

MUSOPHYLLUM INDICUM SP. NOV. — A LEAF IMPRESSION
RESEMBLING BANANA LEAF FROM THE DECCAN
INTERTRAPPEAN SERIES, INDIA

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ABSTRACT

A fossil leaf closely comparable to the leaf of *Musa ornata* is described here from the Deccan Intertrappean beds of Mohgaon Kalan. It further adds to the evidence in favour of the presence of banana in India during the Early Eocene times.

Key-words — Leaf impression, Musaceae, Deccan Intertrappean Series (India).

सारांश

दक्खन अंतरट्रेपी श्रेणी, भारत से केले की पत्ती जैसा एक पर्ण-मुद्राश्म-म्यूसोफिलम इन्डिकम् न० जा० —
उत्तम प्रकाश, मोहन बलवन्त बांडे एवं कृष्ण अम्बवानी

यहाँ मोहगाँव कलाँ के दक्खन अंतरट्रेपी संस्तरों से म्यूसो ऑरनेटा की पत्ती से निकट-तुल्य एक पर्णाश्म का वर्णन किया गया है। इससे प्रारम्भिक ईओसीन में भारत में केले की उपस्थिति के पक्ष में एक और प्रमाण बढ़ जाता है।

INTRODUCTION

THE present paper deals with a monocotyledonous leaf impression exposed on a Deccan Intertrappean chert, collected in December, 1974 from the well known fossiliferous locality of Mohgaon Kalan in Chhindwara District of Madhya Pradesh. Although, the fossil represents only a portion of the leaf, its structural details suggest a close resemblance of this leaf with that of *Musa* of the family Musaceae. Petrified fruit of *Musa*, *M. cardiosperma* (Jain, 1964a) and a pseudostem, *Musocaulon indicum* (Rao & Menon, 1963; Jain, 1964b), probably belonging to this genus are also known from Mohgaon Kalan.

SYSTEMATIC DESCRIPTION

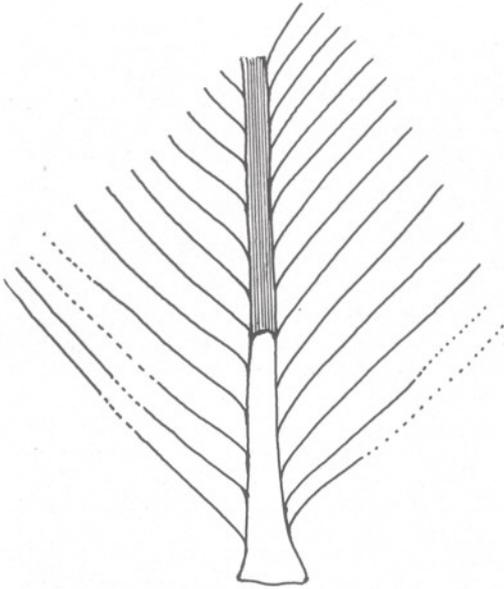
FAMILY — MUSACEAE

Genus — *Musophyllum* Goepfert, 1854

Musophyllum indicum sp. nov.

The fossil represents a part of leaf impression on a piece of chert (Pl. 1, fig. 1). Be-

cause it is a fragment of a leaf and the base, apex and margin being not visible, it has not been possible to know the exact size of the leaf. However, the leaf impression measures about 27.5 cm in length and 23 cm in width. It consists of a primary vein which is massive (Dilcher, 1974, p. 36) and about 8-10 mm thick. It runs throughout the length of the leaf with a slight variation in width being slightly narrower towards the apex (Pl. 1, fig. 1; Text-fig. 1). An important character of the primary vein is the presence of parallel running vertical lines on its surface (Pl. 1, fig. 2; Text-fig. 1). The secondary veins originate from the primary vein at an acute angle and are arranged in a pinnate fashion running parallel to each other at a distance of about 8-10 mm (Pl. 1, fig. 1). They are about 3-4 mm thick. The angle of divergence (Dilcher, 1974, p. 42) between the primary vein and the secondary veins varies from 40° to 50° being more towards the basal region of the leaf. The space between the secondary veins is traversed by a large number of intersecondary veins (Dilcher, 1974, p. 43) ori-



TEXT-FIG. 1 — *Musophyllum indicum* sp. nov. Leaf impression showing external morphological characters $\times 1/4$. (Specimen no. 35295).

ginating directly from the primary vein and running parallel to each other and the secondary veins (Pl. 1, fig. 2). There are about 30-40 intersecondary veins between the two adjacent secondary veins. The secondary and intersecondary veins slightly curve towards the base before joining the primary vein.

DISCUSSION

As only part of the leaf is preserved, it is difficult to visualize the shape and size of this leaf. However, such morphological characters like the presence of a massive primary vein along with pinnately arranged parallel secondary and intersecondary veins suggest the affinity of the present fossil to the members of the order Zinziberales among the monocotyledons. This order includes the families Musaceae, Strelitziaceae, Lowiaceae, Zinziberaceae, Cannaceae and Marantaceae (Hutchinson, 1959). A comparison with the leaves of various genera belonging to these families suggests that the fossil shows somewhat near resemblance to the leaf of *Musa* of Musaceae, *Strelitzia*, *Heliconia* and *Ravenala* of Strelitziaceae and *Maranta* of Marantaceae. Con-

sequently, leaves of a number of species belonging to *Strelitzia*, *Maranta*, *Ravenala*, *Heliconia* and *Musa* available to us were examined critically and compared with the fossil leaf. These include *Musa sapientum* Linn., *M. nagecium* Prain., *M. ornata* Roxb., *M. balbisana* Colla., *M. bakeri* Hook., *Strelitzia augusta* Thunb., *S. reginae* Thunb., *S. anguina* Thunb., *Ravenala madagascariensis* J. F. Gmel., *Heliconia pendula* Wawra., *H. aurantiaca* Griesb., *H. psittacorum* Linn., *H. marginata* (Griggs.) Standl., *Maranta principes* Linden, and *M. setosa* A. Dietr. However, in *Ravenala madagascariensis* the angle of divergence between the primary and the secondary veins is much more than in the fossil leaf being almost about 90° . Moreover, the characteristic parallel lines running vertically on the thick primary vein of the fossil leaf are not observed in the leaf of *R. madagascariensis*.

The leaves of *Strelitzia* are also different from the fossil leaf in possessing arcuating secondary and intersecondary veins which form a somewhat bigger angle of divergence with the primary vein. *Strelitzia pendula* and *S. augusta* further differ from this leaf in the absence of parallel lines on the ventral side of the primary vein.

In *Maranta principes*, the intersecondary veins running in between the secondary veins are few, only about 3-4 in number in comparison to the fossil leaf where 30-40 intersecondary veins are present. *M. principes* also lacks parallel lines on the thick primary vein.

The intersecondary veins are very fine and fairly remote from each other in *Heliconia* unlike that of the fossil leaf. The secondary and intersecondary veins also converge towards the margin of the leaf in *Heliconia* whereas they appear to run almost straight in the fossil specimen. Besides, the angle of divergence between the primary and the secondary and intersecondary veins is quite different in *Heliconia* and the fossil leaf. However, the fossil shows a remarkable resemblance to the leaf of *Musa*. The similarity could be seen in the presence of parallel running vertical lines on primary vein and in the venation pattern of the secondary and intersecondary veins. As far as the angle of divergence of the secondary and intersecondary veins is concerned, although there is some difference in the fossil and

some species of *Musa*, it compares closely with *Musa ornata* (F.R.I. No. 62184) where leaf structure is quite similar to that of the fossil leaf. The leaf of *Musa sapientum* shows some marked difference from the fossil leaf in possessing horizontal secondary veins towards the middle and basal portion. Although, the fossil leaf is closely comparable to *Musa ornata* in having similar primary, secondary and intersecondary veins it would be rather too hasty to assign it definitely to *Musa* as the size and shape of the fossil leaf is not known. However, it can at least be said that the characters preserved in the fossil leaf strongly suggest its affinities to this genus. Circumstantial evidences also support the possibility of its belonging to *Musa* as petrified fruits of this genus and a pseudostem resembling that of *Musa* have already been described from the Deccan Intertrappean beds of Mohgaon Kalan (Jain, 1964a, 1964b; Rao & Menon, 1963). It is interesting to note that closely comparable seeds of the petrified fruit, *Musa cardiosperma* (Jain, 1964a) from Mohgaon Kalan are to be found particularly in those modern species which presently grow in Assam-Burma region, thus supporting further the possibility of the fossil leaf belonging to *Musa* as this leaf also compares closely with a Burmese species, *Musa ornata*.

In spite of its close resemblance with the leaf of *Musa ornata*, it has not been assigned to the genus *Musa* because of its incomplete nature (its size and shape being unknown). As it shows the characteristic venation of a musaceous leaf, it has been placed under the genus *Musophyllum* instituted by Goeppert (1954) to include fossil leaves belonging to the family Musaceae. Recently Pons (1965, table 2), while revising *Musophyllum elegans* Engelhardt, also gave a list of all the known species of this genus with their structural details. Out of these, the species which could be compared with our fossil leaf are *Musophyllum truncatum* Goeppert (1854), *M. bohemicum* Unger (1861), *M. axonense* Watelet (1866), *M. bilanicum* Ettingshausen (1867), *M. complicatum* Lesquereux (1873, in Lesquereux, 1878), *M. styriacum* Ettingshausen (1890), *M. trinitense* Hollick (1924) and *M. tarkanyense* Bubik (1955, in Pons, 1965). However, all these species can be distinguished from the present fossil leaf by one or the other

important morphological character. Thus *Musophyllum truncatum* Goeppert (1854, p. 39, pl. 7, fig. 47) markedly differs from our fossil in the angle of divergence between the primary and the secondary veins. The secondaries originate almost at right angle to the primary vein in *M. truncatum* whereas they form an angle of 40°-50° in the present fossil leaf. Further, there is hardly any difference in thickness of secondary and intersecondary veins in *Musophyllum truncatum* as compared to our fossil leaf where secondary veins are much thicker and prominent than intersecondary veins.

Similarly in *Musophyllum axonense*, *M. bohemicum* and *M. complicatum* there is no difference between the thickness of secondary and intersecondary veins, a feature which separates them from the Deccan Intertrappean leaf. Besides, in *M. complicatum* the secondary veins after forming an acute angle of divergence to the midrib run almost at right angle to it, but in *Musophyllum axonense* and *M. bilanicum* the secondary veins directly originate at an angle of 90° from the primary vein. However, in the present fossil leaf the secondary veins originate at an angle of 40°-50° from the midrib and extend outwards almost at the same angle.

The other comparable species of *Musophyllum*, *M. styriacum* and *M. tarkanyense* can also be distinguished from our fossil leaf in having secondary veins separated from each other at a distance of 5 mm in *M. styriacum* and 4-8 mm in *M. tarkanyense*, whereas the distance between the two adjacent secondary veins is 8-10 mm in our leaf impression. Further, the angle of divergence of the secondary veins from the midrib is 45°-70° in *M. tarkanyense* as against 40°-50° in the present species.

Lastly, *Musophyllum trinitense* also differs from this leaf impression as there is no clear distinction between the intersecondary and secondary veins which are somewhat closely arranged than in the present fossil leaf. The distance between the adjacent secondary veins is about 3-4 mm in *M. trinitense*.

As the fossil leaf from the Deccan Intertrappean beds is quite different from all the known species of *Musophyllum*, it is described here as a new species, *Musophyllum indicum*, the specific name indicating its occurrence in the subcontinent of India.

SPECIFIC DIAGNOSIS

Musophyllum indicum sp. nov.

A portion of leaf without base, apex and the margin, 27.5 cm in length and 23 cm in width. *Primary vein* massive, 8-10 mm thick, running all along the length of the leaf, with parallel running vertical lines on its surface, slightly narrower towards apex than the base. *Secondary veins* prominent, 3-4 mm thick, attached pinnately to the primary vein, running parallel to

each other at a distance of 8-10 mm, and slightly curving towards the base before joining the primary vein; angle of divergence between the primary and the secondary veins 40° to 50° , the angle being more at the base than the apex. *Intersecondary veins* very thin, closely arranged, parallel to each other and 30 to 40 in number between the two adjacent secondary veins.

Holotype — B.S.I.P. Museum no. 35295.

Locality — Mohgaon Kalan, Chhindwara District, Madhya Pradesh.

Horizon — Deccan Intertrappean Series.

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EXPLANATION OF PLATE

PLATE I

Musophyllum indicum sp. nov.

1. Leaf impression showing external features. Note a massive primary vein and arrangement of

- secondary veins. $\times 1/2$. (Specimen no. 35295).
2. Part of the leaf impression magnified to show the lines on primary vein and distribution of finer intersecondary veins. $\times 4$ (Specimen no 35295).

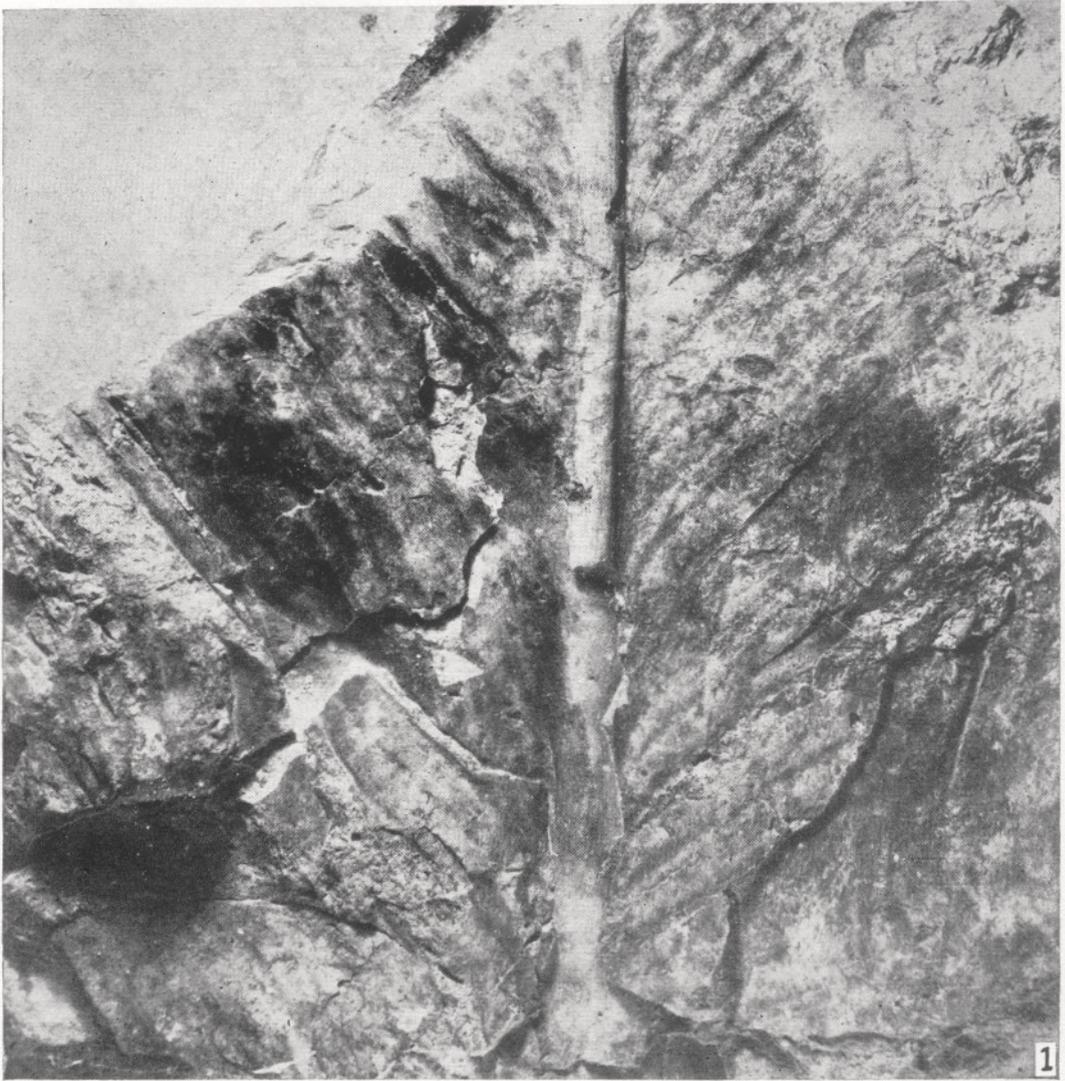


PLATE 1