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Report of a Dicot Wood from the New Exposure at Pudiyal Mohada in Jivati Taluka of Chandrapur, Maharashtra

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ABSTRACT: *The present paper deals with a Dicot wood reported from the Deccan Intertrappean Series of Pudiyal mohada (N 190 342' & E 790 186'); a new locality in Jivati taluka of Chandrapur district. It is of uppermost Cretaceous (Maastrichtian) to lower Tertiary age. The wood is permineralized and well preserved. For its detailed study after itching by hydrofluoric acid, peel sections were made along with its T.S., T.L.S. and R.L.S. plane. It shows secondary growth. Growth rings are absent. Wood is diffuse porous. Vessels are mostly solitary, few in multiples of 2 to 3. They show 90-150 µm in radial diameter and 80-150 µm in tangential diameter. Vessel frequency is 17 to 32 per sq. mm. Perforation plate is simple and oblique. Intervascular pit pairs are alternate, bordered, hexagonal and contiguous. Xylem parenchyma is paratracheal vasicentric type with single layered sheath. Wood rays are uni to multiseriate, heterogenous with procumbent and erect cells with 13 to 20 sq. mm in frequency. Ray height measures 9 to 26 cells. Wood fibres are non-septate and non-storied measuring 420 to 560 µm in length and 23-35 µm in breadth. Tyloses present while other depositions are absent. The present wood is compared with the woods of the families Celastraceae, Rhizophoraceae, Olacaceae, Solanaceae and Erythroxylaceae. It shows close similarity with the living genus Erythroxylon of the family Erythroxylaceae. Hence it is named as* ***Erythroxylon pudiyalmohadai*** *gen. et sp.nov.* The specific name is after the locality Pudiyal mohada.

Keywords: – Fossil, Dicot, wood, Deccan Intertrapps, Maastrichtian, Pudiyal mohada.

INTRODUCTION:-

The material for the present investigation was collected by us from Pudiyal mohada (N 190 342' & E 790 186'); a new locality exposed near village Pudiyal mohada on Gadchandur-Patan road and 25 km away from Gadchandur of Jivati taluka, Chandrapur district. This is the easternmost district of Maharashtra and lies between 190 30' and 200 45' North latitudes and 780 48' and 800 55' east of longitudes. It covers an area of 11,443 sq.km. Geologically this area is well known as Gondwana belt but few Deccan Intertrappean exposures are also found.

The locality shows well preserved fossil flora of all plant groups belongs to Deccan Intertrappean Beds of India of Uppermost Cretaceous (Maastrichtian) to lower Eocene period. Kapgate et al., (2016) [09] described monocot stem and roots, a dicot flower and capsular fruit from this locality as named *Palmoxylon* sp; *Rhizopalmoxylon* sp.; *Sahnianthus* sp.; *Enigmocarpon chandrapurense*. One new petrified dicot wood described in this paper from Deccan Intertrappean beds of Pudiyal mohada locality of Chandrapur district.

MATERIAL AND METHOD:-

The specimen under investigation is a silicified piece of dicotyledonous wood. It is a well preserved black wood measuring 15" in length and 5" in diameter. Serial sections along transverse (Fig. 1), tangential longitudinal (Fig. 4) and radial longitudinal (Fig. 5) planes of the wood were prepared by peel technique (Darrah, 1936 [2]; Joy, et. al 1956 [6]; Stewart & Taylor, 1965 [17]; Holmes & Lopez,1986[5]; Kapgate 2012 [8]).

The silicified permineralized exposed surface of the specimen was etched in dilute hydrofluoric acid (40% HF) by pouring few drops on the smooth surface of the specimen. It was kept for few minutes and then gently washed in running water without holding it directly under the tap to avoid damage to the etched surface and remove all traces of acid. Later it was allowed to dry and then added few drops of butyl acetate to the etched surface of the specimen to prevent entrapping small air bubbles and was immediately flooded with peel solution. The specimen kept horizontally so that solution spreads evenly (If the resultant peel is too thick, less solution should be used and gently spread with a small piece of paper or the solution may be diluted with butyl acetate). It is allowed to dry for 4-6 hours in a reasonably dust free place. The peel was removed by starting an edge with a scalpel or razor and then carefully pulling it off and immediately kept for pressing under the press machine. Further serial sections were prepared by repeating same process. The peels were mounted on microslide under a cover slip in a usual way by using Canada Balsam or synthetic resin (D.P.X. mountant). While mounting the rough side of peel was moistened with a drop of xylene to prevent entrapping air bubbles.

DESCRIPTION

The wood is decorticated and diffuse porous dicot type showing secondary structure. Growth rings are absent. Vessels appears as dots even to the naked eye. Wood rays and vessels are clearly seen along radial longitudinal planes.

Secondary Xylem

It consist vessels, xylem parenchyma, Wood rays and Wood fibres.

Vessels :- They are small, scattered mostly solitary, few in radial multiples of 2 to 4. Frequency of vessels is 17 to 32 per sq. mm. These are medium to large in size, measuring 90 to 155 µm in radial diameter (Fig. 1) and 80 to 150 µm in tangential diameter (Fig 2). The vessel member length varies from 180 to 650 µm and breadth from 80 to 150 µm. Perforation plates are simple transverse and few obliquely placed (Fig. 4, 6). Intervascular pits are alternate bordered, hexagonal and contiguous. The pit pores are round to oval, 7 to 10 µm in diameter. The borders of the pits are contiguous when the vessels are in twos to threes. The adjacent walls are flattened. Wood rays and vessels are at places contiguous (Fig. 3). Vessel ray pits are distinct. They are of same type as that of vessel pitting. Tyloses are prominently seen in T.L.S. and in T.S. also. They fill the vessel lumen and become angular by compression. The wall of the tyloses is thick and at certain places even lignified. These are found in secondary xylem but in primary xylem they are not clear (Fig. 2. 4)

Xylem Parenchyma :- It is predominantly of paratracheal vesicentric type. One celled thick parenchyama forms complete or partial ring around the vessels (Fig. 3).

Wood Rays :- Ray system is heterogenous. Rays are heterocellular, consisting of erect (upright) and procumbent parenchyamatous cells (Fig. 3, 4). They are normally uniseriate, biseriate and triseriate (Fig. 1, 4). At some places, homocellular rays of erect cells are also seen. Wood ray frequency is 13 to 20 per sq. mm for uniseriate rays and 7 to 15 per sq. mm for Multiseriate rays. The cells of the rays are rectangular in R. L. S. Wood rays are both separate and contiguous with vessels (Fig. 5). Mean length of wood rays in tangential sections is 190 to 526 µm and breadth about 28 to 82 µm. More than three seriate rays are 60 to 130 µm broad. Height of rays varies from 9 to 26 cells in T.L.S., and are heterogenous with erect vertical cells at their ends. Ray pits are alternate, bordered same as seen on vessels.

Wood Fibres :- These forms a major mass of wood. They are arranged in radial rows. In transverse sections these are squarish to polygonal in shape (Fig. 1, 3). They are blunt at the end and are non-storied, moderately thick walled. Fibres are exclusively aseptate. They are short, very less in number in between the medullary rays, measuring 460 to 560 µm in length and breadth varies 23 to35 µm (Fig. 4, 6). The pitting of the fibre cells are not cleary seen.

DISCUSSION

From the above description it is clear that the specimen under investigation reveals the following anatomical characters which are of great help in comparison with modern families Srivastava (1996 [15]):-

1. Diffuse porous nature of wood.
2. Vessels of medium size, solitary as well as in radial multiples of 2 to 5 and some time in oblique pattern.
3. Xylem parenchyama of paratracheal vesicentric type.
4. Vessels with alternate, bordered, hexagonal and contiguous pits.
5. perforation plates exclusively simple, transverse and oblique.
6. Wood rays heterogenous mostly made up of erect and procumbent cells. Homogenous nature in some also observed.
7. Wood rays multiseriate, commonly 2 to 3 seriate.
8. Wood fibres non-septate, non-storied and without pitting.
9. Tyloses present.

For identification of the present fossil wood, keys given by Recard and Chatway(1939 [12];), Metcalfe and Chalk (1950 [10];) and Shallom (1963[13];) were used. The characters of the specimen mentioned above suggest its relationship to the woods of the following families (Metcalf and Chalk 1950[10]; Esau 1970[3]; Fahn 1989[4];):-

1. Celastraceae
2. Rhizophoraceae
3. Olacaceae
4. Solanaceae
5. Erythroxylaceae

The present wood resembles with the woods of family Celastraceae in possessing characters like wood diffuse porous, simple perforation plate and alternate bordered pitting. But this family differs in having vessels of typically small size, parenchyma variable in type and amount, commonly spare or absent, exclusively septate fibres with simple pits.

The present wood resembles with woods of family Rhizophoraceae in having small sized to large vessels, simple perforation plates, intervascular pitting scalariform and wood rays mostly 3 to 6 cells wide and heterocellular. But these woods differs from present wood in having scalariform perforation plates, scanty parenchyma, wood rays more than 3 mm in height and 6 to10 per sq. mm, wood fibres with small simple pits and thick walls often gelatinous.

The woods of the family Olacaceae resembles with present wood in having simple perforation plate, intervascular pitting scalariform, paratracheal parenchyma. But differs from present wood in having small sized vessels, perforation plates exclusively scalariform, typically apotracheal parenchyama, wood rays 1 to 4 cells wide and 1.5 to 4 mm height and wood fibres with bordered pits.

Woods of family Solanaceae resembles in having medium sized vessels, simple perforation plates, inter vascular pitting alternate, bordered and presence of paratracheal parenchyma, heterogenous wood rays. But differ from present wood in frequency of vessels and mean member length, wood rays usually of two sizes, some time multiseriate only, fibres with simple or very small bordered pits which are numerous on the radial walls than on tangential walls.

The present wood compared with various dicot woods reported from different localities (shows nearest resemblances to the woods of family Erythroxylaceae in having vessels of medium size, frequency in between 12 to 40 per sq. mm, typical simple perforation plates, intervascular pitting alternate and small, tyloses present, mean member length in between 0.4 to 0.8 mm, paratracheal parenchyma, medullary rays 2 to 5 cells wide, less than I mm in height, numerous uniseriate wood rays, heterogenous, composed of mixed upright and procumbent cells. As compared to other families this family only differs in few genera possessing apotracheal parenchyama and mean member length of the fibers more than 0.8 mm. The living genus *Erythroxylon* of this family shows very close similarities in having medium sized vessels, 50 to 100 µm in diameter with frequency 12 to 40 per sq. mm, typical simple perforation plates, alternate bordered intervascular pitting, presence of tyloses, abundantly paratracheal vasicentric parenchyama, 1 to 3 seriate wood rays with mean member length in between 0.4 to 0.8 mm and their heterogenous nature with procumbent and erect parenchyamatous cells and presence of aseptate wood fibres with minor differences in having fibres 1.2 mm in height.

CONCLUSIONS :-

The present wood is compared with the woods of the families Celastraceae, Rhizophoraceae, Olacaceae, Solanaceae and Erythroxylaceae. It shows close similarity with the living genus *Erythroxylon* of the family Erythroxylaceae. It is also compared with reported fossil woods reported from different intertrappean localities (Prakash 1974[11]; Bande 1990[1]; Srivastava 1991[14]; Kapgate 2005[7]; Srivastav & Guleria 2006{16]); but all are of different families and there is no fossil record of this family from this and other localities of India hence present wood is the fossil record of living *Erythroxylon* and named as *Erythroxylon pudiyalmohadai* gen. et sp. nov. The specific name is after the locality Pudiyal mohada.

SYSTEMATIC POSITION

Angiosperms

Dicotyledons

Erythroxylaceae

Erythroxylon gen. nov.

Wood diffuse porous. Growth rings absent. Secondary wood consist vessels of medium size, frequency in between 17 to 32 per sq. mm; typical simple perforation plates; intervascular pitting alternate, bordered and small; tyloses present; Mean member length in between 0.2 to 0.65 mm. Parenchyma paratracheal. Wood rays 1 to 4 cells wide, less than I mm in height; numerous uniseriate, few bi to tri seriate, heterogenous, composed of mixed upright and procumbent cells. Wood fibres aseptate and non storied.

Erythroxylon pudiyalmohadai gen. et sp. nov.

Wood diffuse porous. Growth rings absent. Secondary xylem consist solitary, scattered vessels, few in multiples of 2 to 4, measuring 90 to 155 µm in radial and 80 to 150 µm in tangential diameter; Mean member length varing from 180 to 650 µm. Vessel frequency 17 to 32 per sq. mm. Perforation plate simple with transverse or oblique septa. Intervascular pits alternate, bordered, hexagonal and contiguous, few with scalariform pitting. Tyloses present. Xylem parenchyama abundantly paratracheal vesicentric type. Wood rays heterogenous with erect and procumbent parenchymatous cells, 1 to 3 seriate. Ray frequency 13 to 20 per sq. mm with 9 to 26 cells in height. Wood fibres aseptate, nonstoried, 460 to 560 µm in length.

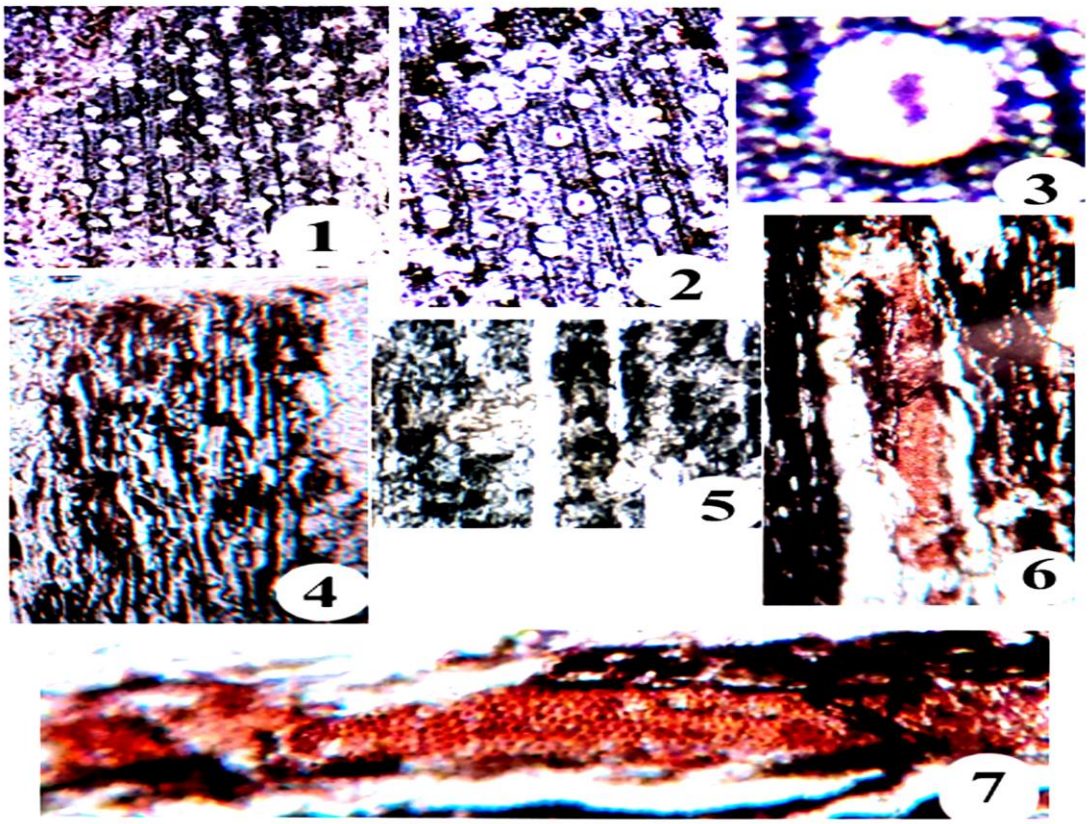
Holotype : Ang / deposited at Botany Department, D.D. Bhoyar College-Mouda

Horizon : Deccan Intertrappean bed.

Locality : Pudiyal mohada, Dist. Chandrapur, Maharastra India.

Age : Uppermost Cretaceous (Maastrichtian) to lower Tertiary.

Plate Figs.1-7: **Fig.1** – T.S. of wood showing secondary growth. (x70). **Fig.2** - Magnified view of fig. 1, showing Vessels, wood rays & fibers. (x90). **Fig.3 -** T.S. wood showing vessels with single layered paratracheal vesicentric parenchyma, (x360). **Fig.4** - T.L.S. wood showing medullary rays, (x 120). **Fig.5** - R.L.S. wood showing heterogenous medullary rays & tyloses in vessels (x110). **Fig.6** - T.L.S. wood showing vessel pitting, (x220). **Fig.7** - Enlarged view of T.L.S. wood showing alternate, bordered pitting on vessel, (x360).



REFERENCES:-

[1] Bande, M.B. and Chandra, S. (1990). Early Tertiary vegetational reconstructions around Nagpur-Chhindwara and Mandla, Central India. **Palaeobotanist** 38:196-208.

[2] Darrh H.C. (1936). A Peel Method in Palaeobotany**. Harward Uni. Bot. Nus.** 4: 69-85.

[3] Esau, K. (1970). Plant Anatomy, **John Wiley & Sons.**

[4] Fahn, A. (1989). Plant Anatomy, **Pergamon Press, Oxford, New York**.

[5] Holmes, J & Lopez, J (1986). The disappearing peel technique: an improved method for studying permineralized plant tissue. **Palaeontology** 29: 66-70.

[6] Joy K.W., Willis A. J., & Lacey W.S. (1956). A rapid cellulose peel technique in Palaeobotany. **Annals of Botany** (N.S.) 20: 635-637.

[7] Kapgate, D. K. (2005). Megafloral Analysis of Intertrappean Sediments with focus on Diversity and Abundance of flora of Mohgaonkalan, Mandla and adjoining areas of Madhya Pradesh. **Gond. Geol. Magz.** 20: 11-24.

[8] Kapgate, D.K. (2012). Plant Preservation and Paleobotanical Techniques Employed to study them. Moti- vational Workshop on **"Techniques in Taxonomy: Classical to Molecular Approach" Nagpur** :46-52.

[9] Kapgate, D.K. Patil, S.P. and Gedam, Y.B. (2016). Report of some fossil angiosperm flora from the new exposure at Pudiyal mohada in Jivati Taluka of Chandrapur District, **Int. Journ. of Researches In Biosci., Agri. & Tech.**: 72-74.

[10] Metcalfe, C. R. & Chalk, L. (1950). Anatomy of Dicotyledons. Vol. I & II. **Oxford Uni. Press. Oxford.**

[11] Prakash, U. (1974). Paleogene angiospermous woods. An Aspects & Appraisals of Indian Paleobotany Ed. Surange K.R., Lakhanpal R.N. & Bhardwaj D.C., B.S.I.P. : 306-320.

[12] Records, S. J. and Chattaway (1939). List of anatomical feature used in classifying Dicotyledonous woods. **Trap Woods**, 57: 11-16.

[13] Shallom, L. J. (1963). Contribution to the knowledge of the Deccan Intertrappean flora of India. **Ph. D. Thesis Nag. Uni., Nagpur**.

[14] Srivastava Rashmi (1991). A catalogue of fossil plants from India—4. Cenozoic (Tertiary) Megafossils. Birbal Sahni Institute of Palaeobotany, Lucknow: 1-45.

[15] Srivastava Rashmi (1996). Systematic anatomy of fossil woods in the Tertiary flora of India. pp. 129-138 in Donaldson, L.J., Singh, A.P., Butterfield, B.G. & Whitehouse, L.J. (Editors)- **Recent Advances in Wood Anatomy, New Zealand Forest Research Institute, Ltd.**

[16] Srivastava Rashmi & Guleria J.S. 2006. A Catalogue of Cenozoic (Tertiary) plant Megafossils from India (1989-1005). **B.S.I.P. Diamond Jubilee Spec-Publ**., 1-76.

[17] Stewart W.W. & Taylor T.N. (1965). The peel technique. In handed B. s. book of Palaeontological Technique, **Kummel & D. Raup.** San Francisco.: 224-232.