



A FOSSIL FLOWER, *SURANGEPUSHPAM DECCANII GEN. ET SP. NOV.* FROM THE DECCAN INTERTRAPPEAN OF MOHGAONKALAN, M.P., INDIA.

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**Abstract**

It deals with the structure of a new petrified flower, collected from the Deccan Intertrappean black cherts of Mohgaonkalan, M.P., India. This flower is petrified. Flower sessile, ebracteate, bisexual, protandrous, zygomorphic, hypogynous, perianth 2 whorled, glands on inner whorl, stamens 4, anthers 2 lobed, 4 locular; gynoecium presumably 6-locular, gynophore moderately long, ovary superior, style simple, moderately long, stigma solid. So far, seven floral form genera have been described from this horizon. The present flower has similarities with some of those reported fossil flowers. But it differs in many characters and is placed under a new form genus. It is named as *Surangepushpam deccanii* gen. et sp. nov. The generic name is after Dr. Surange, the former Director, B.S.I.P., Lucknow and the specific name is after the Deccan plateau area in peninsular India.

Keywords: Petrified, Deccan, Intertrappean, bisexual, zygomorphic, gynophore.

**Introduction:**

This paper deals with the structure of a new petrified flower, collected from the Deccan Intertrappean black cherts of Mohgaonkalan, M.P., India. Flowers being relatively delicate structures are of rare occurrence. So far, several floral form genera have been described from this horizon. These are *Sahnianthus pariai* (Shukla, 1944, Chitaley, 1950a, 1955a; Mahabale and Deshpande, 1957; Dwivedi and Shukla, 1958). *S. shuklai* (Verma, 1956) syn. *S. glandulosum* (Prakash, 1956; Prakash and Jain 1964), *Chitaleypushpam mohgaoense* (Paradkar, 1971a) *C. dilcherii* (Yawale 1980a); *Deccananthus savitrii* (Chitaley and Kate, 1971). *Raoanthus intertrappeum* (Chitaley and Patel, 1975); *Sahinanthus parijai* var. *Shuklai* (Karanjekar, 1982); and *Mohgaonanthus deccani* (Dixit, 1984).

The present flower has similarities with some of those mentioned above but it differs in many characters and is placed under a new form genus.

**Material and Method:**

The present investigation is based on a petrified flower which was exposed in longitudinal plane in a black chert. As the counterpart was partly gone in grinding the available material was sectioned to study the anatomical details. Transverse sections at various levels were also taken.

**DESCRIPTION:**

The flower is small, about 3mm. in length and 2.2mm. broad in middle,

zygomorphic, bisexual, and hypogynous. Perianth is 2 whorled, tubular with glands on either sides on the inner whorl. Androecium consists of 4 intorse, epipetalous, protandrous stamens two on each side and are didynamous. Filaments are short, attached at the middle of anthers. Anther is 2-lobed, 4-locular with pollen grains, some of them showing germination in situ. Gynoecium consists of a presumably 6 locular ovary with a gynophore and is superior. Style is simple, moderately long and solid. Stigma is somewhat conical, smooth and solid (Plate, Fig. 1&2)

**Perianth**

Perianth is made up of two distinct whorls, differentiated as calyx and corolla (Plate, Fig. 1&2). Both the whorls are fused with each other at base. Each whorl consists of 3 members. The arrangement of whorl is valvate. Members of outer whorl (Calyx) are made up of 3 to 4 layers of parenchymatous cells. The cells measure 43-71 µm in diameter. The inner whorl (Corolla) is made up of thick walled cells averaging 57 µm in diameter. These cells are filled with brownish contents. (Plate, Fig. 4.). The inner whorl has glandular structures on both the internal sides bounded by a single layer of small dark cells. Vascular supply is seen in the form of groups of 8-10 vessels (Plate, Figs. 3&4)

**Androecium**

It consists of 4 stamens arranged in 2 tiers i.e. in didynamous condition with 2 each on either sides and are epipetalous. Each stamen measures 0.64 mm. and 0.74 mm.

broad. They are oblong in shape and are introse (Plate, Figs.1&2). The anthers are bilobed, 4-locular and appears to be dorsifixed. Filaments are short, 0.18 mm. long and are free from each other. An individual pollen sac measures 0.15 mm. long and 0.07 mm. broad, bounded by outer single epidermal layer and 2-3 layers of endothelial cells measuring 15-45  $\mu$ m. In diameter. In the anther, the radial wall is seen to have fibrous layer of cells (Plate, Figs. 2&4). Every pollen sac is laden with numerous pollen grains matured in situ, showing protandrous nature. Pollen grains are triangular in shape and are double walled. The exine has distinct sexine and nexine. The sexine is smooth and thinner than nexine. Intine is a thick layer. These layers are 0.5  $\mu$ m. and 1  $\mu$ m. in thickness respectively. The wall is psilate. Further the pollen grains are tricolporate. Syncolpate, and prolate. The mean size of pollen grain is 22  $\mu$ m along the poller axis and 13.5  $\mu$ m. along equatorial axis (Plate, Figs. 6&7). Mode of dehiscence of anthers is perhaps longitudinal.

#### Gynoecium

T.S. of the available material revealed 3 complete carpels along with half portions of 2 others. From the magnitude of the counterpart loss, a sixth can be presumed and so the gynoecium is hexacarpellary syncarpous. (Plate, Figs. 3). The ovary is oval and elongated in shape. It is narrow at the base, quite broad in middle and again narrows down towards the apical part as seen in L.S. The ovary measures 0.93 mm broad and 0.81 mm long, thus its breadth is more than length. It is superior, raised on stalk (gynophore) which is 0.20 mm long and 0.24 mm broad, consisting of moderately thickwalled, parenchymatous cells and is bounded by a single layered epidermis, (Plate, Figs. 2). It is in young condition and the ovules are poorly preserved. The placentation is axile. The style is simple, about 0.65 mm long and 0.28 mm broad. It is solid and consists of distinct epidermal layer and a few cells thick layer of moderately thick walled parenchymatous cells, (Plate, Figs. 2). The stigma is slightly conical in shape measuring 0.36  $\times$  0.49 mm. The stigmatic surface is smooth. Outermost couple of layers consists of radially elongated cells filled with some brownish substance indicating glandular nature of stigma, (Plate, Figs. 2).

#### Discussion

The present flower is compared in details with other fossil flowers described from Mohgaonkalan locality. It is evident that all the

fossil flowers including the present one are bisexual, showing protandrous stamens, tetralocular and introse anthers. All of them except *Sahnipushpam* and *Raonanthus intertrappea* have superior ovaries, while these two have semi-superior ovaries. Except in *Sahnipushpam* where it is basal, the placentation is axile in all the remaining fossil flowers. Germinating pollen grains are found only in *Sahnianthus parijai* and its variety *shukali*. The latter also shows spur enclosing the nectar.

The present flower has similarities with *Sahnianthus parijal* (Shukla, 1944) in having stalked gynoecium, superior ovary, axile placentation and showing absence of spur and nectar, but differs in having 2 whorls of perianth, 4 stamens, tricolporate and syncolpate pollen grains, slightly conical stigma and absence of nectar on ovary wall.

*Sahnipushpam* (Chitale, 1964) differs in having a single whorl of perianth, a spur and basal placentation. *Chitaleypushpam mohgaense* (Paradkar, 1971a) has a single perianth whorl, sessile gynoecium, 7 stamens, pentagonal ovary, 5 locules, and so it can not be linked with this flower, despite showing similarities in superior ovary and axile placentation and not having spur.

*Deccanthus savitri* (Chitale and Kate, 1971) is similar because it has 2 whorled perianth, a gynophore, superior ovary, axile placentation and has not got a spur and nectary. But it differs in having inwardly curved tips of inner whorl of perianth, 6 stamens in 2 whorled perianth, 4 stamens in 2 whorls with 3 each having short and long filaments and simple stigma. *Raonanthus intertrappea* has 1 perianth whorl, 9 stamens opposite to perianth, sessile gynoecium and semi superior ovary with 7 locules. The style is chambered having simple stigma. Present flower on the contrary has 2 whorled perianth, 4 stamens, a moderately long gynophore and superior ovary with 6 locules. Style is smooth with conical stigma. *Sahnianthus parijai* var. *shuklai* (Karanjekar, 1982) is having one perianth whorl, a spur with a nectary, stamen in 2 whorls, unequal filaments, tricolpate and psilate pollen grains, simple long style, stigma papillose and so does not resemble this flower, though it has a gynophore, zygomorphic symmetry, and superior ovary.

*Mohgaonanthus deccanii* (Dixit, 1984) shows 2 whorled perianth, epipetalous stamens, superior ovary, axile placentation and protandrous condition of flower but differs

because it is actinomorphic, perianth with 5 whorls in each, 5 stamens alternating with petals, tricolpate, psilate, suboblate pollen grains differing considerably in size, 5 locules, indistinct stigma and has prominent glandular disk around the base of ovary.

Thus the above discussion makes us to conclude that this flower is different in one or more respects from all flowers reported from Mohgaonkalan locality so far. So we will attempt the affinities of this flower with those belonging to modern families. Samydeaceae has similarity in some respects but differs in having tetralocular anthers and parietal placentation as against bilocular anthers and axile placentation in present flower. Like *Labilatae* it has 4 stamens adnate to corolla tube which are didynamous, longitudinally dehiscent anthers, superior ovary but differs because its ovary is not 4 lobed. As in *Plantaginaceae* it has 4 stamens inserted on corolla tube and has superior ovary but has not got anthers which are pendulous.

*Anacardiaceae* has dorsifixed anthers and superior ovary. Secretory spaces are elongated or canal like (Esau, 1953). Similar gland like structures are seen in the perianth of the present flower. But flowers belonging to this family differ in other respects. The flowers of *Burseraceae* are hermaphrodite and usually small (Cook, 1958). The secretory spaces are roundish (Esau, 1953). The glandular structures in the perianth of present flower may be equivalent to these secretory spaces, barring this no similarity is seen. The flower has many resemblances with family *Lythraceae* as it is bisexual, hypogynous, having superior ovary, axile placentation, 6 locules (Lawrence, 1964 and Rendle, 1967). But it differs in having two whorled perianth and didynamous stamens.

The fibrous layer found in the anther wall is supposed to be adapted, by the thickening of its cell walls, as a mechanism largely responsible for the opening of the anther sacs (Eames-1961) and dehiscence appears to be by longitudinal slits. Thus in light of the comparison with extinct and extant genera and families, it becomes evident that the flower does not belong to any of them so it will be a safe proposition to keep it separately at present as a

new form genus, belonging to some extinct dicotyledonous family. Hence it is named as *Surangepushpam deccanii* gen. et sp. nov. The generic name is after Dr. Surange, the former Director, B.S.I.P., Luknow and the specific name is after the Deccan plateau area in peninsular India.

#### DIAGNOSIS:

Generic diagnosis

*Surangepushpam gen. nov.*

Flower sessile, ebracteate, bisexual, protandrous, zygomorphic, hypogynous, perianth 2 whorled, glands on inner whorl, stamens 4 anthers 2 lobed, 4 locular; gynoecium presumably 6-locular, gynophore moderately long, ovary superior, style simple, moderately long, stigma solid.

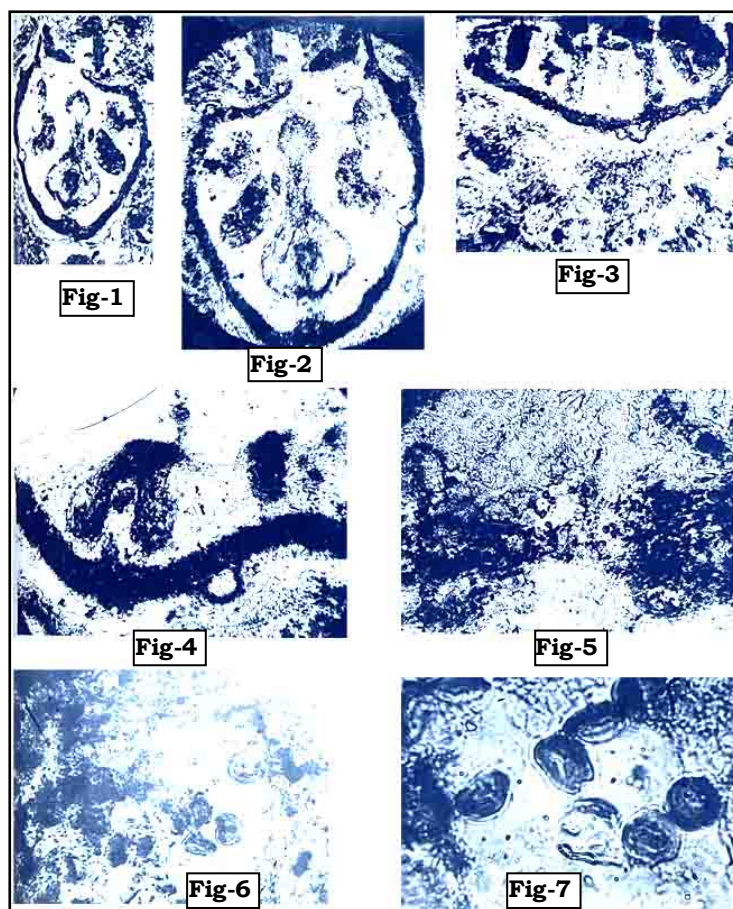
Specific diagnosis *S. deccanii sp. nov.*

Flower small, about 3 mm long, 2.2 mm broad, sessile, zygomorphic, bisexual, hypogynous; perianth 2 whorled, fused at base, valvate, outer whorl cells parenchymatous, measure 43-71  $\mu$ m. In diameter, inner whorl cells thick walled, averaging 57  $\mu$ m in diameter. Contents brownish, glandular structures on inner whorl, vascular bundles with groups of 8-10 vessels; Androecium-stamens 4, in 2 tiers, epipetalous, measures 0.64×0.74 mm, oblong, introse, anthers bilobed, 4-locular, dorsifixed, dehiscence probably by longitudinal slits, filaments short 0.18 mm. long, pollen sac measures 0.15 mm × 0.07 mm, outer layer epidermis, inner endothecium cells 15-45  $\mu$ m in diameter, pollen grains triangular, double walled, exine distinguished into sexine, nexine, intine a thick layer, each pollen grain tricolpate, syncolpate, prolate, psilate, 22 × 13.5  $\mu$ m in size; gynoecium elongated, measures 0.93 mm. × 0.81 mm. superior, gynophores pronounced, 0.20 mm × 0.24 mm in size, ovules indistinct, placentation axile, style simple, 0.65 × 0.28 mm in size, solid stigma conical, measuring 0.36 × 0.49 mm., stigmatic surface smooth, outer layer consists of radially elongated cells, contents brownish, glandular.

Horizon – Deccan Intertrappean Series of India.

Locality – Mohgaonkalan, M.P. India.

Age - ? Uppermost Cretaceous.



Explanation of Plate-Figure 1-7

*Surangepushpam deccanii gen. et sp. Nov.*

1 & 2: The flower in longitudinal view  $\times 18$  &  $30$  respectively.

3: T.S. through ovary showing 3 locules  $\times 25$

4: T.S. flower passing through androecium, showing 2 pollen sacs of a stamen and a gland in inner whorl of perianth  $\times 80$

5: T.S. flower passing through androecium showing pollen grains  $\times 130$

6: The pollen grains in polar and equatorial view  $\times 485$ .

7: The pollen grains showing thin exine and thick intine and colpi  $\times 750$ .

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