

# SEM based pollen morphodiversity studies in some genera of family bignoniaceae

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## Manuscript details:

Available online on  
<http://www.ijlsci.in>

ISSN: 2320-964X (Online)  
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

### Cite this article as:

Rajurkar AV, Tidke JA and Matte RS (2018) SEM based pollen morphodiversity studies in some genera of family bignoniaceae, *Int. J. of. Life Sciences*, Special Issue, A12: 157-160.

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## ABSTRACT

Pollen morphology of seven genera viz., *Kigellia pinnata*, *Milligtonia hortensis*, *Spathodea campanulata*, *Tabebuia argentea*, *Tabebuia rosea*, *Tecoma stans*, *Tecoma smithii* belonging family Bignoniaceae have been examined by Light and Scanning Electron Microscope (SEM). The pollen grains are medium sized, size ranges from 26.4- 44.95  $\mu\text{m}$ , isopolar, radially symmetrical, tricolporate, oblate-sub-oblate, Sub-oblate to oblate spheroidal, prolate-spheroidal, the sexine ornamentation ranges from reticulate to microreticulate. The present reports give an account of pollen morphological variations in seven genera of Bignoniaceae growing in S. G. B. Amravati University campus which can be used as an identification character for the species.

**Key words:** Pollen morphology, Bignoniaceae, LM, SEM.

## INTRODUCTION

The morphological characters of pollen grains are embodies in the exine and are important criteria in consideration of the taxonomy and inter-relationships of plants at various taxonomic levels. Hyde and Williams (1945), Erdtman (1952) and Nair (1960) studied the pollen morphology in detail in different flowering plant species.

Erdtman (1952) seems to be the first one to study the pollen morphology of the family Bignoniaceae. However, later on the pollen of various genera of the family were examined in relation to taxonomy and phylogeny. Bove (1993) examined the pollen morphology of 33 species of 19 genera of Bignoniaceae native to the south Brazilian Atlantic forest using Light- and Scanning Electron Microscopy. In the present investigation seven genera of family Bignoniaceae has been discriminate based on pollen morphological characters.

## METHODOLOGY

The Polliniferous material of eight genera of Bignoniaceae were collected from Amravati University campus and stored in 70% alcohol. The studied taxa were identified from Flora of Marathwada (Naik, 1998). The collected material was crushed with a glass rod in plastic centrifuge tube and crushed material was filtered through fine meshes to isolate pollen grains. The pollen grains were prepared for light and scanning electron microscopy by the standard method described by Erdtman (1960) and Arora and Modi (2008). For light microscopy, the pollen grain were mounted in stained glycerine jelly and observations were made with Trinocular Fluorescence Microscope (Axiostar HBO 50/AC Carl zeiss). For SEM studies, pollen grain were suspended in a drop of ethanol and directly transpired with a fine pipette to a metallic stubs using double sided cello tape and coated with gold palladium in a sputtering chamber (POLARON SPUTTER COATER). The SEM examination was carried out on a LEO electron microscope (LEO 430). The measurements are based on 10 readings from each pollen type by ocular micrometer and the pollen grain size, colpi size, pore size was measured. The terminology used in accordance with Erdtman (1971), Faegri and Iversen (1964), Bhattacharya *et al.* (2006), Agashe (2006) and Punt *et al.* (2007).

## RESULTS

Description of pollen type :

### Family- Bignoniaceae

**1. *Kigellia pinnata* (Jacq.) DC.Prodr:** Pollen grains, PA 49.2-54  $\mu\text{m}$ , EA 41.4-42  $\mu\text{m}$ , sub-prolate ,radially symmetrical, polar outline triangular, equatorial outline elliptic, trizonocolporate, colpi long, narrowly tapering at end,colpi length 37.2  $\mu\text{m}$ , width 18  $\mu\text{m}$  at equator and 6- 7.2 near pole, pori 9.6-10.8  $\mu\text{m}$  in diameter,oval, mesocolpi 21.6  $\mu\text{m}$ , apocolpi 9 -10.2  $\mu\text{m}$ , exine 2.13-2.66  $\mu\text{m}$  thick, sculpturing microreticulate, lumina circular to tetragonal, large at mesocolpi and small at apocolpium ,N3P4C5 [ Fig. 1 (LM), Fig. 2 (SEM, Mag. 2.47), Table No. 1].

**2. *Millingtonia hortensis* L. f. Suppl. :** Pollen grains, PA 43.29 (41-50  $\mu\text{m}$ ), EA 44.95 (44-50  $\mu\text{m}$ ), oblate spheroidal, polar outline triangular obtuse, eqitorial outline elliptic,

colpi faint, tricolporate, colpi length 31  $\mu\text{m}$ , colpi width 4.34- 6.89  $\mu\text{m}$ , pori 3.84 - 4.46  $\mu\text{m}$  wide, mesocolpi 28.14-30.85  $\mu\text{m}$ , apocolpi 16.6-17.23  $\mu\text{m}$ , exine 2.73-3.34  $\mu\text{m}$  thick, sculpturing microreticulate heterobrochate, or reticulate, muri irregularly distributed, lumina oval, elliptic, 0.61-0.91  $\mu\text{m}$  wide, N3P4C5 [ Fig. 3 (LM), Fig. 4 (SEM, Mag. 1.63 KX), Table No. 1 ].

**3. *Spathodea campanulata* P. Beauv.Fl.Oware Benin :** Pollen grain PA 26.4 - 27.77  $\mu\text{m}$ , EA 36.65-41.65  $\mu\text{m}$ , oblate-sub-oblate ,radially symmetrical, polar outline triangular, equatorial outline elliptic, tricolporate, two pore at each colpi, colpi long, narrowly tapering at end, colpi 28.32-29.98  $\mu\text{m}$  long and 2.8-3.2  $\mu\text{m}$  wide, and pori circular 3.32-4.15  $\mu\text{m}$  in diameter, distance between two ori 4.99-7.49  $\mu\text{m}$ , mesocolpi 14.99-16.66  $\mu\text{m}$ , apocolpi 8.33-9.16  $\mu\text{m}$ , exine 2.40-3.39  $\mu\text{m}$  thick sculpturing microreticulate, lumina circular , equally distributed at meso and apocolpium, N3P4C5 [ Fig. 5 (LM), Fig. 6 (SEM, Mag. 885 X), Table No. 1 ].

**4. *Tabebuia argentea* (Bur.&Schum.)Britt.in Sc. Surv.Porto Rico& Virgin Isl. :** Pollen grains, PA 49.2-54  $\mu\text{m}$ , EA 41.4-42  $\mu\text{m}$ , sub-prolate ,radially symmetrical, polar outline triangular, equatorial outline elliptic, trizonocolporate, colpi long, narrowly tapering at end,colpi length 33.43  $\mu\text{m}$  long and 5.2-6  $\mu\text{m}$  wide at equator and 1.5- 3 near pole, pori not distinct, mesocolpi 22.8-24  $\mu\text{m}$ , apocolpi 5.4-5.6  $\mu\text{m}$ , exine 2.08-2.44  $\mu\text{m}$  thick, sculpturing microreticulate, lumina circular to elliptic, equally distributed at meso and apocolpium, N3P4C5 [ Fig. 7 (LM), Fig. 8 (SEM, Mag. 5.60 KX) Table No. 1 ].

**5. *Tabebuia rosea* (Bertol.) DC.Prodr. :** Pollen grains, PA 35.7-36.7  $\mu\text{m}$ , EA 32.56-33.73  $\mu\text{m}$ , prolate-spheroidal ,radially symmetrical, polar outline triangular, equatorial outline elliptic, trizonocolporate, colpi 22.56  $\mu\text{m}$  long and 5.83-7.54  $\mu\text{m}$  wide, pori circular 3.28-4.97  $\mu\text{m}$  in diameter, mesocolpi 28.25-30.01  $\mu\text{m}$ , apocolpi 6.23-6.72  $\mu\text{m}$ , exine 2.22-3.08  $\mu\text{m}$  thick, sculpturing microreticulate, lumina circular to elliptic, equally distributed at meso and apocolpium, N3P4C5 [ Fig. 9-10 (LM), Table No.1 ].

**6. *Tecoma stans* (L.) H.B. & K. Nov. Gen. Sp. :** Pollen grain, PA 33.3, EA 43.29  $\mu\text{m}$ , sub-oblate to oblate spheroidal, medium sized grain, radially symmetrical, polar outline triangular, equatorial outline elliptic, obtuse convex, trizonocolporate, colpi long, narrowly

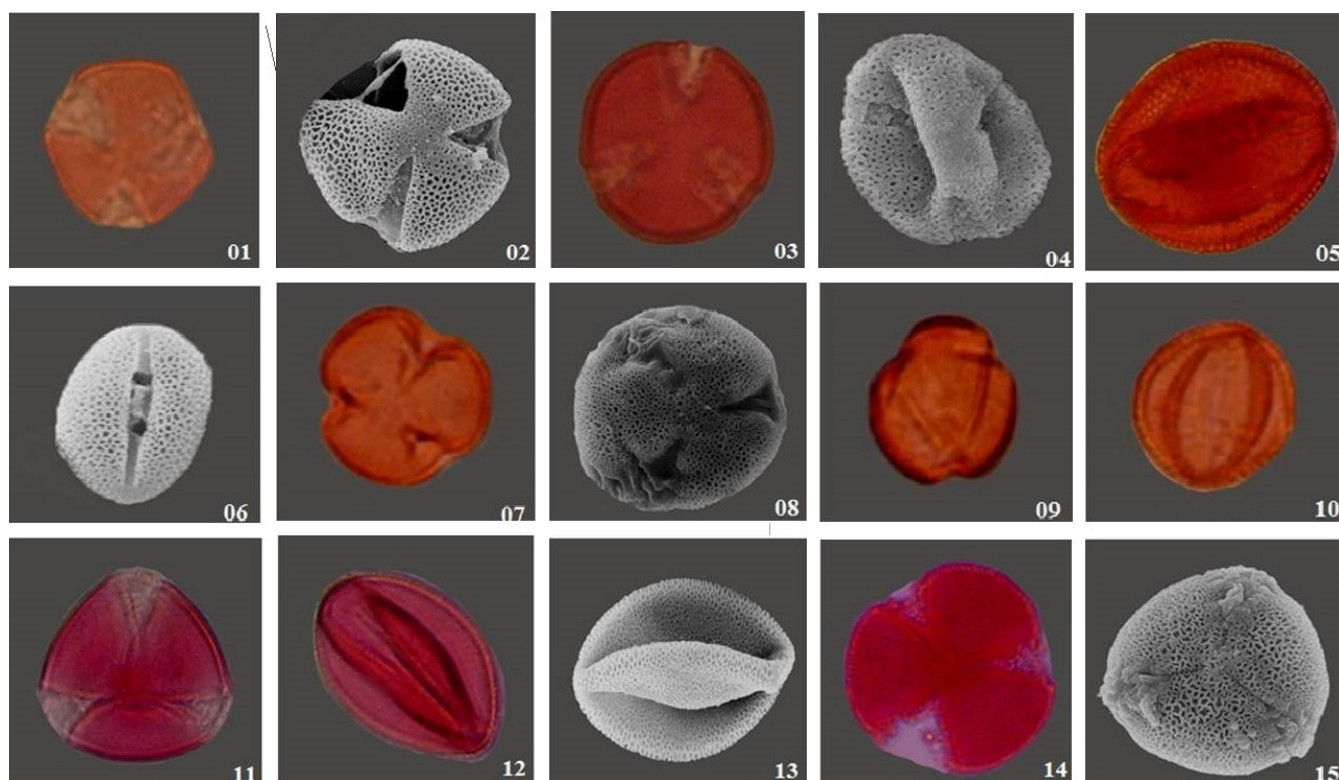
elliptic, colpi length 29.97  $\mu\text{m}$ , width 4.46  $\mu\text{m}$ , pori 3.46-3.54  $\mu\text{m}$  wide, mesocolpi 19.07-20.71  $\mu\text{m}$ , apocolpi 8.97-10.46  $\mu\text{m}$ , exine 2.64-3.20  $\mu\text{m}$  in thickness, sculpturing microreticulate, N3P4C5 [ Fig. 11-12 (LM), Fig. 13 (SEM, Mag. 5.10 KX), Table No. 1].

**8. *Tecoma smithii*** : Pollen grain, PA 34.4, EA 27.6  $\mu\text{m}$ , sub-prolate, medium sized grain, radially symmetrical,

polar outline triangular, equatorial outline elliptic, obtuse convex, trizonocolporate, colpi long, narrowly elliptic, colpi length 29.97  $\mu\text{m}$ , width 6-6.4  $\mu\text{m}$ , pori 3.6-4.4  $\mu\text{m}$  wide, mesocolpi 25.6-27.2  $\mu\text{m}$ , apocolpi 4.2-5.4  $\mu\text{m}$ , exine 2.18-2.88  $\mu\text{m}$  in thickness, sculpturing reticulate heterobrochate, microreticulate at colpal area, N3P4C5 [ Fig. 14 (LM), Fig. 15 (SEM, Mag.5.28 KX), Table No. 1 ].

**Table 1: Pollen grain characteristics of family Bignoniaceae**

Sr. No.	Name of taxa	Pollen grain size ( $\mu\text{m}$ )P×E	Pollen shape	Aperture pattern	Colpi/pori size ( $\mu\text{m}$ )	Exine ornamentation
1	<i>Kigellia pinnata</i>	49.2 × 41.4	Sub-prolate	Trizonocolporate	37.2 × 18	Microreticulate
2	<i>Milligtonia hortensis</i>	43.29 × 44.95	Oblate spheroidal	Tricolporate	31 × 6.89	Microreticulate heterobrochate
3	<i>Spathodea campanulata</i>	26.4 - 27.77	Oblate -sub-oblate	Tricolporate	29.98 × 3.2	Microreticulate,
4	<i>Tabebuia argentea</i>	49.2 × 41.4	Sub-prolate	Trizonocolporate	5.2	Microreticulate
5	<i>Tabebuia rosea</i>	35.7 × 32.56	Prolate-spheroidal	Trizonocolporate	22.56 × 5.83	Microreticulate
6	<i>Tecoma stans</i>	33.3 × 43.29	Sub-oblate to oblate spheroidal	Trizonocolporate	29.97 × 3.81	Microreticulate
7	<i>Tecoma smithii</i>	34.4 × 27.6	Sub-prolate	Trizonocolporate	29.97 × 6.6	Reticulate heterobrochate



**Fig. 1-15: Light and Scanning Electron Micrograph showing structure and exine sculpture of pollen grains:**

**1-2: *Kigellia pinnata*, Fig. 3-4: *Milligtonia hortensis*, Fig. 5-6: *Spathodea campanulata*, Fig. 7-8: *Tabebuia argentea*, Fig. 9-10: *Tabebuia rosea*, Fig. 11-13: *Tecoma stans*, Fig. 14-15: *Tecoma smithii*.**

## DISCUSSION

The **Bignoniaceae** family is represented by seven members. The pollen grains are medium sized, size ranges from 26.4- 44.95  $\mu\text{m}$ , isopolar, radially symmetrical, tricolporate, oblate-sub-oblate e.g. *Spathodea campanulata*; sub-oblate to oblate spheroidal e.g. *Tecoma stans*, *Millingtonia hortensis*; prolate-spheroidal e.g. *Tabebuia rosea*, sub-prolate e.g. *Kigellia pinnata*, *Tabebuia argentea*, *Tecoma smithii*; the sexine ornamentation ranges from reticulate, microreticulate. No far differences were found among the genera studied only *Spathodea campanulata* having two pori at each colpi while other members shows single pori. Nayar (1990) recorded psilate tectum in *Tecoma stans* by LM studies whereas microreticulate tectum was found in *Tecoma* by SEM observation.

Chelong (2011) reported granular tectum within *Millingtonia* and *Tecoma* by LM studies while the present SEM study reveals microreticulate tectum in *Millingtonia* and *Tecoma*. Bove (1993) reported microreticulate, reticulate sexine ornamentation within the family Bignoniaceae, similar observations were noted regarding sexine ornamentation.

## CONCLUSIONS

Pollen morphological characteristics study is an accurate method of relating and differentiating one plant genus to another. The investigation of pollen micro morphological characters suggests intra specific diversity in pollen types of studied genera. From the present findings it is found that qualitative and quantitative micro morphological features of the pollen can be use to discriminate species.

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