

SOME MACROPLANT FOSSILS FROM THE TRIASSIC ROCKS OF NIDPUR, INDIA

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ABSTRACT

A few megaplant fossils, viz., *Gopadia* gen. nov., *Chakrea* gen. nov. and *Conites* sp., have been described here from the Triassic sediments of Nidpur. All of them are carbonized and have revealed epidermal features. Amongst the two newly instituted genera, *Gopadia* is a leaf and *Chakrea* a wheel-shaped plant organ which perhaps is a fruiting body. Besides these, one specimen has been described as *Conites* sp.

INTRODUCTION

QUITE a good many vegetative and fertile plant organs have been discovered and described from the *Dicroidium*-dominated assemblage of Nidpur. While the search for more new plant-forms was going on, a few new specimens could be found and they have been designated under two new genera, namely, *Gopadia* and *Chakrea* because of their characteristic external morphology. *Gopadia* gen. nov. is a leaf having leathery surface with prominent midrib and veins and is represented by two distinct species on the basis of cuticular features. The other form-genus *Chakrea* gen. nov. is more or less wheel-shaped with a thick central axis which appears in all probability to be a fructification. A specimen of cone has also been described here as *Conites* sp. but in this cone no ovules or pollen have been detected.

Gopadia gen. nov.

Diagnosis — Leaf oblong in shape, surface leathery, midrib distinct, veins arising at an acute angle, bifurcating and running parallel towards the margin; cuticle of both surfaces thin, hypostomatic, stomata unevenly distributed; cells smooth or papillate; subsidiary cells usually 6, guard cells cutinized.

Comparison — *Gopadia* gen. nov. approaches closely to the genus *Brightonia* Harris from the Rhaetic of East Greenland, in its

leathery surface associated with distinct ridges and furrows on the lamina but the latter differs in the presence of hair on the surface. In its venation pattern, *Gopadia* comes closer to the genera, *Rhabdotaenia* Pant and *Taeniopteris* Brongniart but the former keeps distinct from the latter two in the presence of transverse ridges and furrows on the lamina surface. Further, in *Rhabdotaenia* cross-netting is sometimes present in between the veins and the cell wall is mostly sinuous, whereas in case of *Gopadia*, both these features are absolutely missing. In the genus *Taeniopteris*, no epidermal characters are known.

Type Species — *Gopadia coriacea* gen. et sp. nov.

Derivation of Name — After Gopad river on the bank of which outcrop is exposed.

Gopadia coriacea gen. et sp. nov.

Pl. 1, figs. 1-5; Text-figs. 1, A-D

Diagnosis — Leaf 6.9 cm in length, 2.8 cm in breadth; oblong in shape, apex obtuse, margin thickened, surface leathery, midrib distinct, 2.5 mm wide, veins emerging at an acute angle, further bifurcating and thereafter running parallel towards the margin.

Cuticle brittle; leaf hypostomatic, stomatal distribution not uniform, at places concentrated and closely placed, orientation irregular, epidermal cells rectangular or polygonal, symmetrically arranged, cell walls about 2.5 μ thick, straight, sometimes unusually thickened, showing fine undulations; surface smooth; subsidiary cells usually 6 in number, not easily differentiated from ordinary cells, forming usually a ring, encircling cells frequently present; stomatal pit oval or rhomboidal rarely angular, guard cells strongly cutinized, aperture unexposed.

Holotype — No. 35155 of Birbal Sahni Institute of Palaeobotany, Lucknow.

Locality — Nidpur, Sidhi District, M.P., India.

Age — ?Lower-Middle Triassic.

Remarks — The observation has been based mainly on the holotype specimen which has been found in counterpart, besides this, other four specimens are fragmentary but they have yielded cuticle. Since the cuticular pieces are very small, it has not been possible to procure the two surface united. However, from small pieces both the surfaces could be separated out and by shape, arrangement of cells and the presence of stomata, upper and lower sides could be differentiated.

Comparison — *Gopadia coriacea* gen. et sp. nov. shows close similarity with *Brigh-tonia arota* Harris (1932) from the Rhaetic of East Greenland in the leathery surface, venation pattern, hypostomatic nature and smooth cell surface but the former differs from the latter in the absence of hair on its surface. Besides this, in *B. arota* ridges and furrows are well marked whereas in *G. coriacea* this feature is not so distinct.

Gopadia papillata gen. et sp. nov.

Pl. 1, figs. 6-7; Text-figs. 1E-G

Diagnosis — Leaf measuring 4 cm in length, 2.9 cm in breadth, base and apex broken, margin entire, thickened; midrib prominent 2.4 mm wide, lamina surface showing conspicuous ridges and furrows; veins arising at an acute angle and bifurcating immediately after emergence.

Leaf hypostomatic, upper and lower surfaces distinct, about 2.5 μ and 2 μ thick respectively, stomata closely placed, distribution restricted to certain region; no definite orientation, epidermal cells rectangular or polygonal, irregularly arranged, cell walls very thinly cutinized, usually finely undulated or straight; surface papillate with minute median papillae; subsidiary cells 6-7 in number occasionally touching each other, not differentiated from ordinary cells, inner wall of subsidiary cells slightly thickened, stomatal pit rhomboidal or elliptical in shape, guard cells cutinized, aperture slit-like.

Holotype — No. 35157 of Birbal Sahni Institute of Palaeobotany, Lucknow.

Locality — Nidpur, Sidhi District, M.P., India.

Age — ?Lower-Middle Triassic.

Remarks — The description of *Gopadia papillata* sp. nov. is based on an incomplete specimen. In preparation both surfaces have been found attached to each other and it has been marked that the stomati-ferous surface is slightly thinner than the nonstomatiferous one.

Comparison — *Gopadia papillata* sp. nov. distinguishes itself from *G. coriacea* in having papillate cell surface while in the latter species surface is smooth. In the presence of prominent transverse ridges and furrows, *G. papillata* closely compares with *Brigh-tonia arota* Harris but the former differs from the latter in the absence of hair on the cell surface.

Chakrea gen. nov.

Diagnosis — Wheel-shaped plant organ bearing radiating ribs from centre to peripheral region, in between the ribs, somewhat elongated conical or triangular areas differentiated all around the thick central part; cuticle tough, amphistomatic, cell walls unusually thickened, showing sometimes the presence of papillae, surface generally papillate; stomata sparsely distributed, subsidiary cells papillate or smooth, 5-7 in number, guard cells moderately cutinized, sunken in a rectangular or rhomboidal-oval stomatal pit.

Comparison — In general appearance, *Chakrea* gen. nov. looks somewhat like equisetalean leaf sheaths but it can sharply be distinguished in the absence of deeply lobed outline. In cuticular features, *Chakrea* can be compared with *Dicroidium papillosum* (Bose & Srivastava, 1971) more especially, in presence of papillae on the cell surface but simultaneously the latter differs from the former in distribution, orientation of stomata and in nature of subsidiary cells and guard cells.

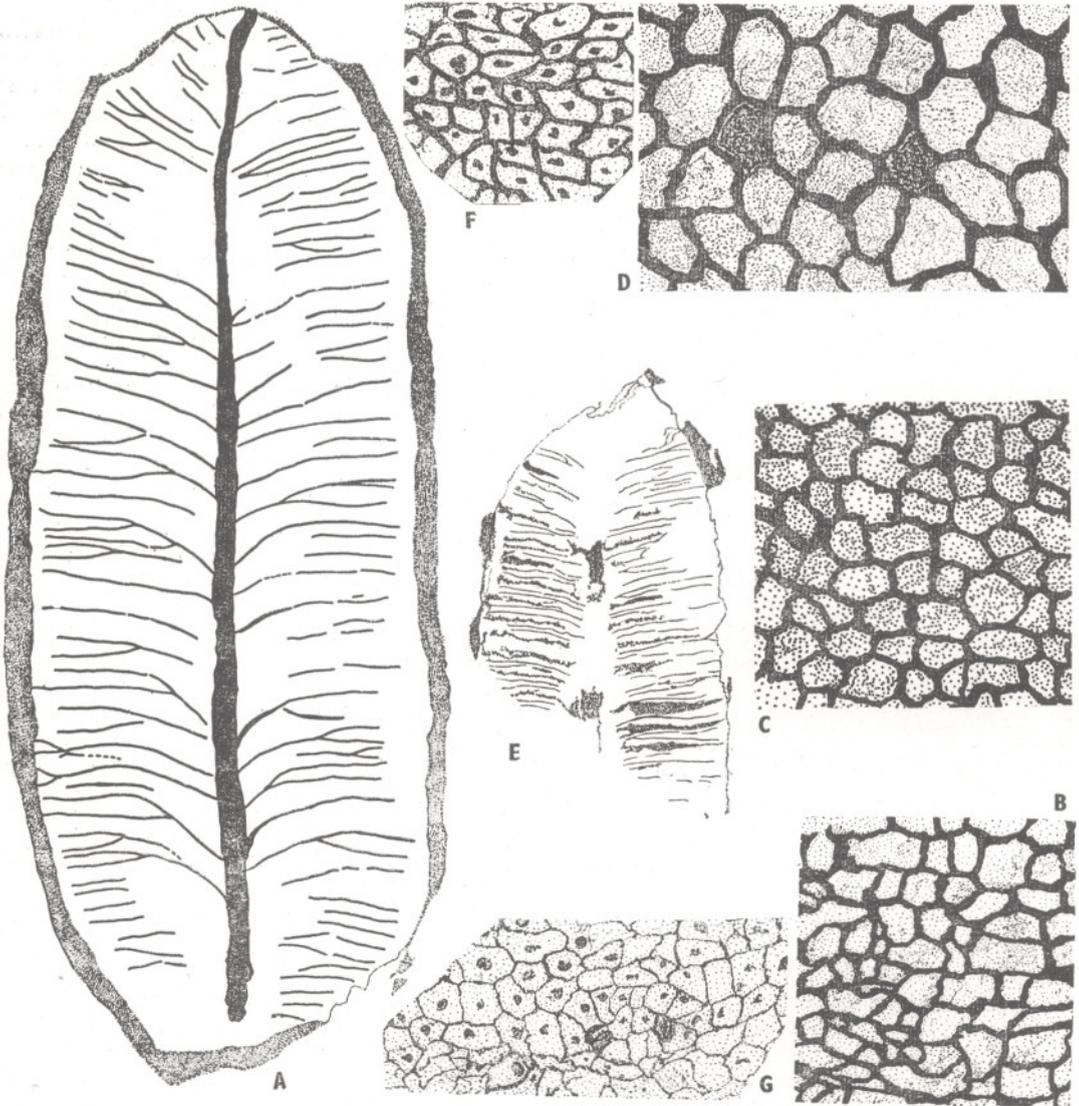
Type Species — *Chakrea papillosa* gen. et sp. nov.

Derivation of Name — After the Sanskrit word "Chakra".

Chakrea papillosa gen. et sp. nov.

Pl. 1, figs. 8-9; Text-figs. 2A-C

Diagnosis — Specimen more or less wheel-shaped, measures 2.9 cm in diameter,

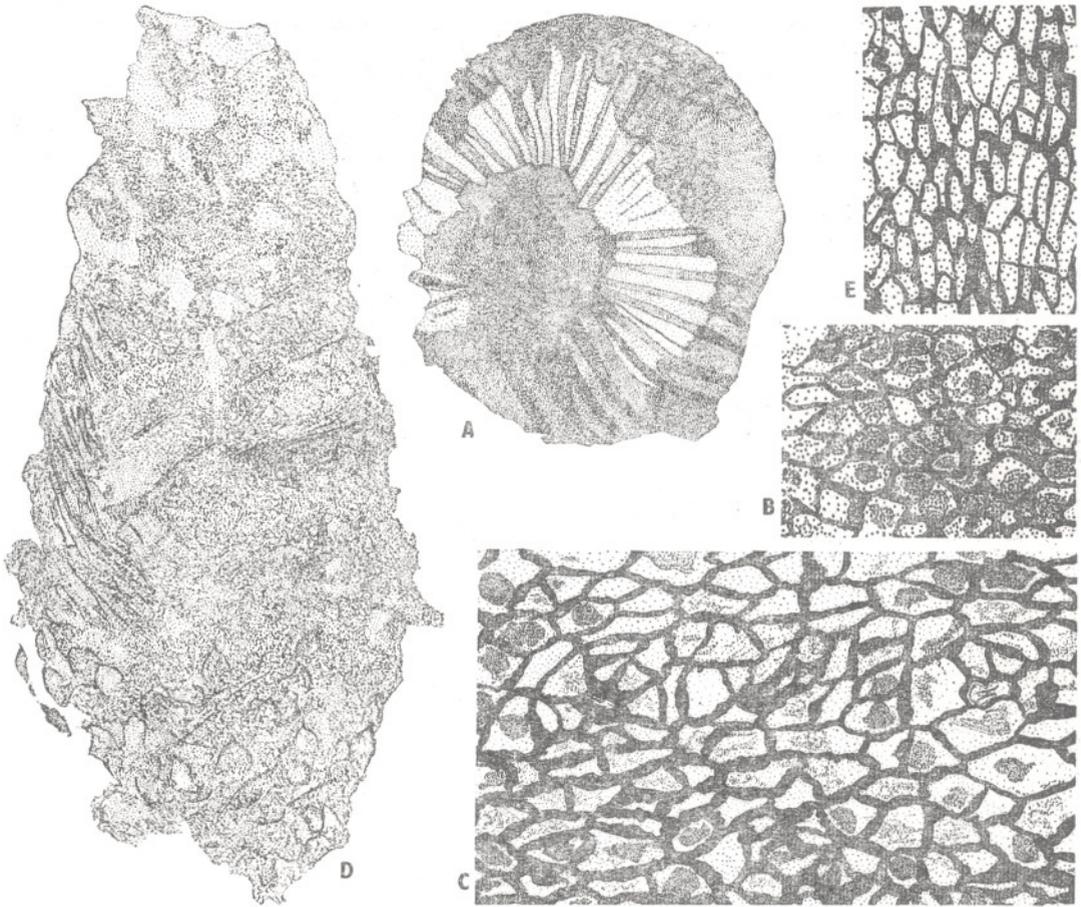


1. *Gopadia coriacea* gen. et sp. nov. A, holotype no. 35155, showing venation pattern $\times 2$. B, thinner surface, showing irregular epidermal cells. Slide no. 35156—1 $\times 100$. C, symmetrically arranged polygonal epidermal cells on thicker side. Slide no. 35156—2 $\times 100$. D, two stomata closely placed. Slide no. 35157—1 $\times 250$. E, *G. papillata* sp. nov., holotype no. 35157, showing veins and leathery texture of lamina $\times 2$. F, upper surface cells Slide no. 35157—1. $\times 100$. G, two stomata touching each other on the lower surface. Slide no. 35157—2 $\times 100$.

radiating ribs gradually merging in peripheral region, in between ribs elongated elliptical or triangular areas differentiated around central part; stomata present on both sides, irregularly distributed mostly along the peripheral region, less frequent on the other side, usually cells rectangular or polygonal, cell walls straight or undulated,

at places unusually thickened, occasionally papillae present, surface generally papillate, more often mottled or smooth; papillae solid or hollow, sometimes diffused or irregular in appearance.

Cells along the radiating ribs differentiated, usually narrower, longer than broad, more or less rectangular having end-walls



2. *Chakrea papillosa* gen. et sp. nov. A, holotype no. 35158, showing radiating ribs and differentiated areas in between the ribs $\times 2$. B, cells of upper surface. Slide no. 35158-2 $\times 100$. C, lower surface showing sparsely distributed stomata. Slide no. 35158-1 $\times 100$. D, *Conites* sp., specimen enlarged to show the pattern of cone scales. Slide no. 35159 $\times 5$. E, epidermal cells of cone scales. Slide no. 35159-1 $\times 75$.

usually oblique, running obliquely in longitudinal direction towards the periphery; in differentiated areas, cells polygonal, symmetrically placed, sometimes associated with unusual thickenings on inner wall of the cells along with a thin strip, cell walls mostly straight, surface smooth or papillate; stomata more in peripheral region, fewer in differentiated areas between the ribs and in the central part, stomatal apparatus similar like other parts, consisting of 4-7 subsidiary cells forming a ring, papillate or smooth, encircling cells fairly frequent, guard cells cutinized, sunken in more or

less rhomboidal-elongated rectangular pit, aperture thin slit-like sometimes indistinct.

Holotype — No. 35158 of Birbal Sahni Institute of Palaeobotany, Lucknow.

Locality — Nidpur, Sidhi District, M.P., India.

Age — ?Lower-Middle Triassic.

Remarks — There is only one specimen of *Chakrea papillosa* gen. et sp. nov. which has been collected so far and here the observations have been made only on that. Although in *Chakrea papillosa*, differentiated areas between the ribs do not show any fertile unit, yet in all probability, the

possibility of this plant organ being a fruiting body can not be ruled out.

Conites sp.

Pl. 1, figs. 10-12; Text-figs. 2D-E

Cone 2.2 cm long and 1 cm broad, elongated-oval in shape, slightly broken at base and apex both; cone scales spirally arranged, triangular-rhomboidal in shape at the base, in upper part strap-shaped.

Both the surfaces devoid of stomata, epidermal cells rectangular, squarish or elongated polygonal, serially arranged, at places irregular, lateral- and end-walls thin and straight, surface smooth or mottled.

Holotype—No. 35159 of Birbal Sahni Institute of Palaeobotany, Lucknow.

Locality—Nidpur, Sidhi District, M.P., India.

Age—?Lower-Middle Triassic.

Remarks—A single specimen of this cone has been found so far. The cuticle has been macerated from basal, middle and apical portions but no ovules or pollen could be seen except for epidermal cells.

Comparison—*Conites* sp. differs from *Conites* sp. (Srivastava, 1971) in having strap-shaped cone scales in upper half of the cone whereas in the later, cone-scales are elongated-lanceolate. In general shape and arrangement of epidermal cells *Conites* sp. seems to be quite similar to the cells from the lower surface of *Glottolepis rugosa* (Bose & Srivastava, 1970). However, in *Conites* sp., stomata could not be detected.

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EXPLANATION OF PLATE

PLATE 1

Gopadia coriacea gen. et sp. nov.

- 1-2. Part and counterpart; Holotype no. 35155 × 1.
3. A fragmentary specimen with well preserved cuticle; No. 35156 × 4.
4. Counter part of the specimen (Fig. 3); 35156 × 1.
5. A single stoma; Slide no. 35156—2 × 500.

Gopadia papillata sp. nov.

6. Holotype no. 35157 × 1.

7. A single stoma; Slide no. 35157—1 × 500.

Chakrea papillosa gen. et sp. nov.

8. Holotype no. 35158 × 1.
9. A stomata associated with encircling cells; Slide no. 35158—3 × 500.

Conites sp. A

10. Specimen no. 35159 × 1.
11. Specimen figured no. 35159 is enlarged to show the arrangement of cone scale × 5.
12. Showing epidermal cells of cone scales. Slide no. 35159—1 × 150.

