

SCIENTIFIC CORRESPONDENCE

Record of new species of *Prototaxoxylon* from Indian Lower Gondwana

Extensive palaeobotanical investigation has been carried out on Lower Gondwana petrified woods occurring in Lower Gondwana strata of the central, north and north-eastern parts of Maharashtra. The main contributions to our knowledge of Lower Gondwana woods from India include the works of several researchers¹⁻¹⁶.

Plenty of petrified woods were collected during our palaeobotanical field trips to various localities of Chandrapur district during the past five years. In the present paper, a well-preserved, petrified gymnospermous wood is described, which was collected on the outskirts of Rangenapalli village, 256 km south-east

of Chandrapur district. The fossil wood was collected from dried-up nallas, then several thin sections were taken in different planes like TS, TLS, RLS by employing standard methods of sectioning using Diamond saw-cutting machine and later grinding and polishing the sections using carborandum powder of grades 100 and 400 no. on grinding lap.

Homoxylc gymnospermous woods, growth rings more/less distinct, radial tracheid pitting of araucarioid type, tangential pits are seen, wood parenchyma are seldom, tertiary spiral bands are present both clockwise and anti-clockwise, cross-field pits are cupressoid.

Specific diagnosis. Decorticated secondary wood showing distinct growth rings, medullary ray 1–2 seriate, 2–18 cells high, on an average height of 4 cells. Radial wall pits are 1–2 seriate araucarioid, mostly uniseriate, cross-field pits 1–6 in groups, partly vested.

Holotype. B.U.P.W. No. 2202 with slides deposited in Palaeobotany and Palynology Laboratory, Department of Botany, Bangalore University.

Locality. Rangenapalli nala, Chandrapur district, Maharashtra, India.

Etymology. The present new species of wood has been described as *Prototaxoxylon rangenapalliense* sp. nov., the specific epithet is being

Table 1. Comparative anatomical characters of different species of *Prototaxoxylon* from Lower Gondwana (Permian)

Genus and species	Medullary ray	Border pitting on radial walls	Spiral bands	Cross field pits
<i>P. gondwanense</i> ⁴	Uni- to biseriate, 2–25 cells high, often up to 31 cells, with an average height of 12 cells	1–3 seriate, alternate/opposite, contiguous/separate, circular/hexagonal pits. 10–11 µm in size pore, circular	Single/double closely spaced, clockwise/anti-clockwise, pass usually across the borders of separate pits/the space between the separate pits	2–8, most commonly 3, 4, 5 pits occur/field round-oval cupressoid 8–10 µm in size, pore circular/elliptical
<i>P. chandrapurensis</i> ³	Uniseriate, 2–26 cells high, often up to 35 cells, with an average height of 12 cells	1–3 seriate, separate/contiguous, circular to slightly compressed (appears to be Podocarpoid), 8–12 µm in diameter, with circular pore sometimes in groups of 3, 4, 5 pits	Single/doubly closely spaced clockwise/anti-clockwise, pass usually through/across the borders of separate pits/often empty tracheids	1–9, most commonly 4, 5, 6 rounded-oval, cupressoid 4–8 µm in size, pore circular oblique
<i>P. uniseriale</i> ¹²	Uniseriate, homogeneous 1–10 cells, with an average height of 3–4 cells	Pits usually uniseriate, rarely biseriate, circular-oval bordered alternate, contiguous with circular-oblique elliptical pit pores	Spiral bands seen both clockwise and anti-clockwise, inclined at an angle of ± 45°	1–2 circular-oval, with sub circular pit pores
<i>P. maithyia</i> ¹²	1–2 seriate, 1–28 cells high, with an average height of 3–4 cells	1–3 seriate circular pits, bordered separate, contiguous alternate and hexagonal	Spiral bands closely placed, clockwise/anti-clockwise, inclined at 40–65° angle	Up to 5, mostly 2–3 sometimes contiguous/bordered
<i>P. mahabaleii</i> ⁵	Uniseriate, rarely biseriate (14%) 1–25 cells high, with an average height of 9 cells	1–2 seriate roundly hexagonal alternate, contiguous pits	Uni- to triseriate spiral bands both clockwise and anti-clockwise, 3 types of spirals are seen—unispiral, bispiral and trispiral, at an angle of 45–90°	1–7 small cupressoid
<i>P. rangenapalliense</i> sp. nov. (Agashe and Shashi Kumar)	1–2 seriate, 2–18 cells high, with an average height of 4 cells, mostly uniseriate	1–2 seriate, mostly uniseriate. Uniseriate circular pits have distinct pit pore, contiguous/separate, biseriate pits alternate/sub-opposite	Spiral bands distinct single/doubly-closely placed, both clockwise and anti-clockwise pass usually across the borders	1–6 cupressoid, in groups, partly vested

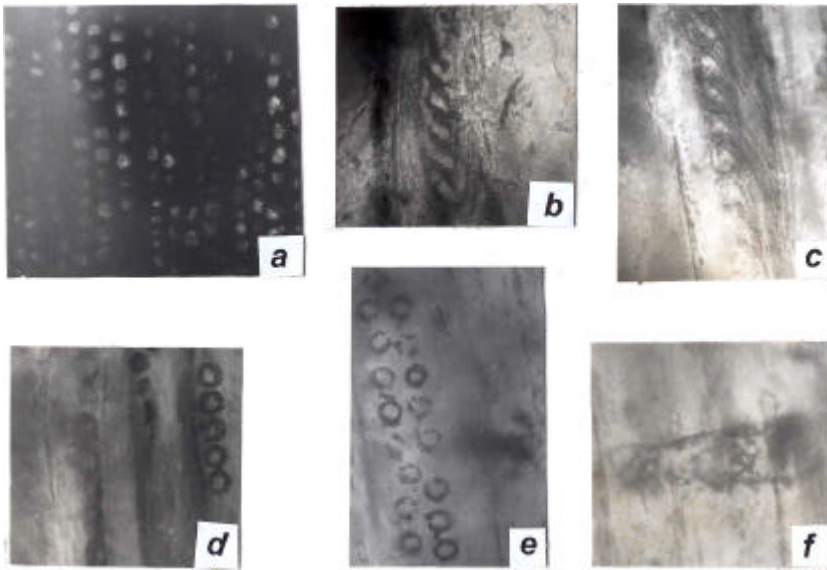


Figure 1. *a*, TS showing distinct growth rings, $\times 100$. Radial longitudinal section showing: *b*, Tertiary spiral bands running on border of radial pit, $\times 250$; *c*, Tertiary spiral bands running on border of radial pits, $\times 400$; *d*, Uniseriate circular contiguous vestured pits, $\times 250$; *e*, Biseriate circular opposite/alternate vestured pits, $\times 250$; and *f*, Vestured three and four fused pits, $\times 400$.

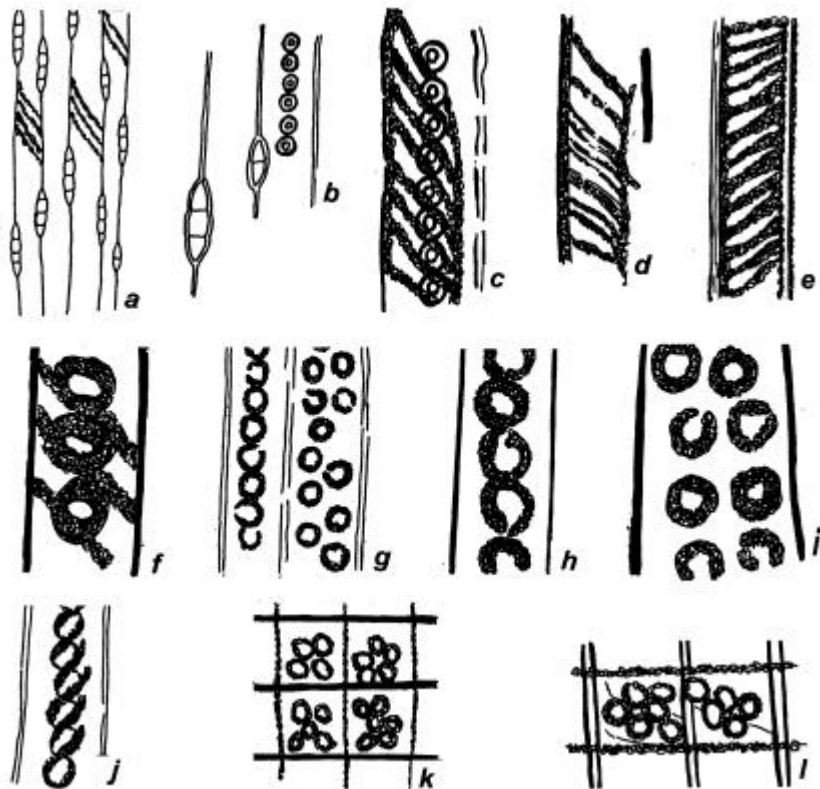


Figure 2. TLS showing *a*, Uniseriate medullary rays, $\times 100$; and *b*, Uniseriate medullary rays and tangential pits, $\times 250$. *c-e*, RLS showing tertiary spiral bands, both clockwise and anti-clockwise, on radial pits, $\times 250$. RLS showing *f*, Circular uniseriate pits on which spiral bands run clockwise, $\times 400$; *g*, Uniseriate contiguous fused circular pits, $\times 250$; *h, i*, Uniseriate circular contiguous pits and biseriate circular opposite pits which appear vestured, $\times 400$; and *j*, Uniseriate circular contiguous pits and spiral bands which run on border of the pits, $\times 250$. *k, l*, Cross-fields showing 4-6 slightly vestured pits, $\times 250$ (*k*); and 5, 6 slightly vestured pits, $\times 400$ (*l*).

derived from Rangenapalli village from where the fossil wood was collected.

Geological age. Lower Gondwana (Permian).

Prototaxoxylon was instituted by Kräusel and Dolianiti⁷ from Lower Gondwana formations. Totally, 10 species of *Prototaxoxylon* are known from all over the world, out of which three species are reported from other places. Kräusel and Dolianiti⁷ described *P. africanum*¹⁶ and *P. brasilianum* from Lower Gondwana formations of Africa and Brazil. Fakhr and Marguerier⁶ reported *P. feriziense* from Iran. The seven species of *Prototaxoxylon* described from India are as follows.

Prakash and Srivastava^{10,11} described two species of *Prototaxoxylon*, i.e. *P. indicum* and *P. intertrappeum* from Sitapuri district of Dhar, Madhya Pradesh. Though reports of occurrence of *Prototaxoxylon* from Maharashtra are scanty, many species of *Prototaxoxylon* have been described. Agashe and Gowda³ described *P. chandrapurensis* and Agashe *et al.*⁴ described *P. gondwanense* from Lohara of Chandrapur district. Biradar and Bonde⁵ described *P. mahabaleii* from Chandrapur district. Prasad¹² described two new species of *Prototaxoxylon*, i.e. *P. maithyii* and *P. uniseriale* from Kanhargaon of Chandrapur district.

Other taxinean fossil woods described from Lower Gondwana formations of India are as follows. Agashe¹ reported *Prototaxopitys andrewsii* from Jharia coal field of Bihar. Prasad and Chandra^{14,15} described *Taxopitys indica* from Kanhargaon of Chandrapur district and *Paleospiroxylon heterocellularis* from Raniganj coal field, respectively. Pant and Singh⁹ described *Parapalaeosprioxylon burmundiaensis* and *Parapalaeosprioxylon multiseriale* from Raniganj coal field.

The fossil wood measures 9.6 cm in length and 3.6 cm \times 3.8 cm in thickness. Growth rings are distinct, the early wood tracheids are 80-180 cells thick measuring 6.7 mm \times 6.9 mm in size, the late wood tracheids are narrower with 2-8 cells thick, measuring 0.16 mm \times 0.24 mm in size (Figure 1*a*). Tangential longitudinal section shows 1-2 seriate medullary rays, mostly uniseriate, 2-18 cells high, with an average height of 4 cells. Tertiary spiral bands are distinct, both clockwise and anti-clockwise (Figures 2*a* and *b*). Radial wall shows 1-2

seriate araucarioid pits, mostly uniseriate, tertiary spiral bands are seen both clockwise and anti-clockwise on radial walls, average thickness of spiral bands is 5.3 μm , at an angle of 40–45° from radial wall (Figures 1b, c, and 2c–f). Uniseriate circular pits are contiguous with distinct pit pore. Biseriate circular pits are alternate/sub-opposite, vested slightly. This is because, as spiral bands pass through bordered pits, the pits look vested. The maximum diameter of a radial pit is 14.3 μm and that of a pit pore is 7.5 μm (Figures 1d, e and 2g–j). Cross-field pits are 1–6 in groups clustered/partly vested. The average diameter of a field pit is 10 μm (Figures 1f and 2k, l).

The present specimen resembles *P. africanum*^{7,16} in medullary ray characters by having 1–2 seriate, 2–18 cells high medullary rays, with an average height of 4 cells, but differs from the above species in anatomical characters such as cross-field pitting and radial-wall pitting. Although it resembles *P. uniseriale*¹², *P. africanum*^{7,16}, *P. brasilianum*⁷, *P. indicum*⁸ comb. nov.¹¹, in having 1–2 seriate araucarioid radial wall pits and 1–6 cross-field pits, it

resembles *P. indicum*⁸ comb. nov.¹¹, but differs from all the species of *Prototaxoxylon* in medullary ray characters, as shown in Table 1. Hence a new species of *Prototaxoxylon* is described, which adds to the diversity of Lower Gondwana flora of Chandrapur district.

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