

TAMARIX INDICA (KOEN EX ROXB) AS A NEW SOURCE OF TANNIN

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Identification of the nature of tannin and the determination of percentage of tannin and non-tannin in *Tamarix indica* are described. The tannin is found to be of mixed type and the percentage about 15.

Introduction

At present most of the raw materials used in the tanning industry are being imported. On the other hand Pakistan is quite rich in indigenous vegetable tanning materials which if systematically investigated may turn out to be good substitutes for the imported materials.

It is reported¹ that there are more than 100 tannin yielding species which are either growing in our country or can be introduced. In the present work *Tamarix indica*, Koen. ex Roxb. is examined for the type and the quantity of tannin present in it.

Some studies on the tannin of the galls of *Tamarix indica* have already been made. It is reported that they contain from 40 to 50% tannin.² Although the percentage of tannin is quite high, they cannot be exploited commercially because these galls are not abundantly found in the plant. It was therefore considered worthwhile to investigate the nature of tannin in the bark of the plant and thus to evaluate it for commercial exploitation.

Description, Distribution and Uses of the Plant

Tamarix indica grows into a bush or a small green tree. Branches are slender, articulated and leaves are minute, covered with a fine bloom. These are white margined bloom not sheathing the branch on which they are borne, smooth, scale-like but amplexical. Flowers are bisexual, minute, white or pink, crowded on slender paniced racemes at the ends of branches. Capsules are minute, surrounded by a withered perianth.

It is commonly known as *jhau* in Punjabi and Bengali, *ghaz* in Pushto, and *farar* in Urdu. It is found in former Sind, Punjab, and throughout India from the Western Himalayas southwards to the Western Peninsula, usually in river beds.

The wood is whitish, fairly hard but not strong; it is used for construction of wells, poles, rafters, agricultural implements, turnery and lacquered work; it is much used as fire wood especially for steamers on the Indus.

Many galls are formed on the tree as a result of an insect attack. These galls, known as 'Sakun,' contain as much as 50 per cent tannic acid as in oakgalls, and are valuable as a tanning agent; they also contain a dye and gallic acid.²

Method of Extracting the Tannin

For extraction two methods were followed. In the first method³ 200 g. of the powdered dry bark was taken in a muslin cloth bag and kept in a large beaker with 4 times its weight of distilled water. It was then heated in a water bath to about 65°C., extract was taken out and fresh distilled water was added. The process was repeated 6-7 times, when almost all the tannin was extracted out. All the extracts were then mixed together. The total volume of extract collected was about 10 liters. The combined extracts were concentrated under reduced pressure at a temperature not exceeding 60°C. until a semi-solid viscous mass was formed. It was then further dried at a temperature of about 60°C. for 2 days in a shallow dish in an oven. The total weight of the dry material was 46.8 g.

In the second method⁴ 500 g. of the powdered dry bark was taken in the flask of a continuous extractor. It was kept soaked with four times the weight of water for about 3 hours. The flask was then placed in a water bath and the temperature gradually raised to about 60°C. Water was passed continuously into the flask from a reservoir through a tube and the extracts were collected in another reservoir through a second pipe. The process continued for about 7 hours when most of the tannin was extracted out. The total volume of extract was about 30 liters. The extracts were concentrated under reduced pressure as in the first method.

For identification of tannin various qualitative tests were performed.

Method of Determining the Percentage of Tannin

The sample hide powder was digested with 500 ml. of distilled water and to it 150 ml. of 3 per cent chrome alum solution was added. It

was thoroughly mixed by agitating with a mechanical stirrer for about one hour and then transferred to a newly washed linen, filtered and squeezed thoroughly. The hide powder was digested repeatedly and squeezed until the colour of the extract became completely clear. Moisture was determined with 20 g. wet powder. The rest was divided into 3 parts and taken in 3 different bottles. Two hundred ml. of the prepared tannin solution was added to each bottle and shaken in a mechanical rotary shaker for 15 minutes. The solution with the powder was transferred to clean muslin cloth supported over a funnel and squeezed by hand. To each of the filtrate 1 g. of kaolin was added and mixed thoroughly. For complete removal of tannin the solution was tested with 1 per cent gelatin solution. It was filtered over a Buchner funnel twice, when the solution became completely clear. From the clear solution 100 ml. were pipetted out in a weighed clean crystallizing dish, dried and the percentage calculated.⁴ The hide powder and other chemicals used were guaranteed reagents according to the specification laid down by the committee of the Society of Leather Trade's Chemist.

For the identification of the nature of the tannin the following qualitative tests were performed with the extracted solution. The observations noted against each test are given in Table 1.⁵

Fifty g. of hide powder (B.D.H.) was lightly chromed and washed according to the method described. The final weight was about 180 g. With 20 g. of squeezed wet hide powder the percentage of moisture was determined and was found to be 75 per cent. The rest, 160 g. of the wet powder was divided into 3 parts and taken in 3 different bottles. To each bottle 200 ml. of the prepared solution (about 2 percent tannin) was added and shaken in a mechanical shaker for

TABLE 2.—ANALYSIS OF THE BARKS OF
Tamarix indica.

Observations	Total soluble solids %	Tannin %	Non-tannin %	Ratio tannin/non-tannin
1	23.8	15.2	8.6	1.76
2	24.1	15.5	8.6	1.82
3	24.3	15.6	8.7	1.79
4	23.4	15.0	8.4	1.78
Mean	23.9	15.33	8.58	1.79

The results are expressed on dry basis.

TABLE 1.—IDENTIFICATION OF TANNIN IN *Tamarix indica*.

No. Experiment	<i>Tamarix indica</i>	
	Observations	Inference
1. Lead acetate test	Greyish brown ppt.	Condensed tannin present.
2. (i) Formaldehyde test (solution of the material + HCHO + conc. HCl)	Brownish orange ppt.	„ „
(ii) Filtrate from above + iron alum + sodium acetate.	Colour changes to bluish pink.	'Pyrogallol' tannin present
(iii) Filtrate from (i) + urea then boiled	Bulky white ppt.	'Pyrogallol' tannin present
3. Iron alum test	Greyish black ppt.	Condensed tannin
4. Br ₂ water test	Brown ppt.	„ „
5. Solution + HNO ₂ + dil. HCl	No indication	Free ellagic acid may be present
6. Solution + HNO ₃ + HNO ₂	Slight ppt.	Ellagic acid not present
7. Fehlings test	Positive	Free sugars present
8. Fe Cl ₃ test	Greenish black ppt.	Mixed tannin

TABLE 3.—COMPARATIVE TANNIN ANALYSIS.⁶

Constituent	Chestnut wood	Oak bark	Hemlock bark	Quebro- chwood	Man- grove bark
Total solids	14.45	24.24	20.84	28.63	44.00
Soluble solids	13.08	21.77	16.76	23.77	37.28
Insolubles	1.37	2.47	4.08	4.86	6.72
Non-tannin	5.31	9.28	6.59	3.12	8.78
Tannin	7.77	12.51	10.17	20.65	28.51

15 minutes. Each sample was squeezed separately in a muslin cloth and the filtrate tested for the presence of any tannin with 1 percent gelatin solution. To each filtrate 1 g. of kaolin (washed with 1 N HCl and dried) was added and filtered twice to get a clear solution. One hundred ml. of the clear filtrate was taken, dried, weighed and the percentage of non-tannin and tannin calculated. The experiments were repeated three times. The results are shown in Table 2.

For comparison, the analysis of chestnut-wood, oak bark, hemlock bark, quebrocho-wood, mangrove bark are given in Table 3.

Discussion

Qualitative tests show that the *Tamarix indica*

tannin may be of mixed type. Formaldehyde, iron alum and bromine water tests give precipitate showing thereby that it belongs to condensed tannin while reactions with urea, iron alum + sodium acetate tests show that it is a pyrogallol type. The bark contains about 24 per cent soluble matter (on dry basis) out of which the percentage of tannin is about 15 which is considered quite satisfactory from the commercial point of view, because of the abundant availability of the materials. An examination of Table 3 shows that the percentage of tannin as well as tannin - non-tannin ratio in *Tamarix indica* is quite high as compared to tannins of chestnut-wood, oak bark and hemlock bark.

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