

actions have been observed in these extracts,^{1,2,3,4} and it is still unknown whether what partakes in the reaction is either one or both of these enzymes.

In addition to these soluble enzymes, however, it has now been found that tea leaf contains an endo-enzyme which is insoluble in the usual aqueous solvents for enzymes. Thus, extraction of the suitably prepared leaf with water, buffer and glycerine solutions still leaves behind an active enzyme, which would also appear to react during fermentation on the polyphenolic substrate.

The presence of this endo-enzyme can be demonstrated as follows:—

The leaf is well ground with sand under acetone and filtered, repeating the operation several times until all the colouring constituents are extracted. The residue, which is almost colourless, is dried in vacuum, thoroughly extracted with solvent buffer solution and washed well. The insoluble leaf tissue thus obtained gives all the reactions familiar to tea fermentation with a tea extract or theotannin isolated according to the method of Shaw.⁵

To indicate the activity of the insoluble enzyme the supernatant liquid is drained off, the residue washed free of colour, and a fresh tea tannin solution added when again the orange red colour is produced.

Sufficient evidence is at hand to show that this enzyme, which is an oxidase in its nature, is different in characteristics from the soluble tea enzyme. Apart from the obvious solubility differences, it would appear to have an optimum pH between 5.0 and 5.5 and withstands concentrations of KCN up to M/50, the usual oxidase or peroxidase being inactivated far below this concentration. Further, the endo-enzyme acts on high concentrations of tea tannin which, it is shown, would inhibit the action of soluble enzymes. The reaction mixture itself with tea tannin has a bright orange red colour identical with the 'tint' of the liquor obtaining when the fermented leaf is infused.

The further nature of this endo-enzyme, the exact mechanism of its action, and the actual

role it plays in 'fermentation', are being investigated.

H. B. SREERANGACHAR.

Biochemical Laboratories,
Tea Research Institute of Ceylon,
December 17, 1938.

¹ Mann, H. H., "The Ferment of the Tea Leaf, Part I, II and III," *Indian Tea Association, Scientific Department*, 1901, 1903, 1904.

² Oparin, *et. al.*, *Biochemical Aspects of Tea Industry, Georgia, U.S.S.R.*, 1935, 107.

³ Kursanov, *ibid.*, 1935, 125.

⁴ Roberts, E. A. H., and Sarma, S. N., *Biochemical Journal*, 1938, **32**, 1819.

⁵ Shaw, W. S., *U.P.I.S.I., Bull. No. 1 (a)*, 1935.

A Note on the Modification of Shellac with Organic Acids

It has been recognised that shellac is mostly composed of hydroxy acids in the form of condensed esters, lactides or lactones. From the constitution of shellac so far understood, it can be said to contain five hydroxyl groups and at least one carboxyl group. The predominance of a large number of hydroxyl groups, free and combined, led to the idea of modifying shellac by esterification with several organic acids and subsequent reduction of residual acidity by combining the esters with mono or polyhydric alcohols. Such combinations might have specially water and heat resistant properties, an expectation fully confirmed by the results of actual experiment.

Shellac was condensed with several organic acids like maleic, phthalic, succinic, adipic, butyric, malic, etc. Later, phosphoric and boric acids were also included in the list, and useful products were obtained. The condensations could be brought about directly or in the presence of solvents and non-solvents of shellac. The alcohols investigated for reducing the final acidity of the condensation products include glycols, glycerine, butyl alcohol, etc. The modifications possess various degrees of hardness, elasticity and adhesion. A typical preparation with maleic acid which (without the final condensation with alcohols) has given promise of an extended use of shellac for special varnishes, is described below.

A 40 per cent. solution of shellac in industrial alcohol (filtered free of wax) and 5 per cent. maleic acid on the weight of shellac are refluxed for 3-4 hours over a water-bath and cooled. Air-dry films of this varnish on glass and metal sheets possess improved adhesion, gloss, elasticity and water resistance.

Films from varnishes treated with maleic acid and control varnish were prepared on copper sheets (0.065 mm. thickness) baked at 120° C. for 18 hours and examined for appearance, adhesion and flexibility. The following are some of the results:

chemical action of shellac on copper was evidenced by the absence of glossing effect even on prolonged baking, say 18 hours at 120° C. In general, baking such films for 24 hours at 100-110° C. confers better mechanical and water-resistant properties without causing holes or blisters. An example of a practical application of this has been found that aluminium and tin-plate coated with such a lacquer assembly do not peel off or show cracks on repeated bending, bending or folding, or when they are dipped in the lacquer stand up for months without fading of colour or cracking of the

TABLE I

					Appearance	Bending test
Control-varnish	..	..	..	..	Method and Glossy	Flexibility and flexibility
..	..	heated	..	..	..	..
..	..	..	with 0.5% Maleic Acid	..	Smooth film, no greenish colouration	Good elasticity and flexibility
..	..	..	.. 5.0% ..	..	..	..
..	..	..	.. 10.0% ..	..	..	Flexibility and elasticity
..	..	..	.. 20.0% ..	..	..	..
..	..	..	.. 40.0% ..	..	..	..

Uniform films from the same varnishes were next prepared on glass slides and their resistance to water was measured qualitatively. Table II summarises the observations made.

When an alcohol-soluble dye is dissolved in such a varnish, the resulting lacquer has superior colour fastness on exposure to light and heat. Maleic acid treatment also prevents the

film. Such a varnish could be used as a furniture polish.

It has also been found that varnishes from such modified shellac could be plasticized with a per cent glycol phthalate or castor oil, resulting in a further improvement in elasticity without deterioration in properties such as water resistance, etc. It, however, is noted that

TABLE II

Behaviour of films on glass after immersion in water

					4 hours	24 hours	1 month
Control varnish	..	..	..	..	Blush	Blush	Blush
..	..	heated	..	..	Slight blush	..	..
..	..	..	with 0.5% Maleic Acid	..	No blush	No blush	No blush
..	..	..	.. 5.0% ..	..	..	..	..
..	..	..	.. 10.0% ..	..	..	Slight blush	Slight blush

5 per cent. castor oil is used, the resulting varnish coated on copper darkens on baking.

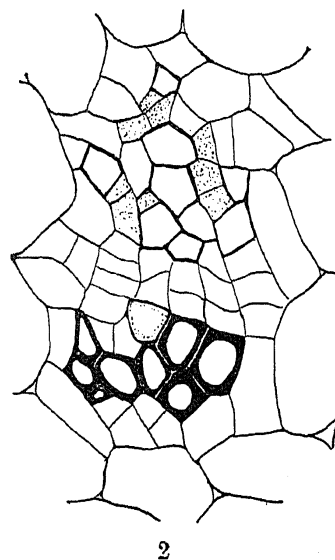
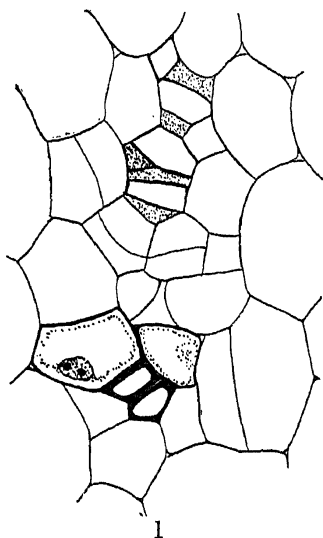
It should be mentioned that addition of more than 5 per cent. of maleic acid to the shellac results in poorer adhesion and elasticity in the varnish film.

M. VENUGOPALAN.

Indian Lac Research Institute,
Namkum,
May 25, 1938.

Intrafascicular Cambium in a Monocotyledon

RECENTLY, while studying the floral morphology of *Iphigenia indica* Kunth (Fam. Liliaceæ),



FIGS. 1 and 2. *Iphigenia indica*

Vascular bundles from transverse sections of two pedicels of different ages. Fig. 1, a young bundle showing differentiation of primary xylem, primary phloem and intrafascicular cambium. Fig. 2, an older bundle, showing the formation of secondary xylem and phloem. $\times 700$.

collected from Krusadai Island, South India, I have come across distinctly active intrafascicular cambium in several parts of the plant. I first observed this in the pedicel, and Figs. 1 and 2 reproduced here are from this organ. Later I observed similar intrafascicular cambium in the vascular bundles of the bracts, young leaves and the nodal regions of young stems. The cambium differentiates along with the primary xylem and primary phloem (Fig. 1), as in a dicotyledonous bundle, and functions in the same manner, forming secondary xylem to the inside and secondary phloem to the outside (Fig. 2), but the amount of the two tissues varies somewhat in different bundles. In some cases, the intrafascicular

cambium gives rise to almost equal amounts of secondary xylem and second phloem, as is the case in Fig. 2, but in others it forms more of secondary xylem or phloem.

The occurrence of intrafascicular cambium in the Liliaceæ has already been recorded in *Hemerocallis*,^{2,4} *Allium*,^{1,4} *Lilium*,¹ *Dracæna*,^{1,6} *Gloriosa*,⁹ *Orinthogalum*,⁸ *Yucca*,¹⁰ *Milla*,¹⁰ *Dipcadi*,¹⁰ *Galtonia*,¹⁰ *Albuca*,^{10,4} *Fritillaria*,¹⁰ *Eremurus*,² *Asparagus*,² *Nothoscordum*,² *Ophiopogon*,³ *Phormium*,^{3,4} *Veratrum*,^{3,4} *Anthericum*,⁴ *Arthropodium*,⁴ *Colchicum*,⁴ *Hyacinthus*,⁴ *Kniphofia*,⁴ *Scilla*,⁴ *Smilax*,³ *Rhipogonum*,⁵ *Asphodelus*⁵ and some other genera,⁷

but there is no previous record of its occurrence in the genus *Iphigenia*.

A. C. JOSHI.

Department of Botany,
Benares Hindu University,
December 12, 1938.

¹ Anderson, S., *Bihang till k. Svenska Vet. Akad. Handl.*, 1888, 13.

² Arber, A., *Ann. Bot.*, 1917, 31.

³ Arber, A., *ibid.*, 1918, 32.

⁴ Arber, A., *ibid.*, 1919, 33.

⁵ Arber, A., *ibid.*, 1922, 26.

⁶ Dauphinaé, A., *Ann. Sci. Nat. Bot. ser.*, ix, 1917, 20.

⁷ Gatin, V. C., *Rev. Gen. de Bot.*, 1920, 32.

⁸ Lonay, H., *Mem. Soc., Roy. Sci. Liege, ser.*, iii, 1902, 4.

⁹ Queva, C., *Trav. et Mem. de l'Univ. de Lille*, 1899, 7.

¹⁰ Sargent, E., *Ann. Bot.*, 1908, 22.