

### A Glossopteridean Fructification from India

ABOUT six genera of reproductive organs have been described as belonging to the *Glossopteris*<sup>1-3</sup>. Some other types have also been reported from time to time<sup>4-8</sup>. Only a few of them occur in India<sup>9-12</sup>. The fossil described here came from Pachwara Coalfield, Bihar (basal Barakar—Lower Permian).

The so-called fructification is a mould-like structure on very fine greyish clayey shale. It compares favourably with the structure of the genus *Lanceolatus*<sup>1</sup>. The leaves associated with it cannot be determined accurately because of their bad preservation. They are simple and lanceolate in shape. Their well-developed midribs and crowded anastomosing veins clearly resemble those of some members of the *Glossopteris*.

It is assumed that the two overlapping leaves completely cover the upper half of the leaf to which the slightly raised fructification is attached (Fig. 1). The hollow nature of the midrib bearing the fructification is not clear possibly due to its poor preservation.

The fructification seems to be fully mature, lanceolate and slightly raised (14 × 7 mm). There is a deep groove along the periphery of the fructification. Immediately above the point of attachment of the fructification there is a slightly raised structure, which is perhaps the remnant of the cupular covering. It is almost sessile and grows from the midrib of the leaf; but the actual distance from the leaf-base cannot be determined due to the broken nature of the specimen. The surface shows shallow depressions of many embedded, small, more or less oval bodies (0.9 mm-1 mm), which may be the ruptured seed- (or pollen-) bearing sacs (Fig. 2).

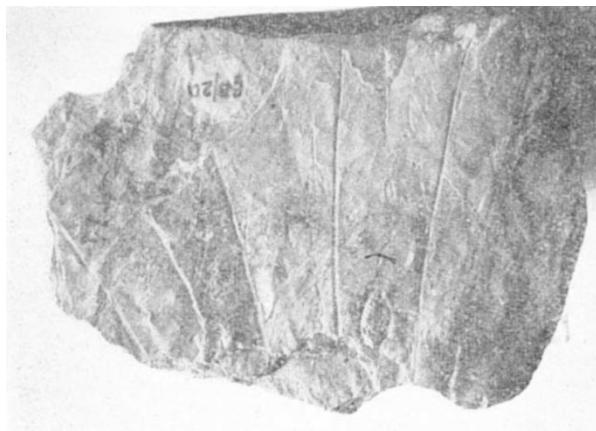


Fig. 1. *Lanceolatus* type of fructification attached to a leaf of *Glossopteris*. The head is slightly raised. Slightly reduced from natural size



Fig. 2. Magnified view of the fructification pitted with hollow depressions which are believed to be ruptured sacs. (× 3)

It appears, therefore, that this type of fructification can only be compared with that of *Lanceolatus* type. The only other similar record from India comes from Murulidih Colliery in Jharia Coalfield, Bihar (Raniganj—Upper Permian)<sup>11</sup>. This shows that the genus at least occurs from the basal Barakar to Raniganj stage, that is, Lower Permian to Upper Permian of India.

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### A Reversal Effect with Pauses on Mixed Schedules of Reinforcement

FIXED ratio (*FR*) schedules of reinforcement typically generate behaviour that occurs with high probability just before reinforcement, but that is unlikely to be repeated for at least a little while afterwards. Also, these post-reinforcement pauses depend on the length of the ratio. Pauses are normally short when the ratio is small and are longer when a larger number of responses is required per reinforcement<sup>1</sup>. In the case of simple *FR* schedules it is impossible to decide whether longer pauses follow longer runs because these runs generate more reactive inhibition than do short runs<sup>2</sup> or because on high ratios organisms have 'a long way to go' between reinforcements<sup>3</sup>, because run lengths before and after reinforcements are equal.

But the relative effects of pre- and post-pause response runs on pauses after reinforcements can be investigated by means of alternating mixed *FRFR* schedules of reinforcement in which reinforcements are given at the end of each ratio. The alternating ratios can be made unequal, and if pre-reinforcement run lengths alone are responsible for the duration of post-reinforcement pauses then long pauses should follow long runs and short pauses come after short ratios on the average. If pauses depend on the amount of responding required before the next reinforcement, then the reverse will be true.

Findley<sup>4</sup> has published observations which appear to show that pauses are a function of ratios they precede. Salman<sup>5</sup>, on the other hand, found that a rat trained to bar press on an alternating multiple schedule *FR4FR93* consistently made longer median pauses after the longer than after the shorter ratio, and the same was true, but less marked, of two other animals reinforced on *mult. FR27FR73* and *mult. FR10FR57* respectively. (On multiple compound schedules a different external stimulus is correlated with each segment of the schedule. This condition obtained in the Findley and Salman experiments. The present experiment utilized mixed schedules in which the external stimulus is the same for all components.) Salman's findings if compared with those of simple *FR* schedules indicate that it is the ratios they follow that have the major controlling influence over post-reinforcement pauses. However, when the schedules of the latter two animals were changed to *mult. FR3FR31* the effect was reversed; median post-reinforcement pauses became