

A GANGAMOPTERID LEAF FROM RANIGANJ FORMATION

USHA BAJPAI

Birbal Sahni Institute of Palaeobotany, 53 University Road, Lucknow 226 007, India

Abstract

A gangamopterid leaf has been described from Raniganj Formation of Raniganj Coalfield, West Bengal. On the basis of external morphology it resembles a *Gangamopteris* leaf but on the basis of cuticular structure it is closely comparable to *Glossopteris intermittens* Feistmantel and *Palaeovittaria kurzii* Feistmantel.

Introduction

The Lower Gondwana sediments of India are characterised by the presence of vast quantities of tongue-shaped gymnospermous leaves which, on the basis of external morphology, have been grouped into several genera, viz., *Gangamopteris*, *Glossopteris*, *Rubidgea*, *Palaeovittaria*, *Rhabdotaenia*, etc. The Lower Permian Talchir and Karharbari formations mostly have *Gangamopteris* and *Rubidgea* while the Middle-Upper Permian Barakar-Raniganj formations are dominated by *Glossopteris* with the occasional presence of *Palaeovittaria* and *Rhabdotaenia*.

Occurrence of the genus *Gangamopteris* in the Raniganj Formation is rather rare. Feistmantel (1876, 1880 b) reported *G. cyclopteroides*, *G. hughesii*, *G. whittiana* and *G. anthrophyoides* from the Raniganj Formation. Srivastava (1957) described epidermal features of four species of the genus, viz., *G. flexuosa*, *G. indica*, *G. sp. A* and *G. sp. B* from the Raniganj Formation of East Raniganj Coalfield, West Bengal. However, the occurrence of the genus *Gangamopteris* in the Raniganj Formation has been doubted by many workers. For example, Chandra and Surange (1979, p. 58) merged all Srivastava's specimens under different species of the genus *Glossopteris*.

In the present paper a fan-shaped gangamopterid type of leaf has been described from Raniganj Formation. There is only a single incomplete specimen collected from the Mahabir Colliery, Raniganj Coalfield.

The genus *Gangamopteris* was instituted by McCoy (1875) for certain simple leaves from the Permian of Australia. These leaves lack a definite midrib and their median region shows either ordinary meshes or possesses a vascular system comprising a number of longitudinally running parallel strands which often dichotomise giving off lateral veins which further dichotomise and anastomose to form a regular mesh work. McCoy described 3 species of the genus. Feistmantel (1876, 1879, 1881 etc.) described 6 more species of the genus, besides the 3 McCoy species, from the Lower Gondwana sequence of India. However, most of his specimens were from the Talchir and Karharbari formations and very few from the upper formations. Pant and Singh (1968) examined cuticular features of a few species of the genus *Gangamopteris* and accordingly gave an emended diagnosis.

Description

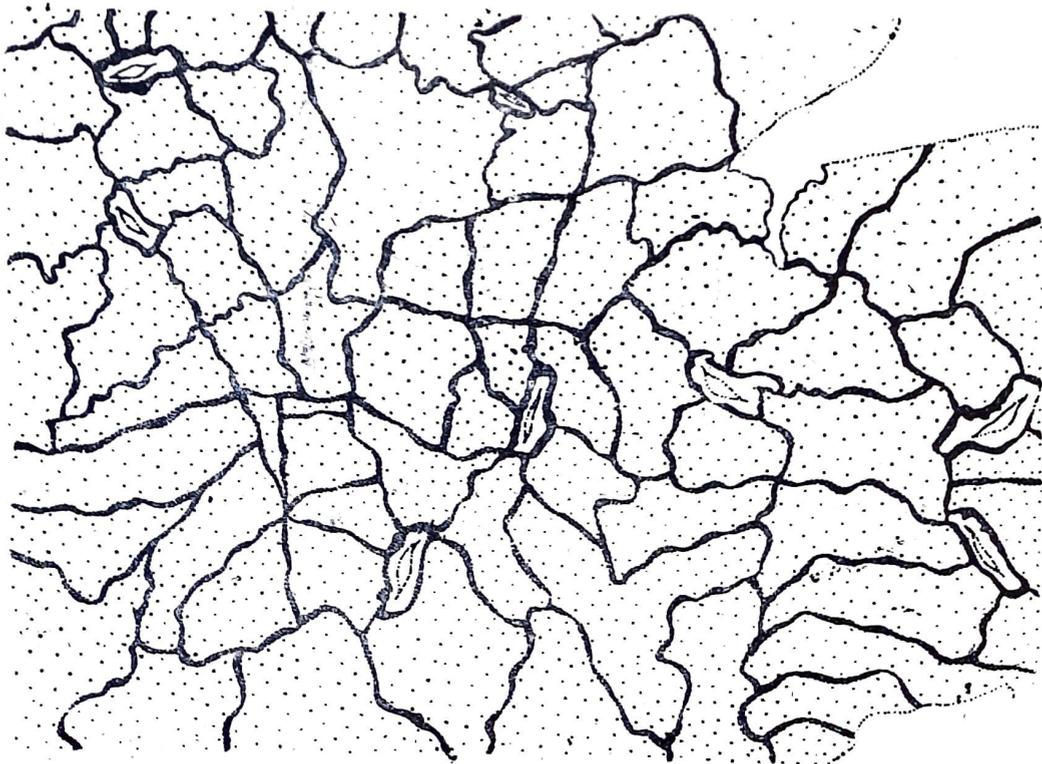
Specimen incomplete, representing only apical part of a leaf, 8.8 cm in width at widest, margin entire, overall shape probably obovate. Lamina with a large number

of secondary veins, running sub-parallel to lateral margins, veins dichotomise and occasionally anastomose to form narrow elongate meshes. Neither a midrib nor a median set of vascular strands seen (Pl. 1, figs. 1-2). Patches of a carbonified crust remain on the specimen. Cuticle fragile, only small pieces recovered through acid/alkali treatment. One of the surfaces showing better preserved cellular outlines and also stoma (? hypostomatic). Cellular outlines on other surface rather dim except over veins. Cuticle of stomatiferous surface relatively thin, vein and mesh areas clearly marked by cell shape and stomatal distribution (Pl. 1, fig. 4). Cells over veins longish, rectangular, arranged end to end, 201-492 μm long, 37-43 μm broad. Cells in mesh area irregularly polygonal, 30-43 μm in diameter. Lateral and end-walls straight, surface walls unspcialised. Stomata present only in mesh areas, distribution and orientation of stomata irregular. Stomata anomocytic, slightly sunken, dumb-bell shaped guard cells enclosing a narrow linear aperture, subsidiary cells 4-6 in number, not forming a definite ring, unspcialised (Pl. 1, fig. 5). Guard cells measure 56-62 \times 37-43 μm .

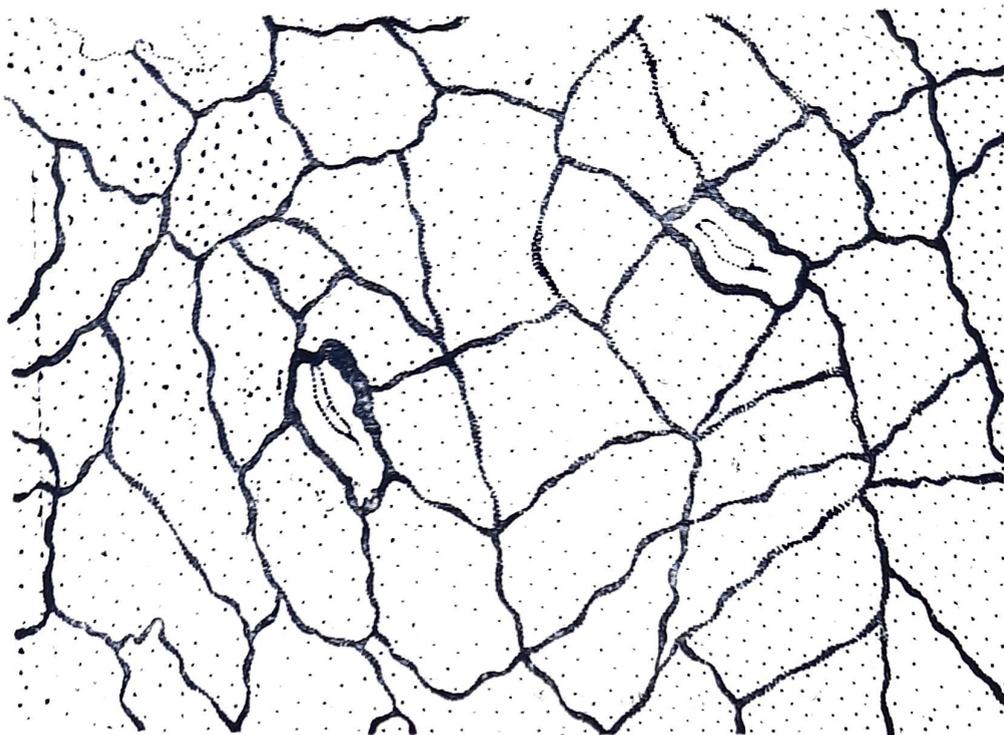
Cuticle of non-stomatiferous surface (Pl. 1, fig. 3) relatively thick and brittle breaking into small pieces during acid/alkali processing. Cellular outlines not clearly marked except occasionally over the veins, cells measure 132-256 \times 31-43 μm and are similar to those of stomatiferous surface and unspcialised.

Discussion

Though the specimen is rather incomplete it is clear that it can not be a specimen of a *Glossopteris* leaf as it lacks a midrib. Even definite median strands are absent. The presence of anastomoses of the veins forming definite meshes rules out the genus *Palaeovittaria* also. Therefore, it is likely that this specimen represents a leaf of the genus *Gangamopteris*. Due to fragmentary nature of the specimen, however, it is not possible to state definitely that the specimen does represent a *Gangamopteris* species. The cuticular



Text-fig. 1. Lower epidermis showing guard cells, subsidiary cells, veins and mesh areas. $\times 100$.



Text-fig. 2. Slightly sunken stomata with dumb-bell shaped guard cells. $\times 425$.

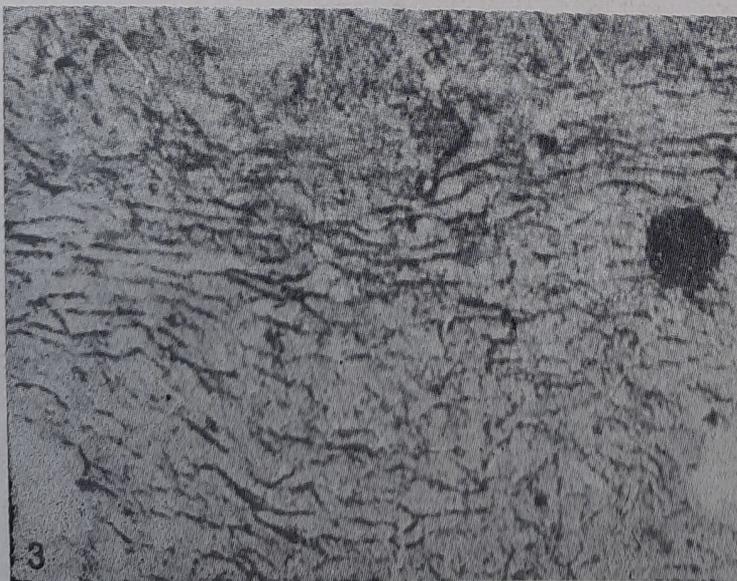
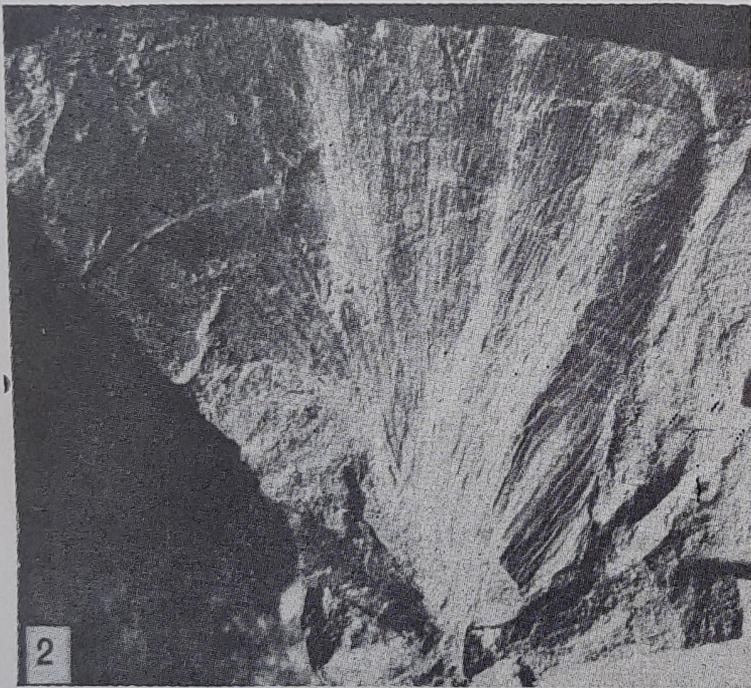
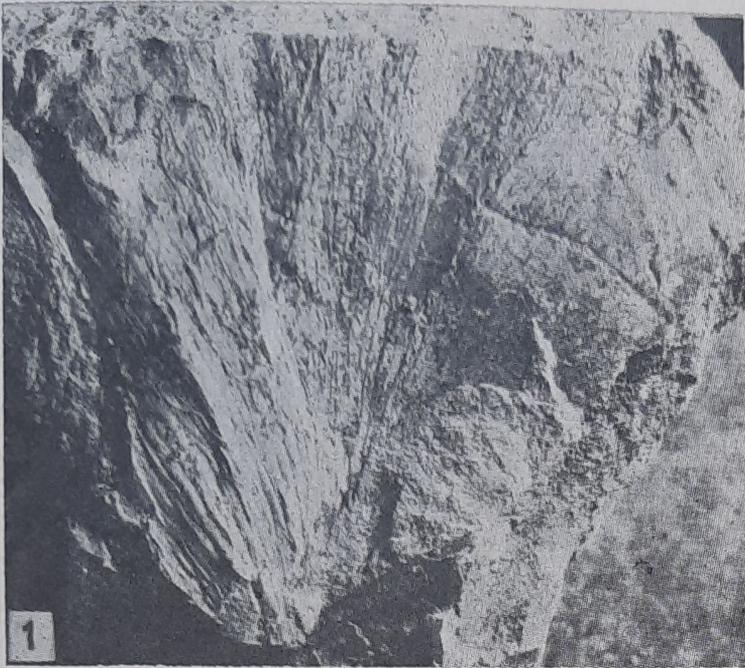
features also do not help. On the basis of epidermal features, so far it has not been possible to delineate the various glossopterid genera of leaves. Pant and Singh (1968) described and illustrated cuticular features of five species of the genus *Gangamopteris*. Of these *G. obtusifolia* is amphistomatic whereas *G. cyclopteroides*, *G. papillosa* and *G. hispida* show a few stomata on the upper cuticle also. *G. indica* is hypostomatic but the cells of the lower cuticle are distinguishable by the presence of a single, median papilla in each. Thus on the basis of cuticular features the Raniganj specimen is different. The cuticle of the Raniganj specimen on the other hand shows very close resemblance to those of *Glossopteris intermittens* Feistmantel and *Palaeovittaria kurzii* Feistmantel (see Srivastava, 1957) and is another example of glossopterid cuticle group 6 of Surange and Srivastava (1957, table 1, p. 48). It is therefore apparent that different genera of glossopterid leaves, based on morphological characters, may have closely resembling epidermal features and these characters of the epidermis may not be suitable criteria for delimiting or demarcating the different genera.

Acknowledgement

The author is indebted to Dr H. K. Maheshwari, Assistant Director, Birbal Sahni Institute of Palaeobotany for discussions and constructive suggestions during the course of investigation.

References

- FEISTMANTEL, O. (1876). Notes on the age of some fossil floras in India. *Rec. geol. Surv. India*, 9(3) : 63-79.
 FEISTMANTEL, O. (1879). The fossil flora of the Gondwana System. I.—The flora of the Talchir-Karharbari beds. *Mem. geol. Surv. India Palaeont. Indica*, Ser. 12, 3 : 1-48.



- FEISTMANTEL, O. (1880-1881). The fossil flora of Gondwana System. II.—The flora of the Damuda and Panchet Divisions. *Mem. geol. Surv. India Palaeont. Indica*, Ser. 12, **3** : 1-149.
- MCCOY, F. (1847). On the Fossil Botany and Zoology of the rocks associated with the coal of Australia. *Ann. Mag. Nat. Hist.*, **20**.
- PANT, D. D. & SINGH, K. B. (1968). On the genus *Gangamopteris* McCoy. *Palaeontographica*, **B124** : 83-101.
- SRIVASTAVA, P. N. (1956). Studies in Glossopteris Flora of India-4. *Glossopteris, Gangamopteris and Palaeovittaria* from the Raniganj Coalfield. *Palaeobotanist*, **5**(1) : 1-45.
- SURANGE, K. R. & CHANDRA, S. (1979). *Revision of the Indian species of Glossopteris. Monograph No. 2*. Birbal Sahni Institute of Palaeobotany, Lucknow.

Explanation of Plate

1. The leaf showing anastomosing veins. Specimen no. BSIP 35784. $\times 1$.
2. Counter part of the above specimen. Specimen no. BSIP 35783. $\times 1$.
3. Upper cuticle (non-stomatiferous) showing vein and mesh area. Slide no. BSIP 35783-1 $\times 100$.
4. Lower cuticle showing irregularly distributed stomata. Slide no. BSIP 35784—1 $\times 100$.
5. Detailed structure of stomata. Slide no. BSIP 35784-1 $\times 425$.