

Triassic Conifer wood from the Tiki Formation, South Rewa Basin, Madhya Pradesh, India

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ABSTRACT

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The present paper records a conifer wood from the Triassic sequence of the Tiki Formation, ~3 km NE of Tiki Village, district Shahdol, Madhya Pradesh, India. Since Triassic wood records are hardly known from India when compared to leaf fossils, the present report of podocarpean wood provides additional evidence for the existence of conifers in the otherwise pteridosperm dominated fossil flora of South Rewa Basin during the Carnian-Norian times.

Key-words—Conifer wood, Triassic, Tiki Formation, South Rewa Basin, India.

भारत में मध्य प्रदेश की दक्षिणी रीवा द्रोणी के टीकी शैलसमूह से प्राप्त ट्राइऐसिक शंकुवृक्ष काष्ठ
राम अवतार एवं ए. रजनीकांत

सारांश

वर्तमान शोध-पत्र भारत में मध्य प्रदेश के शहडोल जिले में टिकी ग्राम के लगभग 3 किमी पूर्वोत्तर में, टिकी शैलसमूह के ट्राइऐसिक अनुक्रम से प्राप्त शंकुवृक्ष काष्ठ को इंगित करता है। जब पर्ण जीवाश्मों से तुलना की जाए तो ट्राइऐसिक काष्ठ अभिलेख भारत में मुश्किल से मिलते हैं, पोडोकार्पियन काष्ठ की वर्तमान रिपोर्ट कार्निअन-नॉरिअन काल के दौरान दक्षिणी रीवा द्रोणी के प्रमुख अशमीभूत पादपजात अन्यथा टेरिडोस्पर्म में शंकुवृक्षों के अस्तित्व हेतु अतिरिक्त प्रमाण प्रदान करती है।

संकेत-शब्द—शंकुवृक्ष काष्ठ, ट्राइऐसिक, टिकी शैलसमूह, दक्षिणी रीवा द्रोणी, भारत।

INTRODUCTION

THE South Rewa Basin embodies rock sequences of Early Permian-Early Cretaceous, often referred to the Gondwana. Hughes (1881, 1884) while mapping the western part of the South Rewa Basin used a comprehensive term – “Supra- Barakar” for all the unclassified strata above the coal-bearing Barakar

Formation. Later, Fox (1931) identified three groups within the Supra-Barakar of Hughes (1884) on the basis of the lithological and biotic evidences. He further correlated the lower group with the Pali-Daigaon beds (Late Permian) and considered it as equivalent to Raniganj Formation of Damodar Basin.

The middle group was given the status of Tiki Bed, which has a distinct floral and lithological identity

assignable to Carnian-Norian age. The upper group was correlated with Parsora Group of Rhaetic age (Cotter, 1917). Subsequently a number of research workers treated Tiki beds under different litho-units as supported by their findings (Rao & Shukla, 1955; Chatterjee & Roy Chowdhury, 1974; Dutta & Ghosh, 1993; Kundu *et al.*, 1993; Tarafdar *et al.*, 1993; Mitra, 1993; Pal, 1996; Bandhopadhyay, 1999; Mukhopadhyay & Mukhopadhyay, 1999). Palaeobotanical evidences were also utilized for stratigraphic placement of Tiki Formation (Sahni, 1931; Sahni & Rao, 1956; Lele, 1964; Sundaram *et al.*, 1979; Maheshwari & Kumaran, 1979; Kumaran & Maheshwari, 1980; Bose *et al.*, 1990; Pal, 1984b, 1991, 1996; Ram-Awatar, 1996, 2003). In the present paper a new fossil wood is described from the Tiki Formation and its significance in climatic interpretation is discussed. Petrified conifer woods belonging to *Podocarpoxyton* have been described earlier from the Tiki Formation (Sahni, 1931). However, the diffuse porous angiospermous woods of *Ailanthoxyton* (*Gondwanoxyton*) described by Saksena (1962), in all probabilities, are not from the Tiki sequence and drifted from some younger strata (Maheshwari & Kumaran, 1979; Maheshwari *et al.*, 1978).

GENERAL GEOLOGY

The exposures of the Tiki Formation are found in between Neosi (23°35'53"N lat. and 81°11'39" E long.) and Tiki (23°56'2"N lat. and 81°21'12"E long.) villages, District Shahdol, Madhya Pradesh. These beds are characterized by red clays, white, pinkish white and yellow coloured sandstones, loose green sandstone, greyish micaceous shale and green sandy shale. The geology of the area was worked out by Dutta *et al.*, 1977; Sundram *et al.*, 1979; Chakrabarty, 1984; Rajaiya and Agasty, 1991; Dutta and Ghosh, 1993; Kundu *et al.*, 1993; Mitra, 1993; Tarafdar *et al.*, 1993; Pal, 1996; Mukhopadhyay and Mukhopadhyay, 1999 and Bandhopadhyay, 1999.

The stratigraphic succession of the area from where the fossil wood was collected is given below (after Chakrabarty, 1984).

Formation	Lithology	Age
Top not exposed		
Bandhavgarh	White coloured medium to coarse grained sandstone with clay clast having siliceous matrix; often with ferruginous cement with medium grained white coloured cross-bedded sandstone.	Lower Jurassic
Unconformity		
Tiki	Red clay; buff coloured fine to medium grained sandstone with calcareous cement. Sandstone with partly or fully ferruginised clay clast.	Late Triassic
Gradational Contact		
Karki	Coarse grained arkosic sandstone. The granules and pebbles of quartz and fresh felspars occur as clast with siliceous matrix.	Middle Triassic
Gradational Contact		
Pali		

MATERIAL AND METHODS

The present material has been collected by one of the authors (RA), about 3 km north east of Tiki Village (23°76'00"N lat.: 81°22'00"E long.) (Fig. 1), from Bhasma Pahari, on way to Barkach Village (Topo Sheet No. 64E/5), District Shahdol, Madhya Pradesh. The wood piece is dark brown in colour, measuring about 30.5 x 15 cm in size. Using conventional section cutting methods, the wood piece was cut into thin sections along the transverse, tangential and radial planes and the sections were mounted on slides using Canada Balsam. Slides were ground with fine quality corborandum powder. The preservation in general is

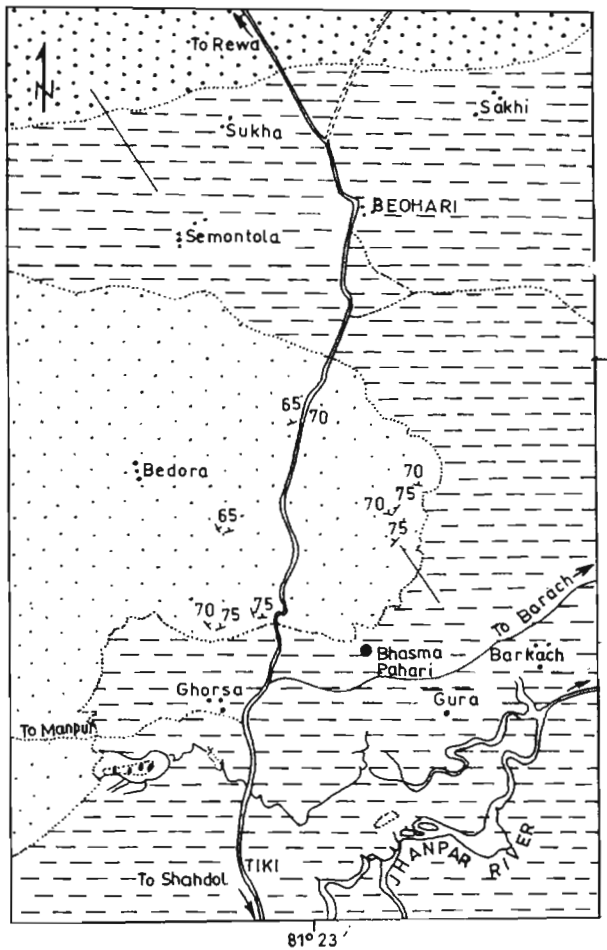


Fig. 1—Map showing fossil locality, South Rewa Basin.

fair and xylotomical details have been studied using Olympus BH-2 Model high power microscope. The registered slides have been deposited in the repository of Museum, Birbal Sahni Institute of Palaeobotany, Lucknow.

SYSTEMATICS

Family—PODOCARPACEAE

Genus—PODOCARPOXYLON Gothan

Karki (Ladian)	Tiki (Late Triassic)	Bandhavgarh (Early Jurassic)
Plant megafossils / microfossils are not recorded	Plant megafossils (Sahni, 1931; Pal, 1984b, 1996) <i>Lepidopteris madagascariensis</i> Carpentier, <i>Dicroidium hughesii</i> (Feistmantel) Gothan, <i>D. zuberi</i> (Szajnocha) Archangelsky, <i>Dicroidium</i> sp., <i>Xylopteris</i> sp., <i>Pachypteris</i> sp., <i>Sphenobaiera janarensis</i> Pal, <i>Baiera</i> sp., <i>Lepidopteris stormbergensis</i> (Seward) Townrow, <i>Dicroidium giarensis</i> Pal, <i>D. coriaceum</i> , (Johnston) Townrow; <i>D. zuberi</i> (Szajnocha) Archangelsky, <i>Dicroidium</i> sp. cf. <i>D. odontopteroides</i> (Morris) Gothan, <i>Elatocladus denticulatus</i> Pal, <i>E. raoi</i> Pal, <i>Pagiophyllum bosei</i> Pal, <i>Yabiella indica</i> Pal, <i>Desmiophyllum singhii</i> Pal, <i>Podocarpoxyylon malerianum</i> Sahni, <i>P. tikiense</i> n. sp.	Plant megafossils (Pal, 1984a) <i>Pagiophyllum</i> sp., <i>Brachyphyllum</i> sp., <i>Desmiophyllum</i> sp., and <i>Conites</i> sp.
Plant megafossils / microfossils are not known	Microspores (Maheshwari & Kumaran, 1979; Kumaran & Maheshwari, 1980) <i>Staurosaccites</i> , <i>Samaropollenites</i> , <i>Aulisporites</i> , <i>Todisporites</i> , <i>Carnisporites</i> , <i>Rimaesporites</i> , <i>Falcisporites</i> , <i>Dictyophyllidites</i> , <i>Infernopollenites</i> , <i>Tikisporites</i> , <i>Camaerозonosporites</i> , <i>Brachysaccus</i> and <i>Chordasporites</i> . Megaspores (Banerji <i>et al.</i> , 1978; Pal 1991, 1996) <i>Bokarosporites</i> , <i>Banksisporites</i> , <i>Biharisporites</i> , <i>Verrutrilletes</i> , <i>Bacutrilletes</i> , <i>Horstisporites</i> , <i>Erlansonisporites</i> , <i>Hughesisporites</i> , <i>Nathorstisporites</i> , <i>Minerisporites</i> and <i>Aneulettes</i>	not recorded not recorded

Fig. 2—Distribution of plant fossils in the Triassic/Jurassic sequences of South Rewa Basin.

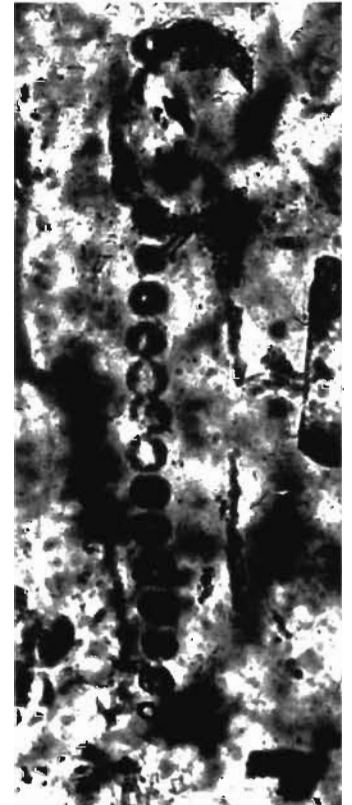
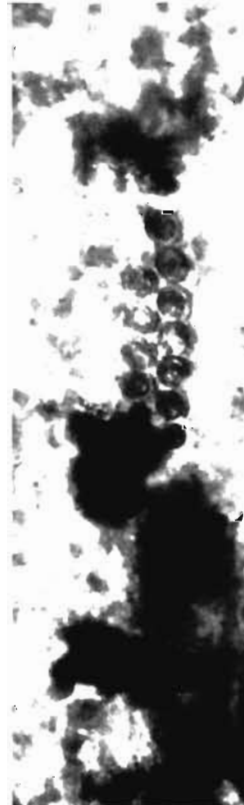
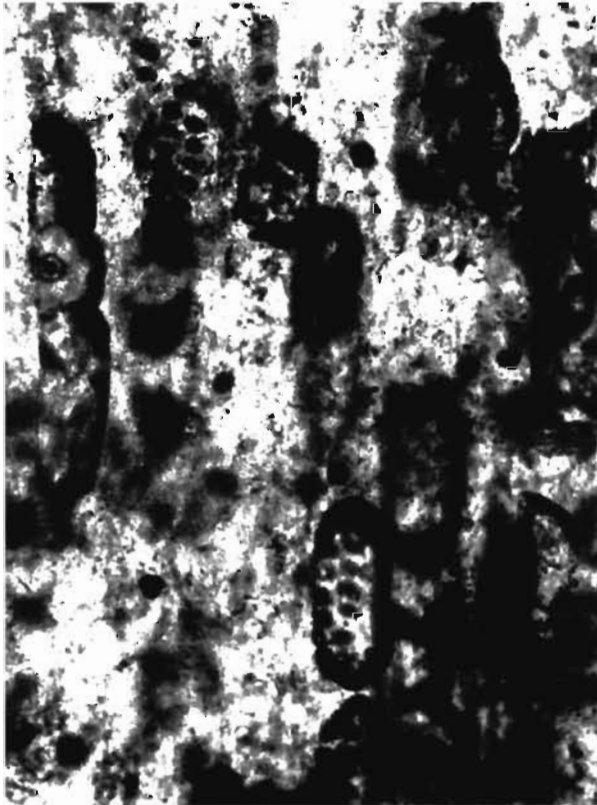
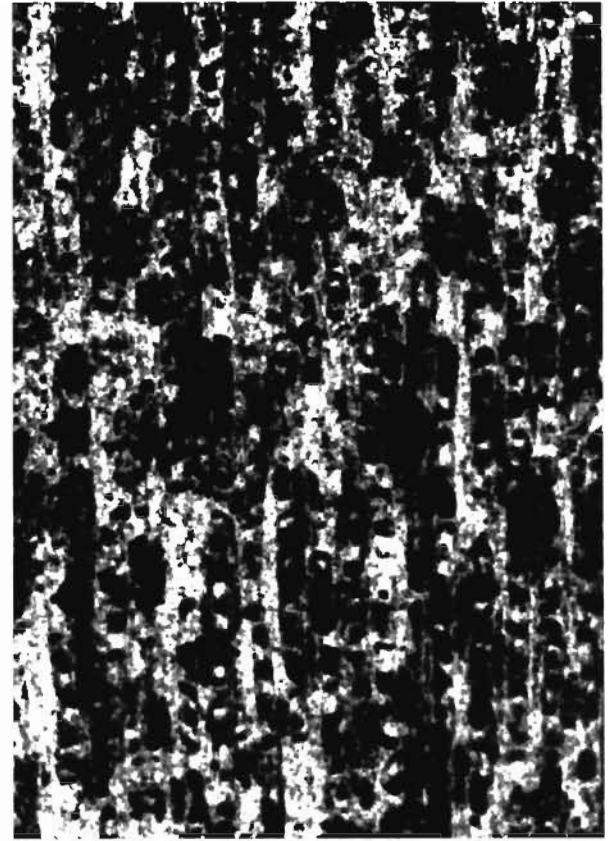
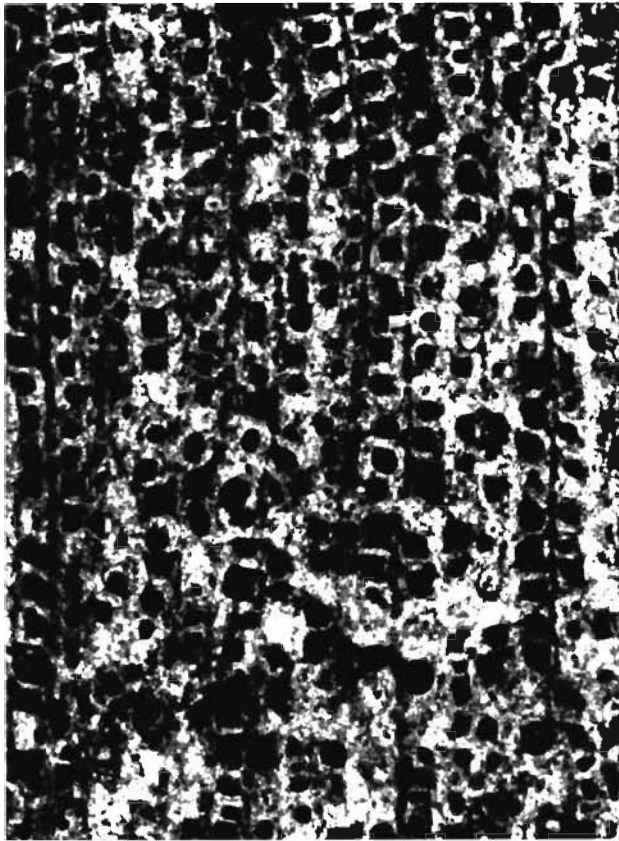


PLATE 1

***Podocarpoxydon tikiense* n. sp.**

(Pl. 1.1-5)

The petrified wood is dark brown in colour measuring about 30.5 x 15 cm.

Transverse section—Growth rings absent. Tracheidal cells squarish to polygonal, 12 x 14 µm, compact, resin cells scattered.

Tangential longitudinal section—Xylem rays mostly uniseriate, sometimes biseriate, average ray height 14-16 cells, variously shaped, mostly oval, tangential wall pits present, uniseriate, circular, 8-10 µm.

Radial longitudinal section—Radial wall pits uniseriate-biseriate, alternate-opposite, contiguous, solitary, circular, bordered, 10-12 µm, cross-field pits arranged in groups, 6-8 in number, 6-8 µm, pore ellipsoid.

Locality—Bhasma Pahari, District Shahdol, Madhya Pradesh.

Specimen No.—BSIP Museum No. 39274 (a, b, c).

Horizon and Age—Tiki Formation, Upper Triassic (Carnian-Norian).

Comparison—The present wood is different from the petrified woods described earlier by Sahni (1931) from the Tiki Formation of South Rewa Basin. It differs from *Podocarpoxydon malerianum* Sahni 1931 in possessing biseriate bordered circular pits and biseriate xylem rays. Further, height of xylem rays and arrangement of cross field pits make the present species different from *P. malerianum*. The newly instituted species also differs from *Podocarpoxydon* sp.

PLATE 1

1. Transverse section showing tracheidal cell distribution. x 40.
2. Tangential longitudinal section showing uniseriate xylem rays. x 50.
3. Radial longitudinal section showing crossfield pits arranged in groups. x 300.
4. Radial longitudinal section showing biseriate circular bordered pits. x 200.
5. Radial longitudinal section showing bordered uniseriate radial wall pits. x 200.

described by Sahni, 1931 in having well preserved bordered biseriate radial wall pits and groups of cross-field pits.

Remarks—Leaves belonging to *Elatocladus* and *Pagiophyllum* (Pal, 1984b) and wood belonging to *Podocarpoxydon* (Sahni, 1931) have earlier been described from the Tiki Formation. The occurrence of the presently described conifer wood provides additional evidence for the existence of conifer forest near the depositional site in South Rewa Basin during the Triassic times (Fig. 2). Moreover Triassic Period was marked by arid conditions and records of conifers are indicative of such conditions. Besides absence of growth rings suggests lack of seasonal growth (Philippe *et al.*, 2004) and more or less uniform generally warm climate (Lele, 1976). Presence of resin cells reflects harsh conditions of growth. Compactly arranged tracheidal cells with thick walls indicate poor availability of water during the period of growth of plant.

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