



A Report of Dicot Leaf *Julianiophyllum Mohgaonensis* from Deccan Intertrappean Beds of Mohgaon Kalan, Madhya Pradesh, India

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ABSTRACT

The black fossiliferous chert was collected from Mohgaonkalan Deccan Intertrappean Beds of Chhindwara district (Lat. 21° 30' N to 22° 50' N and Long 78° 15' to 79° 20'E). Serial peels were taken by cellulose acetate peel technique. The leaf was studied from peel sections. It is dicotyledonous, dorsiventral, bifacial leaf measuring 5 mm in width, left arm 1.5 mm in width and 200 µm in thickness while right arm is completely preserved 3 mm thick and shows blunt end; the midrib region, is 500 × 700 µm thick. From Deccan Intertrappean beds, so far numbers of dicotyledonous and monocotyledonous leaf impressions have been described by many authors. However, only few leaf petrifications are reported for example- *Aerophyllites intertrappea*, *Deccanophyllum intertrappea*, *Dorsiventrophyllum chitaleyii*, *Julianiophyllum sahnii*, *Corokiophyllum mohgaonkalanites*, *Salicaceophyllum mohgaensis*, *Marcgraviaceophyllum mohgaonse*, *Acanthophyllum shiblii*. After comparisons with the leaves of modern families as well as reported fossil leaves. It greatly resembles with *Julianiophyllum sahnii* (Kapgata, 1998). Hence it is created a new species named *Julianiophyllum mohgaonensis* sp. nov. The specific name is after the fossiliferous locality Mohgaonkalan.

Keywords: Fossil, Dicot, Leaf, Deccan Intertrappean, Maastrichtian

I. INTRODUCTION

This paper deals with the anatomy of a dicotyledonous leaf from the Deccan Intertrappean beds of Madhya Pradesh. The specimen was collected from well-known fossiliferous locality Mohgaonkalan of Chhindwara district (Lat. 21° 30' N to 22° 50' N and Long 78° 15' to 79° 20'E). From Deccan Intertrappean beds, so far numbers of dicotyledonous and monocotyledonous leaf impressions have been described by many authors. However, only few leaf petrification are reported for example- *Aerophyllites*

intertrappea Chitaley & Patil (1970), *Deccanophyllum intertrappea* Sheikh & Kolhe (1980), *Dorsiventrophyllum chitaleyii* Mistri et al.,(1995), *Julianiophyllum sahnii* Kapgate (1998), *Corokiophyllum mohgaonkalanites* Narkhede & Patil (2003), *Salicaceophyllum mohgaensis* Kapgate et al. (2008), *Marcgraviaceophyllum mohgaonse* Kapgate & Paliwal (2010), *Acanthophyllum shiblii* Ramteke D. D. & Kapgate D. K.

Present specimen of dicot leaf is considered to be similar to the reported dicot leaf of *Julianiophyllum*

sahnii Kapgate (1998) from the same locality with some differences.

II. METHODOLOGY

The black fossiliferous chert was collected from Mohgaonkalan Deccan Intertrappean Beds of Chindwara district. After itching with HF acid, the specimen appeared in the form of a long strip showing the preservation of one complete arm and other being incompletely preserved. Serial peels were taken by cellulose acetate peel technique. The leaf was studied from peel sections.

III. OBSERVAION

On observation of peel sections it is clear that, this preserved leaf is a dicotyledonous dorsiventral bifacial leaf which shows distinct midrib at middle of leaf lamina. The complete leaf specimen measures 5 mm in width showing the preservation of one complete arm and other being incompletely preserved. At the midrib region, it is $500 \times 700 \mu\text{m}$ thick. The left arm of the leaf is incompletely preserved (Plt. Fig.1) measure 1.5 mm in width and $200 \mu\text{m}$ in thickness while right arm is completely preserved 3 mm thick and shows blunt end (Plt. Fig.3). On both side of midrib, lamina is $200 \mu\text{m}$ in thickness. The left side lamina shows a single lateral vein which cut obliquely. Total width of lamina could not be traced due to its incomplete preservation.

This leaf specimen shows following anatomical characteristics:

Epidermis: The leaf shows an epidermis on both upper and lower surface. Well-preserved upper epidermis is one celled thick, without any outgrowth and stomata. Both upper and lower epidermis is single layered with compactly arranged columnar parenchymatous cells. The lower epidermis shows certain gaps at place and these might be the stomata but the structure of

stomata is not clear. A thin cuticle is present on the upper epidermis.

Mesophyll Tissue: The epidermis is followed by mesophyll tissue which is differentiated into upper palisade tissue and lower spongy tissue (Plt. Fig. 2). Cells of palisade parenchyma are compactly arranged and present towards upper and lower epidermis. They are 2-3 layered towards the upper epidermis and single layered toward lower epidermis. The cells measure about 30 to $45 \mu\text{m}$ in height and 12 - $20 \mu\text{m}$ in breadth and are filled with brown deposition, may be fossilized chloroplast.

The spongy parenchyma occupies the major portion of the leaf. Some cells of spongy parenchyma are oval to ellipsoidal in shaped. The cells of spongy parenchyma are flattened and loosely arranged with intercellular spaces. They are arranged in 3 to 5 layers and bounded on lower side by single layered epidermis. The cavities in spongy parenchyma might be substomatal chambers. At places few cavities present may be secretory canals.

Midrib: Midrib is large and triangular which is distinctly preserved measures $700 \times 500 \mu\text{m}$ in size. The vascular bundle in this region is somewhat saucer shape in outline. It is conjoint, collateral and without distinct bundle sheath (Plt. Fig. 2). Phloem is preserved towards the lower side and xylem is faces the upper side.

Lateral veins: The left side lamina shows a single lateral vein which cut obliquely and measures $220 \mu\text{m}$ thick (Plt. Fig. 4). The vascular bundles are collateral with few conducting elements of xylem. Phloem is not clear but some thin walled cells are observed towards the lower epidermis which might represent phloem.

IV. DISCUSSION AND CONCLUSION

From the above description following important features are confirmed:

- This leaf is a dicotyledonous dorsiventral bifacial leaf which shows distinct midrib at middle of leaf lamina.
- Specimen showing the preservation of one complete arm and other being incompletely preserved.
- The right arm is completely preserved and shows blunt end.
- The left side lamina shows a single lateral vein.
- Single layered upper and lower epidermis with cuticle.
- Absence of epidermal out growth.
- Mesophyll differentiated into palisade and spongy parenchyma.
- Absence of hypodermis.
- Presence of lateral vein.
- Single, large and triangular midrib with saucer shaped, conjoint, collateral vascular bundle without bundle sheath.
- Stomata-like gaps restricted to the lower epidermis only.

From the above discussion present described specimen is confirmed as dicotyledonous leaf.

V. IDENTIFICATION:

For identification of specimen, above mentioned characters of fossil leaf is compared with the leaves of modern families as well as reported fossil leaves.

Comparison with Modern Families:

It is compared with tropical families like Caryocaraceae, Margraviaceae, Apocynaceae, Julianiaceae, Bergia of cosmopolitan family Elatinaceae, Shortia uniflora of a temperate family Daiapensiaceae, as their leaves shows resemblance with above described leaf such as dorsiventral, having

secretary canal, without epidermal outgrowth and stoma mostly confined to the lower epidermis etc. (Table: 1).

Comparison with Reported Species:

This specimen also compared with a fossil dorsiventral leaves Dorsiventrophyllum agashei (Kolhe, 1980) and Julianiophyllum sahnii (Kapgate, 1998). It is also compared with other reported fossil leaves but differ mainly in size and general characters. (Table 2)

Table: 1 showing comparison with modern families.

Caryocaraceae	Margraviaceae	Apocynaceae	Julianiaceae	Range of Euphorbiaceae	Range of Dipsacaceae	Present specimen
Dorsiventral, Secretary canals present, without epidermal outgrowth and stomata mostly confined to the lower epidermis. Mesophyll differentiated into upper and lower palisade and lower spongy parenchyma with intercellular space.			Dorsiventral leaf without hypodermis, presence of canals, presence of stomata on lower epidermis only.	Absence of epidermal outgrowth, hypodermis and presence of secretory canal.	Absence of hairs and hypodermis, differentiation of mesophyll into single layered palisade and 2-3 layered spongy parenchyma and vascular bundle without any bundle sheath.	Dicotyledonous dorsiventral bifacial leaf with distinct midrib at middle of leaf lamina. The right arm is completely preserved and shows blunt end. The left side lamina shows a single lateral vein. Single layered upper and lower epidermis with cuticle. Mesophyll differentiated into palisade and spongy parenchyma. Absence of hypodermis. Presence of lateral vein. Single, large and triangular midrib with saucer shaped, conjoint, collateral vascular bundle without bundle sheath. Stomata-like gaps restricted to the lower epidermis only.
They are with very thick cuticle, 1-2 layered hypodermis, vascular bundles enclosed by a complete sclerenchymatous ring.			Epidermal hairs are unicellular or multicellular	Stomata on both surfaces.	Presence of stomata on both surfaces.	
		Bicolateral vascular bundle and scattered in between palisade and spongy parenchyma.	Presence of resin canal in abaxial, mostly situated in enlarged adaxial cells in the mesophyll.	Irregular distribution of palisade tissue and vascular bundles surrounded by a complete parenchyma ring.	Upper epidermis having sinus with thick cuticle and large papillae epidermis.	

From the above comparisons (Table No-1) it will be clear that the present specimen shares good many features with leaf of Julianiaceae but show some differences.

Table: 2 showing comparison with reported Species.

Dorsiventrophyllum agashei (Kolhe, 1980)	Julianiophyllum sahnii (Kapgate, 1998)	Present specimen Julianiophyllum mohgaonensis sp. nov.
Prominent midrib, conjoint and collateral vascular bundle without bundle sheath, mesophyll differentiated into single layered palisade parenchyma and spongy parenchyma and single layered epidermis.		Dicotyledonous dorsiventral bifacial leaf with distinct midrib at middle of leaf lamina.
	Presence of secretory canals. Absence of sinuous, large parenchymatous epidermal cells, triangular nature of vascular bundles.	The right arm is completely preserved and shows blunt end. The left side lamina shows a single lateral vein. Single layered upper and lower epidermis with cuticle. Absence of epidermal out growth. Mesophyll differentiated into palisade and spongy parenchyma. Presence of secretory canals. Absence of hypodermis. Presence of lateral vein. Single, large and triangular midrib with saucer shaped, conjoint, collateral vascular bundle without bundle sheath. Stomata-like gaps restricted to the lower epidermis only.

From the above (Table No-2) Characters, it is prove that the present fossil described here approaches closely to leaf of Julianiaceae but differs from it in few minor details. It greatly resembles with *Julianiophyllum sahnii* (Kapgate, 1998). Hence it is created a new species named *Julianiophyllum mohgaonensis* sp. nov. The specific name is after the fossiliferous locality Mohgaonkalan.

VI. DIAGNOSIS

***Julianiophyllum mohgaonensis* sp. nov.**

Dicotyledonous, dorsiventral, bifacial leaf measuring 5 mm in width, left arm 1.5 mm in width and 200 μ m in thickness while right arm is completely preserved 3 mm thick and shows blunt end; the midrib region, is 500 \times 700 μ m thick, the left side lamina shows a single 220 μ m thick lateral vein; epidermis single-layered with parenchymatous cells, epidermal outgrowth and hypodermis absent, stomata-like gaps restricted in the lower epidermis only; mesophyll differentiated into upper palisade tissue and lower spongy tissue, cells of palisade parenchyma measure about 30 to 45 μ m in height and 12- 20 μ m in breadth are compactly arranged, 2-3 layered towards the

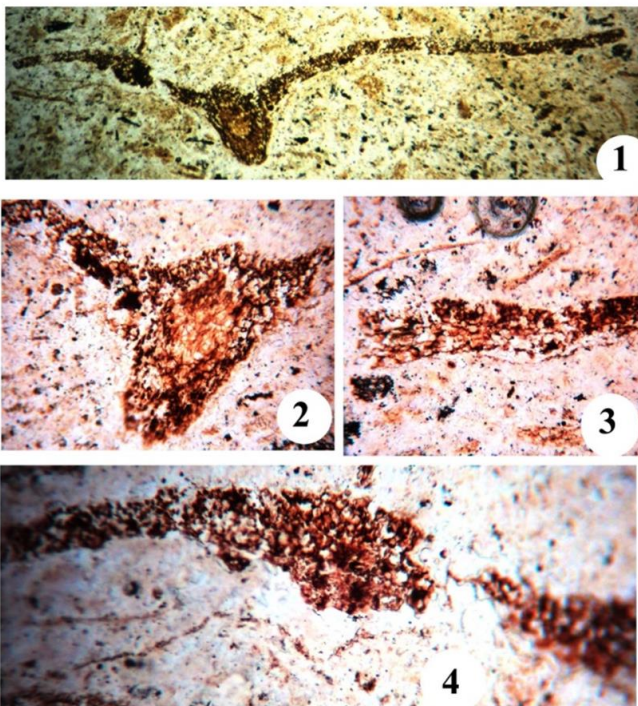
upper epidermis and single layered toward lower epidermis; spongy parenchyma are flattened, 3 to 5 layers loosely arranged cells with intercellular spaces, bounded on lower side by single layered epidermis; few secretory canal like cavities present in mesophyll tissue; large and triangular midrib measures $700 \times 500\mu\text{m}$ in size; vascular bundle is conjoint, collateral and without distinct bundle sheath, saucer shape in outline; phloem is preserved towards the lower side and xylem is faces the upper side.

Holotype:- RWU/Dicot Lf./29/Deposited at Dept. of Botany, J. M. Patel College, Bhandara.

Horizon:- Deccan Intertrappean Series of Madhya Pradesh.

Locality:- Mohgaon Kalan of Chhindwara District.

Age:- Late Cretaceous (Maastrichtian).



PLATE

Explanation of plate: 1. T. S. leaf showing median vascular bundle and laminar arm. (45X), 2. Midrib region with saucer shaped vascular bundle. (90X), 3. Part of arm showing its blunt end. (90X), 4. Left side lamina showing a single lateral vein. (45X)

VII. REFERENCES

- [1]. Chitale, S. D. and Patil, G. V. (1970). A petrified leaf from the Deccan Intertrappean beds of India. *Ind. Bio. Soc.* 13 (2) : 30-36.
- [2]. Kapgate, D. K. (1998). A petrified Dicotyledonous leaf from the Deccan Intertrappean Beds of Mohgaonkalan, M. P. India. *Nagpur University (Science Jour.)* X : 6-13.
- [3]. Kapgate, D. K. & Paliwal, P. (2010). A petrified Dicot leaf "Marcgraviaceophyllum mohgaonse" from Deccan Intertrappean beds of central India. *Botanique.* 14 (1): 58-65.
- [4]. Kapgate, V. D., Kapgate, D. K. & Sheikh, M. T. (2008) A petrified dicot leaf "Salicaceophyllum mohgaonsis" from Intertrappean Beds of Mohgaonkalan, Madhya Pradesh, India. *Gond. Geol. Magz.* 23(1): 77- 80.
- [5]. Mistri, P.B. Kapgate, D.K. and Sheikh M.T. (1995). A petrified dicot leaf from Deccan Intertrappean beds of India. *Nagpur Uni. Journal (Science No.)* 7: 38-41.
- [6]. Narkhede, S. D. and Patil, G. V. (2003). A dicotyledonous leaf from the Deccan Intertrappean beds of Mohgaonkalan, District Chhindwara, M. P. India. *Botanique.* 12: 11-15.
- [7]. Sheikh, M. T and Kolhe, P. D. (1980). Report of new dicotyledonous leaf petrification from Deccan Intertrappean beds of India. *Botanique.* 9(1-4): 179-182.
- [8]. Ramteke D. D. & Kapgate D. K. (2014). A petrified fossil Dicot leaf *Acanthophyllum shiblii* gen. et. sp. nov. from Deccan Intertrappean exposures of Shibla, Yeotmal District, Maharashtra state, India. *International Journal of Research in Bioscience, Agriculture & Technology. Special Issue:* 122-131



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