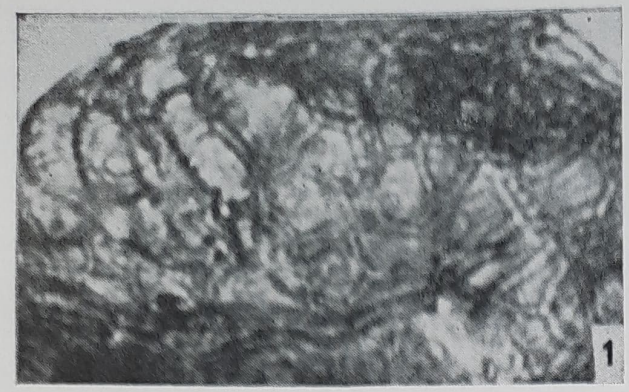
In the recent gymnosperm families Pinaceae and Podocarpaceae the pollen are mostly bisaccate, with a central body (corpus) and two sacci. The saccus is a pouch-shaped hollow structure with sexine as its outer wall and nexine as the inner wall (the central body), that is—the sexine gets loosened from the nexine and the baculoid layer (endosexine) remains sticking to the under layer of the tactum (ectosexine). The air-space between the two layers of the exine increases and a "true saccus" is formed (ERDTMAN, 1952; HARRIS, 1955; POTONIÉ & KREMP, 1955).

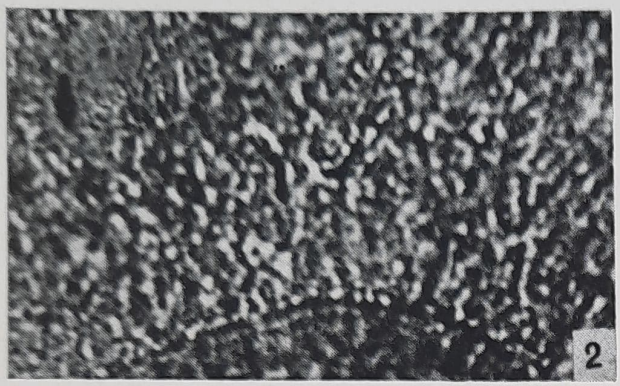
The structure of saccus in all the fossil disaccate pollen, particularly from Permian and Triassic, was considered to be similar to that of the recent Pinus pollen till 1974 when SCHEURING established that in a number of genera in Disaccites the saccus is not a 'true saccus'; it is not hollow but filled with complex, remifying alveolar (network-like) system composed of the collumellar layer of the sexine. To such a "spongy" saccus he termed as "Protosaccus". Later studies of living (KLAUS, 1979) and fossil (SCHEURING, 1978) pollen further established the differences in these two lines of morphography.

The presence of protosaccate condition in the saccate pollen genera of *sporae dispersae* from Gondwana deposits is being reported here for the first time. Inspite of indicators in light microscopy, such an evidence could only be established through the SEM study. In light microscopy, however, the pattern of "double-intrareticulation" described by TIWARI (1964) is an exhibition of protosaccate condition. In such a pattern, big meshes appear to enclose finer meshes; this could be seen under the high-power objective in low light (Pl. 1, Figs. 1, 2). In addition to this, the L-O analysis of a very small area (for example—5 $\times$5 μ) on the saccus surface deciphers the nature of the saccus. The most important region for determining whether the saccus is filled with meshes (protosaccus) or is a hollow pouch (true saccus) is the equatorial outline of the corpus (nexine) at the saccale region—i.e., the line between two points from where the saccus is blown. If the body equator in the saccus region (saccale) is smooth, having no muri attached to it, the saccus is not filled with the infrareticulation (or the alveolar system). Side-by-side comparison with the pollen of living Pinus shall provide better conceptual understanding of this phenomenon.

A SEM study of some Raniganj (Upper Permian) pollen indicates that the alveolar system fills the inner cavity of the sacci. In one of the disaccate nonstriate pollen (Pl.1, Fig. 3) the saccus has just given way near the body junctions and the internal alveolar filling could be seen clearly. In another specimen (Pl. 1, Fig. 4) the tectum from a small area has been removed through which one can peep inside to note the filling of the saccus lumen with network of thick muri. Similar specimen (a striate disaccate; Pl. 1 Figs. 5, enlarged in Fig. 6) depicts an area in saccus from where the tectum has been removed and meshes could be seen. When enlarged, the walls of these meshes show the presence of collumnar vertical thickening. The general surface of the compressed pollen here shows a pattern of wavy, smooth moulds which are low elevations. The examination at the body-saccus-junction also clearly indicates an alveolar filling of the saccus.

The function of protosaccus, which obviously is primitive in comparison to the recent one, i.e. true-saccus with lumen, seems to be related with the steering of the orientation of distal sulcus towards the micropylar canal, rather than floating in the air or in the fluid (also SCHEURING, 1974). The present evidence of such filled-saccus in Gondwana


1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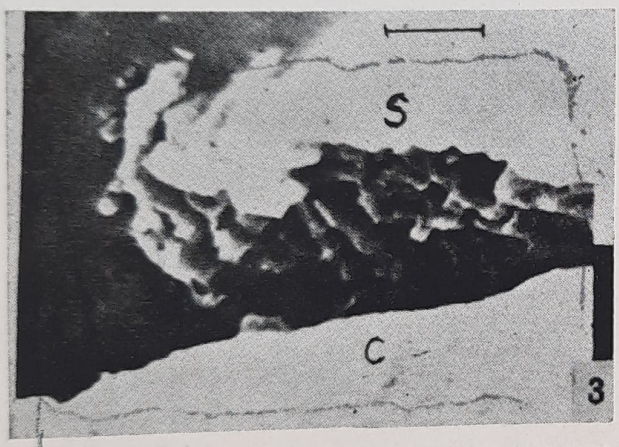
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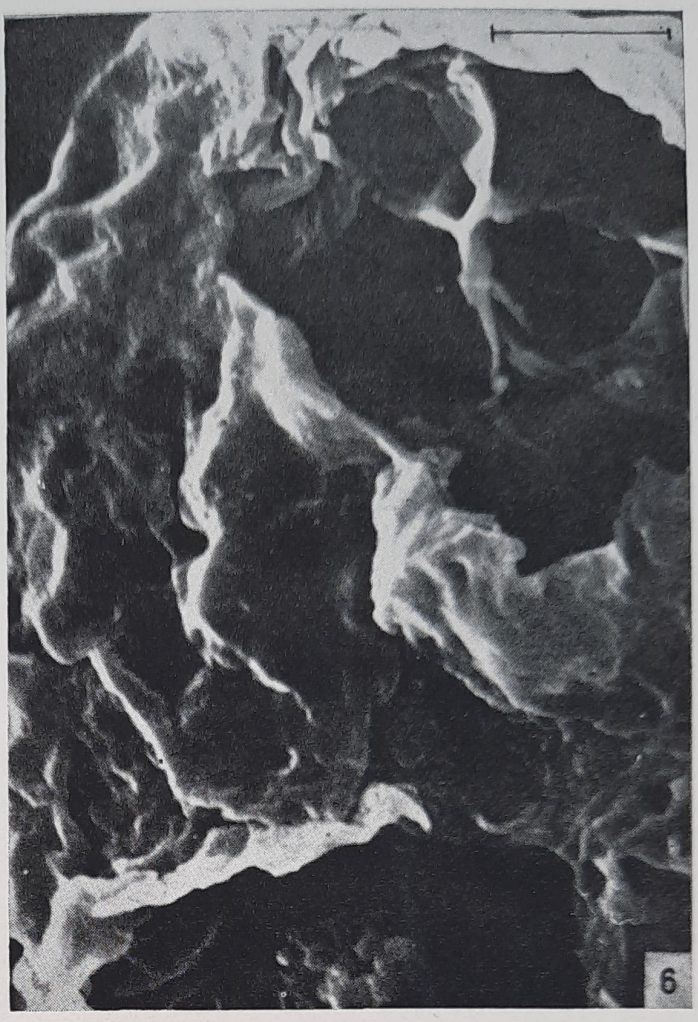
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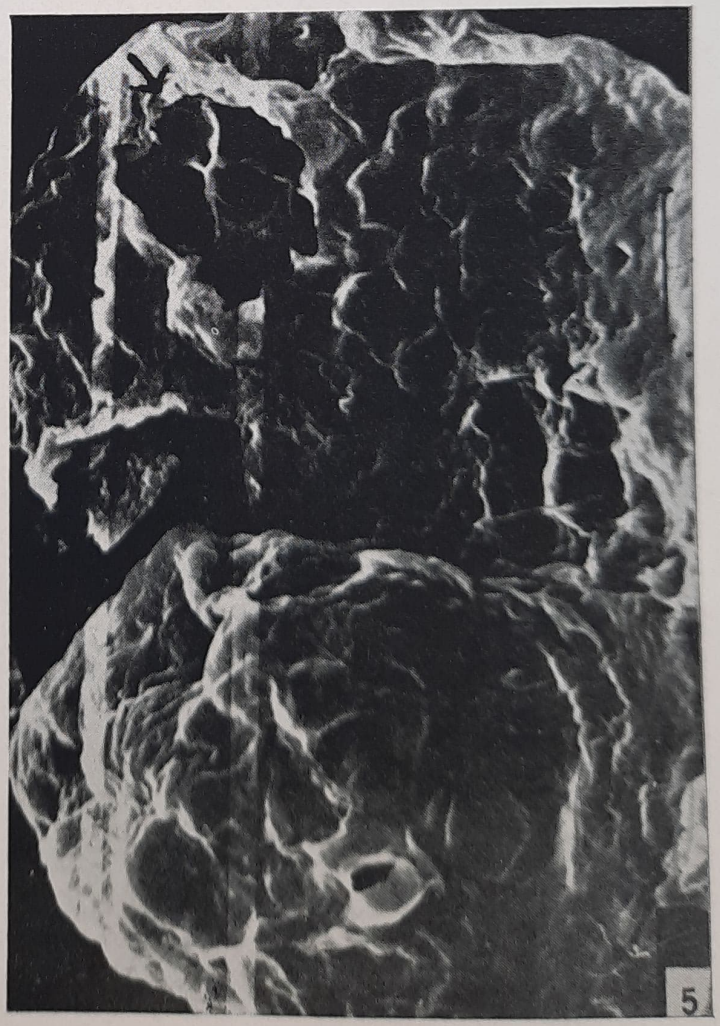
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sporae dispersae now extends their range of occurrence from northern to southern hemisphere irrespective of the basic differences in floral constituents amongst the two regions; that the protosaccatism is a great event in plant evolution—global in incidence and marked in geological time—is evident from this discovery.

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EXPLANATION OF PLATE 1

1, 2. Saccus portions (light microscopy) enlarged to show double-intrareticulation, suggestive of a protosaccate condition, (×1000) ; 3. S—Saccus, C—body, Saccus-body junction showing infilling of protosaccus with alveoli, SEM ; Scale line=15 μ ; 4, Tectun portion removed, showing internal cavity of protosaccus filled with alveoli ; SEM, scale line=15 μ ; 5. Disaccate pollen showing general surface and a small broken portion (arrow) showing internal reticulation—same enlarged in Fig. 6 to show verticle walls with thickenings. Scale line in Fig. 5=10 μ, in Fig. 6=5 μ.