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DIPTEROCARPOXYLON NUNGARHENSE N. SP. FROM KALAGARH (BIJNOR DISTRICT), INDIA

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ABSTRACT

The paper deals with the anatomical studies of a fossil dicot wood from Kalagarh. The structural details show closest affinities with the genus *Dipterocarpus* and therefore it has been described as *Dipterocarpoxylon nungarhense* sp. nov.

Key-words — Xylotomy, *Dipterocarpoxylon*, Mio-Pliocene, Kalagarh (India).

साराँश

कालागढ़ (बिजनौर जनपद), भारत से डिप्टेरोकारपॉक्सीलॉन ननगढ़ेन्से न० जा० — भीम शंकर त्रिवेदी एवं मधु आहूजा

इस शोध-पत्र में कालागढ़ से प्राप्त एक द्विबीजपत्री काष्ठाश्म के शारीरीय अध्ययन का उल्लेख है। इस काष्ठाश्म प्रादर्श के संरचनात्मक विवरण डिप्टेरोकार्पस प्रजाति से घनिष्ठ सजातीयता प्रदर्शित करते हैं अतएव इसे डिप्टेरोकारपॉक्सीलॉन न० जा० के नाम से वर्णित किया गया है।

INTRODUCTION

THE fossil wood was collected from Nungarh Nala in Kalagarh 29°33′N, 78°45′E (District Bijnor) situated in the Siwalik range (Mio-Pliocene). It belongs to Dipterocarpaceae of which the following taxa are known from the Siwalik range, viz., *Dipterocarpoxylon sivalicus*, *D. nalagarhense*, *D. premacrocarpum* by Prakash (1975), *Anisopteroxylon jawalamukhii* Ghosh & Ghosh (1958), *D. kalagarhense*, *D. miocenecum*, *Anisopteroxylon kalagarhense* (Trivedi & Misra, 1980) and *Dipterocarpoxylon* sp. by Rawat (1964) from Mohand near Dehra Dun. Awasthi (1974) described *Dipterocarpoxylon pondicherriense* from Cuddalore Series near Pondicherry in South India. From Mio-Pliocene of Assam, Ghosh and Kazmi (1958) described *Anisopteroxylon bengalensis*. These finds show that members of Dipterocarpaceae were growing all over the northern boundary of India during Mio-Pliocene times but have now disappeared from this area.

SYSTEMATIC DESCRIPTION

FAMILY — DIPTEROCARPACEAE

Genus — *Dipterocarpoxylon* (Hold.) Den Berger, 1927

Dipterocarpoxylon nungarhense sp. nov.

Pl. 1, figs 1-4; Text-figs 1, 2

The fossil wood is represented by a single piece measuring about 4 cm in length and 5 cm in diameter. The preservation of the fossil wood is fairly good.

Topography—Wood diffuse porous. *Growth rings* absent. *Vessels* medium to large sized, usually solitary, occasionally in radial pairs, evenly distributed, 8-15 per sq mm either one or both sides contiguous with xylem rays. *Vasicentric tracheids* present intermingled with parenchyma round the vessels (Pl. 1, figs 1, 2). *Xylem parenchyma* paratracheal and apotracheal; paratracheal parenchyma vasicentric, 2-3 seriate, intermingled with tracheids, at places aliform to con-

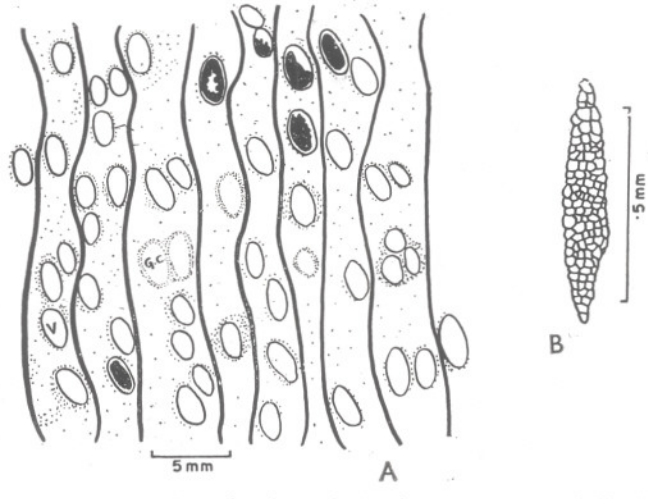
fluent; apotracheal parenchyma diffuse and round the gum canals (Pl. 1, fig. 1; Text-fig. 1). *Xylem rays* 1-6 seriate (mostly 3-5); ray tissue heterogeneous, uniseriate rays very rare, homocellular to heterocellular, 3-8 cells in height; multiseriate rays heterocellular, procumbent cells mostly in the middle portion and 1-3 upright cells occur at one or both the ends, sheath cells are on one or both the flanks but not continuous, 13-22 cells (492-792 μm) high, 78-100 μm thick in the middle, 6-11 rays per mm (Pl. 1, figs 3, 4; Text-fig. 2). *Fibres* 5-7, rows aligned between rays, semilibriform, nonseptate and thick-walled. *Gum canals* vertical, single or in pairs occasionally in short tangential row of 3, surrounded by parenchyma.

Elements — *Vessels* mostly oval in shape, in cross section, t.d. 110-176 μm, r.d. 198-308 μm, vessel member 800-1848 μm long with truncated end; perforation simple; pits leading to contiguous tracheids alternate, bordered with linear aperture. *Upright cells* 35 μm in radial length, 44-48 μm in tangential height; procumbent cells 61-70 μm in radial length, 26-31 μm in tangential height. *Gum canals* t.d. 57-88 μm, r.d. 132-154 μm.

Affinities — The fossil wood shows characteristic features of the family Dipterocarpaceae, viz., solitary vessels, vasicentric tracheids, gum canals solitary in short tangential groups, xylem rays mostly with few sheath cells on the flanks and heterocellular. A comparison of the present fossil wood with the modern wood of various genera of Dipterocarpaceae shows its close resemblance with *Dipterocarpus*.

A detailed comparison of the present fossil wood was made with many species of *Dipterocarpus* (Pearson & Brown, 1932; Reyes, 1938; Desch, 1957; Chowdhury & Ghosh, 1958) and also with thin sections available in the xylarium of the Birbal Sahni Institute of Palaeobotany, viz., *Dipterocarpus actuangulus* Vasque., *D. alatus* Roxb., *D. caylanicus* Thew., *D. gracilis* Bl., *D. griffithii* Mq., *D. indicus* Bedd., *D. macrocarpus* Vasque., *D. obtusifolius* Teyam., and *D. lowii* Hookf. However, it was found that the fossil wood shows closest resemblance with *D. indicus*, *D. gracilis* and *D. obtusifolius*.

Comparison with Fossil Species — All the fossil species described so far possess a number of anatomical features similar to the present fossil wood. However, these differ from it in some significant features. The present fossil wood differs from *Dipterocarpoxylon africanum* Bancroft (1933, 1935) in its having solitary vessels or very rarely paired vessels. The present fossil wood can be differentiated from *D. krauseli* (Den Berger) Edwards (1931), *D. resiniferum* Schweitzer (1958), *D. anisopteroides* Schweitzer (1958) in its having heterogeneous rays.



TEXT-FIG. 1 — **A.** Cross section of the fossil wood showing the nature and distribution of vessels (V), parenchyma and gum canals (G.C.). **B.** Multiseriate xylem ray.

D. schenki (Felix) Schweitzer (1958) differs from the present fossil wood in having larger (t.d. 125-325 μm) vessels. *D. goepperti* Kräusel (1926), *D. porosum* Kräusel (1922) can be differentiated by its broader rays. *D. tertiarum* Prakash (1965) is different from the present fossil wood in having abundant parenchyma.

The Indian species like *Dipterocarpoxylon chowdhuri* Ghosh (1956), *D. malavii* Ghosh & Ghosh (1959), *D. sivalicus*, *D. nalagarhense*, *D. premacrocarpum* Prakash (1975) differ from the fossil wood in having abundant diffuse parenchyma and more prominent sheath cells in xylem rays. *D. pondicherriense* Awasthi (1974) differs in its having vestured intervessel pit pairs, narrower xylem rays 1-5 (mostly 3-4 seriate). *D. kalicharparense* Eyde (1963) differs in its having apotracheal parenchyma in patches and prominent sheath cells in xylem rays. *Dipterocarpoxylon* sp. Rawat (1964) is different in minute details of vessels, parenchyma and gum canals, etc. *D. kalagarhense* Trivedi & Misra (MS) differs from the fossil wood in having smaller gum canals (50-80 μm in diameter), bigger vessels (t.d. 130-247 μm, r.d. 110-300 μm), more uniseriate rays. *D. miocenecum* Trivedi & Misra (MS) can be differentiated from the present specimen in having smaller gum canals (60-100 μm diameter), bigger vessels (t.d. 104-250 μm, r.d. 280-363 μm).

All these differences show that it is a new species and therefore it has been assigned a new name, *D. nungarhense* n. sp.

SPECIFIC DIAGNOSIS

Dipterocarpoxylon nungarhense

Wood diffuse porous. *Growth rings* absent. *Vessels* medium to large sized, t.d. 110-176 μm, r.d. 198-308 μm, solitary, occasionally in radial pairs, 8-15 per sq mm; perforation simple; pits leading to contiguous tracheids large, bordered with linear apertures. *Vasicentric tracheids* present, intermingled with parenchyma round the vessel. *Parenchyma* paratracheal and apotracheal; paratracheal parenchyma vasicentric, 2-3 seriate, intermingled with tracheids, at places aliform to confluent; apotracheal parenchyma diffuse and round the gum canals. *Xylem rays* 1-6 (mostly 3-5) seriate; ray tissue heterogeneous; uniseriate rays very rare, homocellular to heterocellular, multiseriate rays heterocellular, 1-3 upright cells at both ends, sheath cells present but not continuous. *Fibres* semilibriform, nonseptate. *Gum canals* vertical, single or in pairs, occasionally in short tangential row of 3 and also in pairs, surrounded by parenchyma.

Holotype — B. S. Trivedi collection no. D.G. 24, Lucknow.

Locality — Nungarh Nala in Kalagarh.

Age — Mio-Pliocene (Middle Siwalik).

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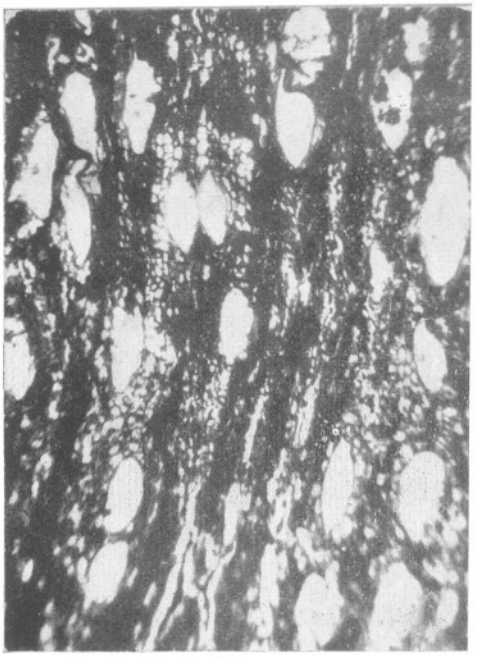
EXPLANATION OF PLATE

PLATE 1

Dipterocarpoxylon nungarhense sp. nov.

1. Cross section of the fossil wood showing the nature and distribution of vessels, parenchyma and gum canals. × 50.
2. A portion of the cross section of fossil wood magnified. × 100.
3. Tangential longitudinal section of the fossil wood showing xylem rays. × 100.
4. Radial longitudinal section of fossil wood showing xylem rays with procumbent and upright cells. × 150.



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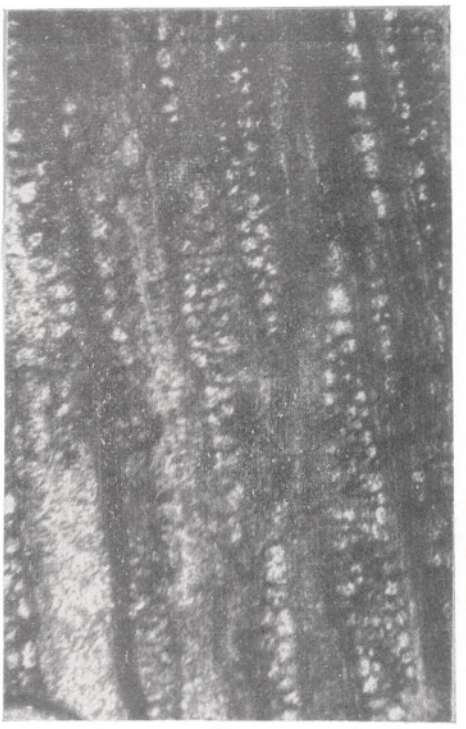

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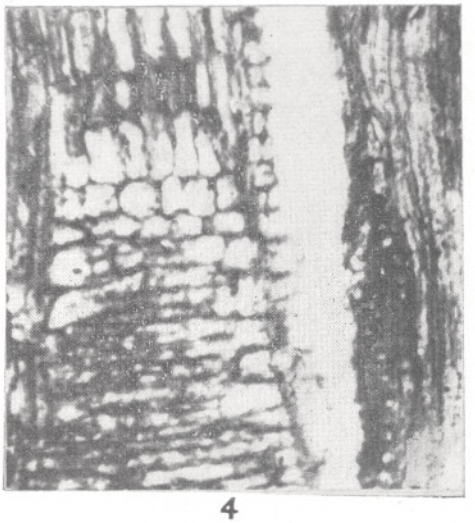

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PLATE 1