Early Cretaceous megaflora from Bartala Hill, Rajmahal Basin, India

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ABSTRACT


The present paper deals with megafossil investigation of Bartala locality of Rajmahal Basin. Nine taxa are recorded for the first time from this locality: Hausmannia, Taxopteris, Anomozamites, Pterophyllum, Pseudocenien, Dictyozamites, Ginkgoites, Desmophyllum, Elaeeocladus and Brachyphyllum. The assemblage is dominated by cycadophytes, pteridophytes and conifers are scarcely represented. Predominance of Anomozamites in this assemblage perhaps shows the local variation. On the basis of assemblage correlation, an Early Cretaceous age has been suggested.

Key-words — Megafossils, Bartala, Rajmahal Basin, Early Cretaceous.

INTRODUCTION

The megafloral assemblage recovered from the Bartala locality of Rajmahal Basin is investigated here in detail. Bartala locality is about 1.5 km south south east of Mirzachowki Railway Station (see Fig. 1). Sahni and Rao (1933) recorded numerous megafossils from three different spots south of Mirzachowki i.e., from Butaha Pahar, Balbhadi Pahar and from quarry dump. Sahni and Rao (1934) reported Dadoxylon (Araucarioxylon) sp. cf. D. rajmahalense from this locality. Later, Sen Gupta (1988) described a few more taxa viz., Equisetum rajmahalense, Marattiaopsis macrocarpa, Cladophlebis indica, C. srivastavae, Sphenopteris rajmahalense, Thinmelfia indica and Pterophyllum princeps.
THE PALAEOBOTANIST

Genus—EQUISETITES Sternberg, 1833

EQUISETITES RAJMAHALENSIS Oldham & Morris. 1863

(Pl. 1:1)

Description—Stem pieces preserved as impression, length varies, maximum preserved width is 2.8 cm, nodes are with 32-42 leaves, joined at base forming a leaf sheath. Nodes are 5 cm apart, internodes with faint impression of ridges and furrows. Leaf sheath borne at nodes, consists of approximately 32-42 incomplete leaf segments, appressed. Leaf segments linear, gradually pointed towards apex.

Order—FILICALES
Family—OSMUNDACEAE
Genus—CLADOPHLEBIS Brongnari, 1849

CLADOPHLEBIS sp.

(Pl. 1:2)

Description—A small frond fragment and a detached pinnae are present in the collection. Pinnae 2.1 cm in length and 0.5 cm in width, lanceolate, base narrow, apex sub-acute, margin entire. Midvein distinct, upper laterals arise at an angle of 45°-50°, mostly once forked at different levels.

Order—FILICALES
Family—DIPTERIDACEAE
Genus—HAUSMANNIA Dunker, 1846

Figure 1—Fossil locality at Bartala in Rajmahal Basin, Bihar.

1. Hausmannia sp.
2. Taeniophyllum sp.
3. Anomozygites fissa & A. anvarjolense
4. Pseudozetites sp.
5. Dictyozygites sp.; cf. D. salmii
6. Ginkgoites rajmahalensis
7. Desmophyllium sp.
8. Elatochloas tenerrimus & E. plana

Plant remains are preserved as impressions on yellowish soft sandstone and shale.

SYSTEMATICS

Order—EQUISETALES
Family—EQUISETACEAE

Remarks—From Rajmahal Basin, Gupta (1955) described Hausmannia indica from Nipania locality which has later been transferred under H. crenata (Nathsorsl) Moller by Bose and Sah (1968) along with another specimen recovered from this locality and also considered the fossiliferous intertrappean sequence around Bartala village belonging to second intertrappean bed of northern sector of Rajmahal Basin. The present paper further adds the following genera to this assemblage besides the already known taxa mentioned above.

1. Equisettes rajmahalensis, Specimen no. BSIP 37703, x 1
2. Cladophlebus sp., Specimen no. BSIP 37705, x 2.
3. Heterozygites sp., lamina with reticulate venation, Specimen no. BSIP 37706, x 2.
4. Thallognites indica, Specimen no. BSIP 37707, x 1.
5. Pterophyllum sceiricinium, Specimen no. BSIP 37710, x 1.
6. Sporangium, Specimen no. BSIP 37715, x 2.
7. Taeniophyllum sp., Specimen no. BSIP 37712, x 2.
8. Dictyozygites sp.; cf. D. salmii, Specimen no. BSIP 37723a, x 3
9. Ginkgoites rajmahalensis, Specimen no. BSIP 37722, x 2.
11. Anozygites fissa, Specimen no. BSIP 37714, x 2.
12. Desmophyllium sp., Specimen no. BSIP 37724, x 1.5
13. Anomozygites anvarjolensis, Specimen no. BSIP 37718, x 2.
14. Elatochloas plana, Specimen no. BSIP 37725, x 1.
15. Pseudozetites sp., Specimen no. BSIP 37716, x 1.
from Chilgojri. Specific identification could not be made for want of better preserved material.

Order—PTERIDOSPERMALES
Family—CORYSTOSPERMACEAE
Genus—THINNFELDIA Ettingshausen, 1852

THINNFELDIA INDICA Feistmantel, 1876
(PI. 1:4)

Description—Three specimens are present in the collection. The best frond fragment is 2.5 cm long with three alternately attached pinna at angles of 45°. Pinnae lanceolate, lamina seems to be thick, measuring 3-3 x 1.2 cm at widest region. Rachis 0.2 cm broad with a median groove. Midvein distinct almost up to apex, at extreme end evanescent. Base of pinnae narrow, basiscopic basal margin decurrent, margin wavy or broadly dentate, lateral veins arise at an acute angle, variously forked once or twice at different levels, vein concentration 14-18 per cm at margin.

Comparison—Bartala specimens of Thinfeldia indica are exactly similar to Thinfeldia indica described and figured by Feistmantel (1877) and Zeba-Bano et al. (1979) from Buskoghat, Burio and Pathargama localities of Rajmahal Basin.

Order—BENNETTITALES
Genus—PTILOPHYLLUM Morris, 1840

PTILOPHYLLUM TENERRIMUM Feistmantel, 1877
(PI. 1:5)

Description—Two pinnae fragments are present in the collection. The largest pinna fragment available is 2.5 cm in length and 1.2 cm in width, margin entire. Lamina with polygonal to elongated areoles. Meshes in the centre measuring 5-6 x 0.8 mm and towards margin measuring 2.3 x 1 mm. No. of veins running across broadest region is 14-17 per cm.

Remarks—Dictyozamites is reported from Bartala locality for the first time. Besides this locality, this species has earlier been reported from Onthea (Gupta & Sharma, 1968), Stalpur, Kendua and Sakridigalighat (Sen Gupta, 1988) localities of Rajmahal Basin and thus showing its wide distribution in Rajmahal Basin.

Genus—ANOMOZAMITES Schimper, 1870

ANOMOZAMITES AMARJOLENSE Sharma, Surana & Singh, 1971
(Pl. 1:13)

Description—About a dozen of leaf-fragments are collected as impression. Leaf linear in shape, up to 6.3 cm in length, lamina segmented, Rachis 1.2-1.5 mm broad. Lamina segments 3.5-4.0 mm in length as well as width, attached by broad base, apices round, distal margin wavy-notched, notch shallow-deep, sometimes up to median region of lamina, acrosopic and basiscopic basal margins curved upward and downward at places and continuous with upper and lower lamina. Veins simple or forked, forking mostly at base, veins 18-24 per cm.

Remarks—Anomozamites amarjolense is so far recorded from Balbhadri Hill, Burio and Amarjola localities of Rajmahal Basin (Bose & Banerji, 1981). This is the first record of Anomozamites amarjolense from Bartala Hills. This species occurs frequently in the assemblage.

ANOMOZAMITES FISSUS Feistmantel, 1879
(PI. 1:11)

Remarks—Many fragments of leaves are preserved but none of them show morphological nature of apex. Lamina segments are almost twice as long as broad and distal margin segmented or deeply notched. The specimens match closely Anomozamites fissus Feistmantel described by Bose & Banerji (1981) from Basgo Bedo, Burio, Bindaban, Onthea and Amarjola in Rajmahal Basin.

Order—CYCADALES
Family—CYCADACEAE
Genus—PSEUDOCTENIS Seward, 1911

PSEUDOCTENIS sp.
(PI. 1:15)

Description—Single specimen with counterpart preserved as an impression. Rachis 0.8 cm broad, striated at places. Pinnae incomplete, 1 cm in width, seems to be linear, apex not preserved, margin entire, base broad. Vein concentration 14-16 per cm at base. Veins running parallel-subparallel.

Remarks—In general features the Bartala specimen could be placed under Pseudoctenis sp. as it is a pinnate leaf with linear segments having parallel, unforked-rarely forked veins. Due to lack of cuticle it is difficult to ascertain its exact generic identity and at present tentatively placed under Pseudoctenis sp. till the better specimens are available.

Genus—TAENIOPTERIS Brongniart, 1828a

TAENIOPTERIS sp.
(PI. 1:7)
Description—Largest leaf fragment 4 cm in length and 2·3 cm in width. Lamina with a distinct midrib, 1·5 mm broad and medianly grooved. Leaf margin entire-wavy, lateral veins mostly unforked, concentration of veins 24-26 per cm.

Order—GINKGOALES
Family—GINKGOACEAE
Genus—GINKGOITES Seward, 1919
GINKGOITES RAJMAHALENSIS Sah & Jain, 1965

Description—Leaves wedge-shaped, 2 cm broad and about 2·2 cm long, dissected into six segments. Segments linear-spatulate, apex acutely rounded, margin entire. Venes arising from base of segments and repeatedly forked twice to four times. Petiole prominent, incomplete, 0·8 mm broad.

Remarks—The Bartala specimen of Ginkgoites rajmahalen'sis is exactly similar to smaller leaves of Ginkgo rajmahalen'sis Sah & Jain (1965) described by Zeba-Bano et al. (1979, pl. 2, fig. 11, fig. 3c) in size, shape and venation pattern.

Order—CONIFERALES
Family—PODOCARPACEAE
Genus—ELATOCLADUS Halle, 1913
ELATOCLADUS PLANA (Feistmantel) Seward, 1919

Description—Shoot with spirally arranged linear leaves. Leaves measuring 1·2-2 cm long, 1·5-2 mm broad, laterally disposed almost at right angle, base narrow constricted, margin entire, apex acute, midvein fairly visible.

Remarks—Shoot with spirally disposed leaves and a cone attached in the axil of leaf. Due to bad preservation its exact nature i.e. male or female cone is difficult to ascertain.

Genus—BRACHYPHYLLUM Lindly & Hutton ex Brongniart 1828b
BRACHYPHYLLUM sp.

Remarks—About 7 cm long shoot with rhomboidal leaves measuring 2 x 2 mm and leaves possessing a distinct median keel. Lack of clarity and further details restrict its specific identification.

INCERTAE SEDIS
Genus—DESMIOPHYLLUM Lesquereux, 1878

DESMIOPHYLLUM sp.

Remarks—Single specimen of sporangium recovered in this assemblage. Sporangium spherical in shape, showing polygonal depressions at the apical region and distal region is with distinct fine striations. Its sporangial affinity is doubtful due to lack of spores.

FLORAL COMPARISON & REMARKS

The present assemblage recovered from Bartala locality of Rajmahal Formation, comprises about 15 taxa belonging to various families of pteridophytes, viz., Equisetaceae, Osmundaceae, Marattiaceae and Dipteridaceae and gymnosperms belonging to Bennettitales, Cycadales, Pteridospermales, Ginkgoales and Coniferales. Bennettitales are well diversified and mainly represented by Ptilophyllum, Anomoazamites, Dictyoazamites and Pterophyllum. Amongst these Anomoazamites is the dominant genus followed by Ptilophyllum, Pterophyllum and Dictyoazamites respectively. Conifers are represented by two genera viz., Elatocladus and Brachyphyllum. Thinnfeldia indica represents pteridosperms and is very frequent in its occurrence in this assemblage. Ginkgoales is represented by single genus - Ginkgoites. Over all dominance of Bennettitales in the Bartala assemblage shows its similarity with Pathargama assemblage of Rajmahal Basin. But in Pathargama, Thinnfeldia is the most common element, whereas in Bartala assemblage, it is Anomoazamites. Thinnfeldia is comparatively less frequent than Anomoazamites in Bartala assemblage. The common elements in both the assemblages are - Taeniapteris, Ptilophyllum, Pterophyllum, Thinnfeldia, Ginkgoites and Elatocladus.

Bartala assemblage can also be compared with Balidih assemblage of Rajmahal Basin. Balidih assemblage also shows dominance of Thinnfeldia as in Pathargama assemblage. Bartala and Balidih megafaunal assemblages also have certain common elements viz., Equisettes, Thinnfeldia, Ptilophyllum, Anomoazamites, Taeniapteris, Pterophyllum and Elatocladus in them. Moreover, the dominance of Thinnfeldia in Balidih and Pathargama and Anomoazamites in Bartala perhaps shows local variations within the flora. These three floras might be contemporaneous floras and show comparatively older aspect than Nipania and Sonajori flora. The older floras show overall dominance of cycadophytes with qualitatively rich pteridophytic remains and less conifers. But the younger Nipania and Sonajori floras show dominance of conifers alongwith qualitatively rich pteridophytic and Pentosylalean remains. According to Sen Gupta (1988) both the fossiliferous beds at Bartala and Balidih stratigraphically belong to second
intertrappean bed and floristically they also show somewhat similar megafloral assemblage.

The overall view of the present assemblage indicates affinity with the Utarrat Plant Bed of Tiruchirapalli District, Tamil Nadu described by Feistmantel (1879), Gopal, Jacob and Jacob (1957), Mangani, Sathy and Subbaraman (1973) and Maheshwari (1986). The common elements are - Thimfeldia indica, Taeniopites spathulata, Elatoecladus, Brachyphyllum and Ginkgoites sp.

In generic comparison it shows close similarity with early Cretaceous flora of Koonwarra, Victoria (Drinnan & Chambers, 1986) and seems to represent a transitional flora between the zone B and C of Victoria's early Cretaceous flora (Douglas, 1969). The common taxa are Philophyllum, Taeniopites, Thimfeldia, Hausmannia and Ginkgoites. On the basis of assemblage correlation an early Cretaceous age has been suggested for the Bartala megafossil assemblage of Rajmahal Basin.

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