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# Discovery of Miocene Wood from Manchar Formation, Lagerstroemioxylon thanobolensis Sp. Nov. of Family Lythraceae , Thanobola Khan District Jamshoro, Sindh, Pakistan

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**Abstract:** The paper presents taxonomic identifications by the paleoxylotomical studies of petrified fossil wood collected from Manchar Formation of Miocene age exposed in Thanobola khan Sindh Pakistan. Sections were prepared by standard ground thin section techniques. Anatomical characters revealed from the microscopic study were used to compare with modern wood and already reported fossil woods. The sample was found comparable with family Lytheraceae and with species in respect of character of Vessels, arrangements of wood Parenchyma and Xylem rays. Therefore it is given as a name Lagerstroemioxylon thanobolensis sp.nov., represent the locality of Thano Bola Khan

**Keywords:** Fossil wood, Lagerstroemia, Thanobola Khan., Manchar formation

## 1. INTRODUCTION

Macro plant fossils deposited in different regions of Pakistan provide great information about past vegetation. Thano Bola khan is one of them where fossils are scattered in fossiliferous locality very little work has been done on this locality represented by two publications (Ahmed *et al*.2007a) (Khan *et al.* 2016) While, from different localities of Sindh different author reported and published number of Species i.e. (Khan and Rahmatullah 1968) , (Khan *et al*.1971), (Khan and Rahmatullah 1972) , (Khan and Rajput 1976) (Rajput and Khan 1982) (Rajput and Khan 1984) (Saeed *et al* 1984). (Rehmatullah. *et al* 1984), ( Rajput *et al* 1985), (Ahmed *et al*. 1991a), (Ahmed *et al*. 1991b), (Bhutto *et a*l. 1993), (Ahmed *et al*. 1993), (Ahmed *et al* 2000) , and ( Ahmed *et al*. 2001) (Ahmed et al 2007b), (Shar *et al*, 2007) while few species were also reported from punjab Province of Pakistan (Soomro *et al* 2016a) (Soomro *et al* 2016b) . The present work deals with the anatomical description and the affinities of a fossil wood with living wood collected from Thano Bola khan, district Jamshoro, Sindh, Pakistan.. (Lat. 67º.50' N. Long. 25º.21' E). The age of the rocks involved is Late Miocene.

## 2. MATERIALS AND METHODS

### Holotype

The specimen No. TB. 09. The material (TB. 09) silicified wood was collected by the first author from 10 Km in south-west of Thano Bola Khan, district Jamshoro, Sindh Pakistan Horizon: Manchar Formation age: Miocene. The wood was a small piece of mature secondary xylem fossil about 7 cm. in length and 4 cm. in diameter. The colour of fossilized wood was brown as in **(Fig. 1).** The anatomical sections, of required direction were prepared by the conventional Rock cutting and grinding technique (Weatherhead,1938) Most of the preliminary investigations were made with the simple light microscope and Steriozoome microscope. Photographs were taken with Ortholux Microscope at the paleobotany lab. Institute of Plant Sciences University of Sindh.

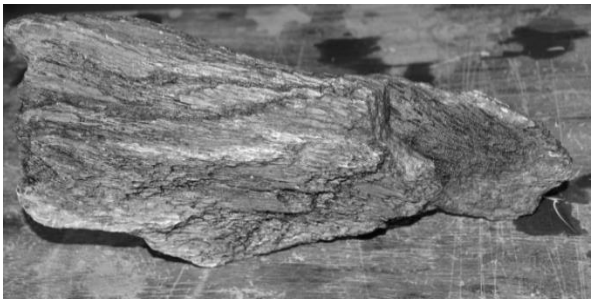

**Fig.1 Macrograph of Fossil wood**

## 3. RESULTS

### Diagnosis of the Species

Wood semi-ring porous, growth rings distinct, marked by smaller vessels. Vessels are small to large in size, mostly solitary also in radial multiples of 2 and 3, solitary vessels are oval in shape with t.d. 70-160 µm, r.d. 90-230 µm. 5-8 per sq. mm. perforations simple, intervessel pit pairs vestured. parenchyma paratracheal vasicentric to aliform and confluent forming long and short often forked bands. Xylem rays mostly uniseriate rarely biseriate 6-20 cells high, composed of homogenous cells, 10-16 per mm. Fibres thick walled and septate.

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### 3.2 Anatomical description

#### 3.2.1 Cross section (Fig 2-4)

Wood diffuse to semi-ring porous. Growth rings distinct marked by smaller vessels. Vessels are mostly small to medium and a few large sized, solitary as well as in radial multiples of 2-3; round to oval in shape, those in multiples, flattened at the place of contact, unevenly distributed in the ground mass, lumens of vessels are mostly empty, sometime filled with dark brown deposits. Tangential diameter of the vessels ranges from 70-160 µm. and radial diameter ranges 90-230 µm. Length of the radial multiples of 2 is 170-320 µm and multiples of 3 is 210-410 µm, distribution of vessels is 5-8 per sq. mm. Tylosis are absent. Wood parenchyma is paratracheal, vasicentric to aliform and aliform to confluent, forming 3-8 celled sheath around the vessels, diameter of the parenchyma cells ranges 20-35 µm, xylem rays numerous, uniseriate forming canal like structure present after 2-4 celled of fibres. Fibres polygonal thick walled aligned in the radial rows between the two consecutive xylem rays, diameter of the fibre cells is 10-16 µm.

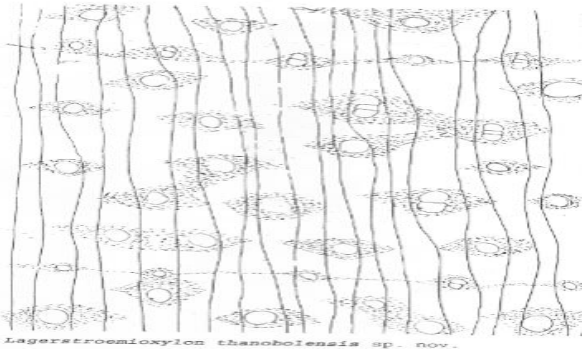


**Fig-2 Cross section showing general distribution of vessels rays and parenchyma.**

#### 3.2.2 Tangential longitudinal section (Fig 5-6)

Vessels are composed of elongated cells having truncate ends. Vessel member length ranges from 220-530 µm and breadth 70-160 µm. Vessels are irregularly distributed, perforation simple, vessel ends transverse, inter-vessel pits are poorly preserved. Xylem rays fine, uniseriate, occasionally biseriate, about 10-16 rays per mm. Ray tissue homogeneous, ray homocellular, consisting wholly of Procumbent cells, ray 55-300 µm, and 3-16 cells high, diameter of procumbent cells ranges 14-25 µm, ray cells are commonly filled with dark brown deposits. Fibres are septate 10-16 µm in diameter and length of the fibres ranges 450-900 µm.

#### 3.2.3 Radial longitudinal section (Fig. 7-8)

Vessels are composed of elongated cells. length of the vessel member ranges 220-530 µm and breath ranges 90-230 µm, perforation simple, vessel ends transverse, 2-8 layered parenchyma cells are present around the vessels. Ray cells are rectangular, Procumbent cells are 14-20 µm broad and 40-62 µm long; fibre-ray pits are not seen due to poor preservation. Fibres are elongated, septate thick walled, diameter ranges from 10-16 µm and length of fibres ranges 450-900 µm. inter-fibre pits are not seen.

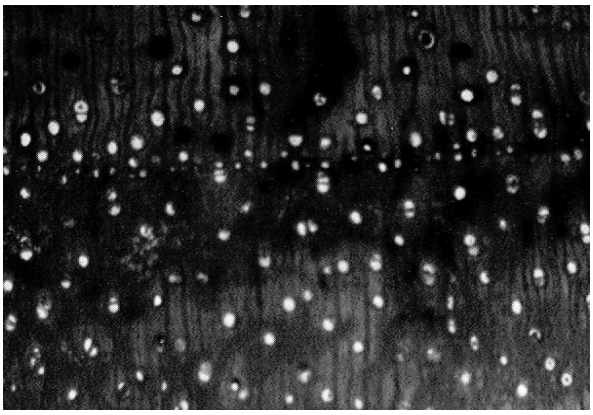

**Fig-3 Cross section showing general distribution of Vessels X40**

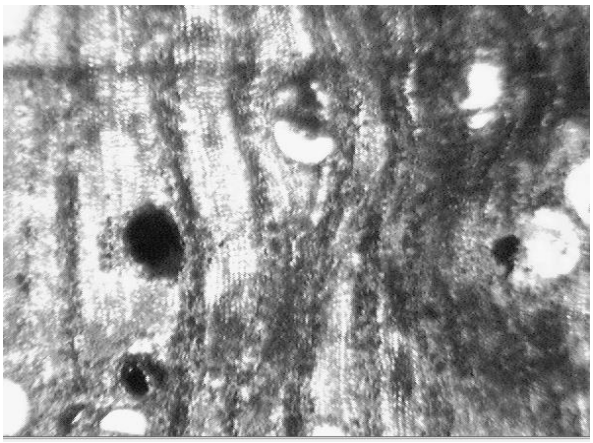

**Fig.4 Cross section showing the nature of Vessels and Parenchyma X100**

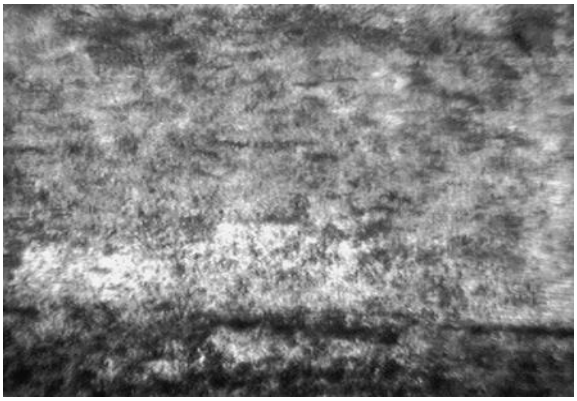

**Fig.5 Tangential longitudinal section showing uniseriate rays X100**

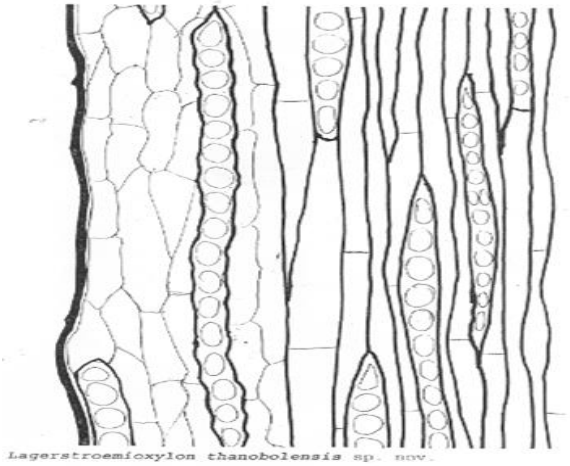


**Fig-6 Tangential Longitudinal Section showing enlarge view of Rays**

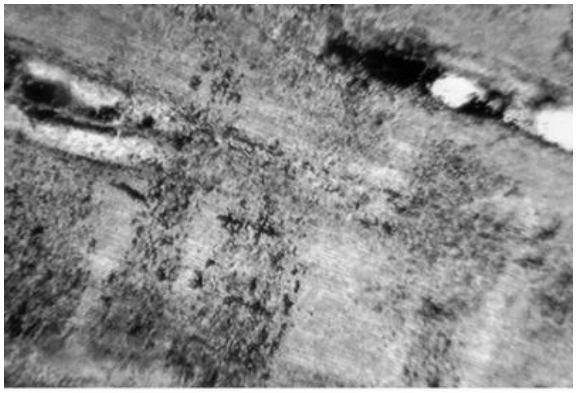

**Fig-7 Radial longitudinal section showing arrangement of Fibers X40**

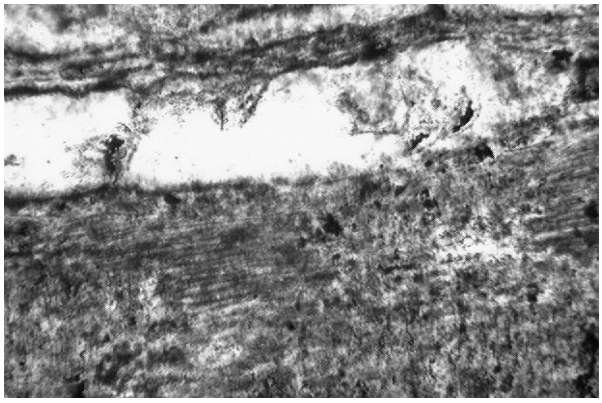

**Fig-8 Radial longitudinal section showing the end wall of the vessels and pits X100**

## 4. DISCUSSION

### Comparison with living Species

The presence of Semi-ring porosity in the present fossil wood is of great diagnostic value. There are only 109 families amongst dicotyledons in which the wood ring are semi ring porous (Metcalfe and Chalk, 1957). Considering the features together with the vestured intervessel pitting of the present fossil wood, the following families only need a detailed consideration. Apocynaceae, Asclepiadaceae, Combretaceae, Dipterocarpaceae, Euphorbiaceae, Leguminoseae, Lythraceae, Malpighiaceae, Oleaceae, Polygonaceae, Rubiaceae and Thymelaceae. of these Apocynaceae, Asclepiadaceae, Dipterocarpaceae, Oleaceae and Thymelaceae can be discarded as these possess vasicentric tracheids (Metcalfe and Chalk, 1950). However, on taking into consideration all other characters of the present fossil, the rest of the families except Combretaceae and Lythraceae can be eliminated. In the family Combretaceae although some species of *Terminalia* show some similarity with the fossil wood in gross structure but on careful examination, they can also be separated from it. The woods of *Terminalia* do not show ring-porosity and the fibres are never profusely septate as seen in the present fossil wood. The anatomical features of the fossil wood specimen under investigation in all the three planes show close relationship with the members of the family Lythraceae in having small to medium sized vessels, diffuse to semi-ring porous wood, simple perforations, inter-vessel pitting vestured paratracheal vasicentric to aliform confluent parenchyma, rays mostly uniseriate rarely biseriate (Metcalfe and Chalk, 1950).Among the members of the family Lythraceae the specimen under discussion shows its closest relationship with the genus *Lagerstroemia* in its size and distributional pattern of the vessels, in having simple perforation plates and vestured intervessel pit pairs, as well as in the distributional pattern of parenchyma in all the three planes, (Metcalfe and Chalk, 1950). As this fossil shows close resemblance with the modern genus *Lagerstroemia* Fig.-9 it is assigned to the form genus *Lager stroemioxylon* Madler 1939.

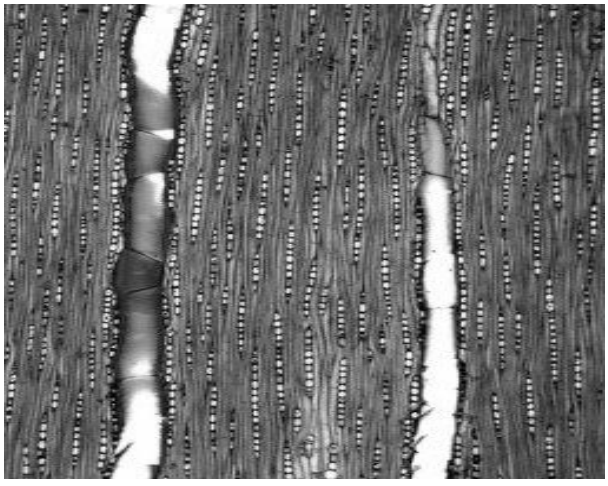

**Fig-9 Modern wood of *Lagerstroemia* Showing the similar pattern of fossil wood under investigation**

The genus *Lagerstroemia* is confined to the old World and consists of over 50 species of trees and shrubs. The centre of distribution is South eastern Asia but it also grows in the East Indies to tropical eastern Australia, China and Japan (Pearson and Brown, 1932). In Pakistan it is represented by only three species including *Lagerstroemia tomentosa* the only tree. In Sindh no living species of this genus is reported (Dar, 1975).

**4.2 Comparison with the already reported Fossil Record**

This form genus was reported for the first time by Madler in (1939) from the Pliocene rocks of Frankfurt under the name *Lager stroemioxylon durum,* later on was reported by various other scientists as well.

Bhutto *et al.* (1993) reported *L. ranikotensis* from Ranikot Fort area, district Dadu, Sindh. *L. ranikotensis* shows similarities with *L. thanobolensis* in the size and distribution of vessels, but it differs in the distribution of xylem rays which are 13-23 per mm. in *L. ranikotensis* whereas 10-16 per mm. in *L. thanobolensis*. The wood parenchyma is also different, the forked bands are absent in the *L. thanobolensis*.

Sirivastava and Bande (1992) reported a fossil wood similar to *Lagerstroemia parviflora* from Late Cenozoic deposits exposed at Bihar, India. This fossil wood shows differences from *L. thanobolensis* in having grouped vessels and apotracheal parenchyma which is sparse and in groupes.

Awasthi, (1981) reported *L. arcotense* from Pondichery, South India. *L. arcotense* differs from *L. thanobolensis* in having forked bands in addition to vasicentric, aliform to confluent parenchyma.

Lakhanpal *et al.* (1980) reported *L. deomaliensis* . *L. deomaliensis* have small to large vessels which are crowded, 12-36 per sq. mm. where as in *L. thanobolensis* the distribution of vessels is only 5-8 per sq. mm.

Prakash and Bande, (1980) reported *L. irrawaddiensis* from the Tertiary deposits of Burma. *L. irrawaddiensis* is ring porous wood which shows very clear rings of large vessels and the small vessels, whereas in *L. thanobolensis* the wood is diffuse to semi-ring prous.

*L. eoflosergeniun* reported from Tipan Sandstones of Assam, India by Prakash and Tripathi (1970) and from Kuchchh, India by Lakhanpal *et al.* (1984) *L. eoflosergeniun* shows similarities in size of vessels and distribution of parenchyma, but it mainly differs in the height of xylem rays which are 3-65 cells high in *L. eoflosergeniun* and 6-20 cells high in fossil wood under investigation.

Prakash (1965 and 1973) reported *L. parenchymatosum* from the Tertiary rocks of Burma. *L. parenchymatosum* have medium to large vessels and terminal parenchyma at the growth ring, whereas in *L. thanobolensis* the vessels are small to medium sized and terminal parenchyma is absent. Madler (1939) reported *L. durum* from the Pliocene rocks of Frankfurt, Germany. *L. durum* have small to medium sized vessels, and paratracheal vasicentric parenchyma which is sometimes aliform. *L. durum* also possess 50-60 cells high rays. It is quite different from *L. thanobolensis* on the basis of nature of parenchyma which is paratracheal, aliform to confluent and xylem rays which are 6-20 cells high.

From the detailed comparison of the reported fossil woods belonging to genus *lagerstroemia,* it can be observed that the species under investigation is quite distinct from already reported species. However, these differences are though minute but are still distinctive enough to assign it to a new species. As such the present species is named *L. thanobolensis* Sp.nov. The specific epithet refers to the locality from where the fossil specimen was collected.

## 5. CONCLUSION

The evidence from the anatomical investigations such as semi ring porous to diffuse porous wood and the arrangement of rays and parenchyma indicate tropical type of vegetation at that time The distribution of fossil wood in the area of Thano Bola khan suggests that these logs of fossil wood were not grown in situ but transported from somewhere else.

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