

that were tried, alkali sulphites were found to be the most effective.

Based on the foregoing and other observations, an improved method of oxidative digestion has been developed and will be described elsewhere.

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<sup>1</sup> Narayanayya and Subrahmanyam, *Curr. Sci.*, 1935, 3.

<sup>2</sup> Narasimhacharya, *J.S.C.I.*, 1935, 54, 596 (Abstract).

*Exchangeable Bases in Milliequivalents per 100 gm. of Air-Dry Soil.*

Head of analysis	Soil depths	Cholam*	Cumbu*	Cholam†		
				Before Sowing	At shot blade	After harvest
Soda .. ..	6"-12"	4.03	2.26	1.23	2.98	4.28
Potash .. ..	6"-12"	1.11	0.91	0.82	0.86	1.11
Magnesia .. ..	6"-12"	11.55	13.96	12.55	13.85	13.53
Total bases .. ..	6"-12"	55.31	55.23	56.10	55.70	58.10
Soda .. ..	12"-1' 6"	3.55	2.56	1.36	2.66	3.44
Potash .. ..	12"-1' 6"	0.90	0.95	1.07	1.04	0.99
Magnesia .. ..	12"-1' 6"	14.21	15.35	13.62	12.93	13.48
Total bases .. ..	12"-1' 6"	50.92	50.84	48.00	50.30	50.80

\* Average of six samples.

† Average of three samples.

(ii) the increase is continuous with the growth of the Sorghum crop.

Sorghum or cholam....*Andropogon Sorghum*.  
Spiked Millet....*Pennisetum typhoides*.

It is not known how exactly this increase in Sodium ion is brought about, but it goes a great way to explain the greater deflocculation and the changes in the physical condition of the Sorghum soils, more particularly their reduced permeability.

In addition, a good deal of evidence has accumulated, in the course of our work, which shows that the explanations usually offered for this phenomenon, *viz.*, soil exhaustion, particularly in nitrogen, toxicity due to the decomposition of plant residues are not in themselves adequate. For example, the injury to the succeeding crop is not seen unless the Sorghum crop is allowed to set seed. Addition of nitrogenous manures like Ammonium Sulphate did not remedy the defect nor did the incorporation of Sorghum

**Injurious After-Effects of Sorghum Growing.**

WHILE working at the problem of the injurious after-effects of Sorghum in the black soil tracts of the Tinnevely District, it was observed that, after Sorghum, the soils became much more compact and much harder than after the Spiked Millet and that their permeability was considerably reduced.

When examined in the laboratory, certain striking differences were observed in the cationic composition of these soils the results of which are given below.

It will be seen that—

- (i) the exchangeable soda of the soil is greater when cropped with Sorghum than when cropped with Spiked Millet and

stubbles brought from outside, give rise to the adverse after-effects.

It looks as though other causes than those abovementioned are responsible for the injury; the increase in Na-ion is probably one such.

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**On a Method of Preparing Large Thin Sections of Plants by Grinding.**

IT is a well-known fact that palm-stems show a peripheral crowding of fibro-vascular bundles in their anatomical structure. This

arrangement and the lignification of the sclerenchyma, with the deposition of minerals make the peripheral zone hard and brittle to such an extent in old stems that it is not possible to cut large thin sections by any known means for microscopic examination.

The author while working on the anatomy of palm-stems had to face this difficulty. Various methods for softening such as hydrofluoric acid were resorted to without any success. Ultimately it was thought advisable to harden the entire structure, thus making it possible to grind it to microscopic transparency.

Attempts were made to deposit calcium carbonate and silica inside the cells but it was soon realised that filling the cell cavities with some grindable substance was not enough, as it failed to make the cell walls sufficiently tough to stand the horizontal pull of the grinding. Some substance was required which could be introduced not only into the cell cavities but into the cell wall itself, and later on made to set there with uniform hardness so that it could be ground like a stone. These properties were found in canada balsam, as it is possible to impregnate it uniformly in the whole tissue quickly and without any difficulty with the help of xylol, in which it is miscible in all proportions, and then allow it to set there first by letting the xylol evaporate slowly and then raising the temperature gradually.

For this purpose a transverse slice about 2 mm. thick was cut from a stem with a fine fret-saw. The slice was first boiled in water to drive out all the air and then dehydrated with 50, 70 and 90 per cent. alcohols first quickly and then more slowly, towards 100 per cent. The time varies with the size of the vessels and that of the lacunæ in the ground tissue of the type selected. The whole process up to 90 per cent. takes about 30 minutes. There is practically no harm done by the sudden changes of the grades of alcohol, as the peripheral tissue in palms is always hard enough to sustain the shocks and even the ground-tissue in that zone gets thickened with age. After 90 per cent. alcohol the case is otherwise. The material should be kept in absolute alcohol as long as possible with frequent changes for the purer absolute alcohol. In practice 24 hours are enough. When the dehydration was complete the alcohol was gradually replaced by xylol, and the material was left for another 24 hours in pure xylol. To this,

later on, canada balsam was gradually added and the xylol allowed to evaporate slowly in a bath till a syrupy solution remained. The material in the syrupy solution was kept in the drying bath at a temperature of about 50°-60° C. to evaporate the xylol for 24 hours or less (depending on the thickness of the slice and other factors). On the next day the material was fixed on a glass slab with pure hot canada balsam just as for a fossil slide. The fixed material was ground with fine carborundum powder to a plane surface, and then it was unfixated by softening the balsam by heat and a glass plate fixed with a ground surface towards the glass. Then the other surface was ground down till the section became sufficiently transparent for microscopic examination. When the required thickness was obtained the carborundum powder was removed from the section by washing with xylol and brushing with an ordinary painting brush. The section was then ready for mounting as a permanent preparation.

Generally it is not necessary to stain sections as the tissue is found already differentiated in colour but if staining is required then the balsam should be removed completely by constant washing with xylol and then bringing the material into water and passing it gradually through the different grades of alcohol in reverse order.

The author was able by this method to prepare sections for his investigations in a comparatively short time and without any special difficulty. The time usually lost in sharpening razors was utilised in grinding the material and even such hard and thoroughly lignified and mineralised structures as the old stems of *Bactris major*, *Areca catechu* and *Oreoclerucea* gave excellent results. The sections obtained were thin enough to be photographed under a magnification of 5000 times. Sections prepared by this method are in fact indistinguishable from those prepared by cutting. It is also possible by this method to obtain sections of tissues which are brittle or too fragile to be worked with a microtome. The author has succeeded in getting good sections from a well-developed *Areca catechu* stem, in which case the central ground-tissue was found to be mineralised. In the accompanying illustration the ground-tissue is shown highly magnified. The perfection of the method will be realised from the fact that the lacunar structure of the ground-tissue is seen in

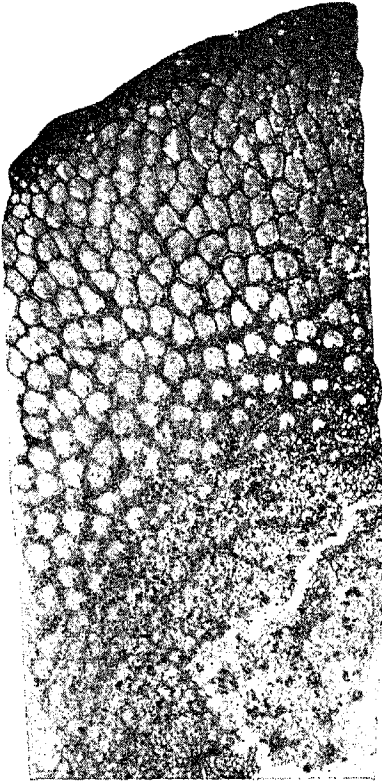


Fig. 1.

*Areca catechu*. Transverse section showing highly lignified sclerenchyma of the fibro-vascular bundles in the dermal, sub-dermal and the central zones.  $\times$  ca 2.

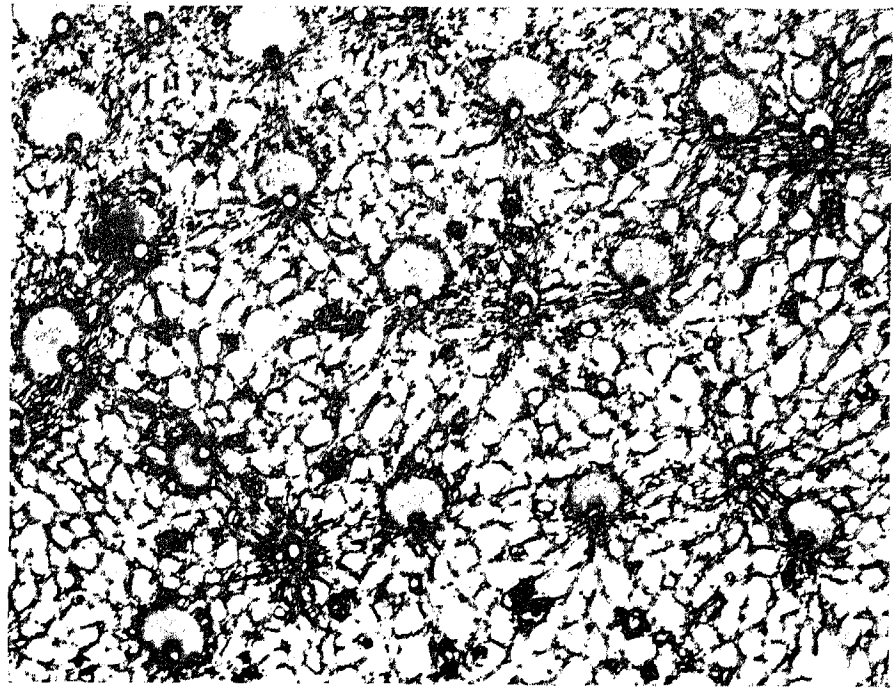


Fig. 3.

The same section. Sub-dermal zone showing the lacunar ground-tissue intact.  $\times 10$ .

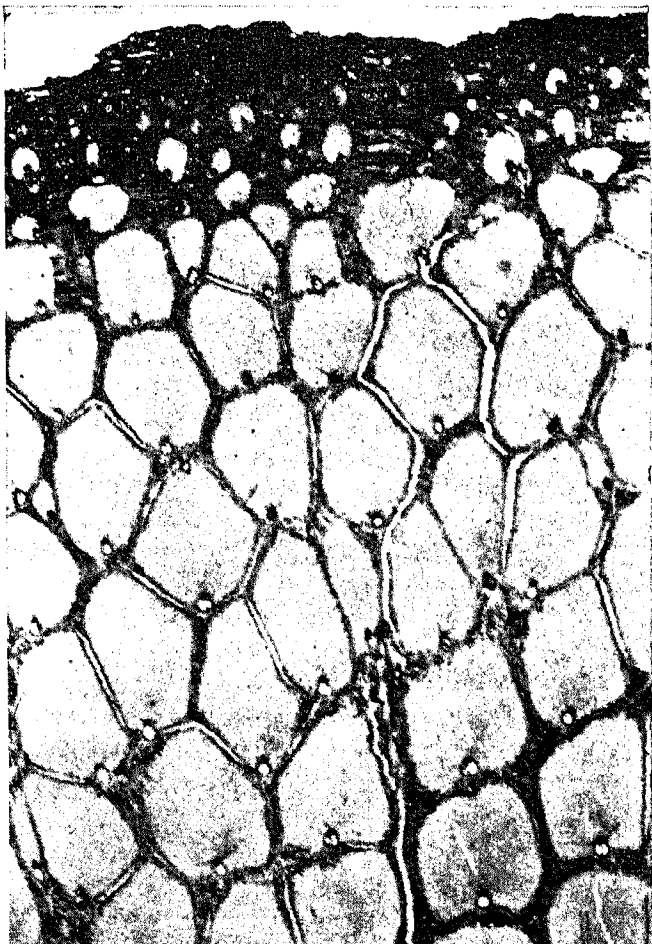


Fig. 2.

The same section. Dermal zone only, showing highly lignified sclerenchyma of the fibro-vascular bundles.  $\times 10$

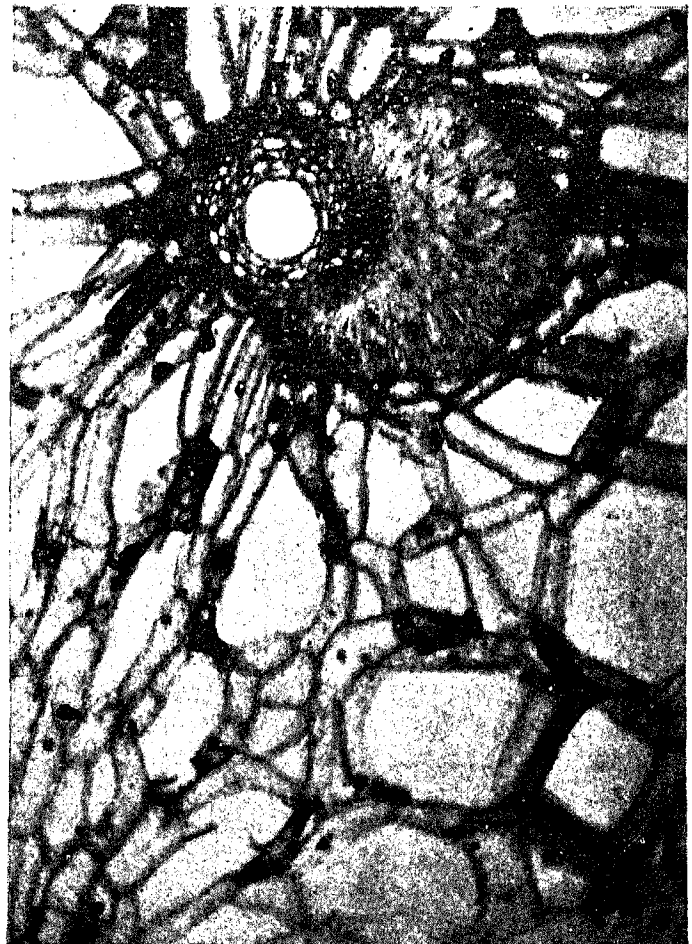


Fig. 4.

The same section. Central zone, highly magnified to show the cell walls of the comparatively soft

and from the perfect, unbroken walls of the individual cells.

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"Dionyle P. W." for Rapid Penetration  
of Fixatives.

It is well known that plant material containing air, for example, flower buds and leaves, etc., does not easily sink to the bottom of the tube containing liquid fixatives specially in those which do not contain alcohol and thus the process of fixation is not as rapid as it should be. When there is plenty of air within the tissues the material remains floating on the surface for a long time or it does not sink at all. Usually suction pumps or water aspirators are used to get rid of the air but in many cases even these are not of much help.

A French Engineer Chemist, Mr. Auguste Blondon of the firm S.A.P.I.C., 33, Quai de Seine, L' Ile-st-Denis, Paris, has recently manufactured a chemical product in the powder form known as Dionyle P. W. which, if added to any plant fixative, allows the material to settle to the bottom with great ease. I have seen Dr. A. Eichhorn using this chemical very successfully with roots, flower buds, etc. I myself have used it with success for fixing the aërial mycelium of *Pythium*. Dr. G. Archambault<sup>1</sup> has tried this chemical and is of opinion that it is very good for rapid penetration of fixatives. He compared the sections of plant material fixed with and without Dionyle in the fixatives and found that the addition of the chemical did not produce any undesirable effects. It has some physical action on account of which pieces of roots sink down rapidly in the fixatives, but in case of leaves and flower buds water aspirators may have to be used for about 2 to 5 minutes. Dionyle is an ether salt of  $\beta$ -naphthalene sulphonic acid with butylic alcohol and isopropyl alcohol. It is easily soluble in water and is neutral in reaction. During the process of its manufacture a little sulphuric acid appears which is neutralised by sodium sulphate, which is not bad for fixation.

In fact it is used in Zenker-formal<sup>2</sup> fixative the composition of which is given below :

Bichloride of Mercury	.. 5.0 gm.
Bichromate of Potassium	.. 2.5 gm.

Sulphate of Sodium	.. 1 gm.
Distilled Water	.. 100 c.c.

To 9 c.c. of this add 1 c.c. of neutral formaline at the time of using the fixative.

Dr. Eichhorn adds Dionyle to any fixative whatever its composition may be.

In France this chemical is used as steeping agent in Dyeing Industry of wool and cotton in the proportion of 0.4 gm. per 100 c.c. of water. Dr. Eichhorn and Dr. Archambault use the same proportion for plant material. It is added to the fixative before the material is put for fixation or even afterwards. It is not necessary always to weigh it.

The Dionyle P. W. is very cheap and can be had from N. Boube & Cie, 3 place St.-Andre-des-arts, Paris (VI). The price for 50 gms. is 4.50 francs and for 100 gms. is 8 francs, i.e., Re. 0-14-0 and 1-10-0 respectively according to the present rate of exchange. It is better to keep it in glass-stoppered bottles.

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At Present :—

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<sup>1</sup> Archambault, G., *Revue de cytologie et cytophysiologie Vegetales*, 1935, 1, 173-174. (Published by Prof. Guilliermond, Paris.)

<sup>2</sup> Laugeron, M., *Precis de Microscopie*, Masson, Paris, 1934, pp. 342.

A Rare Instance of Change of Tropism in  
*Arachis Hypogaea*, Willd.

THE ovary of the groundnut flower, after fertilisation, develops a stalk or gynophore at its base. It elongates rapidly carrying the ovary at the apex which piercing the soil buries the ovary, where it develops into a pod. The structure of the gynophore is almost the same as that of the stem. But, peculiarly enough, while the stem is negatively geotropic, the gynophore is always positively geotropic. This tendency is shown very early even when the gynophore is just a few millimetres long. In 1932, the authors came across a unique specimen of a groundnut plant of A.H. 32—a Spanish Bunch variety, grown under dry conditions (Fig. 1) in which the "pegs" or gynophores exhibited different degrees of geotropism:—14 pods