

**SHOREOXYLON RANIKOTENSIS SP. NOV., A NEW SPECIES  
OF FOSSIL WOOD DIPTEROCARPIACEAE FROM RANIKOT  
FORT AREA, DISTRICT JAMSHORO, SINDH, PAKISTAN**

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**Abstract**

*Shoreoxylon ranikotensis* sp. nov. a new silicified wood fossil has been described from Quaternary deposits of Dada formation exposed near Ranikot fort area, district Jamshoro, Sindh, Pakistan. (Lat. 25°45' – 26°00' N. Long. 67°45' – 68°00'). The xylotomical attributes of the present fossil wood show close affinities with the genus *Shorea* of the family Dipterocarpiaceae. The mode of occurrence of this fossil indicates that the plant from which this fossil wood had developed was not growing *in situ* but transported from some other area, into the present location.

**Introduction**

The occurrence of the fossil dicot and monocot woods in the upper Tertiary and Quaternary deposits of Sindh is known since the early report of Blanford, (1879). Seventeen fossil woods have been identified and described from Sindh, Pakistan, (Khan & Rahmatullah 1968, Khan *et al.*, 1971; Khan & Rahmatullah, 1972; Khan & Rajput, 1976; Rehmatullah *et al.*, 1984; Rajput & Khan, 1982; Rajput & Khan, 1982; Rajput & Khan, 1984; Saeed *et al.*, 1984; Rajput *et al.*, 1985; Ahmed *et al.*, 1989; Ahmed *et al.*, 1991; Ahmed *et al.*, 1993; Bhutto *et al.*, 1993; Ahmed *et al.*, 2000 and Ahmed *et al.*, (2001).

This research work deals with the anatomical description and the affinities of a fossil wood collected from Dada formation exposed near Ranikot fort area, district Jamshoro, Sindh.

**Materials and Methods**

The fossil wood was brown in colour, with nice preservation a small piece of mature secondary xylem measuring 7 cm. in length and 4 cm. in diameter (Plate 1, Fig. 1).

Three-dimensional sections of the fossil petrified wood were prepared following the standard technique (Weatherhead, 1938) and stereozome microscope. Most of the preliminary investigations were made with the simple light microscope and photographs were taken with Urtholux Microscope.

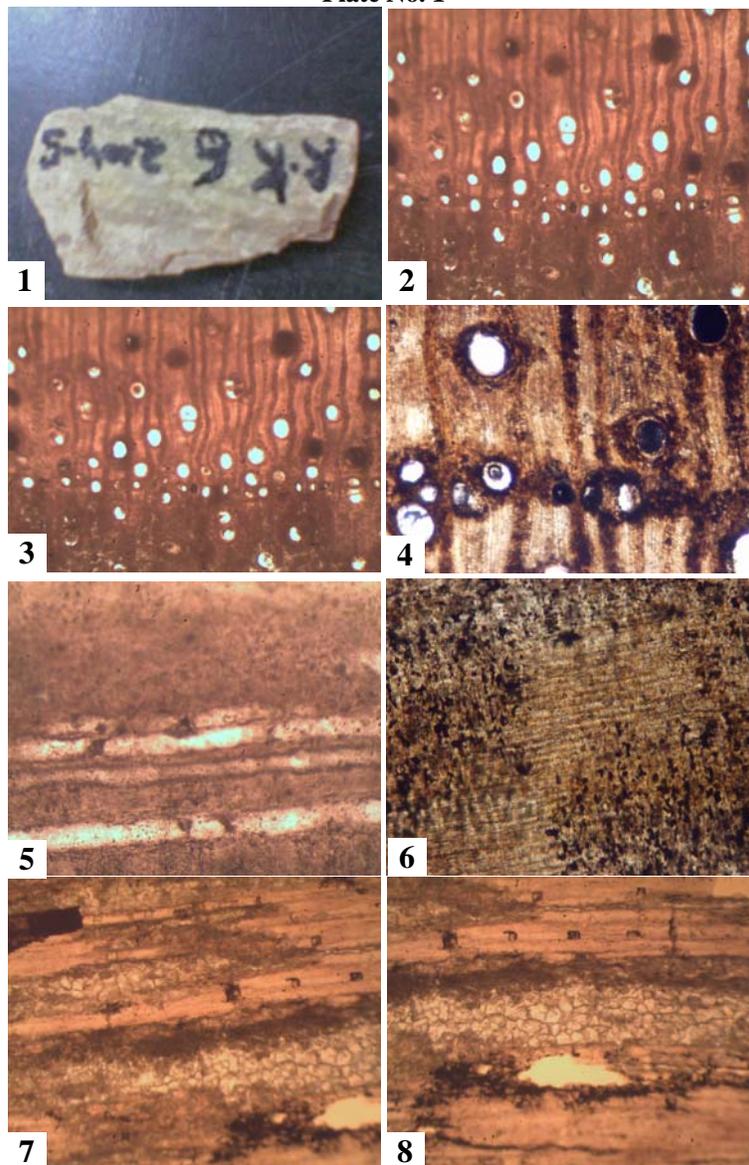
***Shoreoxylon ranikotensis* sp. nov.**

**Anatomical description**

**Plate 1. Fig. 2-8. Text Plate 1,2 & 3**

**Topography:** Wood diffuse-porous. Growth rings absent; concentric bands of vertical resin canals simulate growth marks with the naked eye. Vessels visible to the naked eye as pin holes, large to medium-sized, mostly solitary, often in radial multiples of 2-3, 5-6 per sq. mm. Usually with the rays contiguous on one or both the sides; tylosis and

## Plate No. 1



*Shoreoxylon ranikotensis* sp. nov.

Fig. 1. Macro photograph of fossil wood.

Fig. 2. Cross section showing general distribution of vessels and parenchyma. X 20.

Fig. 3. Cross section showing vessels with aliform parenchyma. X 30.

Fig. 4. Cross section showing vessels with gum canals. X 100.

Fig. 6. Radial longitudinal section showing xylem with end walls. X 30.

Fig. 7. Radial longitudinal section showing parenchyma and ray cuttings. X 200.

Fig. 7. Tangential longitudinal section showing multiseriate xylem rays. X 200.

Fig. 8. Tangential longitudinal section showing multiseriate xylem rays and fibres. X 200.

gummy deposits present. Vasicentric tracheids very rare associated with the vessels along with the paratracheal parenchyma. Parenchyma both paratracheal and apotracheal, the former are vasicentric to occasionally aliform, sometimes with a tendency to join two or rarely more adjacent vessels; the apotracheal type is either diffuse occurring as solitary or groups of cells, occasionally forming short, irregular lines in the fibrous tract between the rays or in long tangential bands associated with the resin canals. Xylem rays not visible with naked eye, distinct with a hand lens, broad to medium, 1-5 seriate, mostly 4-5 seriate, 12-75  $\mu\text{m}$  broad, closely spaced, 7-10 per mm Ray tissue almost homogeneous with rays composed mostly of procumbent cells; uniseriate rays about 12  $\mu\text{m}$  in width, variable in height, 3-12 cells and 100-272  $\mu\text{m}$  high; multiseriate rays up to 75 cells or 1275  $\mu\text{m}$  high. Fibres aligned in distinct radial rows. Gum canals vertical, arranged in long, often 1-2 or 3, rarely 4, tangential rows embedded in parachymatous bands, usually round to oval and 45-150  $\mu\text{m}$  in diameter.

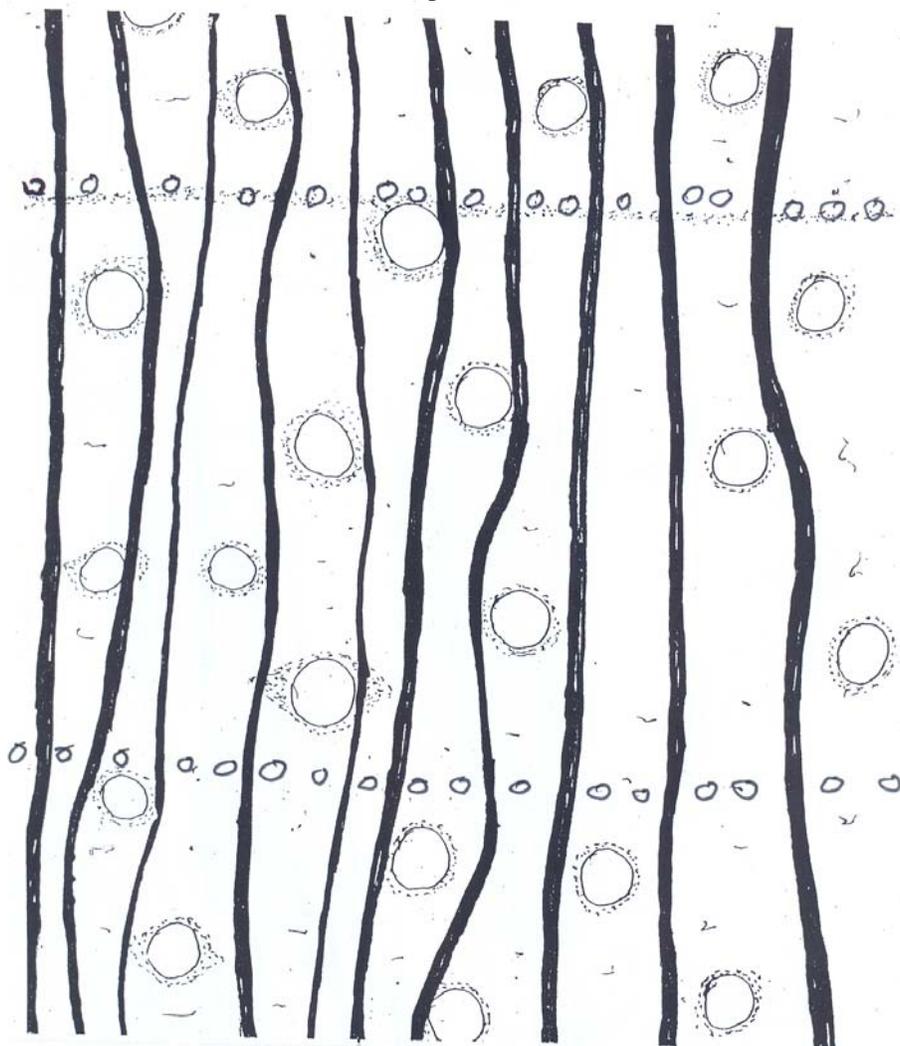
**Elements:** *Vessels* thin-walled, the walls about 3-4  $\mu\text{m}$  thick, t.d. of solitary vessels 135-240  $\mu\text{m}$  r.d. 225-360  $\mu\text{m}$  oval to mostly elliptical, those in radial multiples flattened at the places of contact; vessel-members about 225-345  $\mu\text{m}$  or more, with truncate ends; perforations simple; intervessel pit pairs 5-7  $\mu\text{m}$  in diameter, alternate, bordered oval to orbicular in shape; vessel-tracheid pits bordered, 1-2 seriate, aperture not clear; vessel-parenchyma pits not preserved. Parenchyma cells thin walled, t.d. 14-20  $\mu\text{m}$  height about 64-80  $\mu\text{m}$ . Ray cells slightly thick walled; procumbent cells variously shaped in tangential section, t.d. 8-20  $\mu\text{m}$ , radial length 270-375  $\mu\text{m}$  vertical height 14-24  $\mu\text{m}$ . Fibres libriform, very thick walled with small lumen, appear thin walled at some places due to degradation of secondary walls, non-septate, polygonal in cross section; t.d. 12-20  $\mu\text{m}$  r.d. 10-20  $\mu\text{m}$  length could not be taken due to bad preservation; inter-fibre pits not seen. Gum canals arranged in long concentric, tangential rows small, 45-150  $\mu\text{m}$  in diameter and usually round to oval in shape embedded in long bands of apotracheal parenchyma.

## Discussion

The presence of normal, vertical gum canals in concentric tangential rows, at once shows its resemblance with woods of the family Dipterocarpaceae. Structural features of the fossil wood indicate, after extensive comparison that its closest affinities are with *Shorea* (*Isoptera*), *Doona*, *Hopea*, (= *Dioticarpus*), *Parashorea*, *Pentacme*, *Balanocarpus* and *Dryobalanops*.

*Doona*, *Hopea*, (= *Dioticarpus*), *Parashorea*, *Pentacme*, *Balanocarpus* and *Dryobalanops* can be distinguished anatomically by the presence of almost exclusively solitary vessels and the fibres with bordered pits, while the vessels are solitary as well as in radial multiples and the fibres are with simple pits in *Shorea*, *Pentacme* and *Parahored*. As it has not been possible to ascertain the type fibre pits in the fossil due to bad preservation, it is not possible to apply this criteria. However, the combination of anatomical features of this fossil indicates its affinity especially with *Shorea*, *Pentacme* and *Parahored*. A survey of the thin sections and published description and figures of the members of Shoreae reveals its resemblance with the modern woods of *Shorea* and *Pentacme* (Pearson & Brown 1932). As it is not possible to separate these two species of *Shorea* and *Pentacme* anatomically, the fossil wood might belong to any one of them. Because the present fossil belongs to Shoreae group it has been assigned to the from genus *Shoreoxylon* Den Berger (1923).

## Text plate No. 1



*Shoreoxylon ranikotensis* sp. nov.

Cross section showing general distribution of vessels, rays and parenchyma.

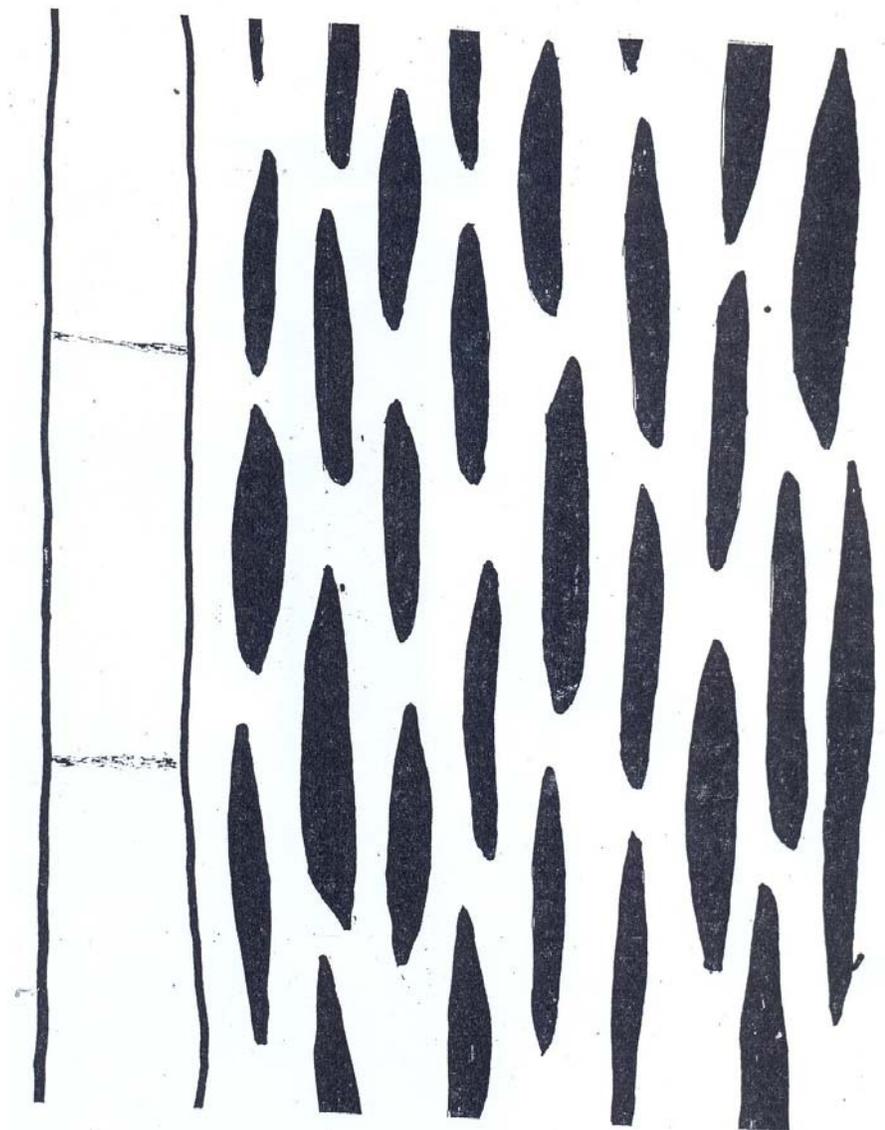
**Comparison with fossil record:** The detailed comparison of this fossil wood with the above species of *Shoreoxylon* (Table 1), it has been seen that the fossil wood is quite different from all above mentioned species. As present fossil wood is quite distinct from all the species of *Shoreoxylon* hence it has been assigned to a new species named as *Shoreoxylon ranikotensis* sp. nov.

The specific epithet indicates the locality from where the specimen was collected. The mode of occurrence of the fossil in question indicates that the plant from which this fossil wood had derived was not growing *in situ* but transported from somewhere else.

Table 1. Comparison of fossil woods related to the genus *Shoreoxylon*.

Fossil species	Growth ring	Vessels	Parenchyma	Xylem rays	Fibers
<i>Shoreoxylon holdeni</i> Ramanujam 1956 South India, Tertiary	Absent	Circular, in radial groups of 2-3 width	Apotracheal, paratracheal	Rays are 1-4 seriate and 7-40 cells usually 15-28 cells high	Libriform
<i>Shoreoxylon mortandranse</i> Ramanujam 1956 South India, Tertiary	Absent	Vessel solitary in radial groups of 2-3 they are medium to large 180-280 $\mu$ m diameter	Abundant both apotracheal and paratracheal	Rays are 1-6 seriate, uniseriate rare, may 4-6 seriate, rays are 10-80 cells high	Fibers libriform to semi libriform
<i>Shoreoxylon irrawaddiensis</i> Parkash & Bandre 1923 Burma Tertiary	Absent	Vessels mostly large and solitary, some times in radial pairs vessels t.d. 90-300 $\mu$ r.d 90-380	Paratracheal and apotracheal	Mostly (3-5) seriate rarely uni and biseriate	Libriform, non septate
<i>Shoreoxylon burmense</i> Prakash 1965 Burma, Tertiary	Absent	Solitary radial multiples of 2-3 vessels t.d. 135-240 $\mu$ r.d. 225-360	Paratracheal and apotracheal	1-5 seriate, mostly 4-5 seriate	Libriform thick walled
<i>Shoreoxylon ranikotensis</i> sp. Nov.	Absent	Mostly large Solitary sometimes radial pairs	Apotracheal, paratracheal	3-6 Seriate with rare UNI-and Biseriate	

## Text plate No. 2



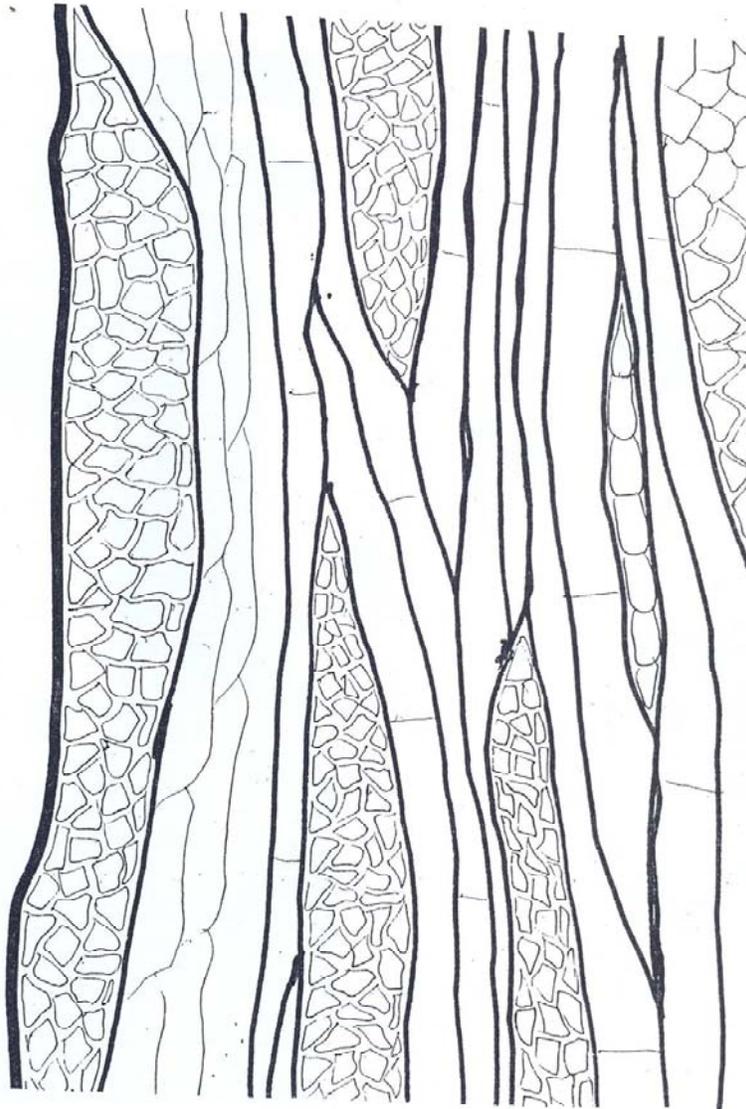
*Shoreoxylon ranikotensis* sp. nov

Tangential longitudinal section showing distribution of xylem rays and end walls.

**Specific diagnosis**

***Shoreoxylon ranikotensis* sp. nov.:** Wood diffuse-porous. Growth rings absent. Vessels large to medium-sized., t.d. of solitary vessels 135-240  $\mu\text{m}$ , r.d. 225-360  $\mu\text{m}$ , mostly solitary often in radial multiples of 2-3 oval to elliptical in shape, tylosed or with gummy deposits, 5-6 per sq. mm., vessel-members about 225-345  $\mu\text{m}$  or more with truncate ends;

Text plate No. 3



*Shoreoxylon ranikotensis* sp. nov

Tangential longitudinal section showing enlarged xylem rays and fibres.

perforations simple; intervessel pit-pairs 5-7  $\mu\text{m}$  in diameter, alternate, bordered, oval to orbicular in shape. Vasicentric tracheids scanty, associated with the vessels along with paratracheal parenchyma. Vessel-tracheid pits bordered, 1-2 seriate. Parenchyma both paratracheal and apotracheal; paratracheal parenchyma vasicentric to occasionally aliform, sometime with a tendency to join two or more adjacent vessels; apotracheal parenchyma either diffuse occurring as solitary or groups of cells, sometime forming

short, irregular lines, or in long tangential bands embedding the canals. Xylem rays 1-5 (mostly 4-5) seriate, 12-75  $\mu\text{m}$  broad and upto 1275  $\mu\text{m}$  high; ray tissue almost homogeneous. Fibres libriform, nonseptate and polygonal; interfibre pits not well preserved. Gum canals arranged in 1-3 rarely 4, concentric, tangential rows, embedded in parenchymatous bands round to oval in shape about 45-150  $\mu\text{m}$  in diameter.

**Holotype:** Ranikot fort area, 22 km, west of Sunn Railway Station, district Jamshoro Pakistan (Basir Ahmed & Majeeda Sher R.K 06/2004, Palaeobotany museum University of Sindh, Jamshoro, Sindh, Pakistan).

**Horizon:** Dada formation.

**Age:** Pleistocene to sub recent.

### References

- Ahmed, B., A.M. Abbassi, Asfrac Bano and K.M. Khan. 1991. *Duabangoxylon pakistanicum* sp. nov. A new taxon of Sonneratiaceae from Ranikot fort area. *Pak. J. Bot.*, 23(1): 55- 61.
- Ahmed, B., C.R. Arain and K.M. Khan. 1993. Two new species of *Terminalioxylon* from Ranikot Fort Area, District Dadu, Sindh, Pakistan. *Sindh. Univ. Res. Jour. (sci. ser.)*, 23(1): 27-41.
- Ahmed, B., M.T.M. Rajput and K.M. Khan. 1989. *Laurinoxylon ellipticum* sp. nov. A new petrified taxon of Larqaceae from the Tertiary deposits of Sind, Pakistan. *Sindh. Univ. Res. Jour. (sci. ser.)*, 21(1): 29-36.
- Ahmed, B., M.T.M. Rajput and K.M. Khan. 1991. *Sidreinium pitensis* sp. nov. A new species of silicified fossil wood from Tertiary deposits of Sind, Pakistan. *Pak J. Bot.*, 23(2): 236-242.
- Ahmed, B., M.T.M. Rajput and K.M. Khan. 1991. *Mangiferoxylon pakistanicum* sp. nov. A new fossil species of the family Anacardiaceae from Ranikot fort area. *Pak. J. Bot.*, 23(1): 62-69.
- Awasthi, N. 1980. Two new Dipterocarpaceous woods from the cuddalore series near pondichery. *Palaeobotanist*, 26(3): 248-256.
- Bhutto, I., B. Ahmed, C.R. Arain and K.M. Khan. 1993. *Lagarstromiaxyton ranikotensis* sp. nov. A new species of Lythraceae from the Tertiary sequences of Sindh, Pakistan. *Sindh. Univ. Res. Jour. (sci. ser.)*, 22(1&2): 25-32.
- Blanford, W.T. 1879. *On the geology of Sindh*. Ind. Geol. Survey.
- Chowdhury, K.A.S. and S.S. Ghosh. 1958. Indian woods. I. Dehradum.
- Den Berger, L.G. 1923. Fossiele houtsoorten uit het tertiair van ruid. *Sumatra Verh. Ge. Mijnb Gen. Ned.*, 7: 143-148.
- Hess, R.W. 1943. Studies of the Fossil woods from the Tertiary Record.
- Khan, K.M., M.R. Ahemd and Ch. Rehmatullah. 1972. *Palmoxylon amriense* sp. nov. A new species of palm from Ranikot Formation (Paleocene) near Amri Sindh. *Palaeontographica*, Abt. B., 132: 128-129.
- Khan, K.M. and M.T.M. Rajput. 1976. *Laurinoxylon rehmanense* sp. nov. A new species of fossil dicot. Wood from Tertiary rocks of Sindh, Pakistan. *S. U. Res. J. (sci. ser.)*, 9: 5-13.
- Khan, K.M. and Ch. Rehmatullah. 1968. *Sapindoxylon petaroensis* sp. nov. A new species of dicot wood from the late Tertiary deposits of Sindh. *S. U. Res. J. (sci. ser.)*, 3(2): 137-142.
- Khan, K.M. and Ch. Rehmatullah. 1971. *Albizzioxylon dhaproense* sp. nov. A new species of silicified fossil wood from Ranikot formation (Paleocene) near Amri, Sindh. *S. U. Res. J. (sci. ser.)*, 5(2): 207-213.
- Pearson, R.S. and H.P. Brown. 1932. *Commercial Timbers of India*. Govt. of India Publ., Calcutta.
- Prakash, U. and M.B. Bandre. 1980. Some more fossil woods from Tertiary of Burma. *Palaeobotanist*, 26(3): 261-278.

- Rajput, M.T.M. and K.M. Khan. 1982. Two new species of fossil woods from Ranikot fort area of Sindh. *Pakistan. J. Bot.*, 14(1): 75-87.
- Rajput, M.T.M. and K.M. Khan. 1984. *Araucarioxylon* sp. A silicified Gymnosperm wood from Manchhar. Formation. *Pak. J. Bot.*, 16(1): 53-60.
- Rajput, M.T.M., S.T. Syeda and K.M. Khan. 1985. *Myristicoxylon ranikotensis* sp. nov. A silicified dicot wood from Ranikot fort area, District Dadu, Sindh, Pakistan. *Pak. J. Bot.*, 17(2): 247-252.
- Ramanujam, C.G.K. 1955. On some Silicified woods from near Pondicherry. *Palaeobotanist*, 3: 40.
- Ramesh Rao, K. and S.K. Purjayastha. 1972. *Indian woods*. 3 Dehra Dun.
- Rehmatullah, Ch. 1966. *Timbers of New World. New Heaven rocks of lower Sindh*, M.Sc. thesis University of Sindh.
- Rehmatullah, CH. 1971. *Studies of the silicified wood from the Tertiary rocks of Sindh*. M. Phil. thesis, University of Sindh.
- Saeed, M., Z.A. Nizamani and N.M. Bhatti. 1984. Anatomical studies of a stem fossil from Ranikot fort area, District Daud, Sindh, Pakistan. *S. U. Res. J. (sci. ser.)*, 16(2): 35-40.
- Santapau, H. and A.N. Henry. 1973. *A Dictionary of Flowering Plants of India*. New India.
- Schonfeld, G. 1947. Holzer aus dem Tertiar Von Kolumbien. *Abh. Senckenb naturf. Ges.*, 475: 1-53.

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