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Two new species of *Elatocladus* Halle from the Jabalpur Formation of Sehora, Narsinghpur District, Madhya Pradesh, India

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ABSTRACT

Prakash N. 2013. Two new species of *Elatocladus* Halle from the Jabalpur Formation of Sehora, Narsinghpur District, Madhya Pradesh, India. Geophytology 43(2): 99-103.

Diversified plant fossils were recovered from blackish-grey, carbonaceous shale of the Jabalpur Formation exposed along Sher River near Sehora village, Narsinghpur District, Madhya Pradesh. Here, two new species of *Elatocladus* (family Podocarpaceae), viz. *E. kasatii* and *E. sherensis*, are described. The hypostomatic cuticle of *E. kasatii* possesses highly sunken stomata exhibiting xeromorphic adaptability. The stomata are arranged in central stomatal band. In *E. sherensis*, leaves are narrow, linear and needle like.

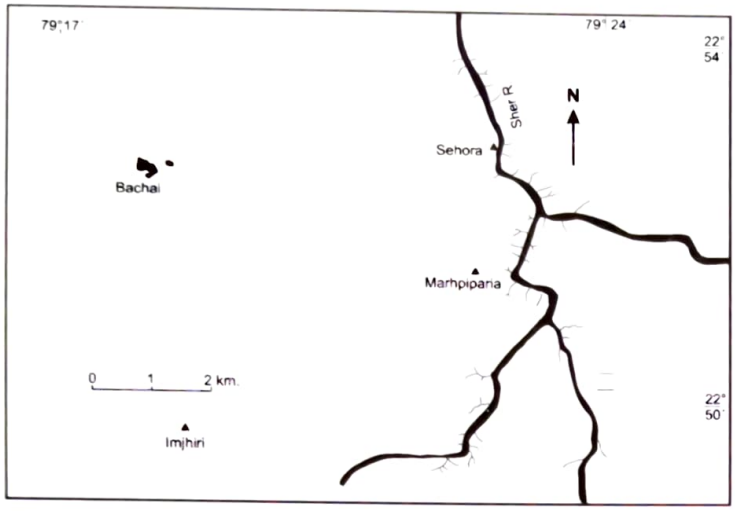
Key-words: *Elatocladus*, Jabalpur Formation, Upper Gondwana, Sehora, Madhya Pradesh, India.

INTRODUCTION

The Jabalpur Formation, exposed along Sher River, near Sehora village, Narsinghpur District, Madhya Pradesh (Text-figure 1), is fluviatile in nature and embodies well-preserved plant megafossils. This formation consists of thick, soft, white-brown massive sandstone alternating with white clays, conglomerate, earthy haematite, carbonaceous shale, red clays and chert beds. The stratigraphic section, exposed along the Sher River (earlier published by Kumar 2011), consists mainly of clay, siliceous clay/shale, sandy shale, carbonaceous shale and sandstones of varied thickness. Isolated outcrops also occur along the Sher River. The fossiliferous bed (about 1 m thick) occurs in the middle of the section while lower part of the section also possesses fossil plant compressions.

MATERIAL AND METHOD

A large number of plant fossils, comprising pteridophytes, pteridosperms, bennettitales and coniferales, were collected from Sher River Section near Sehora Village. About fifty specimens of genus *Elatocladus* were collected and studied under low power binocular microscope. The cuticles were studied under light as well as scanning electron microscopes. The cuticles were prepared by treating with Schultz's solution followed by 10% KOH solution. The cuticles were separated into upper and lower layers under Wild Heerbrugg microscope. For S.E.M. studies, macerated pieces, dehydrated by graded alcohol (10% to 90% alcohol), were placed over double-sided tape on stubs and were coated with gold palladium of 441Å thickness.



Text-figure 1. Map showing fossil locality near Sher River, Sehora, Satpura Basin.

SYSTEMATIC PALAEOBOTANY

Order: Coniferales

Family: Podocarpaceae

Genus: *Elatocladus* Halle 1913

Remarks: Majority of the leafy twigs, now included under *Elatocladus*, were originally included under *Palissya* Endlicher (1847) or *Taxites* Brongniart (1828) in Feistmantel (1877a, b, 1879, 1882) and Sahni (1928). Halle (1913) introduced the genus *Elatocladus* to include species having "sterile coniferous branches of the radial or the dorsiventral type".

Elatocladus kasatii N. Prakash, sp. nov.

Plate 1, figures 1-6, 9

Diagnosis: Leafy twigs, 19-72 mm in length. Branching occurs at an angle of about 50°. Leaves spirally borne but disposed in one plane, 2-8 mm long and about 1 mm wide, linear, straight or falcate. Margin entire, apex obtuse or sub-acute, base slightly contracted, decurrent, midrib running up to apex. Leaves at basal portion of branch small, triangular, gradually changing into mature leaves. Leaves hypostomatic, cuticles almost equally thick on both surfaces. Epidermal cells of upper cuticle rectangular, polygonal or squarish, arranged end to end; wall may be pitted at places, periclinal walls unevenly thickened. Stomata on lower surface arranged in a broad band in the middle of the leaf, leaving astomatic region on either side. Stomata within the band arranged in rows, rows 2-5 cell apart, stomata longitudinal, oblique and rarely transverse in orientation. Subsidiary cells 4-5, slightly sunken. Periclinal walls more cutinized than the ordinary epidermal cells. Guard cells thinly cutinised and narrow. Epidermal cells between the stomatal rows elongated, rectangular or polygonal, arranged serially. Periclinal walls unevenly thickened, anticlinal walls straight at places, pitted on upper surface.

Holotype: Specimen No. 38914, stored in the museum of Birbal Sahni Institute of Palaeobotany, Lucknow.

Locality: Sehora, Narsinghpur District, Madhya Pradesh.

Horizon and age: Jabalpur Formation, Early Cretaceous.

Etymology: The epithet honours Dr. M. L. Kasat, Department of Botany, Government College, Kota, India.

Comparison: Heteromorphic, narrow, linear leaves, attached with decurrent base and having stomatal band in the middle region of the lower surface, characterize *Elatocladus kasatii*. Based on these characters, it stands out distinct from other species of the genus. In shape, size and hypostomatic nature of the leaves, the new species resembles *E. chawadensis* Bose & Banerji (1984). However, in *E. chawadensis*, leaves are not heteromorphic and stomata are distributed

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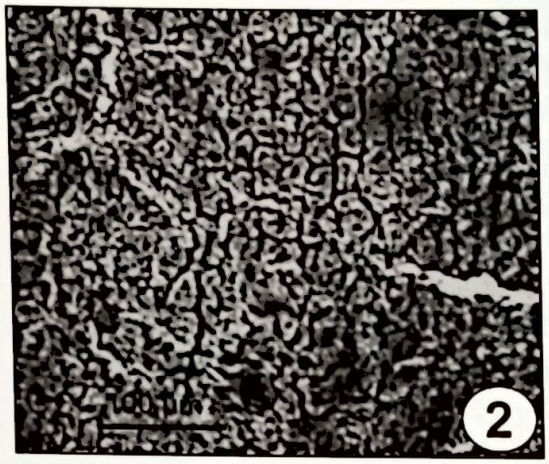
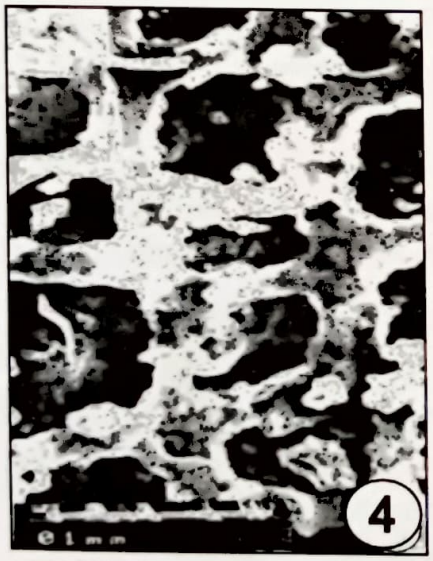
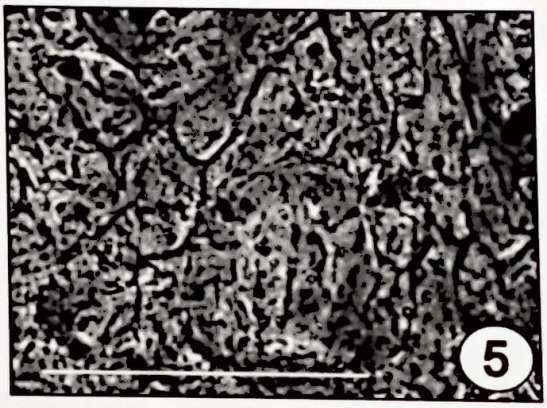
Plate 1

1-6, 9. *Elatocladus kasatii* sp. nov., specimen no. 38914. 1. Showing heteromorphic leaves. 2. L.M. photograph, showing epidermal cells. 3. S.E.M. photograph, showing distribution of stomata within the stomatal band. 4. S.E.M. photograph of epidermal cells, showing uneven thickness on anticlinal wall. 5. Enlarged stomata along with epidermal cells, showing subsidiary and guard ceils. 6. L.M. photograph, showing stomatal band in the centre of lower layer. 9. L.M. photograph of enlarged stomata. 7. *Elatocladus sherensis* sp. nov., specimen no. 38913. 8. *Elatocladus plana* (Feistmantel) Seward, specimen no. 38917.







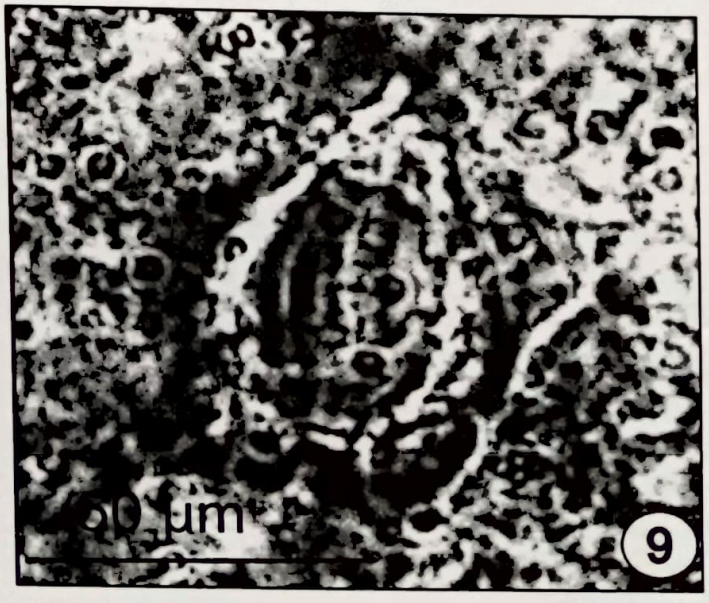


Plate 1

irregularly on the entire lower surface unlike in *E. kasatii*. In *E. tenerrima* (Feistmantel) Sahni (1928), leaves are also heteromorphic and almost similar in shape and size as in *E. kasatii* but *E. tenerrima* is distinct in being amphistomatic. *E. plana* (Feistmantel) Seward (1919) has also similar leaves but has only a single stomata present on the lower surface. *E. kingianus* Bose et al. (1982) is differentiated by having longitudinally arranged stomata whereas in *E. kasatii* they are longitudinal as well as oblique in orientation.

***Elatocladus sherensis* N. Prakash, sp. nov.**

Plate 1, figure 7

Diagnosis: Leafy twig, 72 mm x 27 mm. Rachis wide. Leaves narrow, linear, spiral and biserially arranged, 10-22 mm x 1 mm, straight or slightly falcate, attached at an angle of 40°-50° by decurrent base. Midrib feebly marked.

Holotype: Specimen No. 38913, stored in the museum of Birbal Sahni Institute of Palaeobotany, Lucknow.

Locality: Sehora, Narsinghpur District, Madhya Pradesh.

Horizon and age: Jabalpur Formation, Early Cretaceous.

Etymology: The epithet refers to Sher River.

Comparison: *Elatocladus sherensis* has narrow, linear leaves attached at acute angle by entire decurrent base. In *E. plana* (Feistmantel) Seward (1919), leaves are of about the same size but they are attached at an angle of 90° or more. *E. kasatii* sp nov. is distinguished by shorter and more spreading leaves. *Elatocladus jabalpurensis* (Feistmantel) Sahni (1928) can be compared with *E. sherensis* as in both the leaves are sparse and similar in the angle of attachment. However, in *E. jabalpurensis*, leaves are shorter and stiff unlike *E. sherensis*. The present species is comparable to *E linearis* Cantrill & Falcon-Lang (2001) described from Alexander Island, Antarctica in having linear, narrow leaves but can be distinguished in size and attachment to the axis.

DISCUSSION

The genus *Elatocladus* Halle is an important element of Gondwana flora. Altogether, 16 species of this genus (including the two new species, here described) are known from India. Of these, nine species have been recorded from the Jabalpur Formation of Sehora, Narsinghpur District, Madhya Pradesh. In addition to the two new species, *Elatocladus plana* (Feistmantel) Seward has also been recovered from this area, for the first time. These are represented by small fragmentary leafy twigs, with needle like, biserially-arranged leaves having slightly narrow and decurrent base and acute apex (Plate 1, figure 8). The leaves in the present specimens closely resemble those of *E. plana* (Baksi 1968) from Raghvapuram, Godavari Basin, Andhra Pradesh, except for being slightly larger in size.

Occurrence of narrow, linear, hypostomatic leaves with sunken stomata in the genus *Elatocladus* indicates xeromorphic adaptability.

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