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Spodogram – A Useful Technique for Studying Silica Deposition in Plants

by

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Silica deposition in plant material is usually studied by examining epidermal peels. These peels are obtained either by working with a razor (Prat, 1932) or by using a macerating fluid like sulphuric acid and potassium dichromate (Suryanarayana and Krishnaswamy 1948; Parry and Smithson, 1958) and mounting them in Canada-balsamphenol mixture.

A better method of studying the arrangement of silica deposits *in situ* is by 'spodograms', which are mounted ashed material on glass slides (Uber, 1940). The evolution of spodograms and the latest methods have been detailed in this paper.

The spodogram technique : Usually transverse or longitudinal sections are used in the preparation of spodograms. For thinner plant parts like leaves, Molisch, (1920) was successful in getting a clear silica skeleton by incinerating the entire tissue. By following this method Okki (1932) studied in detail the spodograms of leaf blades of the Japanese *Bambusaceae* including in his study six genera and various species and found that the silica pattern was constant and distinct for each species. Okki (1932) in his preparation of spodograms ashed the material in special chambers and then removed it carefully without breaking it and mounted the same on glass slides in Xylol and canada balsam. The method of ashing on the slide itself was divided by Werner (1929). The curling up of the tissues was prevented by the use of cover-glasses in this case.

Although there were many methods of ashing the material, the use of a muffle furnace as suggested by Husmann (1930) was found to be the most convenient, since the ashing temperature could be accurately controlled by a pyrometer. A temperature of 450°C was found to be necessary for ashing the material and if it exceeded 475°C, the glass slide was found to melt and warp (Ponnaiya 1951).

The leaf sheath bit was placed flat on a clean microscope slide and was covered with another microscope slide. The pair of slides with the leaf tissue in between was heated in the muffle furnace. The temperature was gradually increased to 450°C., in the course of an hour. If tender leaf sheaths (third and fourth) were used, it was found to be ashed completely by the time 450°C was

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reached. But tougher material had to be kept for an hour more at the same temperature for complete ashing. The ashed material presented a whitish appearance if all the carbon was oxidised. After giving sufficient time for the ashing to be completed depending on the nature of the material, the temperature of the furnace was allowed to fall below 100°C and material was taken out and the top slide removed. Permanent preparations of these incinerated "spodograms" on microscope slides were prepared by addition of two to three drops of xylol over the ashed material followed by direct mounting in canada balsam. There was no need to pass the material through alcohol-xylol grades, since incineration fulfils the purpose of this process, viz., dehydration. The slides were allowed to dry overnight at 35°C and the resulting spodogram preserved and examined.

The author during the course of his investigation realised that an ordinary house-hold electric stove could be satisfactorily substituted to the muffle furance. The following modifications, however, were found necessary for the efficient working of the contrivance. The desired temperature was obtained by careful manipulation of the length of the heating coil.

Shutting off any cold blast of air immediately after the completion of incineration prevented cracking of the slides from sudden cooling. The contact between the slide and the coil should be avoided to prevent their fusion. With these simple precautions the ordinary electric stove was used with great facility and the spodograms were comparable to those obtained with the muffle. The elegance of the technique was reflected in the quickness of incineration possible due to a more rapid oxidation of the organic matter in the open than in the closed space of the muffle and the advantage of controlling the time of incineration according to the nature of the material to be ashed which was always in view. The ashed preparations were directly mounted with dilute Canada balsam. A 1:1 mixture of phenol, Canada balsam made the silica deposits more refractive and gave a clearer picture.

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Effect of Continuous Application of Fertilizers and Manure on the Yield and Composition of Certain Crops-1. Effect on *Ragi (Eleusine coracana)*

By

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Ragi forms one of the most important staple food crops in India and yet enough effort has not been made to assess precisely its response to manures and fertilizers. The importance of nitrogen in increasing cereal yields is widely accepted (Lipman, 1932; Karunakar, 1951 and Church, 1956). However, contradictions in opinions exist on the effect of nitrogen in increasing protein content in cereals. Ohlrogge (1949) and other workers opined that large increase in yield in relation to nitrogen was not accompanied by any change or decrease in protein, on the other hand, reverse was also true (Bisset and Andrews, 1954; Huppert and Buchner, 1957 and Miller, 1958). But instances at which higher doses of nitrogen decreasing protein content were also met with (Patterson, 1932). The indirect influence of nitrogen also found by its enhancing effect on the translocation of P from vegetative parts to grains (Bennet, 1939). Besides nitrogen, the effect and usefulness of P and K for satisfactory growth of *Ragi* crop have been reported by Govindarajan and Venkata Rao (1952) Thus a judicial combination of N, P and K was visualised and recommended for *Ragi* crop (Mariakulandai, 1960; Venkataramana and Krishna Rao, 1961 and Sanyasi Raju, 1952).

The effect of fertilizers on the quality of cereals is another important factor to be studied carefully. At present there seems to be no definite basis for predicting an increase in protein content of a crop as a result of N fertilizer

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