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A Bryophytic Thallus with Fructification from the Deccan Intertrappean Beds of India

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ABSTRACT
Deccan intertrappean flora is very rich in plant remains of different groups.
Angiospermic flora reported, appear to be the dominant one, but the finding of lower group like Algae, Fungi, Bryophytes and Pteridophytes are not meager.

Bryophytic remains known from this series are; Notothyllus, type of sporogonium (Gupta, 1956); Shuklanitesdecanii(Sahani, 1973); Notothallitesnirulai (Chitaley and Yawale,(1975) ; a bryophytic capsule, Bharadwagiamohgaoense (Yawale, 1975); a sporogonium, Nagpuritesjungaranii (Sheikh,and Kolhe,(1980);Andreaceatiesramanujmii (Kapghaate,(1982) and Mohgaonitesindica (Karangikar,(1982). All these reported specimens, are sporogonium, the report of bryophyatic gametophyte is however rare . The only record is on Riccia like thallus (Sheikh,and Kapaghate,(1982) from this region, but this finding is without any plate figures.

The account deals with a nicely preserved petrified bryophytic specimen of a thallus, and a sporogonium. The preservation is so nice that almost all anatomical details would be made out.

MATERIAL AND METHODS

A piece of chert collected from Mohgaonkalon, after breaking exposed a capsule. Series of sections taken by peel method reveled three specimens of gametophytic thallus. One specimen was exposed in transverse plane, another specimen just near to it was cut in oblique longitudinal plane and seems to be in continuation with sporogonium , while third one was exposed in an oblique transverse plane.

DISCRIPTION

The study is based on all the three gametophytic thalli and sporogonium. All these specimens show common character of having hairs all over the surface.

The thallus is dorsiventral with mid rib, showing distinct notch above and almost semicircular below in transverse plane (Plate.1 Fig.3; Text Fig.5). Thallus is about 2.4 mm wide and 0.23mm thick. It is 10 to 14 cells thick in the middle and abruptly thins out towards the margins. It is covered on either side by the epidermis. Both the epidermis shows the presence of small hyaline, unicellular hairs of 15 µm to 20 µm length.

The lower epidermis is continuous, formed of oval to elliptical cells, measures about 15 µm ×17 µm to 17 µm × 20 µm in size (Plate.1 Fig.8; Text Fig 15). Rhizoids are present along the surface (Patel.2 Fig.14; Text Fig.9). The tuberculated rhizoids are 70 µm to 205 µm long and 10 µm to 12 µm broad, while the smooth walled rhizoids are longer and narrower than the tuberculated type. It measures about 85 µm long and 8 µm to 10 µm broad.

Scales are present along the margins and are 0.60 mm to 0.61 mm long and 0.08 mm to 0.9 mm broad with abrupt ends (Plate.1 Fig.1-8;Text Fig. 9-11).

The upper epidermis is uniseriate, discontinuous due to air pore. Cells are similar to the cells of lower epidermis and measures 12 µm× 15 µm to 16 µm×18 µm in size (Plate.1 Fig.8;Text Fig.15). The air pore is simple, bounded by 6 epidermal cells.

Internally the thalllus tissue is differentiated into two zones. Plate1.1 Fig.7;Text Fig.12). The upper, the dorsal zone is spongy and consists of a loose net work of many irregular to polygonal air chambers, arranged in several layers and separated from one another by single layered lamellae (Plate1 Fig.7;Text Fig .12). The lamella is formed of small bricks shaped cells of 8 µm to 37 µm long having some deposition inside .The lower, the ventral zone is composed of compact parenchymatous, irregular cells of 12 µm to 30 µm size, without the intercellular spaces, It is thick in the middle, 10 to 14 cells thick, towards margins .It is reduced to 2 to 4 layers of cells. This region is infected with fungus (Plate 1, Fig .6) ,4 to 6 cells in the region of midrib are larger, thick compactly arrange, hexagonal, showing thickening on their walls and measures 18 µm to 30 µm in size .

In surface view the thallus shows irregular branching and almost all the branches en d in a circular to elongated tubules of 0.15 µm to 0.25 µm size (Plate 1 Fig .2; Text Fig .1-11). The tubules are formed of large circular cells of 40 µm to 70 µm size, all the cells seems to come out by pushing one another .The hairs are quite prominent in this region as compared to the hairs of thallus and measures about 30 µm in length.

A distinct capsule is exposed in its longitudinal plane, present above the thallus. The capsule seems to be compressed and burst opened during preservation. In exposed view capsule appears to be oval, 4.5 mm in length, and 1.4mm in breadth in the middle .The epidermal cells of the capsule are quit prominent at places, made up of large oval cells of 112 µm to122 µm broad and 51 µm to 60 µm in width, showing a cuticle on outer surface (Plate 2 Fig .10;Text Fig. 18). The outer surface also shows small peg like projections, may be the hairs filled with some content. Many spores, spores tetrads, and elaters are present inside the capsule. They are globular, 27 µm to 30 µm in size each covered by a 4 µm thick exine (Plate 2, Fig .11 and 15; Text Fig .13). Some of the spores show tri radiate marking in the surface view. Elaters are also well preserved. They are elongated with tapering ends measure about 150 µm × 22 µm showing, ill defined, spiral thickening.

The whole capsule raised on a "stalk "the seta is 1.1mm long and broken at places .The cells of seta are richly deposited with dark content. Half of the capsule is covered on one side by a layer of four cells, the calyptra (Plate1 Fig .1; Text. Fig.1). The calyptra is about 2.3mm long and 0.1mm broad .The cells of the calyptra are compactly arrange, brick shaped, measures about 22 µm to 40 µm in size, The epidermal cells of the calyptra, and one to two layers of cells of calyptra are also filled with dark content.

Seta is not in direct connection with the thallus but at one place the thallus tissue is seen ruptured (Plate.1 Fig.4; Text, Fig.3).

DISCUSSION AND IDENTIFICATION

The important characters of the fossil specimens are that the plant body is thalloid, dorsiventralally flattened, bulbils at the tip of the branches, covered with prominent hairs ; thallus differentiated in to photosynthetic zone with air chambers , air pores guarded by the six epidermal cells ; the lower storage zone composed of parenchymatous store tissue ; rhizoids of two types ; scales on ventral surface of the thallus ; thallus covered with hairs ; sporogonium with capsule having short seta covered by multilayered calyptra ; capsule contains spore tetrads , spores , and elaters.

These structural details of the specimens suggest their bryophytic nature particularly of Hepaticeae.

Comparisons are made with known fossils and living forms of bruyophytes. The affinities are traced with the Hepaticeae.

Hepaticeae is divided into four orders Marchentiales, Sphaerocarpales, Jungaermaniales and Campbeles by Campbell (1936) Sperocarpales and Jungermaniales though represented by thalloid plant body but the thallus is without the differentiation of the thallus tissue unlike the present form. In Calobryales the plant body is erect and leafy, and leaves are present in three vertical rows. Thus these three orders are totally different in their characters from the fossil specimens,

In Marchentiales the thallus is dorsiventral, differentiated into two zones, photosynthetic and storage. Photosynthetic zone with air chambers and air pore, while along the ventral surface two types of rhizoids are present. Inaddition to these characters the thallus is thickest in the middle part and thins out towards margins, In these respects, the present specimen comes closer to the order Marchentiales . The entire plant body is covered with hairy out growths.

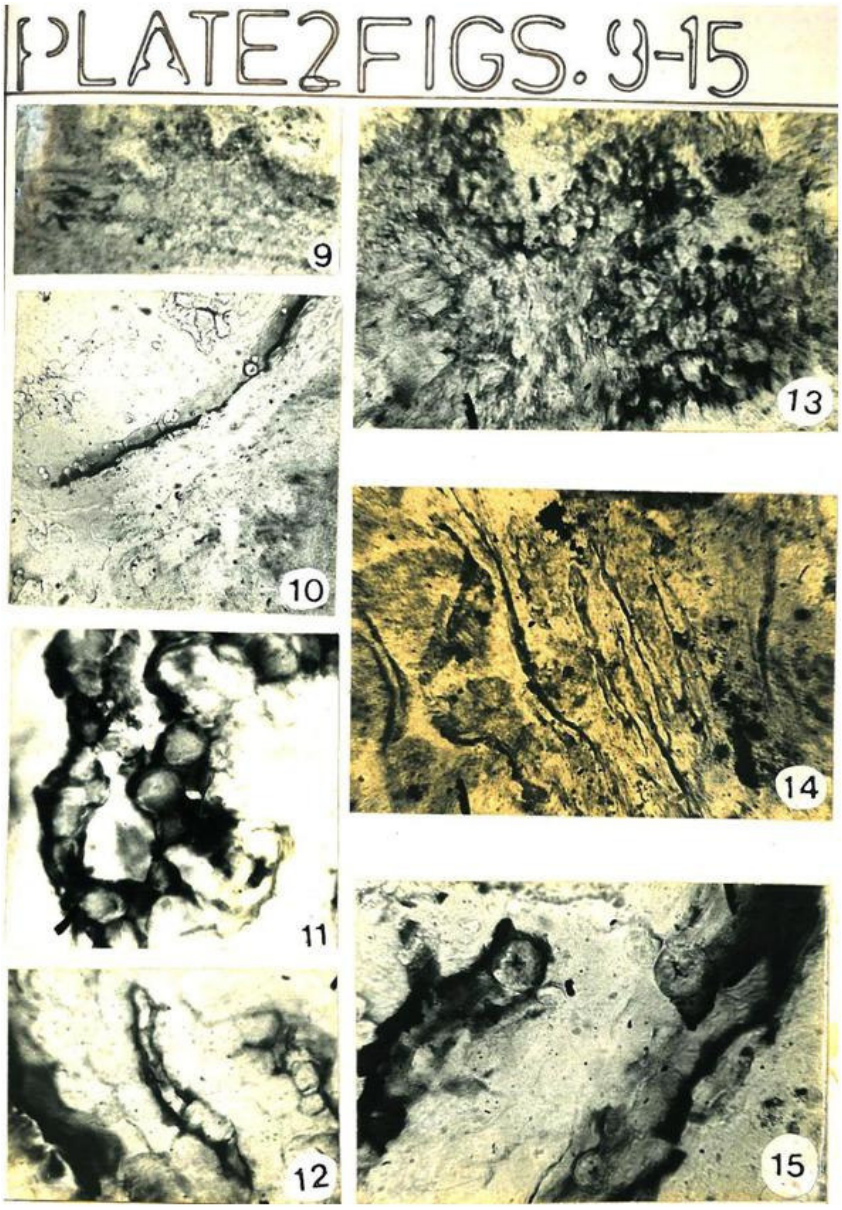
The affinities of the specimens are latter on traced with the modern genera of Marchentiales . In Plasiochasma the nature of the air chambers of photosynthetic zone is the same as that of the fossil specimens. The hair like projections absent in Plasiochasma. Further the air pores are simple in the specimen but they are well developed in Plasiochasma, Other members of Marchentiales, such as Riccia, Targionia ,Reboulia, Conocephalum ,Lunularia Marchentia also considered for comparisons but non of them showed similarities to the extent of the genus Plasiochasma . The air pores are complicated as compared to fossil form and has been also the characters of the species separation in a group Marchentiales. Due to the similarities of the characters as described above with Plasiochasma L.mais the fossil specimens are placed under living species of Plasiochasma as its extinct species and named as Plasiochasma intertrappea sp. nov. The specific name is after the Deccan Intertrappean series from which the 2 specimen was collected.

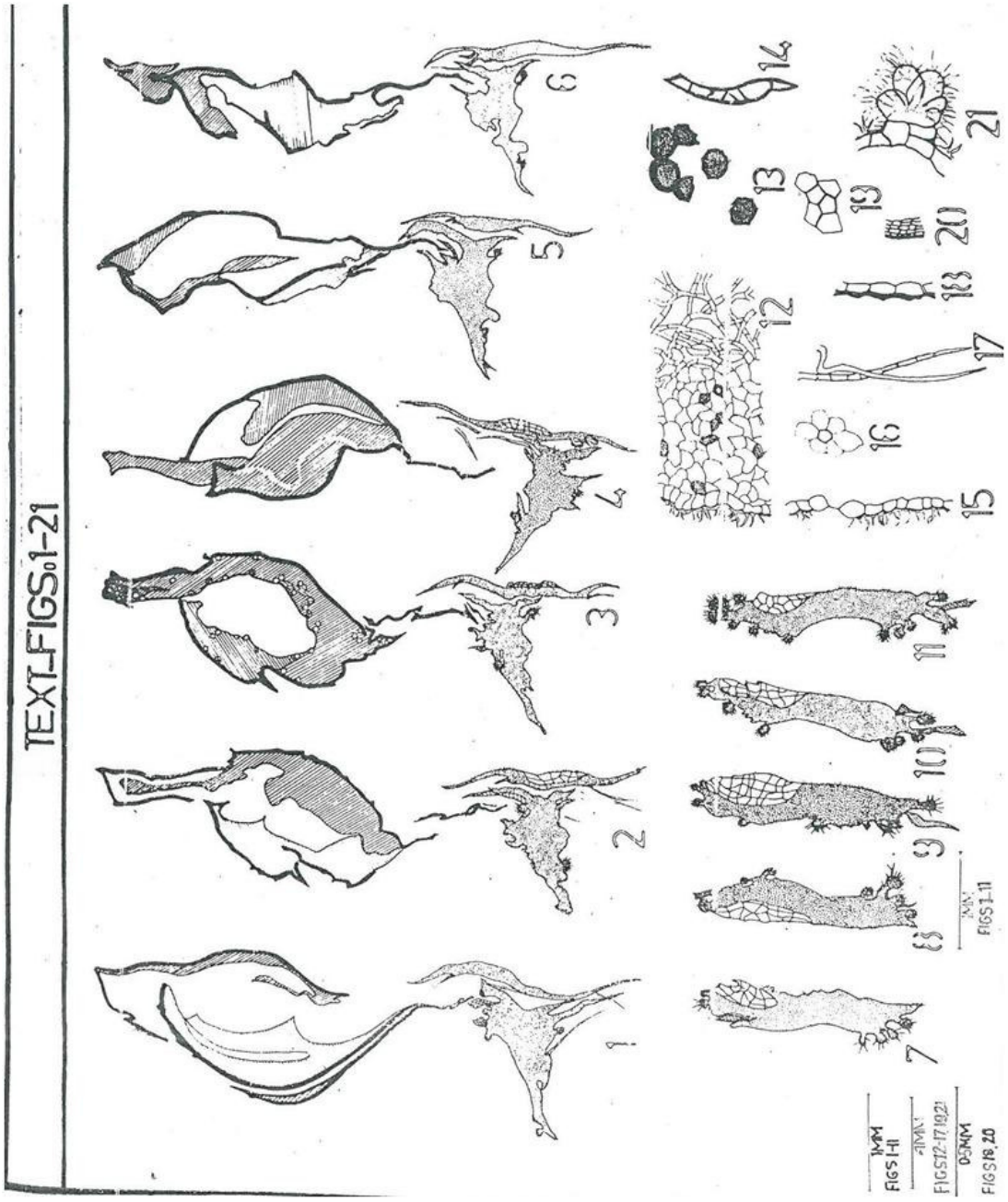
DIAGNOSIS

Plasiochasmaintertrappea sp. nov.

Plant body- thalloid, 2. 4 mm wide 0.23mm thick in preserved state, branching dichotomous. Tip of the branches with bulbils, covered by hairs, two types of rhizoids and scales, scales along the ventral surface. Thallus differentiable in to dorsal photosynthetic and ventral storage zones, photosynthetic zone with air chambers guarded by pore, bounded by six cells, storage zone, is of compact parenchymatous cells. Sporogonium consists of a capsule, 4.5 mm long and 1.4 mm broad. Seta and foot is not clear. Capsule consists of spore-tetrad, spores are 27 µm to 30 µm in size and elaters are 150 µm long and 22 µm broad in the middle with spiral thickening. Spores with tri-radiate mark and smooth exine, calyptra multilayered made up of brick shaped cells.

HOLOTYPE: **ADC-6/slide 1-18.**
HORIZONE: **Deccan Intertrappean Series of India.**
LOCALITY: **Mohagaonkalon , Chhindwara Dist . M.P., India**
AGE: **Eocene**




TEXT_FIGS.1-21
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FIGS 1-11
FIGS 12-17,19,21
FIGS 18, 20

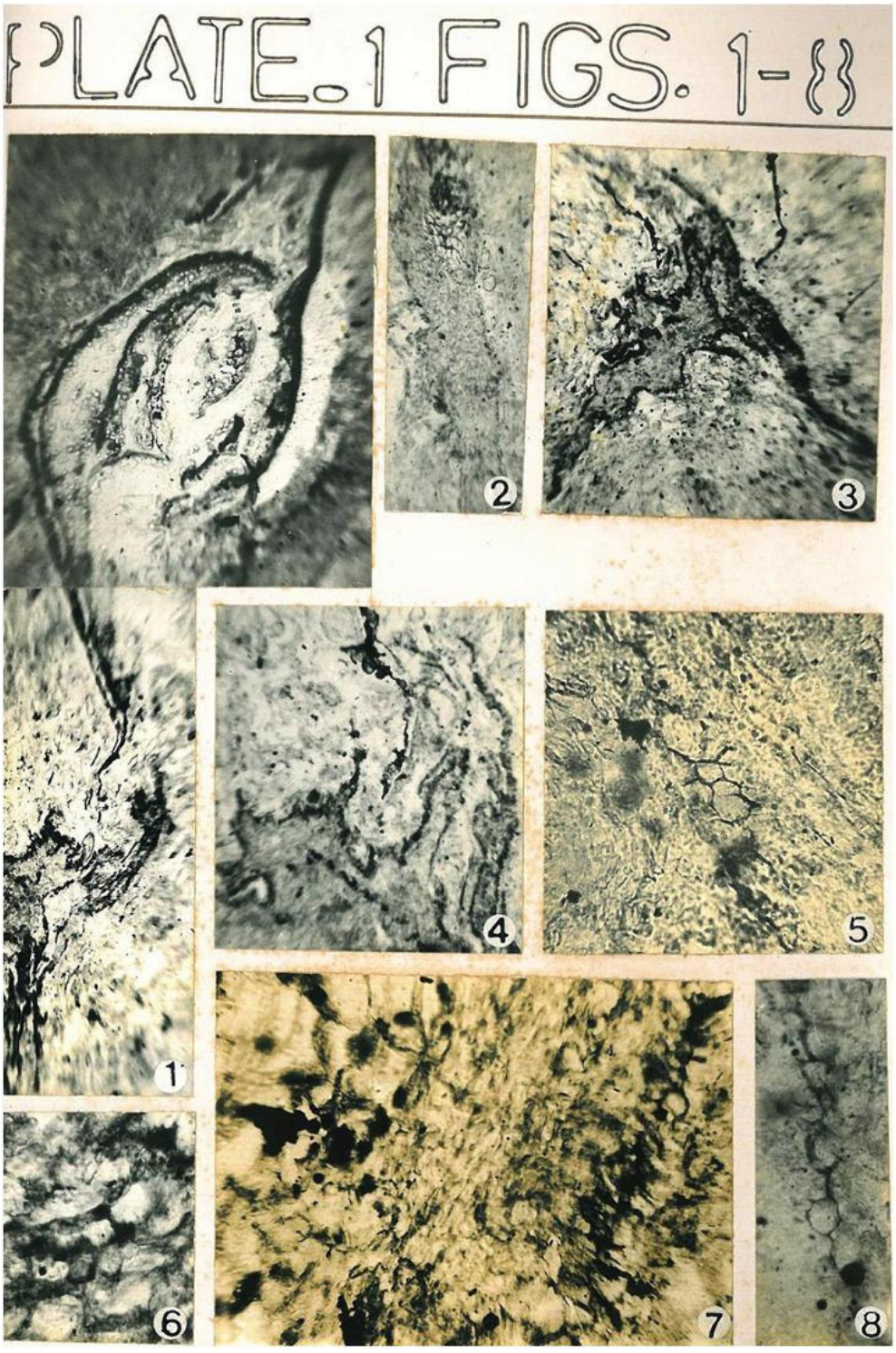
PLATE.1 FIGS. 1-8
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