

Pollen morphodiversity in some genera of family solanaceae

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Abstract

Pollen morphology is a useful tool to study the interrelationship of plant taxa. Pollen morphology of seven genera viz., *Capsicum annuum*, *Daturainoxia*, *Daturametel*, *Petunia hybrida*, *Solanum melongena*, *Solanum torvum* and *Solanum xanthocarpum* belonging to family solanaceae have been examined by Light and Scanning Electron Microscope (SEM). The morphological variation in size, shape, surface structure and surface pattern occurs in all studied acetolysed and unacetolysed pollen grain. The size of all studied pollen ranges between 17.6-40 µm and shape of the pollen grains varies from sub-oblate, oblate-spheroidal to prolate-spheroidal. The exinesurface pattern of all studied genera was found to be striate reticulate, striate perforate, scrubate, psilate, granulate etc. The present report gives an account of pollen morphological variations in seven genera of family Solanaceae growing in Amravati University campus.

Keyword: Pollen morphology, Solanaceae, LM, SEM

1. Introduction

Pollen morphological characteristics study is an accurate method of relating and differentiating one plant genus to another. The investigation of pollen micromorphological characters suggests diversity in pollen types. Pollen morphology of seven genera viz., *Capsicum annuum*, *Daturainoxia*, *Daturametel*, *Petunia hybrida*, *Solanum melongena*, *Solanum torvum* and *Solanum xanthocarpum* belonging to family Solanaceae have been examined by Light and Scanning Electron Microscope (SEM). There are several early records available on the study of family Solanaceae [4, 8-13]. Perveen and Qaiser [10] examined pollen morphology of 20 species representing 7 genera of the family Solanaceae from Pakistan and found pollen morphology of the family Solanaceae is significantly helpful at the generic and specific level. The present findings reveals qualitative and quantitative micromorphological features of the pollen which can be used to discriminate species.

2. Materials and Methods

For the collection of pollen samples daily visits to different sites were undertaken during the blooming period of the plants, mostly in the morning hours. Anthers from mature flower were selected for pollen collection. Collected anthers were preserved in glass vial containing 70% ethanol. The pollen becomes isolated from the preserved anther in 70% alcohol. The anthers were removed in a small glass cavity from a glass vial and crushed by a glass rod to release the pollen from closed anther wall. The crushed material was sieved through a wire mesh having 40 meshes per sq.cm and

the pollen containing alcohol was collected in glass centrifuge tube.

The pollen grains were prepared for light and scanning electron microscopy by the standard method [3]. For light microscopy, the pollen grains were mounted in stained glycerine jelly and observations were made with Trinocular Fluorescence Microscope (AxioStar HBO 50/AC Carl zeiss). Ocular micrometer is used for LM pollen measurement. The SEM examination was carried out on a LEO electron microscope (LEO 430). The terminology was used in accordance [1-3, 5].

3. Results and Discussion

Description of pollen types

01) *Capsicum annuum* L.

Pollen grains, PA 17.6 -18.8 µm, EA 18.8 – 19.2 µm, oblate-spheroidal, radially symmetrical, polar outline triangular obtuse convex, equatorial outline elliptic, trizonocolporate, colpi 16.8 µm long, colpi width 1.1-1.3 µm near pole and 2.44 µm at equator, tapering towards the end, pori 5.10- 6 µm wide at equator, mesocolpia 12.65-13.98 µm, apocolpia 4-4.8 µm, exine 2.72-3.20 µm thick, sculpturing scrubate, N3P4C5 [Fig. 01 (LM), Fig. 02 (SEM, Mag. 8.42 K), Table No. 01].

02) *Daturainoxia* Mill. Gard. Dict. ed. (KLP and BSI)

Pollen grains 55.88-56.63 µm, prolate-spheroidal, radially symmetrical, polar outline rounded triangular, trizonocolporate, colpi linear, long, 4.31-5.95 µm wide, pori 3.52-4.08 µm, sexine form interwoven ridges, ridges 2.96-3.7 µm long, exine 2.85-3.80 µm in thickness, tectum and columellae indistinct but together, sculpturing striate-reticulate, N3P4C5 [Fig. 03 (LM), Fig. 04 (SEM, Mag. 2.89 KX), Table No. 01].

03) *Daturametel* L.

Pollen grains PA 32.56, EA 35.52 µm, prolate-spheroidal, radially symmetrical, polar outline rounded triangular, tricolporoidate, colpi faint, 3.51-4.56 µm wide, ori not distinct, mesocolpium 28.05 µm, sexine form interwoven ridges, ridges 2.96-3.7 µm long, exine 3.52-4.01 µm in thickness, tectum striate with distant perforation in between sexine element, ornamentation striate-reticulate, N3P4C5 [Fig. 05 (LM), Fig. 06 (SEM, Mag. 1.90 KX), Table No. 01].

04) *Petunia hybrida* Vilm. Fl. Pl. Terr.

Pollen grains, PA 24.6, EA 31.2 µm, sub-oblate, radially symmetrical, polar outline triangular, equatorial outline elliptic, trizonocolporate, colpi 22.8 µm long, 4.99-6µm wide, colpi linear, tips acute, pori 2.50-2.94 µm wide at equator, mesocolpia 10.8-16.2 µm, apocolpia 3.6-4.2 µm, exine 2.22-

2.94 μm thick, sculpturing striate perforate, N3P4C5 [Fig. 07 (LM), Fig. 08 (SEM, Mag. 2.51 KX), Table No. 01].

05) *Solanum melongena* L.

Pollen grains PA 19.09- 19.75 μm , oblate-spheroidal, radially symmetrical, polar outline triangular obtuse convex, equatorial outline elliptic, trizonocolporate, colpi 19.77 μm long, 0.92-1.15 μm wide, colpi linear, tips obtuse, pori 1.38-2.07 μm wide at equator, mesocolpia 15.64-16.33 μm , apocolpia 4.6-5.75 μm , exine 2.31-2.94 μm thick, sculpturing granulate, N3P4C5 [Fig. 09 (LM), Fig. 10 (SEM, Mag. 8.48 KX), Table No. 01].

06) *Solanum torvum* Sw., Prodr.

Pollen grains, PA 26.35 μm , EA 21.22 μm , radially symmetrical, sub-prolate, outline triangular, equatorial outline elliptic, tricolporate, colpi 13.6-15.25 μm long and 5.51 μm wide, pori 3.04-3.91 μm wide, mesocolpi 19.88-20.68 μm , exine thick, 2.02-2.31 μm in thickness, tectum granulate, N3P4C5 [Fig. 11 (LM), Table No. 01].

07) *Solanum xanthocarpum* Schrad & Wendl. Sert. Hanov.

Pollen grains, PA 18 -20 μm , EA 20.5- 21 μm , oblate-spheroidal, radially symmetrical, polar outline triangular

obtuse convex, equatorial outline elliptic, trizonocolporate, colpi 13.63 μm long and 5.01-6.05 μm wide, tapering towards the end, pori 3.24-3.85 μm wide at equator, tips acute, mesocolpia 15-16.5 μm , apocolpia 12.5-13 μm , exine thick, sculpturing psilate-scrabate N3P4C5 [Fig. 12 (SEM, Mag. 2.75 KX), Table No. 01].

Pollen morphology of the family Solanaceae is heterogeneous (Erdtman, 1952) [3]. Seven genera studied under the family Solanaceae including two *Datura* species, three *Solanum* species and *Capsicum annuum* and *Petunia hybrida*. The pollen was found to be radially symmetrical, oblate-spheroidal, prolate-spheroidal, medium sized, usually trizonocolporate in all the studied genera (Perveen and Kaiser, 2007) [10]. Murray and Eshbaugh (1971) [6] studied reticulate exine ornamentation within some *Solanum* and *Capsicum* genera. In contrast to this, during the present investigation pollen vary in the exine ornamentation, striate-reticulate in *Datura metel* and *Datura innoxia*, striate perforate in *Petunia hybrida*, psilate - scrabate in *Solanum xanthocarpum*, *Capsicum annuum* and granulate in *Solanum melongena*, *Solanum torvum*. Vijayakumari and Vilasini (2005) [13] reveal a trizonocolporate and granulate exine ornamentation within *Solanum melongena*, *Solanum torvum*, which are quite similar to present findings.

Table 1: Pollen grain characteristics of family Solanaceae

Sr. No.	Name of taxa	Pollen grain size (μm) P×E	Pollen shape	Aperture pattern	Colpi/pori size (μm)	Exine ornamentation
1	<i>Capsicum annuum</i>	17.6 × 18.8	Oblate-spheroidal	Trizonocolporate	16.8 × 1.3	Scrabate
2	<i>Datura innoxia</i>	36.5 × 40	Prolate-spheroidal	Trizonocolporate	-	Striate-reticulate
3	<i>Datura metel</i>	32.56 × 35.52	Prolate-spheroidal	Tricolporoidate	-	Striate-reticulate
4	<i>Petunia hybrida</i>	24.6 × 31.2	sub-oblate	Trizonocolporate	22.8 × 2.4	Striate perforate
5	<i>Solanum melongena</i>	19.09 × 19.75	Oblate-spheroidal	Trizonocolporate	1.15	Sculpturing granulate
6	<i>Solanum torvum</i>	26.35 × 21.22	sub-prolate	Tricolporate	13.6 × 5.51	Granulate
7	<i>Solanum xanthocarpum</i>	18 × 20.5	Oblate-spheroidal	Trizonocolporate	13.63 × 5.01	Psilate - scrabate

4. Conclusion

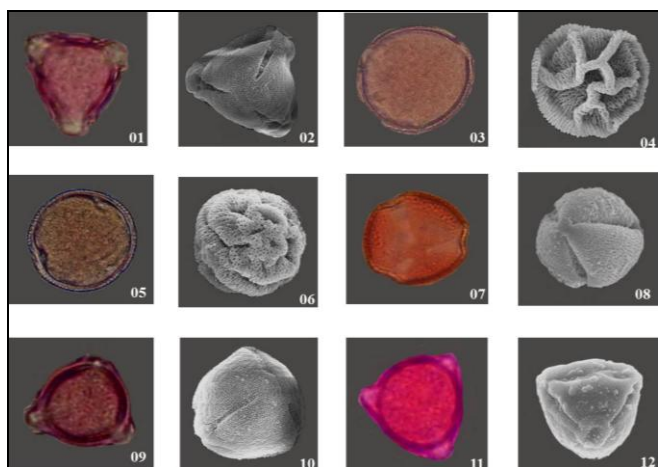


Fig 01-12: Light and Scanning Electron Micrograph showing Structure and Exine sculpture of Pollen grains: Fig. 01-02 *Capsicum annuum*, Fig. 03-04 *Datura innoxia*, Fig. 05-06 *Datura metel*, Fig. 07-08 *Petunia hybrida*, Fig. 09-10 *Solanum melongena*, Fig. 11 *Solanum torvum*, Fig. 12 *Solanum xanthocarpum*.

In the present study, SEM based pollen characters are found to be useful in identification and discrimination of taxonomically related genera and species as it going to reveal more number and minute characters. During the present investigation, it was found that Light microscopy reveals only size, shape and symmetry more clearly whereas surface pattern cannot found more clearly by light microscopy but with help of SEM with high magnification it assist more clear picture of pollen wall surface and helps to withdraw more minute characters which becomes found invisible under light microscope.

5. References

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