



REINVESTIGATION OF VELAMINORHIZOS INTERTRAPPEANUM (BARLINGAY AND PARADKAR) EMEND MATIN FROM THE DECCAN INTERTRAPPEAN BEDS OF SINGHPUR (M.P.), INDIA

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Abstract

A thoroughly reinvestigated monocot root has been described from the locality Singhpur, M.P.. India. it has a small-sized, terete root which has been named *Velaminorhizos intertrappeanum* (Paradkar and Barlingay) Emend. Matin. The prominent characters observed in it were— outermost multiseriate epidermis (the velamen), followed by a single-layered exodermis; somewhat differentiated cortex into one-two-layered outer and middle cortex and multi-layered inner cortex with few intercellular spaces and air chambers; endodermis distinct (the innermost layer of cortex), followed by a single-layered pericycle; vascular bundles radial and with exarch xylem, metaxylem vessel elements 9-10 in numbers in a ring, protoxylem present towards endodermis, phloem as traces of faint band in between xylem; presence of conjunctive tissue in between metaxylem elements; conspicuous pith in the centre with few intercellular spaces. Modified diagnosis has been proposed here due to some of the interesting features observed. This root has been assigned to the monocot family Orchidaceae as its extinct genus and named *Velaminorhizos*, and the species *V. intertrappeanum*.

Keywords: multiseriate epidermis = velamen, exodermis, radial VBs, monocot orchid

Introduction

The family Orchidaceae is one of the largest among the monocot families. It finds its distribution almost in all the continents. Most of the genera are epiphytes, however saprophytes and other terrestrial genera also occur. According to APG (Angiosperm Phylogeny Group) II system considers under an order Asperagales. New information is being added continuously, hence it is experiencing a constant flux. Five subfamilies have been recognized in this family for almost 1000 genera. Very few well preserved root fossils have been described. Some Indian records from Deccan Intertrappean Beds (of Mohagaonkalan, Singhpur and Yavatmal) include *Rhizopalmoxyylon penchiensis* (Rode KP, 1934), *R. indicum* (Sahni B, 1938), *Aerorhizos harrissi* and *Sonneratiarhizos raoi* (Chitaley SD 1968, 1974), *Velaminorhizos intertrappeanum* (Barlingay and Paradkar, 1979), *Hygrorhizos deccani* (Trivedi, Shrivastava and Bajpai, 1985), *Restiorhizos chitaleyii* (Ainapore, 1994), *Rhizopalmoxyylon shiblaii* (Dahegaonkar, 2002). We found some interesting features to compare it with some living orchid roots as well as the fossil roots, more similarities being with *Velaminorhizos intertrappeanum*. It needed to modify the diagnosis of this fossil species. Hence this paper includes the complete reinvestigation of this species with emended diagnosis. Some of the records are the unpublished ones, hence not quoted in references.

Material and Methods

Two fossil specimens were collected from the oldest but not so explored fossil locality of Deccan Intertrappean Beds of Singhpur, Madhya Pradesh (India), considered to be of Upper Cretaceous Period. The specimens were exposed in transverse plane in blackish permineralized silicified cherts. Counterparts could not be recovered as these specimens were the part of big chert. The anatomy of the roots was studied by serial peel-section method. Specimen 2 was well-preserved as compared to the specimen 1. Seventeen serial sections were taken from specimen 2 camera-lucida sketches were drawn by Matin, and the microphotography was done by Khubalkar.

Result and Discussion

The fossil monocot root showed the following prominent characters— outermost multiseriate epidermis (the velamen), followed by a single-layered exodermis; somewhat differentiated cortex into one-two-layered outer and middle cortex and multi-layered inner cortex with few intercellular spaces and air chambers; endodermis distinct (the innermost layer of cortex), followed by a single-layered pericycle; vascular bundles radial and with exarch xylem, Large circular (in T.S.) metaxylem vessel elements, about 9-10 in number in a ring, protoxylem present towards endodermis, phloem as traces of faint band in between xylem; presence of conjunctive tissue in between metaxylem elements; conspicuous pith in the

centre with few intercellular spaces. When compared to the already known Permineralized fossil roots from the Deccan Intertrappean Beds of India, we found that it was a monocot root because of the fact that the 9-10 large prominent vessels (metaxylem) formed a ring around the prominent pith. Distinct exodermis around the well-differentiated multi-layered cortex indicated its closest resemblance with Orchidaceae. However, it was also compared to some other monocot families for some anatomical features viz., Amaryllidaceae, Araceae, Dioscoreaceae, Iridaceae, Liliaceae, Taccaceae to reach a reasonable conclusion and assignment of the root to its family.

Genera	Total root diameter	Diameter of the Vascular cylinder	Diameter of the Cortical zone	Ratio (Vascular / cortical zone)
Monstera	1.21 mm	0.19 mm	0.38 mm	0.5 mm
Alocasia	1.52 mm	0.45 mm	0.57 mm	0.78 mm
Palmae	2.28 mm	0.76 mm	1.52 mm	0.5 mm
Cleisostoma tenuifolium	1.63 mm	0.45 mm	1.14 mm	0.4 mm
Vanda spathulata	3.8 mm	0.4 mm	3.19 mm	0.12
Maleola rosea	1.21 mm	0.38 mm	0.83 mm	0.4
Acampe praemorsa	3.8 mm	0.4 mm	3.19 mm	0.1
Cymbidium aloifolium	0.49 mm	0.41 mm	1.52 mm	0.2
Vanilla walkeriae	2.96 mm	0.54 mm	2.28 mm	0.2
Aerides maculosum	2.39 mm	0.64 mm	1.9 mm	0.3
Aerides crispum	2.96 mm	0.64 mm	2.28 mm	0.3
Aerides ringens	3.23 mm	0.91 mm	0.24 mm	0.3
Luisia zeylanica	3.42 mm	0.54 mm	2.66 mm	0.2
Cottonia peduncularis	2.20 mm	0.49 mm	1.52 mm	0.3
Rhynchostylis retusa	3.04 mm	0.72 mm	2.66 mm	0.3
Velaminorhizos intertrappeanum (Barlingay & Paradkar, 1979)	0.24 mm	0.30 mm	0.64 mm	0.57 mm

Figure 1

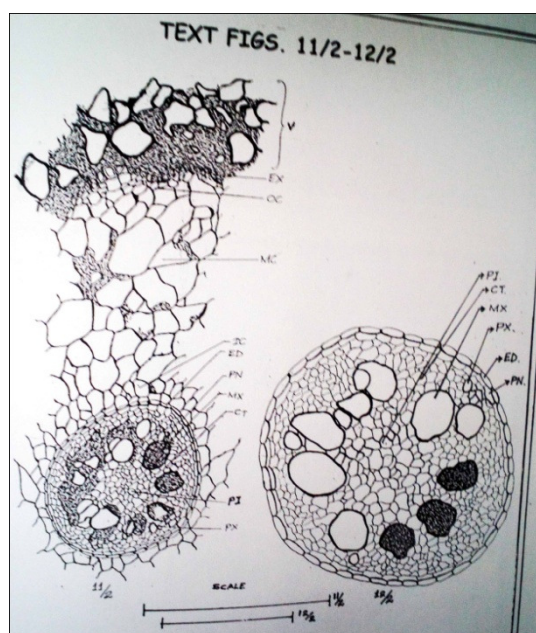


Figure 2

Conclusion

The fossil root cut in its transverse plane is assigned to a monocot family Orchidaceae based on the vascular cylinder to cortical zone ratio. It is the first record of fossil root of family Orchidaceae since no fossil record has been reported for this family (Steven J Royer, Editor of Michiana Orchid Society, 2003). An indirect evidence for the much older origin of this family has been quoted in the journal "Nature", 2007. In about 15 to 20 my old Miocene amber, a stingless bee *Preoplebeia dominicana*, an extinct species was found trapped; it carried the pollen of a new genus and species of extinct Orchid *Meliorchis caribea* on its wing. It has also been suggested that the family might have coexisted along with the dinosaurs in Late Cretaceous, about 76 to 84 my ago. This record was from Dominican Republic from a private collector. It has been assigned to the extant taxa as under Tribe Cranichideae, Subtribe Goodyerinae (subfamily Orchidoideae). This evidence supports the Upper Cretaceous age for the Deccan Intertrappean Beds of India for M. P. locality from where the specimens were collected. However, we need to find more specimens and more reports of this family from Deccan Intertrappean beds of India or other parts of the world.

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