



## LIGHT MICROSCOPIC STUDY OF POLLEN MORPHOLOGY ON SELECTED SPECIES OF *JATROPHA* L.

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The pollen morphology of 5 *Jatropha* species namely *J. glandulifera*, *J. gossypifolia*, *J. integerrima*, *J. multifida* and *J. tanjorensis* of family Euphorbiaceae from India was studied using Light Microscope (LM). The pollen grains of *Jatropha* are typically crotonoid, uniformly spheroidal, in aperturate/omniaperturate, with hexagonally arranged exinous knobs.

**Keywords:** Crotonoid; Euphorbiaceae; *Jatropha*; Omniaperturate; Pollen morphology.

### Introduction

The genus *Jatropha* L. appears to be a natural genus first described by Linnaeus in 1737<sup>1</sup> belonging to tribe Jatropheae of subfamily Crotonoideae in Euphorbiaceae family<sup>2</sup> and represents about 175 species in the world<sup>3-4</sup>, of which 12 species have been reported from India<sup>5</sup>. Lectotype species of this genus is *Jatropha gossypifolia* L.<sup>6</sup>. The genus *Jatropha* shows great variation in terms of their morphological diversity. Morphological characteristics of pollen grains can be useful in plant taxonomy due to their many pollen traits are influenced by the strong selective forces involved in various reproductive processes, including pollination, dispersal, and germination<sup>7-11</sup>.

Pollen morphology is an expression of part of the genome and very useful in taxonomic studies<sup>12</sup> and also valuable in the genetic changes of crops as well the weedy plants<sup>13-14</sup>. Hence, five important species belonging to genus *Jatropha* were selected

and studied for pollen morphology.

### Material and Methods

*Collection of flowers for pollen study:* Five species of *Jatropha* viz., *J. glandulifera* Roxb., *J. gossypifolia* L., *J. integerrima* Jacq., *J. multifida* L. and *J. tanjorensis* J.L. Ellis and Saroja were selected for pollen morphological studies. Fresh flowers were collected before dehiscence and stored in formaldehyde (20%). Pollen grains were dissected from anther under light microscope and used for Acetolysis method<sup>15</sup>. The pollen grains were observed under light microscope with 1000x magnification. For all the species, herbarium specimens were collected and deposited at FRLH, Bengaluru for reference.

*Dimensions:* For all the species, 50 samples were studied and their size was measured by micrometer. The size of pollen grains were measured in the optical section of meridional view under the oil immersion and the mean and standard deviation of

acetolysed grains were calculated. The measurement of objective (100 x 10 magnification) the pollen grains and exine does not include the sculptural elements such as clavae, verrucae etc. The maximum thickness of the exine was measured. All the dimensions were expressed in micrometers. LO analysis was carried out to describe the pollen grains. The pollen morphological terminology followed

standard glossaries<sup>16-17</sup>.

### Results and Discussion

*Pollen Characteristics of selected species:* Light microscopic investigations of the pollen grains of five selected species revealed the presence of crotonoid pollen type (Plate 1). Table 1 summarizes the detailed pollen morphological features of the investigated taxa. Representative pollen grains are illustrated in Plate 1.

**Table 1:** Morphological characters of selected species of *Jatropha* from India

S. No.	Species with Herbarium No.	Symmetry	Shape	Aperture	Sculpture	Diameter (µm)
1	<i>J. glandulifera</i> FRLH 120012	Radial	Spheroidal	Omniperturate	Poly-hexagonal lax crotonoid pattern of round shape clavae (Plate 1 – Fig. 3)	82.6
2	<i>J. gossypifolia</i> FRLH 120009	Radial	Spheroidal	Omniperturate	Triangular Clavae (Plate 1 – Fig. 5)	73.7
3	<i>J. gossypifolia</i> variant FRLH 120010	Radial	Spheroidal	Omniperturate	Triangular Clavae (Plate 1 – Fig. 8)	73.8
4	<i>J. integerrima</i> FRLH 120011	Radial	Spheroidal	Omniperturate	Clavae round and striated (Plate 1 – Fig. 12)	59.2
5	<i>J. multifida</i> FRLH 120007,	Radial	Spheroidal	Omniperturate	Psilate clavae of triangular to round (Plate 1 – Fig. 14-15)	81.9
6	<i>J. tanjorensis</i> FRLH 120006	Radial	Spheroidal	Omniperturate	Heavily sculptured polymorphic round clavae with various transverse patterns of striae (Plate 1 – Fig. 18)	94.6

In the present study, the size of the pollen grains was ranged from 59.2 µm to 94.6 µm in diameter for all the 5 selected species of *Jatropha* from India. The pollen grain size observed under light microscope were 94.6 µm in *J. tanjorensis*, 81.9 µm in *J. multifida*, 73.7 µm in *J. gossypifolia*, 82.6 µm in *J. glandulifera*, and 59.2 µm in *J. integerrima*. There is panporate type of pollen in all 5 species of the genus *Jatropha* and the pollen grains are similar with radial symmetry, spheroidal shape and omniperturate type and showed variations

in sculpture. Fig. 1 shows the single cluster analysis dendrogram of the *Jatropha* species<sup>18</sup>, based on the pollen diameter. The figure reveals a strong relationship among the members of the section Peltatae (*J. multifida*) with *Jatropha* section (*J. glandulifera*, *J. gossypifolia*, *J. gossypifolia* variant and *J. tanjorensis*) and section Polymorphae (*J. integerrima*) and in their pollen size. Though, *J. gossypifolia* variant shows different leaf colouration, pollen morphological characters show no variation with *J. gossypifolia*. The single linkage

dendrogram shows close relationship between *J. multifida* and *J. glandulifera* but both are placed under different sections<sup>19</sup>. However, *J. glandulifera*, *J. gossypifolia*, *J. gossypifolia*

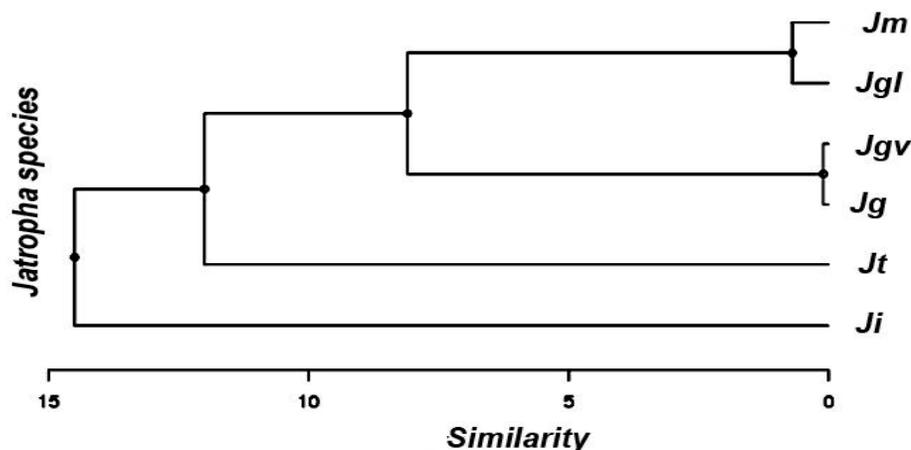
variant and *J. tanjorensis* belong to section *Jatropha* and aligned with the previous studies based on their vegetative morphology and epidermal and petiole anatomy<sup>1,20-21</sup>.



**Plate 1.** Pollen morphology of species of *Jatropha*; 1 – Floral twig of *J. glandulifera*; 2-3 – Pollen of *J. glandulifera*; 4 – Floral twig of *J. gossypifolia*; 5-6 – Pollen of *J. gossypifolia*; 7 – Floral twig of *J. gossypifolia* variant; 8-9 – Pollen of *J. gossypifolia* variant; 10 – Floral twig of *J. integerrima*; 11-12 – Pollen of *J. integerrima*; 13 – Floral twig of *J. multifida*; 14-15 – Pollen of *J. multifida*; 16 – Floral twig of *J. tanjorensis*; 17-18 – Pollen of *J. tanjorensis*.

Section Polymorphae (*J. integerrima*) is clearly forming a different clade which aligning with the synoptic classification of

Dehgan and Webster<sup>1</sup> but oppose wood anatomical characters<sup>22</sup> and quantitative phytochemical analysis<sup>23</sup>.



**Fig. 1.** Dendrogram of quantitative pollen morphology (pollen diameter) of five species of *Jatropha*.

Legend: *Jgv* – *Jatropha gossypifolia* variant; *Jg* – *J. gossypifolia*; *Ji* – *J. integerrima*; *Jm* – *J. multifida*; *Jgl* – *J. glandulifera*; *Jt* – *J. tanjorensis*.

Pollen research is helpful to understand the systematic and evolutionary relationships of various groups of flowering plants<sup>24</sup>. Pollen morphological characters of the studied members of genus *Jatropha* has shown marked consistency and uniformity not only in wall features but also in the shape and size of the pollen grains. The intrageneric pollen morphological characters of the genus include: pollen is  $\pm$  spheroidal, outline circular, radially symmetrical, inaperturate (omniaperturate<sup>25-26</sup>), heavily sculptured with clavate or pilate processes aligned reticulately to form crotonoid pattern<sup>7</sup>, pattern lax, heads  $\pm$  rounded, large lumina, with groups of 3–6 much smaller free clavae or pila and hexagonally arranged exinous knobs<sup>27-28</sup>. Ectexine is much thicker than endexine<sup>29</sup>.

### Conclusion

In the present study, pollen morphology of 5 *Jatropha* species such as *J. glandulifera*, *J.*

*gossypifolia*, *J. integerrima*, *J. multifida* and *J. tanjorensis* of family Euphorbiaceae from India were studied using Light Microscope (LM). The pollen grains of *Jatropha* showed stenopalynous condition with typically crotonoid, uniformly spheroidal, inaperturate/omniaperturate and hexagonally arranged exinous knobs.

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