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-spheroideal to prolate-spheroideal. The exinesurface pattern of all studied genera was found to be striate reticulate, striate perforate, scrobate, 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 Quaiser [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 became 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-spheroideal, 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 4.48 µm, exine 2.72-3.20 µm thick, sculpturing scrobate. 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-spheroideal, 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-spheroideal, radially symmetrical, polar outline rounded triangular, tricolporoidate, colpi faint, 3.51-4.82 µm wide, ori not distinct, mesocolpium 28.05 µm, sexine form interwoven ridges, ridges 2.96-3.7 µm long, exine 2.96-3.70 µm in thickness, tectum striate with discont. perforation in between sexine element, ornamentation striate-reticulate, N3P4C5 [Fig. 05 (LM), Fig. 06 (SEM, Mag. 1.90 KX), Table No. 01].

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) Solanumelongena 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, 0.92-1.15µm 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) Solanumtorvum Sw., Prodr.
Pollen grains, PA 26.35µm, EA21.22 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, mesocolpia 19.88-20.68 µm, exine thick, 2.02-2.31 µm in thickness, tectumgranulate, N3P4C5 [Fig. 11 (LM), Table No. 01].

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–scrabateN3P4C5 [Fig. 12 (SEM, Mag. 2.75 KX), Table No. 01].

Pollen morphology of the family Solanaceae is heterogeneous (Erdtman, 1952) [9]. Seven genera studied under the family Solanaceae including two Datura species, three Solanum species and Capsicum annum 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 Qaiser, 2007) [10]. Murray and Esbaugh (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 inoxia, striate perforate in Petunia hybrida, psilate – scabrate in Solanumxanthocarpum, Capsicum annum and granulate in Solanumtorvum, Solanumlongena, Vijayakumari and Vilasini (2005) [13] reveal a trizonocolporate and granulate exine ornamentation within Solanumxanthocarpum, Solanumtorvum, which are quite similar to present findings.

Table 1: Pollen grain characteristics of family Solanaceae

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of taxa</th>
<th>Pollen grain size (µm)</th>
<th>Pollen shape</th>
<th>Aperture pattern</th>
<th>Colpi/pori size (µm)</th>
<th>Exine ornamentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Capsicum annum</td>
<td>17.6 × 18.8</td>
<td>Oblate-spheroidal</td>
<td>Trizonocolporate</td>
<td>16.8 × 1.3</td>
<td>Scrabate</td>
</tr>
<tr>
<td>2</td>
<td>Datura inoxia</td>
<td>36.5 ×40</td>
<td>Prolate-spheroidal</td>
<td>Trizonocolporate</td>
<td>-</td>
<td>Striate-reticulate</td>
</tr>
<tr>
<td>3</td>
<td>Datura metel</td>
<td>32.56 ×35.52</td>
<td>Prolate-spheroidal</td>
<td>Tricolporateoid</td>
<td>22.8 × 2.4</td>
<td>Striate perforate</td>
</tr>
<tr>
<td>4</td>
<td>Petunia hybrida</td>
<td>24.6 ×31.2</td>
<td>sub-oblote</td>
<td>Trizonocolporate</td>
<td>1.15</td>
<td>Sculturing granulate</td>
</tr>
<tr>
<td>5</td>
<td>Solanum longena</td>
<td>19.09 ×19.75</td>
<td>Oblate-spheroidal</td>
<td>Trizonocolporate</td>
<td>13.6×5.51</td>
<td>Granulate</td>
</tr>
<tr>
<td>6</td>
<td>Solanum torvum</td>
<td>26.35×21.22</td>
<td>sub-prolate</td>
<td>Trizonocolporate</td>
<td>13.63×5.01</td>
<td>Psilate – scabrate</td>
</tr>
</tbody>
</table>

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