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A new species of *Agathoxylon* Hartig from the Sriperumbudur formation, Tamil Nadu, India

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Abstract:

Sriperumbudur Formation is one of the Upper Gondwana rock Formations found along the Palar basin, Tamil Nadu, India. The rock units found in this Formation are arenaceous and argillaceous, consists of green shales, clays and sandstones with limestone intercalations. These shales contain animal and plant remains of Upper Jurassic-Lower Cretaceous age. The present work is about a piece of petrified secondary wood of conifer having affinity with Araucariaceae. Based on the anatomical characters the present wood is identified as a new species of *Agathoxylon* Hartig.

Keywords:
Agathoxylon, Sriperumbudur Formation, Upp. Jurassic-Low Cretaceous.

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INTRODUCTION

The out crops of sedimentary rocks exposed in patches all along the eastern shoreline of Indian Peninsula starting from Cuttack in Orissa to Sivagangin Tamil Nadu are collectively referred to as the East Coast Gondwanas. These exposures occur along the Mahanadhi basin, the Krishna-Godavari basin, the Palar basin and the Cauvery basin. The upper Gondwana exposures found along the Palar basin are divided into the lower Sriperumbudur Formation and the upper Satyavedu Formation. Equivalent to these two Formations there is a marine Formation known as Avadi Formation (Kumaraguru,1991).

The Upper Gondwana rocks exposed near Sriperumbudur are part of a large Sriperumbudur Formation found along the Palar basin (Kumarasamy and Jeyasingh, 1995). The rock units found in this formation are arenaceous and argillaceous, consist of green shales, clays and sandstones with limestone intercalations.

These shales contain both marine animal and plant remains of Upper Jurassic-Lower Cretaceous age. These fossilferous shales are covered by the recent lateritic and alluvial Formations.

Plant fossils found in this Formation includes impressions of leaves of petridophytes and gymnosperms and petrifield woods of gymnosperms. Many publications came out regarding the fossils found in this Formation, they are Feistmantel, 1879; Seward and Sahni, 1920; Sahni, 1928 and 1931; Suryanarayana, 1953 and 1954; Ramanujam and Srisailam, 1974; Ramanujam and Varma, 1977 and 1981; Varma, 1983 and 1984; Varma and Ramanujam, 1984; Jeyasingh and Kumarasamy, 1994a, 1994b and 1995; Kumarasamy and Jeyasingh, 1995, 2004 and 2007. The present work is about the observation of a new species of *Agathoxylon*, from this Formation.

MATERIALS AND METHODS

The present observation is about a piece of petrified secondary wood (SPR/VK/52) collected from Vallakottai, a village near Sriperumbudur (Formation named after this town). The specimen was sectioned using rock cutting and grinding machine. Thin sections (TS, TLS and RLS) were prepared and observed under light microscope. Photomicrographs were prepared using Olympus digital camera attached with Olympus microscope.

Agathoxylon aptiana sp. nov.

Holotype : Specimen-SPR/VK/52

Slides : SPR/VK/52/1, 2, 3 and 4

Type locality : Vallakottai

Stratigraphic horizon : Sriperumbudur Formation, Upper Jurassic-Early Cretaceous

Etymology : Named after the probable age (Aptian) of the sediment from where the specimen was picked up.

Description (Fig. 1-a,b,c,d and *e)*

The study is based on a single piece of decorticated pycnoxylic wood, measuring 5 cm long and 4 cm wide. The specimen is impregnated with ferrous compounds. Growth rings distinct, almost straight, almost equal, 600-710 mm (26-33 cells) wide. All growth rings have more of early wood than late wood (four rows of tracheids in average). Tracheids are regularly arranged in radial rows. Transition from early wood to late wood gradual. No reaction wood and false ring. Early wood tracheids 2.0-3.3 mm long, radially 15-50 µm (average 24.7 µm) wide, rectangular to circular. Radial wall pits mostly uniseriate, in some places it is biseriate, alternate; pits bordered, circular, contiguous, 12.5 µm in size. Aperture elliptic, crossed, 6.25 µm long and 2.5 µm wide. Tracheids per mm^2 are 1599. Late wood tracheids 10.0-23.7 µm (average 11.1 µm) in radial diameter. Rays uniseriate, a few are partially biseriate, 1-19 (average 6) cells high, homocellular, cells 22.3 µm long and 17.5 µm wide.

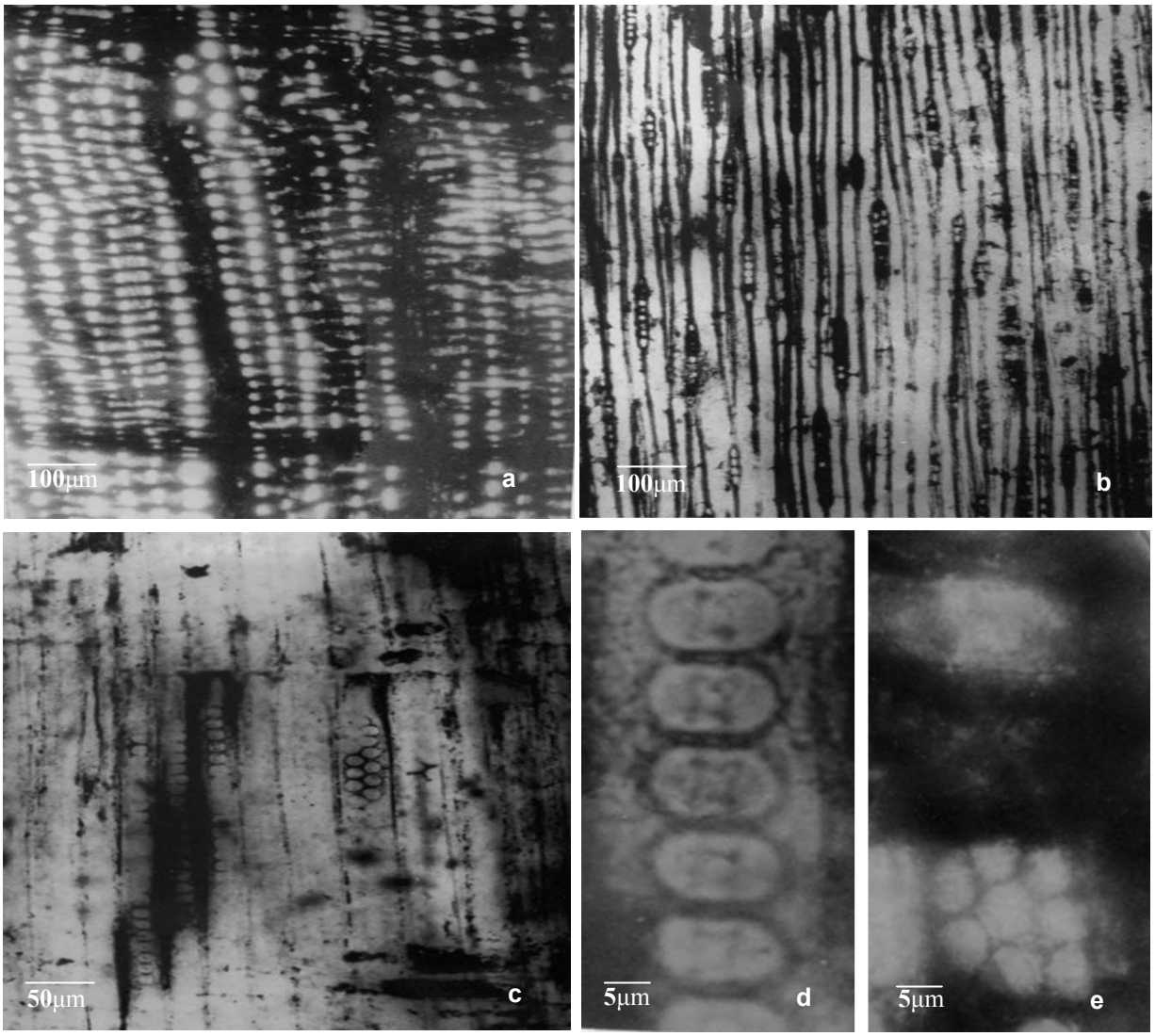

Fig. 1. ***Agathoxylon aptiana.*** **a) transverse section showing growth ring, b) tangential longitudinal section showing uniseriate rays, c) radial longitudinal section showing alternate pitting, d) tracheid radial wall pits showing crossed apertures and e) gross field pits.**

Both tangential and horizontal walls are smooth. Radial wall pits 3-9, circular, bordered, 7.5 μm wide, tightly packed. Aperture circular, ray cells spanning 2½-3 tracheids, end walls vertical. Vertical parenchyma, resin tracheids or resin canals are completely absent.

Diagnosis

Wood pycnoxylic, growth rings distinct. Only radial wall of the tracheids are pitted. Radial wall pits uni-biseriate, alternate, contiguous, circular with elliptical crossed apertures, cross field pits 3-9, circular and contiguous. Rays simple, uniseriate, 1-19 cells high; xylem parenchyma and resin tracheids are absent.

The present wood shows alternate, uni-biseriate pits (araucarioid pitting) on the radial wall of the tracheids, uniseriate rays, and 3-9 pits per cross field. These characters indicate that the present wood having affinity with Araucariaceae.

DISCUSSION

There are sixteen morphogenera of fossil plants have araucarian affinity. They are *Agathoxylon* Hartig, *Araucariopsis* Caspary, *Araucarioxylon* Kraus in Schimper, *Araucarites* Endlicher Sensu Goppert, *Baieroxylon* Greguss, *Cedroxylon* Kraus in Schimper,

Cordaioxylon Lignier, *Cordaioxylon* Lignier, *Cormaraucarioxylon* Lignier, *Dadoxylon* Endlicher, *Dammaroxylon* Schultze-Motel, *Palaeoxylon* Brongniart, *Peuce* Lindley and Hutton, *Pinites* Witham, *Platyspiroxylon* Greguss, *Simplicioxylon* Andreanzsky. Among these names *Araucarioxylon* and *Dadoxylon* are considered to be invalid names. *Agathoxylon* Hartig is the earliest validly published name that can be used to name fossil woods with an *Araucarioxylon*-type anatomy (Philippe, 1993 and 2011)

So far, there are three species *Araucarioxylon* reported from this formation namely *A. rajivii* (Jeyasingh and Kumarasamy (1994a)), *A. giftii* (Jeyasingh and Kumarasamy (1994a)) and *A. mosurense* (Jeyasingh and Kumarasamy (1995)). The present fossil wood differ from *A. rajivii* in having 3-9 cross field pits, whereas in the latter wood there are 1-2 cross field pits per field, similarly in *A. giftii* the cross field pits are 1-3. In *A. mosurense* the rays are 1-3 seriate, where as in the present wood the rays are exclusively uniseriate.

The present specimen superficially resembles *Araucarioxylon bikanerense* reported by Harsh and Sharma (1988) from the tertiary deposits of Rajasthan and *A. agathioides* reported by Krausel and Jain (1964) from the Rajmahal hills. But the present specimen differs from *A. bikanerense* in having uniseriate pits on the radial walls of the tracheids, whereas in *A. bikanerense* the radial wall pits upto triseriate. *A. agathioides* differs from the present specimen is having frequent resin tracheids but in the present specimen there are no resin tracheids at all.

In the presence of biseriate radial wall pits with elliptical, crossed apertures, 3-9 cross field pits per field and the complete absence of xylem parenchyma and resin tracheids, the present specimen stands apart from all other species, so it is assigned to a new species.

So far, many species of fossil conifer woods reported from this formation *viz. Cupressinoxylon coromandelianum* Sahni (1931), *M. thirumangalense* Suryanarayana (1953), *Dadoxylon rajmahalense* Suryanarayana (1954), *Araucarioxylon rajivii* Jeyasingh and Kumarasamy (1994a), *A. giftii* Jeyasingh and Kumarasamy (1994a), *A. mosurense* Jeyasingh and Kumarasamy (1995), *Cupressinoxylon gondwanensis* Kumarasamy and Jeyasingh (2004) and *Sahnioxylon savitrii* Kumarasamy and Jeyasingh (2007) have been reported from this formation. Apart from these petrified woods, many impression fossils of petridophytes and gymnosperms were reported from this Formation (Jeyasingh and Kumarasamy, 1994b; Kumarasamy and Jeyasingh, 1995).

Recently a species of *Agathoxylon* was also reported from this Formation (Kumarasamy, 2013). This species (*Agathoxylon gondwanensis*) differs from the present species in having one pit per cross field and long xylem rays (1-39 cells high).

In general the overall climate during the deposition of the sedimentary rocks in the Palar basin should have been warm, humid and uniform. This is indicated by the abundance of cycodophyte foliage in these sediments. However, there must have been yearly, seasonal variations as evident from the distinct growth rings found in all the secondary wood pieces coming from this formation. Most of the wood pieces show 'C' type growth-rings (as per Creber and Chaloner, 1984) in which the early wood is more than the late wood and the transition from the early wood to late wood is gradual. These features indicate that the climate of this region was almost uniform through the growing season except at its close.

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