



A FOSSIL PETRIFIED DICOTYLEDONOUS LEAF *XEROPHYLLUMINTERTRAPPEA* FROM DECCAN INTERTRAPPEAN BEDS OF INDIA

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Abstract: The fossil dicotyledonous leaf collected from Mohgaonkalan. The fossil leaf dicotyledonous, dorsiventral, hypostomatic leaf. Mesophyll differentiated into palisade parenchyma and spongy parenchyma. Single layered upper and lower epidermis, single layered hypodermis, clustered crystal like bodies present in mesophyll, bicollateral vascular strand in midrib region, collateral and conjoint in veinlet bundle, canals in mesophyll, stomata on lower surface of the leaf present in pit cavity with unicellular hairs. Veinlets bundle conjoint and collateral. The fossil leaf under discussion shows many characters of Apocynaceae with close approach to genus *Nerium* of Apocynaceae. But it does resemble *Nerium* in sensu stricto. As it shows xerophytic characters it is named as *Xerophyllumintertrappea* gen. et. sp. nov.; the generic name is being after xerophytic characters and specific name is being after beds.

Keywords: Petrified leaf, dicotyledonous, mesophyll, canal, conjoint, collateral, bicollateral, pit cavity.

INTRODUCTION:

The present paper deals with the dicotyledonous leaf from the Deccan Intertrappean series of Mohgaonkalan (Lat. 22° 1' 0" N; Long. 79° 11' 18" E) Chhindwara district M.P., India. Only one Apocynaceous wood has been reported from this locality by Patki (1986) as *Tabernaemontana mohgaensis*. So far many dicotyledonous leaves have been reported from this locality but the present leaf is the first record of Apocynaceous leaf from the same locality.

MATERIAL AND METHOD:

The material was collected from Mohgaonkalan, dist. Chhindwara, M.P. The specimen is in the form of a long strip with prominent midrib portion which can be seen with naked eye after itching. The material is studied by taking peel section along transverse plane only.

Description: The leaf is dorsiventral swollen in midrib portion with two arms (Plate. 1, fig. 1). One arm of the leaf is completely preserved while the other arm is incompletely preserved. The leaf measure 18 mm in width. One laminar arm measures 12mm in width while incomplete arm 5mm in width and midrib region measure 1 mm in width. The leaf measure 928 μ in thickness in the region of median vascular bundle, while laminar arms measure 214 μ in thickness. Laminar arms are uniform in thickness except at vein let vascular bundle where it measures 270-470 μ in thickness. (Plate. 1 fig. 1). The under investigation is thick and leathery with well developed cuticle and hair in pit cavity (Plate 2. Fig. 4,5). The upper epidermis is well preserved. It is single layered with more or less barrel shaped parenchymatous cells. The upper epidermis id

divoid of stomata and other out growths. The cells of epidermis are compactly arranged with very thick cuticle. Cuticle is displaced at some places (plate 1. Fig. 5). Epidermis is followed by single layered hypodermis. The cells of hypodermis are squarish to rectangular and epithelial cells with contents which are parenchymatous in nature. These canals measure 62 μ in diameter spongy parenchyma is followed by lower epidermis with thick cuticle (Plate.1, Fig.2). It is single layered consisting of barrel shaped parenchymatous cells. On lower epidermis large pits are present in which stomata are observed (Plate.2. Fig. 4 & 5). However the structure of stomata cannot be studied due to ill- preservation. But this pit show presence of unicellular hairs. So the nature of stomata might be sunken? Hair measures 11 μ in length. Hairs are preserved only at some places (Plate. 2, Fig. 4,5). There is a single median vascular bundle with bundle sheath (Plate 1, Fig. 2,3). In this region epidermis is followed by 7-8 layered compactly arranged parenchymatous cells with contents (Plate. 1, Fig. 2,3). They are most compact then laminar region. Vascular bundle is crescent shaped by co-lateral (Plate 1, Fig. 2,3). The arrangement of xylem is v shaped with metaxylem and proto-xylem. Metaxylem is present towards the lower epidermis (Plate. 1, Fig. 2,3) while protoxylem elements are towards the upper epidermis. Metaxylem elements measure 39-46 μ in diameter. In oblique section, Metaxylem shows spiral thickening, protoxylem elements measure 7-14 μ in diameter. These are not well measured. The phloem is present on both sides i.e, towards upper n lower faces of the xylem (Plate. 1, Fig. 2,3). Phloem is

well preserved at places. Cells of the phloem are somewhat squarished to spherical in shaped. Bundle sheath surrounds vascular bundle which is 1-2 layered. Cells of the bundle sheath are thick walled parenchymatous in nature. The vascular strands of lateral veins are seen in laminar wings. These are conjoint, collateral. They show 5-7 xylem elements with parenchymatous sheath. The smaller veinlet bundle measures 270- 285 μ while larger veinlet bundle 380- 470 μ in thickness. Xylem elements shows spiral thickenings. In oblique sections. Phloem is present towards the lower epidermis (Plate 1, Fig. 2,3). Cells of phloem are thin walled. However details of phloem cannot be seen because of ill preservation.

DISCUSSION:

The important anatomical characters of this leaf are as follows-

- Presence of thick cuticle on both surfaces. Upper cuticle is thicker than the lower.
- Presence of single layered upper and lower epidermis.
- Presence of hypodermis.
- Differentiation of mesophyll into palisade and spongy parenchyma.
- Presence of clustered crystal like bodies in the mesophyll.
- Single median vascular bundles which is bi-collateral.
- Veinlet vascular bundles are conjoint and collateral.
- Presence of canals in the mesophyll tissue.
- Presence of stomata in the pit cavity showing unicellular hairs. (sunken in nature).

Above mentioned characters show that fossil leaf under consideration is dicotyledonous, dorsiventral and xerophytic in nature. Therefore it is compared with families like Asclepiadaceae and Apocynaceae. The present fossil leaf resembles the leaves of the family Asclepiadaceae in the following characters.

- Presence of thick cuticle.
- Single layered epidermis.
- Presence of hypodermis.
- Presence of unicellular hairs.
- Differentiation of mesophyll into palisade and spongy parenchyma.
- Nature of vascular bundle in midrib and veinlet region.
- Presence of canals (comparable with laticiferous canals).
- Presence of clustered crystals.

Present fossil differs from Asclepiadaceae in having stomata in pit cavity and absence of hair on upper epidermis. The comparison of fossil

specimen with Apocynaceae shows following similarities.

1. Differentiation of mesophyll into palisade and spongy parenchyma.
2. Presence of unicellular hairs.
3. Presence of hypodermis.
4. Nature of vascular bundle of midrib. (In both bicollateral vascular strand is present).
5. Presence of canals (Asclepiadaceae, laticiferous canals are present).
6. Presence of clustered crystals in mesophyll.

The fossil shows similarities with genus *Nerium* of Apocynaceae in following characters:

1. Presence of cuticle.
2. Presence of hypodermis.
3. Nature of vascular bundle in midrib region (bicollateral) and in veinlet region (collateral).
4. Presence of clustered crystals in mesophyll.
5. Presence of canals.
6. Presence of stomata in the pit cavity on the lower side of leaf with hairs which are unicellular (i.e. Sunken stomata).

But in *Nerium* multiple epidermis is present on both sides of the leaf which is absent in the fossil leaf. In *Nerium* both upper and lower palisade parenchyma are present whereas in the present fossil leaf only upper palisade parenchyma is seen and lower palisade parenchyma is absent. Laticiferous canals are present in vein region in *Nerium* (Metcalf and Chalk, 1950). In fossil leaf canals comparable with laticiferous canals are present in mesophyll. In *Nerium* hairs are present on upper epidermis while in present fossil specimen hairs are absent on upper epidermis. Thus it is evident that the leaf under discussion shows many characters of Apocyanaceae with close approach to genus *Nerium* of Apocyanaceae. But it does resemble *Nerium* in sensu stricto. As it shows xerophytic characters it is named as *Xerophyllum intertrappea* gen. et. sp. nov.; the generic name is being after xerophytic characters and specific name is being after beds.

DIAGNOSIS: *Xerophyllum* gen. nov.

Dicotyledonous, dorsiventral, hypostomatic leaf. Mesophyll differentiated into palisade parenchyma and spongy parenchyma. Single layered upper and lower epidermis, single layered hypodermis, clustered crystal like bodies present in mesophyll, bicollateral vascular strand in midrib region, collateral and conjoint in veinlet bundle, canals in mesophyll, stomata on lower surface of the leaf present in pit cavity with unicellular hairs.

Xerophyllum intertrappea gen. et. sp. nov.

A leaf 18 mm in width and 214 μ m in thickness; cuticle present on both surfaces, epidermis single layered, single layered hypodermis, stomata in pit

cavity present on lower side of the leaf with unicellular hairs. Hairs 11μ . Mesophyll differentiated into 2-3 layered, palisade parenchyma and multilayered spongy parenchyma, cells of the palisade parenchyma 19μ in length and 8μ in breadth. Clustered crystal like bodies present in cavity in mesophyll, $36-52\mu$ in diameter, canals present in spongy parenchyma, 62μ in diameter, vascular bundle single median and bicollateral, 928μ in thick, veinlets bundle conjoint and collateral and $270-470\mu$ in thickness, metaxylem elements measures $39-46\mu$ in T.S. diameter. Protoxylem elements measures $7-14\mu$ in diameter.

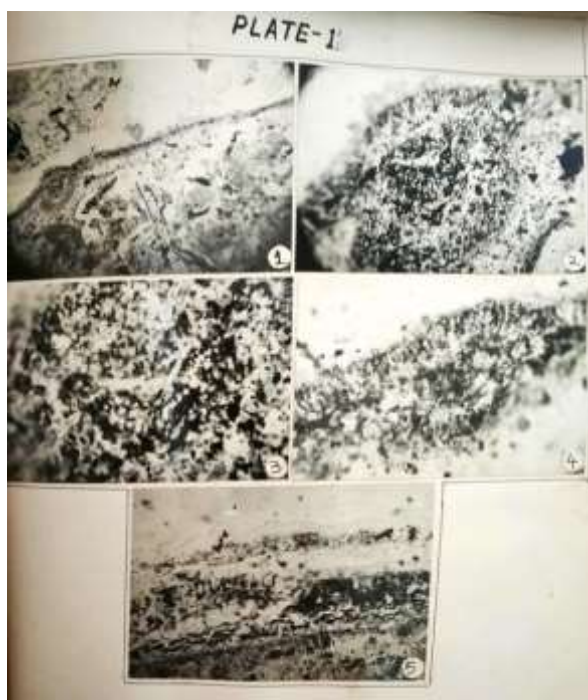
Holotype: Department of Botany, Institute of Science, Nagpur.

Locality: Mohgaonkalan.

Horizon: Deccan Intertrapean Series of India.

Age: ? Palaeocene.

Xerophyllum intertrapea gen. et. sp. nov.



Explanation of Plate 1

- Fig. 1: T.S. leaf showing median vascular bundle and two laminar arms. X40
- Fig. 2: T.S. of leaf showing median vascular bundle with xylem and phloem, phloem on both sides of the xylem. X 155
- Fig. 3: Median vascular bundle (magnified). X 300
- Fig. 4: T.S. of veinlet bundle showing conjoint, collateral condition. X 200
- Fig. 5: T.S. of leaf showing laminar region with thick cuticle (displaced), hypodermis, palisade



Explanation of Plate 2

- Fig. 1: T.S. leaf showing upper epidermis, hypodermis and mesophyll. X580
- Fig. 2: Mesophyll showing cavities with contents (arrow) X 300
- Fig. 3: Mesophyll showing cavities with clustered crystals (druses) (star shaped). X 580
- Fig. 4: T.S. lamina showing large pit cavity on lower epidermis and canal with epithelial cells in spongy parenchyma. (arrow) X 200
- Fig. 5: Magnified structure of pit cavity with unicellular hairs and stomata. X 750

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