

Wood of *Dipterocarpus* from a new locality of the Champanagar Formation of Tripura, India

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ABSTRACT

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A fossil wood, *Dipterocarpoxyton bolpurensis* Ghosh & Roy is described from a new locality, Bisalgarh, situated near Agartala, Tripura. It shows affinities with *Dipterocarpus* of Dipterocarpaceae and its presence indicates the occurrence of tropical evergreen forest in the vicinity.

Key-words—Fossil wood, *Dipterocarpoxyton*, Tipam Group, Bisalgarh, Upper Miocene, Tropical evergreen forest.

भारत के त्रिपुरा राज्य के चम्पानगर शैलसमूह की एक नयी संस्थिति से प्राप्त डिप्टेरोकार्पस के काष्ठ का विवेचन

राकेश चन्द्र मेहरोत्रा एवं अमलव भट्टाचार्य

सारांश

त्रिपुरा के अगरतला नामक स्थान के समीप अवस्थित एक नवीनतम संस्थिति बीसालगढ़ से डिप्टेरोकार्पोज़ाइलॉन बोलपुरेन्से घोष एवं राय नामक एक अशिमत काष्ठ का विवेचन प्रस्तुत शोध पत्र में किया गया है। यह डिप्टेरोकार्पेसी के डिप्टेरोकार्पस के साथ बन्धुता प्रदर्शित करता है तथा इसकी उपस्थिति सन्निकट में ऊष्णकटिबन्धीय सदाबहारी वनों की उपस्थिति को इंगित करती है।

संकेत शब्द—अशिमत काष्ठ, डिप्टेरोकार्पोज़ाइलॉन, टीपम समूह, बीसालगढ़, उपरि मायोसीन, उष्णकटिबन्धीय सदाबहारी वन.

INTRODUCTION

GEOGRAPHICALLY the Tripura lies in the north eastern part of India and has a link with rest of the country through the adjoining Cachar District of Assam. Palaeobotanically it is still unexplored as only five fossils in the form of woods have so far been described from near Khowai bridge Teliamura and Dumbur water falls near Amarpur. These

are *Glutoxyton burmense* (Holden) Chowdhury of Anacardiaceae (Ghosh & Taneja, 1961), *Pahudioxylon sahnii* Ghosh & Kazmi (1961), *Cassinium tripuranum* Acharya & Roy, *Millettioxylon bengalensis* Ghosh & Roy (Acharya & Roy, 1986) and *Cynometroxylon holdenii* (Gupta) Prakash & Bande of Fabaceae (Awasthi *et al.*, 1994).

The fossil wood being described here was collected from a new locality, Bisalgarh, situated at a distance of about 20 km

south west of Agartala, Tripura (Fig. 1) where petrified woods occur scattered about in loose sand.

The fossil woods found in Tripura belong to the Champanagar Formation of the Tipam Group which is considered as Upper Miocene in age. The generalised geological succession of Tripura proposed by Karunakaran (1974) is presented in the form of a table (Fig. 2).

MATERIAL AND METHODS

The study is based on a solitary specimen measuring 6 cm in length and 3 cm in width. The wood is silicified and its structural details are fairly preserved. The wood was sectioned in three different planes and its ground thin sections were prepared by grinding on the disc using carborundum powder. Then these sections were mounted on the slides and polished. After polishing they were studied under the high power microscope.

The original specimen and slides have been deposited in the Museum of the Birbal Sahni Institute of Palaeobotany, Lucknow.

SYSTEMATICS

Family—DIPTEROCARPACEAE Bentham and Hooker f.

Genus—DIPTEROCARPOXYLON Holden emend. Den Berger, 1927

Species—DIPTEROCARPOXYLON BOLPURENSE
Ghosh & Roy, 1979

Pl. 1:1-7

Description—Wood diffuse porous. Growth rings absent. Vessels medium to large, t.d. 100-250 μm , r.d. 150-330 μm , almost exclusively solitary, very rarely in pairs, circular to oval, sometimes deformed due to compression, evenly distributed, 5-11/sq mm, tylosed; vessel members 180-440 μm in height with oblique to horizontal ends; perforations simple; intervessel pits rarely preserved due to exclusively solitary vessels and presence of tyloses, circular to oval, bordered, alternate, about 10 μm in diameter with lenticular apertures.

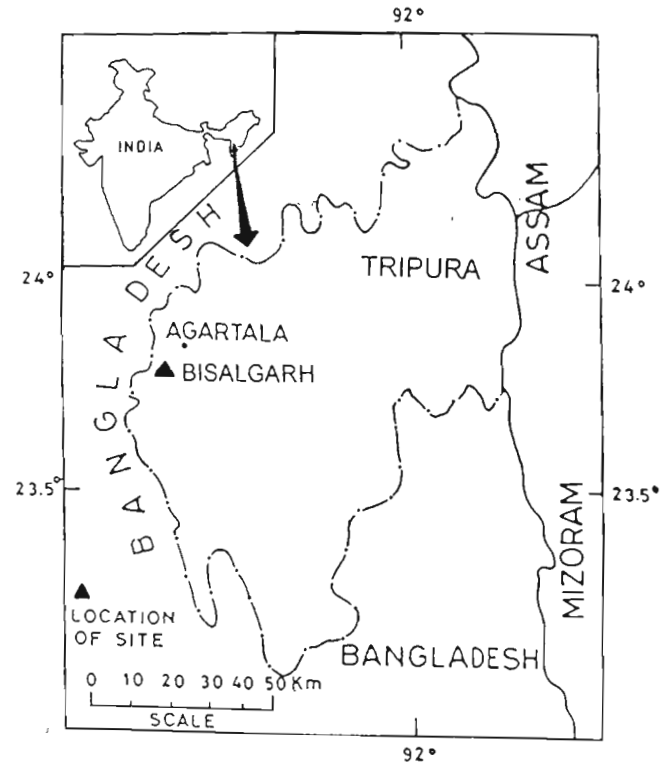


Fig. 1—A map of Northeast India showing the fossiliferous locality of Bisalgarh near Agartala, Tripura.

Tracheids vasicentric, intermixed with parenchymatous cells and forming a thin sheath around the vessels. *Parenchyma* both paratracheal and apotracheal; paratracheal scanty to vasicentric, forming a thin sheath around the vessels; apotracheal diffuse and in the form of short, broken tangential bands enclosing gum canals; cells 22-45 μm in width and 30-110 μm in length. *Xylem rays* 1-4 seriate, 4-6/mm, ray tissue heterogeneous, uniseriate rays made up of both procumbent and upright cells, 30-35 μm in width and 3-6 cells and 100-165 μm in height; multiseriate rays made up of procumbent cells in the central portion and a few upright cells at the margins, 80-110 μm in width and 15-20 cells and 500-1100 μm in height; sheath cells occasionally present on the flanks of multiseriate

PLATE I

Dipterocarpxylon bolpurens Ghosh & Roy



1. Cross section of the fossil wood in low power showing distribution of vessels and gum canals (marked with arrows). x 40; Slide No. BSIP 38885-I.
2. Cross section of the fossil wood in high power showing shape and size of the vessels and parenchyma pattern. x 100; Slide No. BSIP 38885-I.
3. Radial longitudinal section of the fossil wood showing heterogeneous ray tissue. x 100; Slide No. BSIP 38885-III.
4. Tangential longitudinal section of the fossil wood in low power showing distribution of the xylem rays. x 40; Slide No. BSIP 38885-II.
5. Tangential longitudinal section of the fossil wood in high power showing structure of the xylem rays and fibres. x 100; Slide No. BSIP 38885-II.
6. Intervessel pits magnified. x 400; Slide No. BSIP 38885-II.
7. Tangential longitudinal section of the fossil wood in high power showing vasicentric tracheids. x 200; Slide No. BSIP 38885-II.

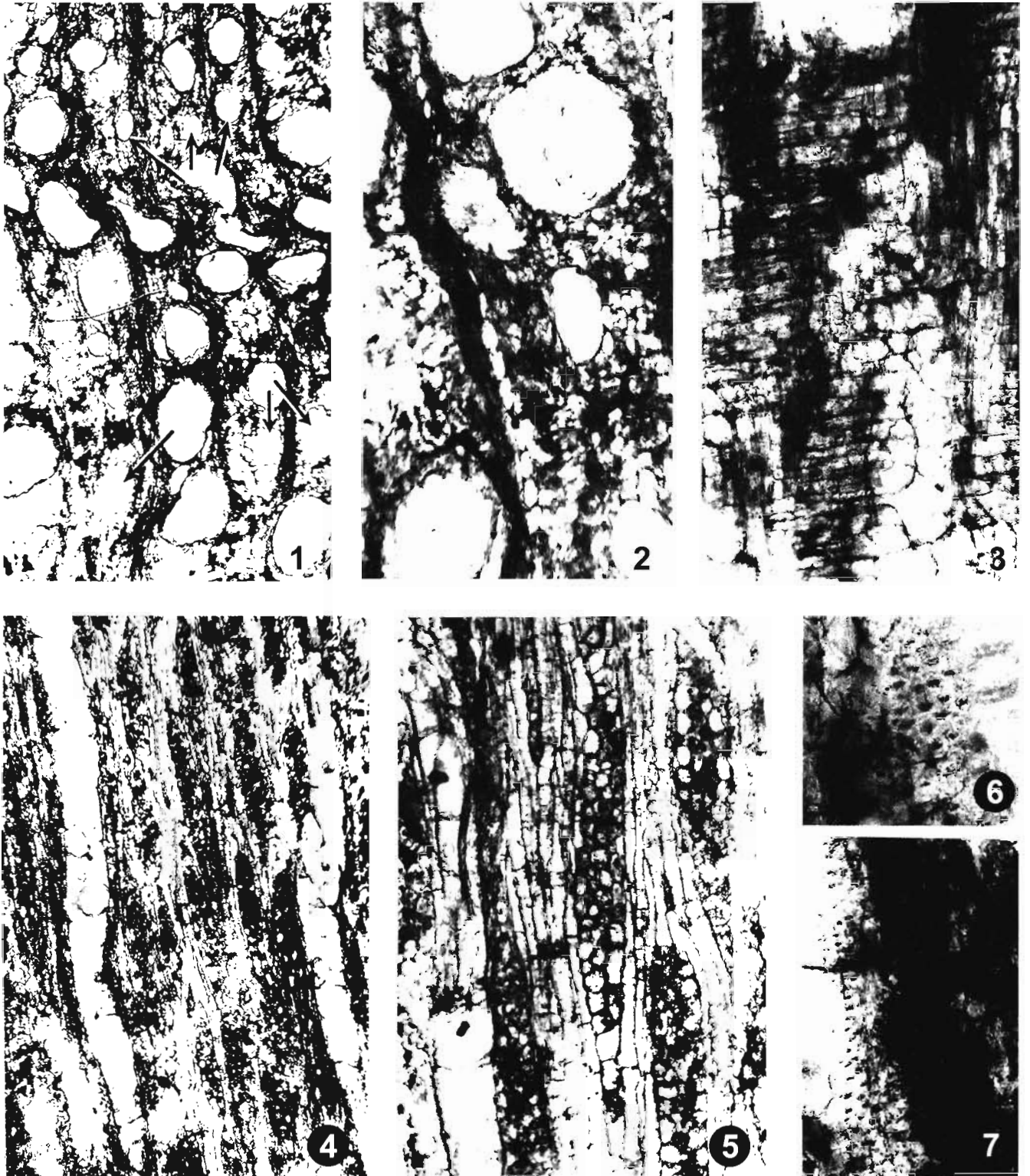


PLATE 1

Group	Subgroup	Formation	Lithology
Recent	--	Recent	Alluvium with decomposed vegetable matter
----- Unconformity -----			
Dupi Tila	--	Dupi Tila	Earthy brown to brown buff sandy clays with coarse to gritty ferruginous sandstone
----- Unconformity -----			
Tipam	Tipam Sandstone	Champanagar	Medium to coarse, friable, sub arkosic sandstone, with abundant lumps of silicified fossil wood
		Manu Bazar	Fine to medium, sub arkosic sandstone, including sandy shale, siltstone and sandy mudstone
----- Contact gradational -----			
Surma	Bokabil	--	Thinly bedded, repetition of sandstone, siltstone/ shale alternations, shales, mudstone and ferruginous sandstone
	Bhuban	--	Hard, compact, both massive and well bedded sandstone, sandy shale and siltstone repeatedly occurring in space
----- Contact gradational to transitional -----			
----- Contact transitional -----			
Base not seen			

Fig. 2—Generalised geological succession of Tripura (after Karunakaran, 1974).

rays; ray to ray fusion observed; procumbent cells 50-60 μm in radial length and 20-45 μm in tangential height; upright cells about 25-30 μm in radial length and 30-45 μm in tangential height. *Fibres* moderately thick walled, polygonal in cross section, non septate, 12-18 μm in diameter. *Gum canals* normal, vertical scattered and in groups of 2-4, usually smaller than vessels, enclosed in parenchyma bands, t.d. 80-110 μm and r.d. 100-110 μm .

Specimen—Museum No. BSIP 38885.

Occurrence—Champanagar Formation; Bisalgarh, near Agartala, Tripura; Upper Miocene.

DISCUSSION

Presence of vertical gum canals is the most important character of the fossil. In the absence of epithelial lining these canals look like vessels, but a careful examination distinguishes them from the other vessels. In the present fossil wood vessels have generally scanty paratracheal to vascentric parenchyma whereas gum canals are mostly smaller than the vessels and enclosed by apotracheal bands of parenchyma. The diagnostic features of the fossil, viz., exclusively solitary vessels, vertical gum canals solitary or in short tangential rows, vascentric tracheids, vascentric to diffuse to short broken tangential bands of parenchyma, 1-4 seriate heterocellular xylem rays along with a few sheath cells and non septate fibres, indicate its affinities with the woods of *Dipterocarpus* Gaertn. of Dipterocarpaceae (Pearson & Brown, 1932; Metcalfe & Chalk, 1950; Kribs, 1959; Miles, 1978; Ilic, 1991).

Den Berger (1927) instituted the genus *Dipterocarpylon* for those fossil woods which show

resemblance with the woods of the extant *Dipterocarpus* of Dipterocarpaceae. Prakash (1973) and Awasthi (1974, 1980) listed various species of the fossil genus described from various parts of the world. Since then a large number of species of *Dipterocarpus* have been described from many Neogene localities of India (Ghosh & Roy, 1979; Trivedi & Ahuja, 1980; Prakash, 1981; Guleria, 1983, 1996; Yadav, 1989; Awasthi & Mehrotra, 1993, 1997; Antal *et al.*, 1999). After a detailed comparison with all these species it was found that our fossil is closely comparable with *Dipterocarpylon bolpurensis* Ghosh & Roy (1979). This species is already known from the Neogene of Birbhum District, West Bengal (Ghosh & Roy, 1979) and Deomali, Arunachal Pradesh (Awasthi & Mehrotra, 1993). Its presence in Tripura indicates that the species was widespread in Northeast India during the Neogene.

The genus *Dipterocarpus* (Hindi name *Gurjun*) includes about 80 species found mainly in the Indo-Malayan region. The range of its distribution is from South India and Sri Lanka in the west to the Philippines in the east. About 13 of its species grow in the Indian Zone (Andamans, Myanmar, Sri Lanka, India and Pakistan). All of them are large to very large trees found in tropical evergreen forests having good amount of moisture and humidity (Ghosh, 1958).

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