

ON A NEW PETRIFIED FLOWER, *SAHNIPUSHPAM SHUKLAI*
SP. NOV. FROM THE INTERTRAPPEAN BEDS OF MOHGAON-
KALAN IN THE DECCAN

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ABSTRACT—In this paper is described a new petrified flower from Mohgaon-Kalan (22° 1' N: 79° 11' E.), Chhindwara District, M.P. The description is based on nearly thirty specimens, the first of which was collected by Professor V. B. Shukla and named as *Sahnipushpam*. During subsequent years many more specimens were collected by the author and studied both in longitudinal and transverse sections. The flowers are bisexual, sessile, with the receptacle forming a cup-like hypanthium enclosing the ovary; sepals not seen; petals 0; stamens probably many, perigynous near the mouth of the hypanthium, incurved, anthers small, basifixed, dehiscing by longitudinal slit, pollen grains ellipsoidal; ovary superior, spherical in cross section, five locular, each locule incompletely partitioned by half septum, central axis disorganised in the middle part of the ovary, each half locule containing one ovule, placentation probably basal, style thick, traversed by a styler canal, ending in an umbrella shaped plate. Dehiscence of the fruit septifragal, seed endospermic, cellular details partly observed. Anatomical details of most of the floral parts fairly well preserved.

The affinities of the flower have been traced to the family Sonneratiaceae, Order Myrtiflorae, with a near approach to the genus *Sonneratia*

INTRODUCTION

THE type specimen of the present material was first discovered in 1948 by Professor V. B. Shukla while investigating thin slices of a chert containing a bunch of *Tricocites trigonum* fruits (Sahni and Rode, 1937) from the Inter-trappean beds of Mohgaon-Kalan, District Chhindwara. This flower lay a little away from these palm fruits and possibly might have been swept close to these specimens before fossilisation. A general study of this new form, based on one more smaller specimen was made by Professor Shukla and he referred it to a new genus *Sahnipushpam* (Palaeobotany in India, Vol. 6).

Here I wish to take the opportunity of expressing my heartfelt thanks to Professor V. B. Shukla for kindly placing at my disposal all his material including the type specimen, for study and investigation. During subsequent years several excursions were undertaken by the author to the above locality and while quite a few hundred cherts were being broken and sliced for the investigation of micro- and megaflores, more and more new specimens of this

flower, cut along different planes and exhibiting different anatomical details, were obtained. A few of the specimens were so neatly exposed in the sliced cherts that they were more or less perfect radial longitudinal sections showing different parts clearly and distinctly. The varying planes of other specimens were also immensely useful, since these were helpful in giving almost a perfect three dimensional picture of the material along with its internal details. In some cases even fragments, which otherwise would have appeared insignificant were of immense value, as one could study some marvellously interesting details in these. The total number of specimens so far collected is now about three dozen and the following description is a comprehensive account of this genus based on all these specimens.

MATERIAL AND METHOD

The chert slices exposing the specimens were carefully ground up and polished with finest carborundum powder taking care not to lose much of the material. These were then thoroughly flushed with polishing fluids till they became more or less shining. It

was now convenient to study them under reflected light, often with a drop of water or a little clove oil on the surface of the specimen. In other cases, the slice with the exposed surface of the specimen, after being finally polished was stuck on to a glass slide with hot Canada balsam. In some cases the superfluous rock was gently rubbed away till the specimen became exposed on the other side as well. The material was thus visible on two sides of the rock and represented two sections passing through two different planes of the flower. The two surfaces could be illuminated by strong light and with the help of suitable filters, could be studied and micro-photographed. Such a study with the help of reflected light gave fairly good results. This method, though with its obvious limitations, had to be resorted to, as peel sections were at times not very successful. In still other cases, some specimens were neatly ground up to microscopic transparency for studying the cellular details. Camera lucida sketches were made on the basis of adjusted foci, using strong surface illumination. Text-figures were prepared also directly from the photographs taken on matt paper.

DESCRIPTION

Several specimens of the fossil flower, cut along various planes, have been studied. The following is a diagnostic account of the flower as a whole based on such a study.

Diagnosis.—Flower: Actinomorphic, hermaphrodite, 0.5 mm. in length and 0.25 mm. in breadth across the middle, sessile, perigynous, with an hypanthium (calyx tube of authors) which is cupular and closely adhering to the ovary along its length. The hypanthium is produced slightly beyond the ovary, its mouth forming a swollen rim round the base of the style. Hypanthium not produced into calyx tube or lobes above the ovary; petals absent; stamens many, small, perigynous, inserted near the mouth of hypanthium or on its throat, reflexed, dehiscence by longitudinal slit, pollen grains elliptical; ovary superior, free from hypan-

thium, outer surface of ovary wall studded with numerous round glands, multilocular, central axis of the flower disorganising in the middle portion of the ovary, loculi of the ovary incompletely halved by false divisional walls, each half loculus containing one ovule. Ovules eleven in number one inside each half loculus, attachment probably basal, style short, terminal, thick, ending in an umbrella-shaped stigma. Stylar canal septate, opens by a single opening on one side below the stigmatic plate. Fruit a capsule dehiscing septifragally.

Structural details of the different floral parts.—The receptacle is clearly seen in a number of radial longitudinal and transverse sections. It is mostly composed of thin walled tissue having a large number of oval cavities (Pl. 21, fig. 1; Pl. 22, fig. 7; text-figs. 1 & 7). In transverse section it is more or less circular in outline. The oval cavities seem to have been formed lysigenously and are without contents. Vascular supply is not seen at this level though it becomes visible upwards in the style and plate.

Hypanthium (Calyx tube of authors).—It is a tube-like structure surrounding the ovary. It seems receptacular in origin having been formed by a peripheral extrusion of the receptacular tissue round the ovary.

Its average length is 0.4 mm. and it forms an almost straight tube which is quite closely applied to the ovary along its whole length, up to the top (Text-fig. 1). A very narrow annular space is left throughout between the ovary and the hypanthium tube and in no case is there any trace of adnation between the two*. The tip of the hypanthium is fleshy and forms a swollen rim round the base of the style. In the lower region, the hypanthium is distinctly four angled and ribbed in transverse section (Pl. 22, figs. 5 & 7; text-figs. 7, 8 & 9) and very thick. The tissue of the hypanthium mostly consists of thin walled cells with numerous intercellular spaces (Pl. 23, fig. 9). Large number of lysigenous passages and cavities filled with yellow granules of undeterminable nature are abundant throughout the length of the tube. These cavities are comparatively more

* Myrtiflorae is characterised by an increased tendency to perigyny culminating in the complete union of the ovary with hypanthium in the typically epigynous families. The various species in several families e.g. Melastomaceae, Myrtaceae, Rhyzophoraceae, show progressive fusion of hypanthium with the ovary wall representing different stages between fully epigynous and perigynous condition.

pronounced in the basal region (Text-figs. 1 & 2). An outer epidermis of square closely set cells is seen at several place (Pl. 22, fig. 4). A vascular strand consisting mostly of spirally thickened elements is seen in one longitudinal section (Text-fig. 3). Appearing to start about half way up the length of the hypanthium, it runs straight up to

and its peculiarly swollen rim are very characteristic of the flower.

Gland.—A dome-shaped multicellular gland with a pointed apex present at the base of the hypanthium is seen projecting into the narrow space between the ovary and the tube in a few specimens (Text-fig. 3).

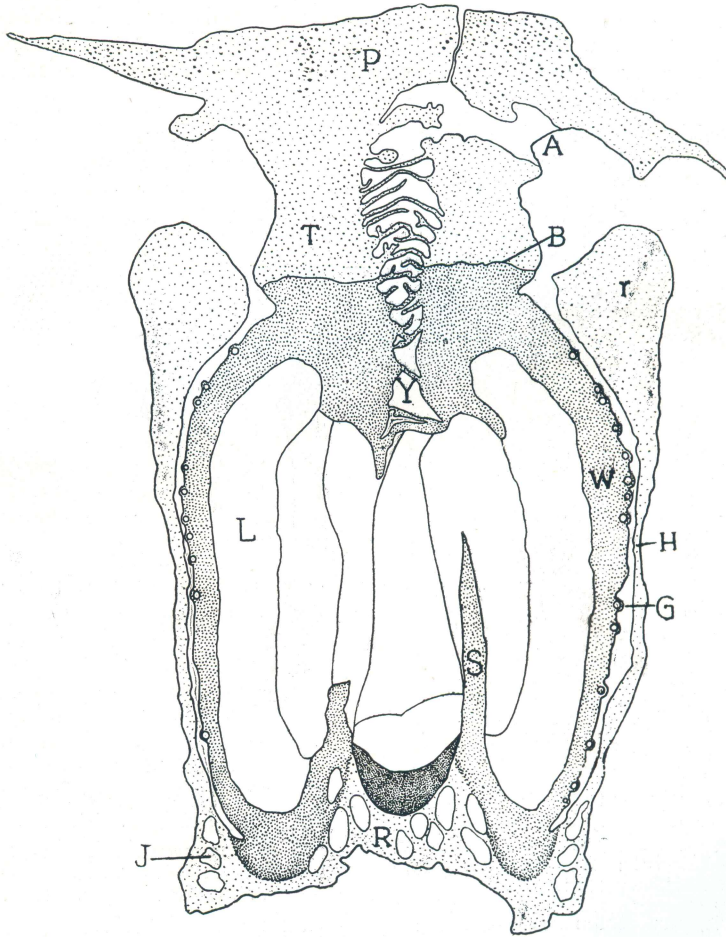


FIG. 1—Radial longitudinal section of the flower. H, hypanthium; *r*, swollen rim of the hypanthium; J, lysigenous cavities in the lower region of the hypanthium; W, wall of ovary; G, glands; S, septum, L, locule; T, style; Y, styler canal; A, opening of the styler canal; P, peltate plate; B, horizontal plane where the style would break off from the ovary (cf. Pl. 21, fig. 1). $\times 23$.

the top and ends abruptly just below the epidermis in the swollen rim. This may be the vascular supply leading to the calyx. The closely adhering tubular hypanthium

Androecium.—Stamens have been observed in only one specimen (Text-fig. 4). In the longitudinal section, about three of these are seen on one side of the throat

of the hypanthium just below the fleshy swollen rim and these are reflexed towards the style. The total number of stamens could not be determined from this single specimen, nor is it expected to see all of them in one section. These, might however, have been numerous. Cellular structure could not be observed in the filaments.

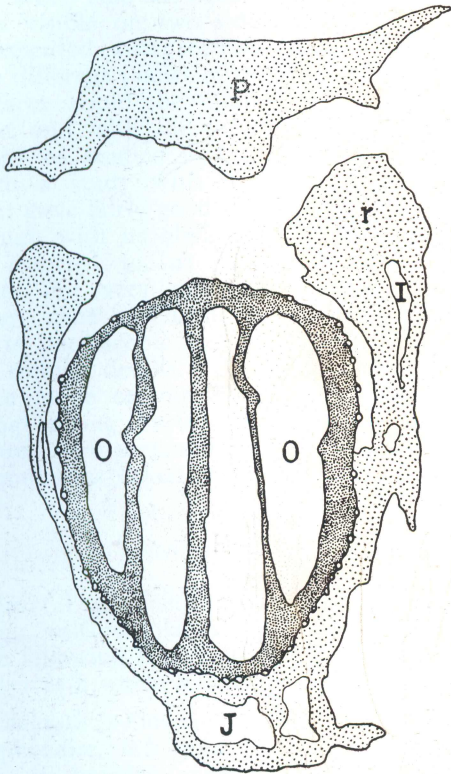


FIG. 2—Counterpart of text-fig 1; tangential section, l, rim of hypanthium; I, lysigenous passage; J, lysigenous cavity; O, silicified ovule; P, peltate plate seemingly detached. $\times 20$.

Anthers, which are terminal, are seen in the section along a longitudinal plane

passing through one pollen sac (Pl. 23, fig. 12). These are fully mature and the fibrous layer of the wall is fairly well preserved. No tapetum or intermediary layers are visible. Pollen grains are elliptical (Text-fig. 5), with a dotted surface and are seen actually present inside the pollen sac (Pl. 23, fig. 12). In one longitudinal section the very characteristic group of cells formed by the epidermis at the line of dehiscence have been observed cut transversely (Text-fig. 6). This is suggestive of dehiscence by a longitudinal slit.

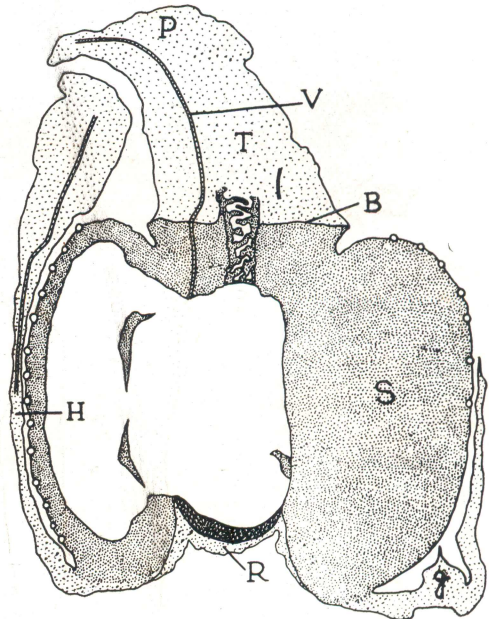


FIG. 3—Longitudinal section through an old flower showing H, hypanthium; g, gland; R, receptacle; S, stout septum cut longitudinally along its whole breadth from the ovary wall upto the disorganised central axis; T, style; P, peltate plate; V, vascular supply. $\times 23$.

Gynaecium.—Total average length 0.4 mm., superior.

EXPLANATION OF PLATE 21

SAHNIPUSHPAM SHUKLAI sp. nov.

FIG. 1—A perfect radial longitudinal section of the flower showing various parts: H, the tubular hypanthium closely adhering to the ovary, with its peculiarly swollen rim, r; J, lysigenous cavities; G, glands on the ovary wall; S, septum; T, style ending in a peltate plate, P; The stylar canal opening A, on one side below the plate; B, the horizontal plane where the style would break off from the ovary; L, locule. $\times 26$.

The magnifications as reproduced have become slightly altered from those given in the body of the photographs: In Plate 21, 1" is reproduced as 1.1" and in Plate 22 & 23 as 0.92". The photographs are all from untouched negatives.



VERMA : A NEW PETRIFIED FLOWER, SAHNIPUSHPAM SHUKLAI SP. NOV.

Ovary.—In transverse section it is four angled in outline with rounded edges upwards. It measures 0.2 mm. in width in the smallest specimen (Text-fig. 14) and 0.35 mm. in the largest. In younger stages it is usually longer than broad. The wall of the ovary is several cells thick being made of small cells (Pl. 22, fig. 4). The epidermis of the wall consists of squarish thick walled cells (Pl. 22, fig. 4). A very characteristic feature is the presence of small glands in the form of papillae all over the surface of the ovary wall (Pl. 22, fig. 3; text-figs. 1, 2, 3, & 8). These are more or less equal in size, often very close to each other and seemingly without contents.

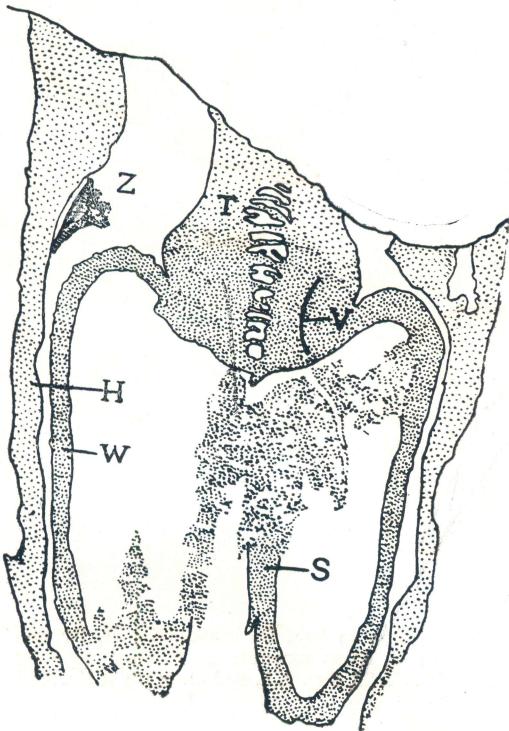


FIG. 4—Radial longitudinal section of a specimen showing H, hypanthium; Z, tissue of stamens; W, ovary wall; S, septum; T, style; V, vascular supply. $\times 20$.

The ovary is multilocular. Five stout septa run to the centre of the ovary forming five

loculi. Four of the five loculi so formed are each again divided by a thin incomplete septum into two contiguous chambers. The fifth locule is divided by two septa into three such chambers. There are thus eleven half loculi, with one ovule in each.*

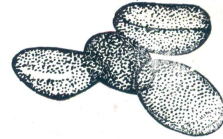


FIG. 5—Group of pollen grains occurring inside the anther. (cf. Pl. 23, fig. 12). $\times 260$.

At the top and near the base of the ovary, however, all the septa, including the thinner ones join on to a central axis or column (Pl. 22, fig. 5; text-fig. 9). But in the middle of the ovary, consequent to disorganisation of the axis the five stout septa as well as the

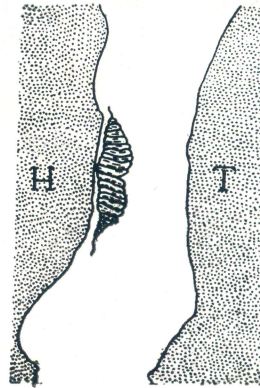


FIG. 6—The characteristic cells formed by the epidermis at the line of dehiscence of anthers, H, hypanthium; T, style. $\times 24$.

thinner ones just remain projecting inside the cavity so formed (Text-fig. 8). In a number of specimens (Pl. 22, fig. 2) this disorganised central axis is only represented by a small shapeless patch of ill preserved tissue. The stout septa are long and almost reach the centre. This condition is a constant feature in all the specimens. Each septum widens out at the outer and inner end. The

* In one specimen, however, each locule of the ovary (Pl. 22, fig. 6) appears to be incompletely divided by one septum, thus bringing the total number of loculi to ten, in contrast with eleven seen in the usual specimens. This probably is due to unsatisfactory preservation of this specimen and the total number of loculi may even here have been eleven.

inner lining of the loculi is a smooth layer of thin-walled cells, while the septum is made of small thick-walled, rather elongated cells (Pl. 22, fig. 4). It has not been possible to study the cellular details, specially the vascular supply, of the central axis due to its complete disorganisation in all the specimens so far studied.

strands, consisting of spirally thickened elements emerge out of the septum on either side and run up the length of the style for a considerable distance, one on each side of the stylar canal (Text-fig. 3). One of these bends out, and runs horizontally in the peltate head up to its margin, and seems to end blindly. Though the exact number of

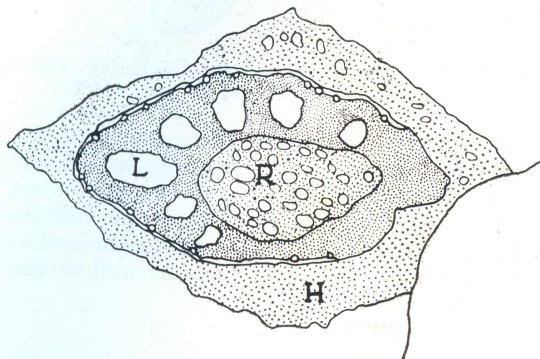


Fig. 7

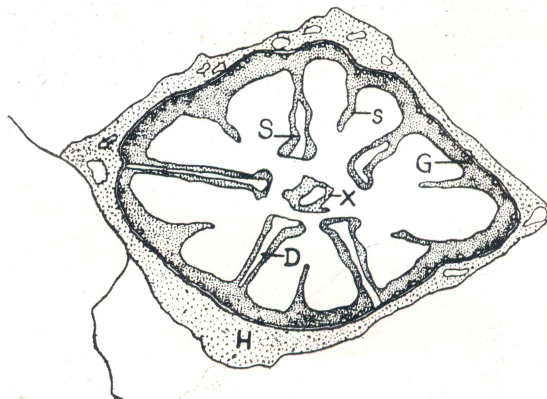


Fig. 8

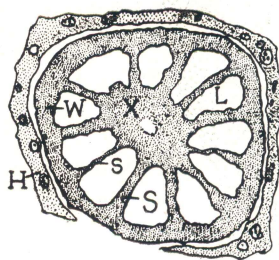


Fig. 9

Figs. 7-9—Sections through different flowers at varying levels, base to top, R, receptacle; H, hypanthium; W, ovary wall; G, glands; X, central axis; S, stout septum; s, thinner septum; L, locule; D, splitting up of the stout septum. (cf. Pl. 22, figs. 2, 5, and 6). $\times 18$; $\times 18$; $\times 12$ respectively.

Style.—It is short, terminal, very thick (Pl. 21, fig. 1), distinctly five angled in cross section (Text-fig. 10) and ends in an extremely characteristic umbrella shaped plate which is broader even than the ovary (Text-figs. 1, 2, 11 & 12). It is made of small rounded cells (Pl. 23, fig. 10) and is traversed by a distinct stylar canal which is quite broad and also septate. It has been possible to study the vascular supply of the style in only one longitudinal section. Two vascular

vascular bundles could not be studied in the transverse section, it is likely that the total number of these might have been five.

The stylar canal is more or less circular in cross section (Text-figs. 11 & 12), and runs through the middle of the style all along its length (Pl. 21, fig. 1 and Pl. 23, fig. 10). It is narrow in the lower region, where it opens out into the central disorganised region of the ovary, but gradually widens up along

the style (Text-figs. 1 & 4). Then it bends horizontally in the region of the plate and opens out by a single broad opening on one side just below the peltate plate (Text-fig. 1 & 10). The styler canal is not lined by any special epithelium and is obviously formed by the disorganisation of the cells of the style. The septa run transversely inside the canal. These are made of irregular multicellular plates, left due to the disorganised cells. The septa often run into one another. The cells of the plate are thin walled and elongated (Pl. 23, fig. 10).

The transverse plane where the style joins the ovary is distinctly conspicuous because of the demarcation of cells on the two sides which are different in size and shape (Pl. 21, fig. 1; text-figs. 1, 3 & 12). In older flowers the style tends to break away from the ovary along this plane, so distinctly seen in the longitudinal sections of younger flowers. This plane where the style joins the ovary is represented peripheraly by a collar-like thickening.

Ovule.—Each half chamber contains a single ovule and its attachment is probably basal (Pl. 23, fig. 11). It has not been possible to study complete cellular details of the ovules as these are often badly preserved. Such silicified forms have often represented a problem of study in quite a number of Deccan chert material eg. *Tricocites*

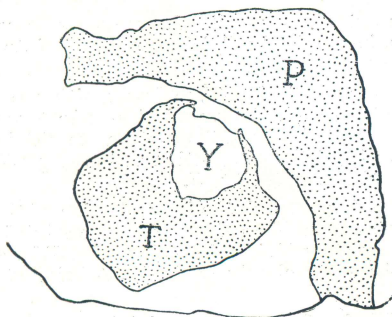


FIG. 10—A transverse section through the upper portion of the style showing T, style; Y, styler canal which is opening out; P, peltate plate. $\times 20$.

trigonum, *Veeracarpou* (Sahni, 1934), *Rodeites* (Sahni, 1943) etc., except for some fortunate cases like *Sahnianthus* (Shukla, 1944) & *Enigmocarpou* (Sahni, 1943). In one speci-

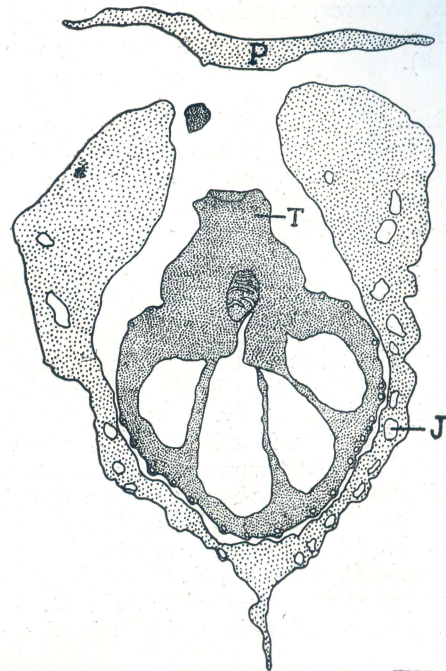


FIG. 11—A slightly oblique longitudinal section of another flower. J, lysigenous cavities in the tissue of the hypanthium; T, style; P, peltate plate. $\times 18$.

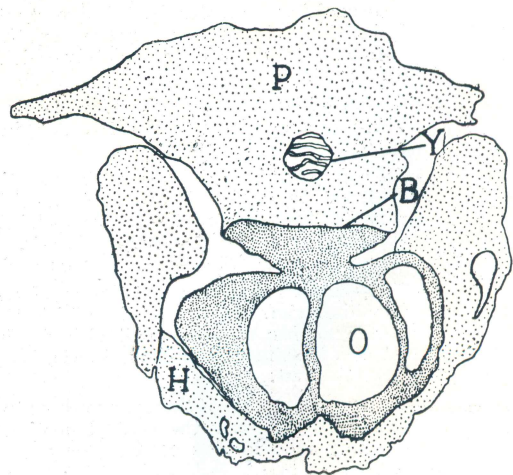


FIG. 12—A very oblique longitudinal section of a flower showing H, hypanthium; O, silicified ovule; Y, styler canal with transverse septa; P, peltate plate; B, horizontal plane where the style would break off from the ovary. $\times 18$.

men, however, certain cellular details of imperfect nature are seen in the seed (Pl. 22, fig. 8).

Fruit.—It is a septifragal capsule of septidial type, showing longitudinal splitting up of the stout septa as well as the disorganisation of the central axis (Pl. 22, figs. 2, 6, & 8; text-figs. 8 & 13).

Pieces of wood.—In several cherts, small pieces of wood cut along various planes are found lying in association with the present specimens. Most of these wood sections are oblique and rather badly preserved, not allowing a close study. But in a few cases, where the wood is a little better preserved and is fractured transversely, the anatomical details very much resemble those described in another wood by the author from the same locality and referred to the genus *Sonneratia* (Verma, 1950). Secondary wood diffuse, porous, growth rings absent. Pores numerous, small, quite uniform in size and

evenly distributed, mostly single and arranged in radial rows. Contiguous rays present

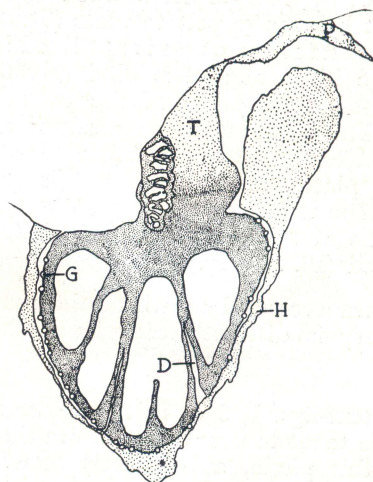
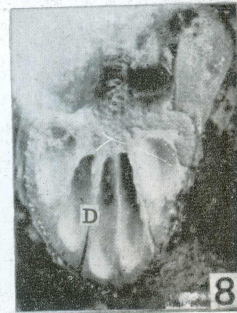
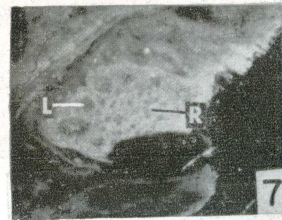
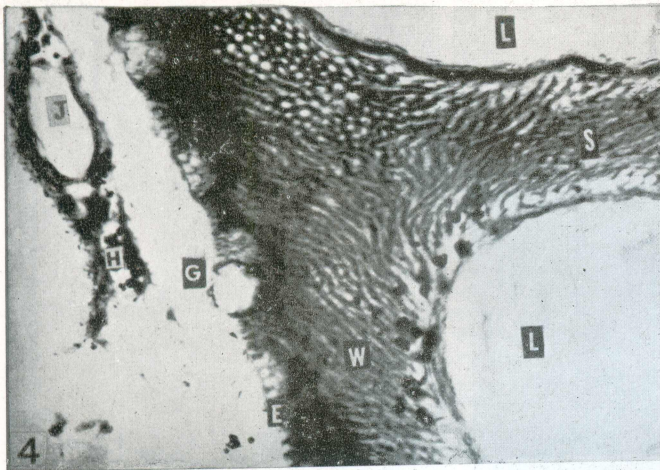
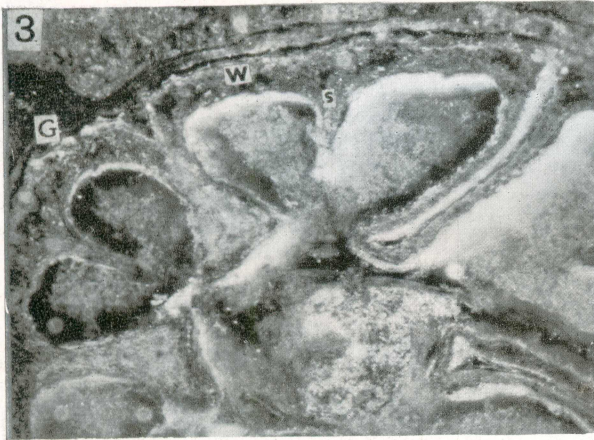
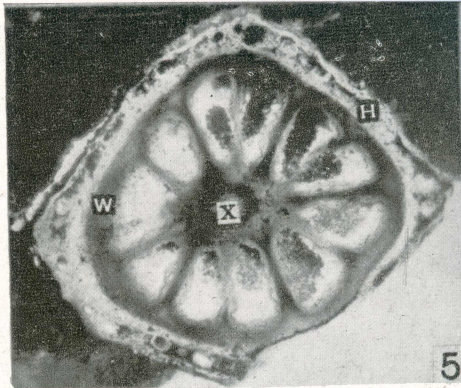
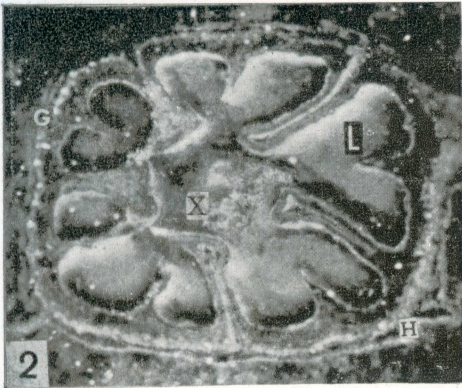


FIG. 13—Another oblique longitudinal section of a flower. H, hypanthium; G, glands; D, splitting up of the stout septum; T, style; P, peltate plate. $\times 13$.

EXPLANATION OF PLATE 22

SAHNIPUSHPAM SHUKLAI SP. NOV.

- FIG. 2—The type specimen of Professor Shukla, cut transversely through the middle showing the hypanthium tube, H, closely applied to the multilocular ovary; G, the spherical glands; X, the disorganising central axis; the five stout and the six comparatively thinner septa projecting inside the cavity of the ovary are seen, the stout septa being split up along their length for dehiscence; L, locule with completely silicified ovules (cf. figs. 5, 6 & 7; and text-figs. 7, 8 & 9). $\times 25$.
- 3—A part of fig. 2 magnified. The glands, G, on the outer ovary wall, W, are seen as a row of white dots, specially on the left. A thin septum, s, incompletely divides each locule into two. $\times 50$.
- 4—An enlarged view of the transverse section of the ovary-wall of another flower with one stout septum. E, epidermis made of squarish closely set cells; G, the spherical glands; the small round cells composing the ovary wall, W, and the elongated cells of the septum are visible. L, the locule not lined by any epidermis. On the top left is seen a portion of the hypanthium tissue H, with intercellular spaces and a large lysigenous cavity, J. $\times 80$.
- 5—Cross section of an ovary at the top along a plane passing through the lower portion of the hypanthium rim. H, hypanthium fairly thick, having large number of irregular spaces filled with dark granules; W, ovary wall with glands; ovary completely divided into eleven loculi by septa all of which meet the central axis, X. Five of the septa clearly marked out being stouter than the rest. $\times 18$.
- 6—Transverse section of the ovary nearer to the base showing five stout septa joining on to central axis of which only the central portion has so far disorganised; thinner septa incompletely dividing each loculus $\times 24$.
- 7—A slightly oblique transverse section of the flower through the base with rounded edges. L, loculi cut just at the base; large number of oval cavities lie in the tissue of the receptacle, R; ovules silicified. (cf. figs. 2, 5 & 6). These are sections through different flowers at various levels. $\times 9$.
- 8—A flower cut obliquely showing also the longitudinal splitting up of the septum for dehiscence, D. $\times 10$.



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on one, or generally on both the sides of the pore. Fibres angled in transverse section, arranged in radial rows between two rays. Rays in transverse section uni-or multiseriate, separated by 1 to 6 fibres.

AFFINITIES OF THE FLOWER

The general characters of the flower, specially the position of the ovary and the development of hypanthium suggest a reference to the Order Myrtiflorae. This order is characterised by Engler as a taxon whose components show a transition from perigyny to epigyny, the stem tissue in general containing an internal phloem, the flowers being cyclic and the development of hypanthium, distinctive. The Order was sub-divided by Engler and Diels into four sub-orders, and treated as comprising 23 families (Lawrence, 1952). These families have been variously rearranged and classified by different taxonomists. Rendle (1952) accepted the Engler arrangement but included the Nyssaceae and Alangiaceae as separate families of Umbelliflorae. Wettstein also agreed with Engler but included the Hydrocaryaceae within the Onagraceae, and separated Gunneraceae from Haloragaceae as a distinct family. Hutchinson (1926 and 1948), however, distributed these families among five Orders: the Thymeliaceae in the Order Thymelaeales Elaeagnaceae in the Order Rhamnales; the Lythraceae, Crypteroniaceae, Sonneratiaceae, Punicaceae, Onagraceae (including Hydrocaryaceae) and Haloragaceae in his Lythrales; the Nyssaceae, Alangiaceae in the

Umbelliflorae and the Combretaceae, Myrtaaceae, and Melastomaceae in Myrtales.

On the basis of characters described above, specially the condition of the hypanthium, which is free from the multilocular ovary,

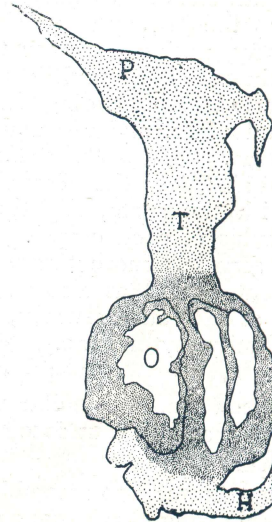


FIG. 14—Longitudinal section of a young flower. H, hypanthium; O, silicified ovule; T, style; P, peltate plate. $\times 13$

the present flower can be traced to the sub-Order Myrtinae, which includes about 15 families, all of which have inferior ovaries except the Lythraceae, Sonneratiaceae and some times Melastomaceae.

Taking the sum total of characters, the fossil flower here described, can thus be

EXPLANATION OF PLATE 23

SAHNIPUSHPAM SHUKLAI sp. nov.

- FIG. 9—Another specimen showing thickness of hypanthium in transverse section: spongy tissue with intercellular spaces may be seen; J, lysigenous cavity. $\times 55$.
- 10—Portion of the style in longitudinal section showing septate styler canal Y, which gradually widens out towards the top, empty, and unlined by any epithelium; septa are multicellular and several cells thick; V, vascular supply of the style T. $\times 40$.
- 11—Another oblique section through a flower; W, wall of the ovary; S, septum; R, receptacle. The ovules, O, with some cellular details are seen. $\times 32$.
- 12—Part of a longitudinal section of another flower showing, H, hypanthium tissue and also the stamens on the right; F, fibrous wall of pollen sac and some included pollen grains p. $\times 65$. Inset—magnified part of the above showing pollen grains p, and some fibrous wall. $\times 130$.
- 13—The counter part of fig. 1, pl. 21, comparatively tangential. Lysigenous passages and cavities in the hypanthium, H, are visible; four half chambers fractured tangentially; O, ovules completely silicified; P, peltate stigma. $\times 10$.
- 14—A tangential longitudinal section through another specimen: r, rim of hypanthium; L, loculi; P, peltate stigma seemingly detached at the top. $\times 8$.

The magnifications as reproduced have become slightly altered from those given in the body of the photographs: In Plate 21, 1" is reproduced as 1.1" and in Plate 22 & 23 as 0.92",

traced to the family Sonneratiaceae, though it also shows characters of Lythraceae and to a certain extent those of Lecythidaceae.

Among Sonneratiaceae, near approach is to *Sonneratia apetala* in the following distinctive characters : Cupular hypanthium surrounding the ovary ; petals absent ; stamens many, perigynous near the mouth of hypanthium ; ovary multilocular, style slightly exerted and ending in an umbrella shaped plate, stylar canal present ; fruit capsular. In *Sonneratia apetala* the mid ribs of the carpels, which alternate with the septa, slightly protrude into the loculus of each carpel. The same condition is seen in a more pronounced form in the present flower, as also in *Lagerstroemia* (Joshi and Venkateswarlu, 1935) of the allied family Lythraceae.

The pollen grains found inside the anthers of this specimen too, are similar to those in Sonneratiaceae and Lythraceae in certain respects.

The present flower also resembles Lythraceae in the following characters : perigynous flower, presence of a cupular or campanulate hypanthium ; reflexed stamens ; syncarpous multilocular ovary, single style with a capitate stigma and stylar canal ; fruit a capsule dehiscing variously in the genus *Lagerstroemia* of Lythraceae, as mentioned above, the loculi of the ovary are also incompletely halved by false divisional walls which project into the loculi as longitudinal ribs.

It may here be pointed out that the family Sonneratiaceae was formerly included in Lythraceae by Bentham & Hooker (1862-67) and in fact on embryological grounds there is nothing to separate the two (Venkateswarlu, 1937)*.

The present flower shows certain characters of the family Lecythidaceae as well. In several species of this family the petals are absent, ovary 2-6 or more celled and the ovules may be solitary in the loculi, style often thick, ending in a five angled plate ; stigmas radiating from the centre of the plate to the angles along the lines of the five rayed opening of the stylar canal. However, the ovary here is inferior.

Though an isolated character, spherical glands are also found on the ovary wall in Myrtaceae which again has an inferior ovary.

It may here be mentioned that the Lythraceae, Sonneratiaceae and other allied families frequent damp places and several of these form part of mangrove swamps. Professor Sahni is of the opinion that the amphibious habit was quite a characteristic feature of the Lythraceae, specially in the early days. Koehne assigns to this, an age not exceeding that of the mammals (Koehne, 1886). To quote Professor Sahni..... "There lies good evidence that the amphibious habit still seen in many Lythraceae was an ancient characteristic of the family, much more widely spread in the early Tertiary times than it is today. No one, who has examined the seeds of the known fossil Lythraceae can fail to be impressed by the part which water must have played in their dispersal. Nearly all the species known in the fossil state were adapted to dispersal by water. The data is still meagre but so far as they go, they indicate that the family was from its origin adapted to an amphibious existence and that during the course of evolution some of the genera have spread into drier situations. The tissue in the seeds of some modern genera eg. *Lagerstroemia* and *Lawsonia* which are not known for any special preference for damp habit, is probably a relic of an amphibious ancestry" (Sahni, 1943).

It is, of course, not easy to suggest an amphibious habit on the basis of the floral characters alone, but it is likely that the fruit of the present species might have later developed such characters as did *Enigmocarpon* from *Sahnianthus* (Shukla, 1944)§. The spongy nature of hypanthium in addition to its massiveness, seen in all the species of the present flower so far examined, may perhaps be considered as an indication towards this habit to a certain extent, especially the fact that it has been persistent and closely adhering to the ovaries of all the specimens either young or old. Such a persistent hypanthium, it may be mentioned, has also been recorded very recently in *Enigmocar-*

* "From the above account it can at once be seen that the embryological features of the family Sonneratiaceae agree even in details with those of the Lythraceae."—(Venkateswarlu, 1937).

§ "The fruit and seed of *Enigmocarpon* were adapted for aquatic dispersal and seem to have been fitted for long immersion in brackish waters."—(Sahni, 1943).

pon by J. N. Dwivedi (1956). The associated fruits of *Nipa*, *Tricocites* and *Rodeites* discovered from the same locality also show amphibious characters. Thus in the present flower, the evidence of such an hypanthium for a probable aquatic habitat finds some support in the circumstantial evidence afforded by the associated fossils not only from the Deccan but also in several genera like *Minsterocarpum*, *Pachyspermum*, *Tamesicarpum* and *Cranmeria* from the London Clay Flora (Reid and Chandler, 1933).

A critical study of the morphology of the fossil flower thus makes it clear, that most of its characters are distributed mainly over the different families included in the Order Myrtiflorae with comparatively closer resemblance to Sonneratiaceae, yet exhibiting several characters of its own.

NOMENCLATURE

The generic name *Sahnipushpam* was proposed by Professor V. B. Shukla for this unique type (Palaeobotany in India. Vol. 6) and it is now proposed to refer it to *Sahnipushpam shuklai* sp. nov., after Professor V. B. Shukla who has done remarkable work, specially on the Indian fossil flowers.

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