture was well shaken and allowed to settle, and the ammonium ferrocyanide determined in the clear liquid (B). The total $(\text{NH}_4)_2\text{Fe}(\text{CN})_6$ contained in the original muddy liquid was determined (C).

The calculation was made as follows:—

Let x = the number of c.c. of liquid in the 50 c.c. mud taken for (B) before dilution, then as 50 c.c. of water was added, $(50+x)$ is the number of c.c. of liquid in the 100 c.c. after dilution, and this would contain the same total amount of ferrocyanide as was contained in the x c.c. before dilution, provided of course none of the insoluble ferrocyanide went into solution on dilution.

$$\therefore (x \times A) = (50+x) B$$

$$\text{whence } x = \frac{50 B}{A-B} \text{ c.c.}$$

Then $50-x$ c.c. = volume of solid matter in 50 c.c. of the original mud.