

HYGRORHIZOS DECCANII GEN. ET SP. NOV. FROM THE DECCAN INTERTRAPPEAN BEDS OF MOHGAONKALAN (M. P.), INDIA

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Abstract

A fossil root of *Hygrorhizos* from the Deccan Intertrappean beds of Mohgaonkalan, M. P., has been described and compared with the living roots of the families Palmae, Cyclanthaceae, Araceae, Cyperaceae, Gramineae and also with the fossil roots described so far. This fossil root shows affinities with the roots of the family Poaceae (Gramineae).

Introduction

The material for the present work was collected by Dr C. L. Verma and party from the Deccan Intertrappean beds of Mohgaonkalan in Chhindwara District, M. P., India. So far only a few angiospermous fossil roots have been described by various workers (Shukla, 1946; Sahni & Surange, 1953; Lakhanpal, 1955; Rao, 1957; Chitale, 1961; 1968a, b; Chitale, 1970; Verma, 1974; Trivedi & Verma, 1976; Trivedi *et al.*, 1982) from these-beds.

Description

Epiblema is single layered and parenchymatous in nature, cells are $66.3 \times 53.2 \mu\text{m}$ in size. Root hairs could not be observed in any of the sections. Epiblema is followed by 2-3 celled thick hypodermis made up of thin-walled cells. Just beneath the hypodermis a narrow zone of compactly arranged small sclerenchymatous cells is present. This zone is followed by very wide cortex which is divisible into three zones, i.e. outer, middle and inner zone (Pl. 1, Fig. 1). Outer cortex is 1-2 layers thick and parenchymatous in nature, middle cortex is very broad and aerenchymatous with large intercellular spaces separated from one another by radiating plates of cells which are formed by contraction and disorganisation of cells. The inner cortex is 1-2 layered, parenchymatous and its cells are arranged in a distinct radial manner (Pl. 1, Fig. 3).

Central stele is surrounded by a well marked endodermal layer which shows prominent thickening in its radial walls. Beneath the endodermis a single celled pericycle is present. Vascular system consists of circle of 8-10 metaxylem vessels which are $93 \times 53 \mu\text{m}$ in diameter. Two or three small protoxylem vessels towards pericycle can be made out, i.e. arrangement of the stele is exarch (Pl. 1, Fig. 3). Phloem cells are small and inconspicuous and alternate with xylem vessels. Ground tissue is thick-walled, small sclerenchymatous pith is present in the centre, fibrous bundles are absent.

A number of lateral roots can be observed coming out from the pericycle, their number appeared to depend on the size of the main root (Pl. 1, Figs. 1 and 3).

Table

Name	Epiblema	Hypodermis	Outer Cortex	Middle	Inner
<i>Phoenix</i> (Palmae)	Large celled and dark in colour	Two layers of lignified cells	Large cortex of thin walled round circular bundles surrounded by Raphide sacs containing acicular mucilage cells are also present		cells with fibre silica crystal. crystal and few
<i>Cyperus</i> (Cyperaceae)	Single layer of small cells	Absent	Parenchymatous with small angular thin walled cells	Aerenchymatous with rectangular air spaces	Parenchymatous cells small
<i>Cyclanthodendron</i> (Cyclanthaceae)	Single layered parenchymatous	Absent	Outer cortex has three zone outermost Parenchymatous middle sclerenchymatous inner again parenchymatous	Many large air spaces are present	2-3 layered parenchymatous
<i>Hygroryza</i> (Gramineae)	Single layered Parenchymatous	2-3 layer of thin walled hyperdermis/ followed by 2-3 layers of sclerenchymatous cells	Parenchymatous 1-2 cells thick	Very wide Aerenchymatous with large air spaces	Parenchymatous 1-2 cells are small
<i>Fossil</i> (Gramineae)	Parenchymatous & single layered	2-3 layer of thin walled cells followed by 2-3 celled sclerenchyma	1-2 celled large parenchymatous	Very wide aerenchymatous with large air spaces	1-2 celled parenchymatous, radially arranged

Comparison and discussion

The fossil root has been compared with the roots of many living taxa of the families Palmae, Cyclanthaceae, Araceae, Cyperaceae, Gramineae and also with the fossil roots described so far (Table 1).

The root described here differs from the roots of the families Palmae, Cyclanthaceae, Araceae, Cyperaceae in characters like absence of fibrovascular bundles, raphide cells, starch grains and also in the structure of cortex and stele. It shows very close affinities with the roots of the family Graminae in many characters (Table 1).

Sections of grasses like *Hygroryza*, *Paspalam*, *Arundo*, etc. were examined. On comparison it has been found that fossil root shows closest resemblance with the root of *Hygroryza* (Pl. 1, Figs. 2,4; Table 1), a hydrophytic grass which grows wildly in or near water throughout the country.

Generic diagnosis—Epiblema single layered, parenchymatous, followed by thin-walled hypodermis, beneath it a narrow zone of sclerenchymatous cells present, cortex very wide, aerenchymatous, divided into outer, middle and inner zones; stele surrounded by endo-

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Endodermis	Pericycle	Xylem	Phloem	Pith
Single layered	Single layered	Stele with 17 arches of xylem and phloem	Phloems bands are broader	Parenchymatous.
Single layered	Single layered	A large metaxylem vessel in centre circled by many vessels	Phloem alternate to xylem, some silica cells are also present	Sclerenchymatous
Single layer with- out thickening	Absent	Many metaxylem vessels in centre	Not well preserved but alternate to xylem	Sclerenchymatous
Single layer with thickening on radial wall	Single layered, on many lateral roots coming out from this	8-12 metaxylem ves- sels arranged in a ring with 2-3 proto- xylem arrangement, exarch.	Phloem cells small & alternate to xylem	Sclerenchymatous
Single layered with thickening on the radial walls	Single layered with many lateral root arising from pericycle	8-10 metaxylem ves- sels arranged in cir- cle with protoxylem towards pericycle	Phloem in conspi- cuous and alternate to xylem	Sclerenchymatous

dermis, vascular system has 8-10 metaxylem vessels in the centre; phloem inconspicuous, alternate to xylem vessels, pith sclerenchymatous.

Specific diagnosis—Epiblema single layered, parenchymatous cells $66.3 \times 53.2 \mu\text{m}$ in size, hypodermis of thin-walled cells, followed by small and compactly arranged sclerenchymatous cells, cortex wide, aerenchyma divided into three zones, outer, inner and middle with large air spaces; stele surrounded by well marked endodermis with a circle of metaxylem vessels $93 \times 53 \mu\text{m}$ in diameter; phloem inconspicuous, alternate to xylem, pith small sclerenchymatous.

Holotype—B. S. Trivedi collection no. M. K. 29, Botany Department, Lucknow University, Lucknow.

Locality—Mohgaon Kalan in Chhindwara District, Madhya Pradesh.

Horizon & Age—Deccan Intertrappean beds; Tertiary (Early Eocene)

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Explanation of Plate

1. T. S. of fossil root. x 17.
2. T. S. of *Hygroryza* root. x 17.
3. A portion of the fossil magnified to show the cortex and stele. x 50.
4. A portion of the *Hygroryza* root to show the cortex and stele. x 50.

