

A REVISION OF *RAJMAHALIA*

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ABSTRACT

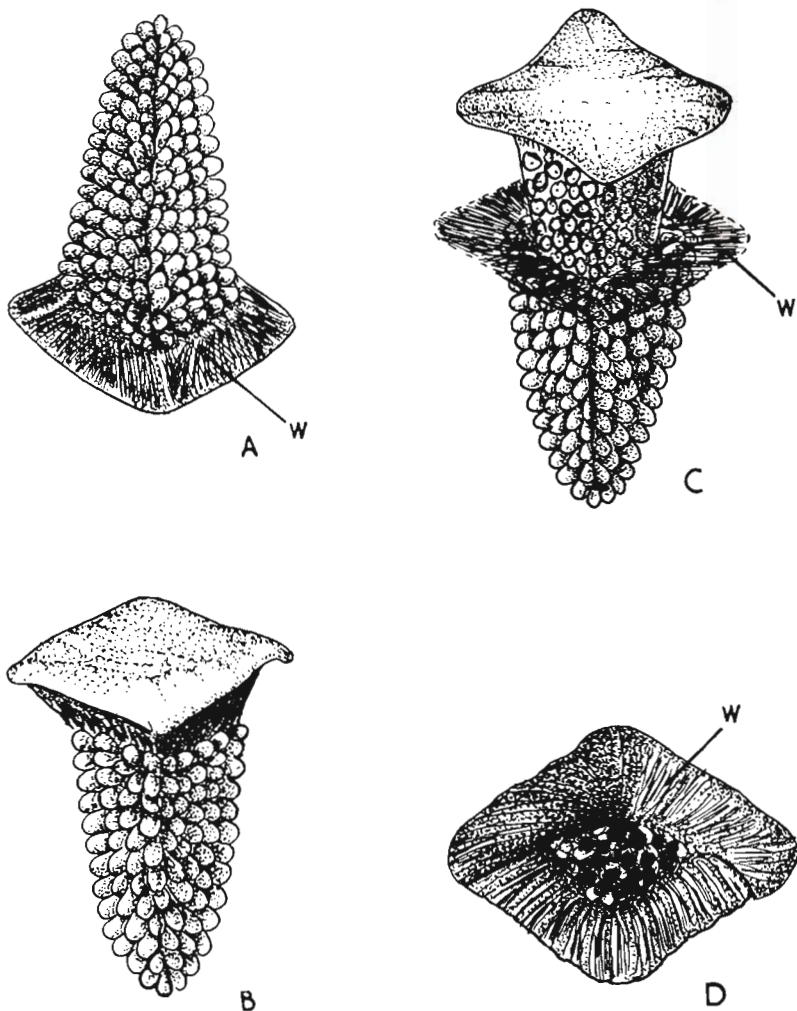
A re-interpretation of *Rajmahalia paradoxa* Sahni & Rao forms the basis of this paper. Also under *Rajmahalia* the genus *Ontheostrobos* Ganju (1947) has now been included.

INTRODUCTION

THE genus *Rajmahalia* was instituted by Sahni & Rao in 1934. When it was first described the authors (1934, p. 267) considered it to be "a unique type of fossil, somewhat comparable in form and size with the receptacle (hypanthodium) of a modern *Dorstenia*, and provisionally regarded as an open seed-bearing "flower" probably of a new genus of fossil cycads". Later, in 1935 (p. 712) the same authors gave a revised interpretation of *Rajmahalia* as "an inverted funnel-like organ (possibly part of a deciduous androecium) fallen from the top of a Bennettitalean receptacle and bearing on its inner surface the impress of the seeds and interseminal scales once pressed against it, but now no longer preserved". Also in this later work Sahni and Rao had completely discarded the possible comparison between *Dorstenia* and *Rajmahalia*. In the present paper yet another interpretation of *Rajmahalia* is given. Here, the type specimen of *R. paradoxa* is considered to be a group of closely set seeds originally arranged all round an elongated quadrangular receptacle like *Ontheostrobos sessilis* as described by Ganju (1947, p. 120, PL. 13, FIGS. 3-5 and PL. 14, FIG. 9). This receptacle is supposed to have no seed at its extreme base which is much wrinkled radially (PL. 2, FIGS. 11-12, W). It seems that the receptacle fell (TEXT-FIG. 1A-D) from the parent plant upside down and during the preservation the receptacle got detached from the seeds, leaving its impression of the basal wrinkled surface (here seen as a rhomboidal rim about 6-8 mm. all round the seeds, PL. 1, FIG. 1, W and TEXT-FIG. 1D) and some of the seeds as seen from the chalazal end. Sahni & Rao (*l.c.*) in their revised interpretation thought the

inner elliptical or circular scars, each with minute central pit, as the micropylar ends and the few polygonal areas between the seed scars as the impressions of the interseminal scales. I think the micropylar ends of the seeds are all embedded in the matrix; we are only seeing the chalazal ends of the seeds with minute pits representing the vascular supply of the seeds. The "so-called" interseminal scales, in my opinion, are merely the spaces left between the bases of the seeds which were fairly big in size. A careful examination of the original specimen of *Rajmahalia paradoxa*, figured in PL. 1, FIGS. 1-3, and the specimens figured in PL. 2, FIGS. 10-12, reveals that the circular or elliptical scars seen in the type specimen are similar to the circular or elliptical areas present on the receptacles of the two specimens figured in PL. 2, FIGS. 10 and 11. Moreover, the circular or elliptical scars in all the three specimens have the similar type of pits. Such circular or elliptical scars with pits were also noticed by Ganju in some of his specimens (1947, PL. 13, FIG. 4). So from all this it is evident that the impressions of the seeds as seen within the quadrangular area, in the type specimen of *R. paradoxa*, are from the chalazal ends.

Sahni & Rao (1934, p. 265) while describing *R. paradoxa* included a specimen previously described by them (1931, p. 203, PL. 15, FIG. 3) as "axis with elliptical scars" under the same species (*R. paradoxa*). This specimen with round or elliptical scars resembles the seeds described by Ganju (*l.c.*, PL. 13, FIGS. 1-2 and PL. 14, FIGS. 6-8) and the detached seeds figured here in PL. 1, FIGS. 4-7 and PL. 2, FIGS. 8-9. Also the detached seeds figured here and by Ganju resemble from their chalazal ends the seeds of the type specimen of *R. paradoxa*. The only difference one finds is that the circular or elliptical scars in the type specimen are smaller than the detached seeds figured by Ganju and the specimens figured here in PL. 1 and 2. This difference is of course possible depending on the state of maturity. So considering all these facts *viz.*, the points



TEXT-FIG. 1A-D — Diagrammatic sketches showing the possible mode of preservation of the type specimen of *Rajmahalia paradoxa*. A, receptacle in erect position with seeds attached. B, receptacle fallen upside down. C, receptacle getting detached. D, a sketch resembling the type specimen as it is preserved now, showing outer rim (w) and seeds inside.

of resemblances between *Rajmahalia paradoxa* and *Ontheostrobos sessilis*, the two genera are here merged with each other and described under *Rajmahalia*. This was already foreseen by Ganju (*l.c.*, p. 123) when he had mentioned, "It is possible that further research especially when more material is collected, may prove some sort of relationship between *Ontheostrobos sessilis* and *Rajmahalia paradoxa* Sahni and Rao, . . .". Unfortunately all the specimens of Ganju are now misplaced. Therefore, the present diagnosis is based on the

original specimen of Sahni & Rao (1934, PL. 36, FIG. 12) and a few new specimens from *Onthea* consisting of detached as well as attached (to the receptacle) seeds.

The affinities of *Rajmahalia paradoxa* have already been discussed by Sahni & Rao (*l.c.*) and Gauju (*l.c.*) In the absence of sporophylls no comparison is possible with the Cycadales. In the presence of a definite floral axis or the receptacle, *R. paradoxa* may be compared with the Cycadeoidales. Here again the absence of interseminal scales and a perianth

rules out its being a Cycadeoidalean fructification. *R. paradoxa*, having a large number of fairly big seeds arranged all round a receptacle, may be compared with the genus *Carnoconites* instituted by Srivastava (1945) and further described by Sahni (1948) and Vishnu-Mittre (1953). In *Carnoconites* too the seeds are fairly big, sessile and arranged all round a central floral axis in a crowded manner. Also in *Carnoconites*, as in *R. paradoxa*, there are no interseminal scales, sporophylls or a perianth. Thus, in the major plan of construction the two genera resemble each other. The only difference is that the receptacle in *R. paradoxa* is much bigger and thicker than in *Carnoconites*.

Although there are some points of similarity between the two genera as far as external characters are concerned, nothing is known regarding the internal anatomy of the receptacle and the seeds in *R. paradoxa*. So until and unless we know the anatomical details of *R. paradoxa* it is very difficult to say whether the two genera are related to each other and belong to the same group. Therefore, with the data available at present it would be better to leave the systematic position of *R. paradoxa* open.

Genus *Rajmahalia* Sahni & Rao

Diagnosis — As for, the only species, *Rajmahalia paradoxa* Sahni & Rao, emend.

Rajmahalia paradoxa Sahni & Rao, emend.

1933 — Axis with elliptical scars: Sahni & Rao, p. 203, pl. 15, fig. 30 (right).

1934 — *Rajmahalia paradoxa* Sahni & Rao, p. 265, pl. 36, figs. 12-13.

1935 — *Rajmahalia paradoxa* Sahni & Rao, p. 282.

1935 — *Rajmahalia paradoxa* Sahni & Rao, p. 710, pl. 67, figs. 1-3; pl. 68, figs. 4-6.

1944 — *Ontheostrobos sessilis* Ganju, p. 77, pl. 3, figs. 21-24.

1947 — *Ontheostrobos sessilis* Ganju, p. 119, pl. 13, figs. 1-5; pl. 14, figs. 6-9.

1963 — *Rajmahalia paradoxa* Sahni & Rao: Sitholey, p. 16.

Emended diagnosis — Gymnospermous megastrobilus consisting of numerous sessile seeds attached in a crowded manner all around a much elongated receptacle without a megasporophyll or ovuliferous scale.

Available length of receptacle about 3.2-4.5 cm. and breadth about 1.6-3 cm. at base (in flattened condition), gradually tapering towards apex; apex not preserved, base (?) quadrangular in cross-section. Where seeds detached, exposed surface of receptacle showing a number of circular or elliptical areas left by the fallen off seeds. These circular or elliptical areas slightly raised in the form of a cushion. Each cushion showing in the centre a small pit marking the vascular supply of seed. Seeds fairly large, largest seed measuring 6×4.5 mm. Micropylar end of seeds never preserved. Detached seeds having a large elliptical scar, about 2×1.2 mm. to 5×2.5 mm. at chalazal end. In some, chalazal end showing a minute pit representing the vascular supply of seed.

Locality — Locality of holotype unknown (seems to be from Khairbani, Chunakhal, or Bindaban near Mirzachowki). Other specimens from Onthea, Rajmahal hills, Bihar.

Age and Horizon — Jurassic, Rajmahal Stage.

Collection — Holotype no. F.465/6 of Sahni & Rao 1934, Pl. 16, Fig. 12 (present No. 32844 of the Birbal Sahni Institute of Palaeobotany, Lucknow).

Description — The above diagnosis is based on the type specimen of Sahni & Rao (1934) and a few new specimens from Onthea which resemble the figured specimens of Ganju (1947). Unfortunately, as stated before, all the specimens of Ganju are now misplaced. Hence, for the specific diagnosis more importance has been given to the holotype and to the new specimens from Onthea. However, Ganju's description and illustrations have also been taken into consideration wherever necessary as I have no doubt that the new specimens from Onthea are identical with Ganju's figured specimens. Although Ganju's figured specimens are now not available, the other half of the big block from Onthea from which Ganju had isolated his specimens still exists. This piece, measuring more than a metre in length, is under display in the Museum of the Birbal Sahni Institute of Palaeobotany, Lucknow. In it are still present two specimens like those figured by Ganju and in these only two groups of detached seeds are present.

Holotype — *Specimen* no. 32844 (PL. 1, FIGS. 1-3 and PL. 2, FIG. 13) — The specimen shows an outer quadrangular margin

about 8-9 mm. wide with rounded corners. This represents the impression left behind by the wrinkled surface of the receptacle near the base which bears no seed. The quadrangular margin is highly striated radially. Inside the quadrangular margin the seeds are seen from their chalazal end. Each chalazal end is circular or elliptical, slightly depressed and has a small pit in the centre marking the vascular supply of the seed.

Specimen no. 32848 (PL. 2, FIGS. 11-12 & 14)—In this the receptacle on one surface is fully exposed. The receptacle appears to be quadrangular (? rhomboid), its base being about 3 cm. broad in compressed state and the apex not preserved. The exposed surface shows a number of circular or elliptical, slightly raised areas, mostly with a small pit near the centre representing the vascular supply of the

seeds. It seems the seeds were placed in these cushion-like circular or elliptical areas. At the extreme base about 0.5 cm. in breadth no such circular or elliptical areas are present. This area is devoid of seeds and is highly wrinkled or rugose radially. As stated earlier, perhaps the outer quadrangular area in the holotype is the impression of this part of the receptacle.

On right hand side of the receptacle some of the seeds (PL. 2, FIG. 11, S) are still attached. Unfortunately, in each of them the micropylar end is embedded in the matrix. A few seeds are also preserved near the apical region of the receptacle where the latter is broken.

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EXPLANATION OF PLATES

PLATE 1

1-3. *Rajmahalia paradoxa* Sahni & Rao; figs. 2 & 3, showing distinctly the seeds with small pits (v) marking the vascular supply of the seeds and the outer quadrangular rim formed by the impression of the basal wrinkled (W) part of the receptacle. Holotype no. F465/6 (present no. 32844 of B.S.I.P.). Fig. 1. $\times 1$, Fig. 2. $\times 2$, Fig. 3. $\times 4$.

4-7. *R. paradoxa*, showing groups of detached seeds exposed by their chalazal end. Fig. 4. — no. 33674, Fig. 5. — no. 33675, Fig. 6. — no. 32847 and Fig. 7. — no. 33676. All $\times 1$.

PLATE 2

8-9. *R. paradoxa*, showing a few detached seeds. Some of the seeds give a clear side view but in none micropylar end visible. Fig. 8. — no. 32245 and Fig. 9. — no. 32848. Fig. 8. $\times 1$, Fig. 9. $\times 2$.

10-11 *R. paradoxa*, showing two receptacles with circular and elliptical scars. In some of the scars a small pit marking the vascular supply (v) of the seeds is seen. In Fig. 11, a few seeds are still attached. Fig. 10. — no. 32846 and Fig. 11. no. 32848. $\times 1$

12. Specimen in Fig. 11 magnified, the receptacle at the base showing clearly the wrinkled surface (w).

13-14. Plasticine casts of the specimens shown in Figs. 1 and 11 respectively. $\times 1$.

