

# Floral diversity of two fossil sites (Dudhkol & Sitalpur) of Rajmahal Formation, Bihar, India

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## ABSTRACT

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The megafloora of two fossil sites, Sitalpur and Dudhkol of Rajmahal Formation have been described. The Sitalpur assemblage includes *Equisetites rajmahalensis*, *Cladophlebis indica*, *Cladophlebis srivastavae*, *Coniopteris* sp., *Taeniopteris spatulata*, *Ptilophyllum acutifolium*, *Pterophyllum medlicottianum*, *Dictyozamites indica*, *Dictyozamites sahnii*, *Elatocladus confertus*, *Pagiophyllum* sp., *Brachyphyllum* sp. and *Araucarites* sp. Whereas, the Dudhkol assemblage includes *Equisetites rajmahalensis*, *Todites indicus*, *Haydenia thyrsopteroides*, *Ptilophyllum acutifolium* and *Elatocladus* sp. The flora of both these sites are comparable to Dhokuti and Chunakhil floral assemblages of Rajmahal Formation.

**Key-words**— Fossil flora. Early Cretaceous, Rajmahal Formation.

## भारत के बिहार प्रान्त के राजमहल शैलसमूह की दो पादपाशम संस्थितियों (दुधकोल एवं सीतलपुर) का वनस्पतिजातीय विविधरूपण

नीरू प्रकाश

सारांश

प्रस्तुत शोध पत्र में राजमहल शैलसमूह की सीतलपुर एवं दुधकोल नामक दो पादपाशम संस्थितियों का वर्णन किया गया है. सीतलपुर समुच्चय के अन्तर्गत *इक्वीसिटाइटीज़* राजमहलेन्सिस, *क्लैडोफ्लेबिस* इण्डिका, *क्लैडोफ्लेबिस* श्रीवारतवाइ, *कोनिऑप्टेरिस* प्रजाति, *टीनियोप्टेरिस* स्पेट्यूलेटा, *टिलोफिल्लम* एक्यूटीफोलियम, *टेरोफिल्लम* मेडलीकोट्टियानम, *डिक्टोजैमाइटीज़* इण्डिका, *डिक्टोजैमाइटीज़* साहनियाइ, *इलेटोक्लैडस* कॉनफर्टस, *पैजियोफिल्लम* प्रजाति, *ब्रैकीफिल्लम* प्रजाति एवं *अराउकैराइटीज़* प्रजाति आती हैं, जब कि दुधकोल समुच्चय के अन्तर्गत *इक्वीसिटाइटीज़* राजमहलेन्सिस, *टोडाइटीज़* इण्डिकस, *हेडीनिया थिरसॉप्टेरोयड्स*, *टिलोफिल्लम* एक्यूटीफोलियम तथा *इलेटोक्लैडस* प्रजाति आती हैं. इन दोनों संस्थितियों के वनस्पतिजात की तुलना राजमहल शैलसमूह के धोकुटी एवं चूनाखिल वनस्पतिजात समुच्चयों के साथ की जा सकती है.

**संकेत शब्द**—पादपाशम वनस्पतिजात, प्रारंभिक क्रिटेशस, राजमहल शैलसमूह.

## INTRODUCTION

THE first critical revision of Rajmahal megafloora was made by Feistmantel (1877) who considered this flora as Liassic (Lower Jurassic) age. Based on palaeobotanical evidences Seward (1917) proposed 'Rajmahal Series' of Rhaetic (Lower Jurassic) period. Further, Sahni (1938) assigned Middle Jurassic age to this flora. Rao (1953) studied megafloora of this formation and favoured Sahni's opinion. The palynological studies were carried out by Rao (1943), Vishnu-Mittre (1954) and Sah and Jain (1965). They suggested Middle to Upper Jurassic age. Singh and Venkatachala (1988) reassessed the palynofossils of Rajmahal Formation and assigned an Early Cretaceous age. Mc Dougall and Mc Elhinny (1970) considered Albian (100 - 105 million years) age for Rajmahal Traps based on K-Ar dating which is also favoured by Agarwal and Rama (1976). Recently, Banerji (1992) studied fossil flora of Chunakhal, Rajmahal Formation and assigned an Early Cretaceous age on the basis of occurrence of *Phyllopteroides*, an index fossil.

The present study deals with well preserved megafloreal impressions in light grey, reddish baked siltstone collected from eastern slope of a small hillock situated north of the village Dudhkol (25°06'00" N : 87°44'12" E). The other locality Sitalpur (25°03'06" N : 87°33'12" E) (Fig. 1) yielded impressions of plant fossils on bluish grey claystone at dried up nalla and recognised as 3<sup>rd</sup> intertrappean bed by Sen-Gupta (1988) who enlisted the plant fossils without morphotaxonomical details. The detailed stratigraphic sequence has been given in (Fig 2).

## SYSTEMATICS

The floral assemblage of both the localities have revealed predominant occurrence of mainly of pteridophytes and gym-

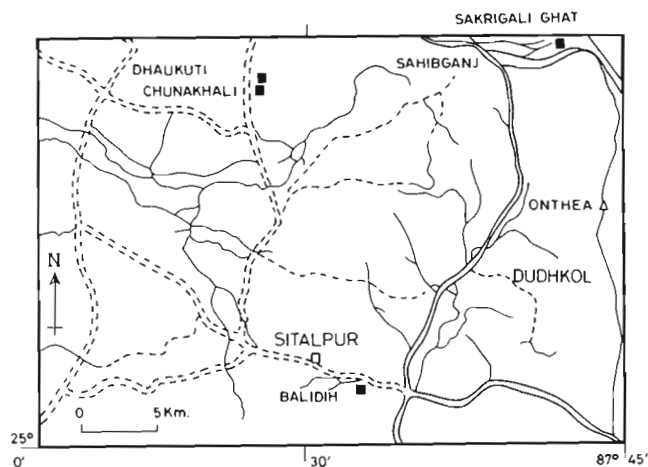


Fig. 1— Locality Map of Sitalpur, Dudhkol, Rajmahal Hills, Bihar.

nosperms. Among pteridophytes, sphenopsids and ferns are common whereas cycadophytes and conifers are the main constituents of gymnosperms.

### Family—EQUISETACEAE

#### Genus—EQUISETITES Sternberg, 1833

#### EQUISETITES RAJMAHALENSIS (Oldham & Morris) Schimper, 1870

Pl. 1-1

*Remarks*—A characteristic plain internode or internode with faint ridges and grooves are observed in *Equisetites rajmahalensis*. About 10-26 leaves per sheath are attached at nodes. Bose and Banerji (1984) reported comparatively more (25-30) leaves attached per leaf sheath in the species recovered from Kutch but other characters are similar with the

## PLATE 1

1. *Equisetites rajmahalensis* (Oldham & Morris) Schimper. Stem showing nodes and internodes. Specimen no. BSIP 38098. x 1, Dudhkol, Rajmahal Hills, Bihar.
2. *Todites indicus* Bose & Sah. Sterile pinnae, pinnules showing venation. Specimen no. BSIP 38105. x 1, Dudhkol, Rajmahal Hills, Bihar.
3. *Araucarites minutus* Bose & Maheshwari. Specimen no. BSIP 38117. x 1, Sitalpur, Rajmahal Hills, Bihar.
4. *Haydenia thyrsopteroides* Seward. Showing pinnate leaves. Specimen no. BSIP 38102. x 1.5, Dudhkol, Rajmahal Hills, Bihar.
5. *Todites indicus* Bose & Sah. A sterile pinnae. Specimen no. BSIP 38101. x 1, Dudhkol, Rajmahal Hills.
6. *Taeniopteris spatulata* Mc Clelland. Specimen no. BSIP 38101. x 1, Sitalpur, Rajmahal Hills, Bihar.
7. *Coniopteris* sp. Specimen no. BSIP 38112. x 1, Sitalpur, Rajmahal Hills, Bihar.
8. *Brachyphyllum* sp. A. Branched leafy twig. Specimen no. BSIP 38110. x 3, Sitalpur, Rajmahal Hills, Bihar.
9. *Ptilophyllum cutchense* Morris. Specimen no. BSIP 38109. x 3, Dudhkol, Rajmahal Hills, Bihar.
10. *Ptilophyllum cutchense* Morris. Specimen no. BSIP 38101. x 3, Dudhkol, Rajmahal Hills, Bihar.
11. *Ptilophyllum acutifolium* Morris. Specimen no. BSIP 38108. x 1, Dudhkol, Rajmahal Hills, Bihar.
12. *Elatocladus* cf. *tenerrima* (Feist.) Sahni. Specimen no. BSIP 38099. x 3, Dudhkol, Rajmahal Hills, Bihar.
13. *Elatocladus* cf. *tenerrima* (Feist.) Sahni. Specimen no. BSIP 38099. x 3, Dudhkol, Rajmahal Hills, Bihar.
14. *Elatocladus* cf. *tenerrima* (Feist.) Sahni. Specimen no. BSIP 38111. x 3, Sitalpur, Rajmahal Hills, Bihar.
15. *Elatocladus confertus* Halle. A sterile twig. Specimen no. BSIP 38104. x 3, Sitalpur, Rajmahal Hills, Bihar.
16. *Araucarites cutchensis* Feistmantel. Specimen no. BSIP 38116. x 3, Sitalpur, Rajmahal Hills, Bihar.
17. *Pagiophyllum* sp.. A fragmentary twig, showing spirally arranged leaves. Specimen no. BSIP 38115. x 3, Sitalpur, Rajmahal Hills, Bihar.

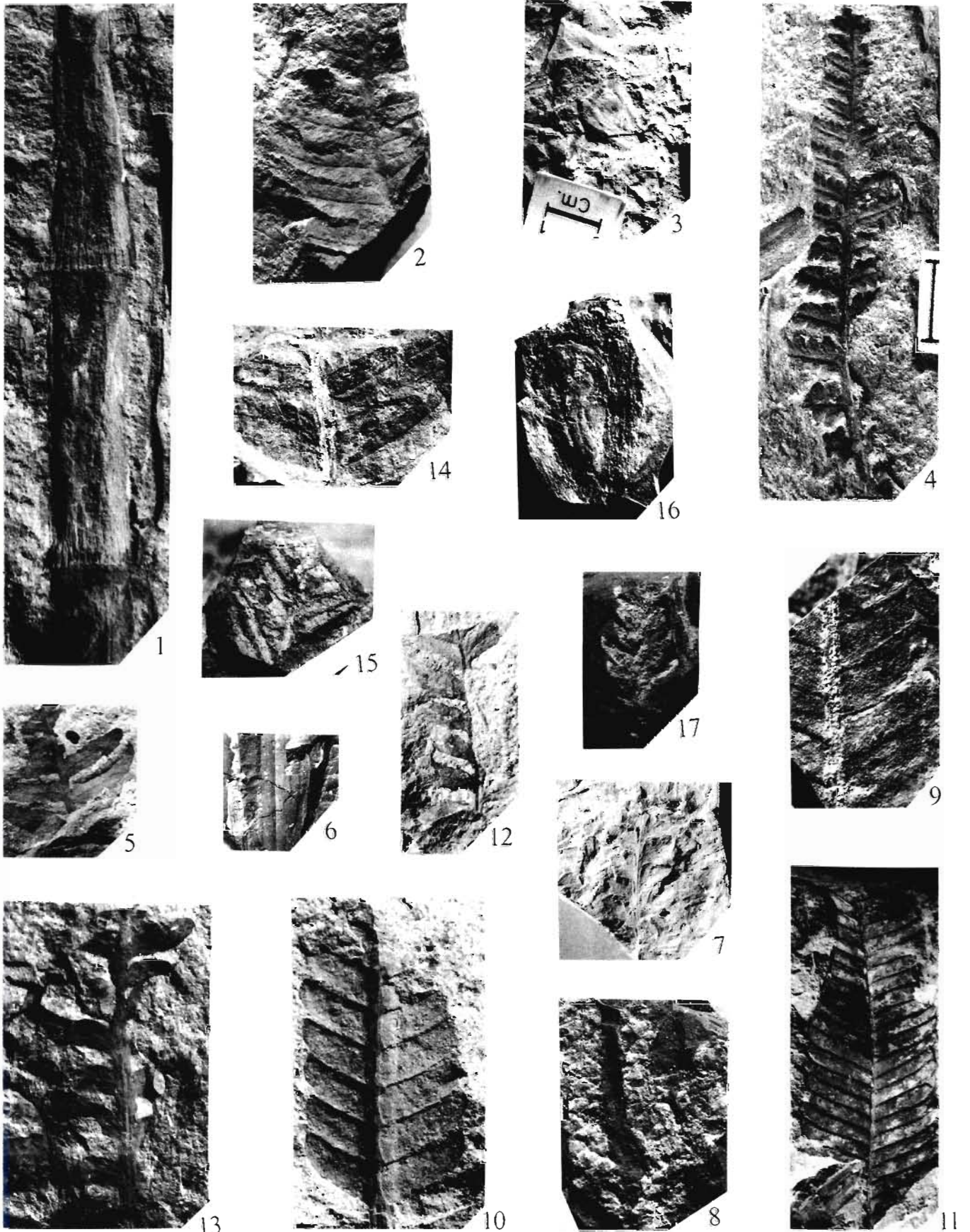


PLATE 1

		DUDHKOL	SITALPUR
			Laterites
RAJMAHAL FORMATION	Exposed Basalt flow VIII		
	Exposed Basalt flow VII		
	Exposed Basalt flow VI		(finer grained than the fifth flow)
	Exposed Basalt flow V		
	Exposed fourth		(Highly baked siltstone, cherty in appearance centicular body with plant fossils at places)
	Intertrappean bed		
	Exposed IV Basalt flow		
	Exposed Third		(Bluish grey clay stone bed with rich <i>Ptilophyllum</i> floral assemblage)
	Intertrappean bed		
	Exposed Basalt flow III		
Exposed Basalt flow II	weathered and bouldary out crop		
Exposed first	(Light grey to reddish brown baked siltstone fossiliferous at places)		
Intertrappean bed			
Exposed Basalt flow I	Pitch stone with amygdaloidal filling of silica at top		
	Base not exposed	Base not exposed	

(After Sen Gupta, 1988)

Fig. 2 — Lithostratigraphy of two fossil sites (Dudhkol &amp; Sitalpur) of Rajmahal Formation.

present specimen. Moller and Halle (1933) reported 8-10 leaves per node in *E. mobergii* from Scania and repeatedly equal number in *E. minensis* from Japan by Konno (1962). Both species show smooth internode but differ from *E. rajmahalensis* because of comparatively lesser number of leaves per node.

*Collection*—Specimen no. BSIP 38098.

*Locality*—Dudhkol, Rajmahal Formation, Bihar.

*Horizon*—Rajmahal Formation, Early Cretaceous.

**Family—OSMUNDACEAE**

**Genus—TODITES** Seward 1900

**TODITES INDICUS** (Oldham & Morris) Bose & Sah, 1968

Pl. 1-2, 5

*Description*—Pinnae paripinnate, sterile, lanceolate in shape. 1-1.5 cm in length, 1.5-2.3 cm wide. Pinnules falcate, 8-18 mm long, 2-6 mm wide, alternate, arising at an angle of 20°-85°. Apex acute or bluntly pointed. Acroscopic margin slightly expanded, basiscopic margin decurrent. Margin entire or crenulate. Midrib prominent, persisting up to apex. Lateral veins bifurcated.

*Collection*—Specimen nos. BSIP 38100 and 38105.

*Locality*—Dudhkol and Sitalpur, Rajmahal Hills, Bihar.

*Horizon*—Rajmahal Formation, Early Cretaceous.

*Remarks*—*Todites indicus* (Oldham & Morris) Bose and Sah (1968) is the commonest frond found in the Rajmahal Hills Bihar. It resembles with *Cladophlebis denticulata* Fontaine described by Harris (1961) from the Jurassic of Yorkshire but differ due to smaller in size.

**Family—CYCATHEACEAE**

**Genus—HAYDENIA** Seward 1912

**HAYDENIA THYRSOPTEROIDES** Seward 1912

Pl. 1-4

*Description*—Frond bipinnate or pinnate. Main rachis 1 mm wide. Pinnae lanceolate, arising at an angle of 65°-70°. Pinnule small to large, lanceolate or falcate measuring 0.3-1 cm in length and 0.3-0.4 cm in width. Margin lobed, sometimes deeply lobed. Pinnules lobed. Pinnule axis emerges from the pinna axis and passes through the pinnules and reaches up to the apex, secondary veins bifurcated. Apex mostly obtuse.

*Collection*—Specimen nos. BSIP 38102, 38103, and 38106.

*Locality*—Dudhkol, Rajmahal Hills, Bihar.

*Horizon*—Rajmahal Formation, Early Cretaceous.

*Remarks*—This species was originally instituted on the basis of fertile fronds. But Sharma (1969) suggested that there is no distinction between fertile and sterile fronds except that fertile fronds have sori enclosed by cup-shaped indusium. The frond described from Dudhkol match exactly with fronds described from Dhokuti by Sharma (1969), from Saigan series by Jacob and Shukla (1955) and Appert (1973).

## INCERTAE SEDIS

**Genus**—CONIOPTERIS Brongniart 1849

**CONIOPTERIS** sp.

Pl. 1-7

*Description*—Pinnae paripinnate, 1.5 cm long and 0.8 cm wide; elongate to lanceolate, constricted at base, 3-7 mm long and 2-7 mm wide. Basal pinnule of pinnae constricted, mainly obovate in shape. Lateral margin lobed. Venation sphenopteroid type.

*Collection*—Specimen no. BSIP 38112.

*Locality*—Sitalpur, Rajmahal Hills, Bihar.

*Horizon*—Rajmahal Formation, Early Cretaceous.

*Remarks*—The present specimen resembles *Sphenopteris hislopia* which is common in Rajmahal Formation.

**Family**—CYCADACEAE

**Genus**—TAENIOPTERIS Brongniart 1832

**TAENIOPTERIS SPATULATA** Mc Clelland 1850

Pl. 1-6

*Remarks*—The genus *Taeniopteris spatulata* Mc Clelland is very common in occurrence in Rajmahal Hills, Bihar, India.

*Collection*—Specimen no. BSIP 38101.

*Locality*—Sitalpur, Rajmahal Hills, Bihar.

*Horizon*—Rajmahal Formation, Early Cretaceous.

**Family**—WILLIAMSONIACEAE

**Genus**—PTILOPHYLLUM Morris 1840

**PTILOPHYLLUM ACUTIFOLIUM** Morris 1840

Pl. 1-11

*Remarks*—Morphologically *P. acutifolium* Morris closely resembles with the specimens described from Gollapalli and Bhuj formations. But the Kutch specimens have comparatively long-linear and lanceolate pinnae.

*Collection*—Specimen no. BSIP 38108.

*Locality*—Dudhkol, Rajmahal Hills, Bihar.

*Horizon*—Rajmahal Formation, Early Cretaceous.

**PTILOPHYLLUM CUTCHENSE** Morris 1840

Pl. 1-9, 10

*Remarks*—*Ptilophyllumutchense* is closely comparable with the specimens from Kutch (Bose & Banerji, 1984) from Athgarh (Prakash & Sukh-Dev, 1994) and Gollapalli formations (Pandya & Sukh-Dev, 1990).

*Collection*—Specimen nos. BSIP 38107 and 38109.

*Locality*—Dudhkol, Rajmahal Hills, Bihar.

*Horizon*—Rajmahal Formation, Early Cretaceous.

**Family**—PODOCARPACEAE

**Genus**—ELATOCLADUS Halle 1913

**ELATOCLADUS CONFERTA** (Oldham & Morris) Sahni 1928

Pl. 1-15

*Remarks*—The small fragmentary specimen from Sitalpur closely resembles with some of the specimens of Bhuj Formation, (Bose & Banerji 1984), Sahni (1928) and Halle (1913).

*Collection*—Specimen no. BSIP 38104.

*Locality*—Sitalpur, Rajmahal Hills, Bihar.

*Horizon*—Rajmahal Formation, Early Cretaceous.

**ELATOCLADUS cf. TENERRIMA** (Feistmantel) Sahni 1928

Pl. 1-12-14

*Description*—Leaves spirally arranged on rachis measuring 1.2 cm long and 1 cm wide, individual leaves 1.2 mm long and 0.2 mm broad, linear-lanceolate in shape. Base constricted and decurrent, attached with axis by broad decurrent base. Lateral margins entire. Apex obtuse. Venation not discernible.

*Collection*—Specimen nos. BSIP 38111 and 38099.

*Locality*—Dudhkol and Sitalpur, Rajmahal Hills, Bihar

*Horizon*—Rajmahal Formation, Early Cretaceous.

*Remarks*—The specimens from Sitalpur match with the specimens of *Elatocladus cf. tenerrima* from Kutch reported by Sahni (1928) and Bose *et al.* (1983).

**Family**—ARAUCARIACEAE

**Genus**—PAGIOPHYLLUM Heer 1881

**PAGIOPHYLLUM** sp.

Pl. 1-17



Name of plant fossils	Dhokuti	Sitalpur	Dhudkol	Chunakhal	Name of plant fossils	Dhokuti	Sitalpur	Dhudkol	Chunakhal
<i>Lycopodites rajmahalensis</i>	-	-	-	+	<i>Thinnfeldia</i> cf. <i>T. amarjolense</i>	+	-	-	-
<i>Selaginella</i> spp.	+	-	-	-	<i>T. chunakhalensis</i>	-	-	-	+
<i>Selaginellites gracilis</i>	+	-	-	-	<i>Pachypteris indica</i>	-	-	-	-
<i>Equisetum rajmahalensis</i>	+	+	+	-	<i>Morrissia mc lellandii</i>	+	-	-	-
<i>Equisetites rajmahalensis</i>	+	-	+	+	<i>Ptilophyllum cutchense</i>	+	-	-	+
<i>Marattiopsis reversa</i>	+	-	-	-	<i>P. acutifolium</i>	+	+	+	+
<i>M. macrocarpa</i>	+	-	-	+	<i>Williamsonia companulatiformis</i>	+	-	-	-
<i>Todites indicus</i>	+	-	+	-	<i>Williamsonia</i> sp.	+	-	-	-
<i>Todites</i> sp. cf. <i>T. williamsonii</i>	-	-	-	+	<i>Cycadolepis pilosa</i>	+	-	-	-
<i>Cladophlebis denticulata</i>	-	-	-	+	<i>Cycadolepis</i> (?)	+	-	-	-
<i>Cladophlebis indica</i>	+	+	-	+	<i>Zamites chunakhalensis</i>	-	-	-	+
<i>Cladophlebis srivastavae</i>	-	+	-	-	<i>Pterophyllum incisum</i>	-	-	-	+
<i>Osmundopsis</i> sp.	-	-	-	+	<i>P. morristanum</i>	+	-	-	+
<i>Klukia</i> sp.	+	-	-	-	<i>P. medlicottianum</i>	+	+	-	+
<i>Dryopteris indica</i>	+	-	-	-	<i>P. princeps</i>	-	-	-	-
<i>Havdenia thyrsopteroides</i>	+	-	+	-	<i>Dictyozamites falcatus</i>	-	+	-	-
<i>Phyllopteroides laevis</i>	-	-	-	+	<i>D. indica</i>	-	+	-	-
<i>Cacumen</i>	-	-	-	+	<i>D. sahnii</i>	-	+	-	-
<i>Gleichenia gleichenoides</i>	+	-	-	-	<i>Taeniopteris lata</i>	+	-	-	+
<i>G. dhokulense</i>	+	-	-	-	<i>T. spatulata</i>	-	+	-	-
<i>Gleichenia</i> sp.	+	-	-	-	<i>Taeniopteris</i> sp. cf. <i>T. spatulata</i>	-	-	-	+
<i>Pecopteris lobata</i>	-	-	-	+	<i>T. crassinervis</i>	-	-	-	+
<i>Eboracia lobifolia</i>	-	-	-	+	<i>Macrotaeniopteris crassinervis</i>	+	-	-	-
<i>Dicksonia speciosa</i>	+	-	-	-	<i>Ctenis rajmahalensis</i>	-	-	-	+
<i>Dennstoedia rajmahalensis</i>	+	-	-	-	<i>Elatocladus confertus</i>	-	+	-	+
? <i>Mohriopsis</i> sp.	-	-	-	+	<i>E. jabalpurensis</i>	-	-	-	+
<i>Asplenites</i> sp.	-	-	-	+	<i>Elatocladus</i> sp.	+	-	+	-
<i>Sphenopteris histopii</i>	+	-	-	+	<i>Pagiophyllum</i> sp.	-	+	-	-
<i>S. nauckhoffiana</i>	-	-	-	+	<i>Brachyphyllum</i> sp.	-	+	-	-
<i>Sphenopteris</i> cf. <i>S. imbricata</i>	+	-	-	-	<i>Araucarites cutchensis</i>	+	-	-	-
<i>S. eliminata</i>	+	-	-	-	<i>Torreyites</i> sp.	+	-	-	-
<i>Sphenopteris</i> cf. <i>S. lobifolia</i>	+	-	-	-	<i>Taxaceoxylon cupressoides</i>	+	-	-	-
<i>Coniopteris</i> sp.	-	+	-	-					

Fig. 3 — Distribution of fossils at Dhokuti, Sitalpur, Dudhkol and Chunakhal localities.

*Description*—Leafy twig, 16 mm long and 5 mm broad. Leaves small, ovate-lanceolate, spirally arranged, imbricating on main axis. Leaf size 1-3 x 1 mm. Margin complete. Apex acute, base decurrent.

*Collection*—Specimen no. BSIP 38115.

*Locality*—Sitalpur, Rajmahal Hills, Bihar.

*Horizon*—Rajmahal Formation, Early Cretaceous.

*Remarks*—*Pagiophyllum* sp. is a rare fragmentary element found in Sitalpur, Bihar. In gross morphology it closely resembles to a portion of twig of *Pagiophyllum chawadensis* Bose and Banerji (1984) but differs due to absence of cuticle. In external morphology *Pagiophyllum sherensis* Maheshwari and Kumaran (1976) shows similarity with *Pagiophyllum* sp. The only difference is that in earlier described species leaves are slightly spreading and have well preserved phytollemma.

**Genus**—BRACHYPHYLLUM (Lindley & Hutton)

Brongniart 1849

**BRACHYPHYLLUM** sp.

Pl. 1-8

*Description*—Branched leafy twig, measuring 1.5 - 3.5 mm in length and 0.3-0.5 mm in width. Leaves hexagonal, some times lanceolate, apex acute, base curved.

*Collection*—Specimen no. BSIP 38110.

*Locality*—Sitalpur, Rajmahal Hills, Bihar.

*Horizon*—Rajmahal Formation, Early Cretaceous.

*Remarks*—This specimen closely resembles with *B. mammillare* Sahnii (1928) and Sen-Gupta (1988) and *B. feistmantelii* Halle (1913). But present specimen differs from latter species in having compact arrangement and frontally

pointed leaves, whereas, *B. feistmantelii* (Halle, 1913) shows some loosely arranged leaves that come out of the stem.

#### Genus—ARAUCARITES Presl 1838

#### ARAUCARITES CUTCHENSIS Feistmantel 1876

Pl. 1-16

*Remarks*—The *Araucarites cutchensis* Feistmantel described here exactly resembles the specimens described by Sahni (1928), Bose and Maheshwari (1973) and Bose and Banerji (1984) in general shape and size. Morphologically few characters show resemblance with *A. sehoraensis* Bose and Maheshwari (1973). The only difference is that in the latter species phytollemma is well preserved which is absent in the present specimen.

*Collection*—Specimen no. BSIP 38116.

*Locality*—Sitalpur, Rajmahal Hills, Bihar.

*Horizon*—Rajmahal Formation, Early Cretaceous.

#### ARAUCARITES MINUTUS Bose & Maheshwari 1973

Pl. 1-3

*Remarks*—*Araucarites minutus* has been reported for the first time from the Sitalpur, Rajmahal Formation. The specimens morphologically resembles with the specimens of Kutch Bose & Banerji (1984) and of Sher River, near Schora by Bose and Maheshwari (1973). In general morphology the present specimen closely resembles with *A. minimus* described by Archangelsky (1966) from Tico Formation, Argentina.

*Collection*—Specimen no. BSIP 38117.

*Locality*—Sitalpur, Rajmahal Hills, Bihar.

*Horizon*—Rajmahal Formation, Early Cretaceous.

### MEGAFLORAL COMPARISON

The plant fossil assemblage recorded from the Sitalpur represents 12 genera and 14 species and is mainly dominated by Cycadophytes and Conifers. The floral assemblage shows similarities with the flora found at Chunakhal of Rajmahal Formation. *Equisetites*, *Cladophlebis*, *Ptilophyllum*, *Pterophyllum*, *Taeniopteris* and *Elatocladus* are common in both Chunakhal and Sitalpur, while, the genera *Phyllopteroides*, *Osmundopsis* and *Cacumen* have so far not been obtained from Sitalpur. The plant fossil assemblage of Dudhkol is dominated by pteridophytes represented by the dominance of *Equisetites rajmahalensis* and *Haydenia thyrsopteroides*, which are also known in Dhokuti. The Dudhkol flora shows similarity with Chunakhal flora by the common occurrence of *Equisetites*, *Todites*, *Ptilophyllum* and *Elatocladus*. However, the genus *Phyllopteroides* has so far not been reported from Dudhkol. The Chunakhal flora is akin to Early Cretaceous flora of Aus-

tralia in having common occurrence of index fossil *Phyllopteroides* along with *Sphenopteris hislopilii*, *Ptilophyllum cutchense*, *Pachypteris* and *Taeniopteris*. Both Sitalpur and Dudhkol floral assemblages show resemblance with Early Cretaceous floras of Chunakhal and Dhokuti and hence these floral assemblages have been assigned an Early Cretaceous age.

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