Pollen Flora of Pakistan -XIX. Aizoaceae

Anjum PERVEEN, Mohammad QAISER
Department of Botany, University of Karachi, Karachi-Pakistan

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Abstract: The pollen morphology of 7 species belonging to the 7 genera of the family Aizoaceae was investigated by light microscope and scanning microscope. It is stenopalynous in nature. Pollen grains are usually radially symmetrical, isopolar, oblate-spheroidal to prolate-spheroidal, rarely sub-prolate, tricolpate, colpi long, with tapering ends, colpal membrane granulate. Sexine slightly thinner or thicker than nexine, rarely thicker at the polar region than at the equator. Tectum scabrate-punctate or spinulose. On the basis of exine ornamentation 2 distinct pollen types are recognized, namely, the Zaleya pentandra type and the Aizoon canariense type.

Key Words: Pollen morphology, Aizoaceae, Pakistan Flora

Introduction

Aizoaceae are a small family of c. 128 genera and c. 1170 species, many of which are cultivated, distributed in South and tropical Africa, South America, the West Indies, the Mediterranean and tropical Asia [1, 2]. This family is represented in Pakistan by 8 genera [3]. Hunziker & Coccaci [4] studied the pollen morphology of the genus Trianthema L. The pollen morphology of a few genera of the family Molluginaceae and Aizoaceae from America has been examined by Bogren [5]. Narayan [6] studied the embryology of Limeum indicum Stocks. Mitriou-Radulscu [7] examined the pollen of the family Aizoaceae. Nowicke [8], Skvarla & Nowicke [9], Nowicke & Skvarla [10, 11] also described the pollen morphology of some members of the family Aizoaceae, while studying the pollen of the order Centrospermae. The pollen morphology of family Aizoaceae has also been examined by Erdtman [12], Behnke [13], Buxbaum [14], and Moore & Webb [15].

Materials and Methods

Pollen samples were obtained from Karachi University Herbarium (KUH) or collected from the field. The list of voucher specimens is deposited in KUH. The pollen grains were prepared for light (LM) and scanning microscopy (SEM) by the standard methods described by Erdtman [15]. For light microscopy, the pollen grains were mounted in unstained glycerine jelly and observed with a Nikon Type-2 microscope, under (E40, 0.65) and oil immersion (E100, 1.25), with a 10x eye piece. For SEM studies, pollen grains were suspended in a drop of water and directly transferred with a fine pipette to a metallic stub using double-sided celltape and coated with gold in a sputtering chamber (Ion-sputter JFC-1100). Coating was restricted to 150A. The S.E.M examination was carried out on a Jeol microscope JSM-T200. The measurements were based on 15-20 readings from each specimen. Polar axis, equatorial diameter, colpi length and exine thickness were measured (Table 1-2).
The terminology used is in accordance with Erdtman [15]; Kremp [21]; Faegri & Iversen [22] and Walker & Doyle [23].

Observations

General pollen characters of the family Aizoaceae

Pollen grains are usually radially symmetrical, isopolar, prolate-spheroideal to sub-prolate, tricolpate, amb triobed, fossaperturate, colpi long, with tapering ends, colpal membrane granulated. Sexine slightly thinner than nexine or slightly thicker at the polar region than at the equator. Tectum scabrate-punctate.

Pollen type - I: Aizoon canariense - type (Fig.1 E-G)

- Pollen class: Tricolpate, zonoaperturate.
- P/E ratio: Suberect, subtransverse.
- Shape: Prolate-spheroideal to oblate-spheroideal.
- Apertures: Ectoaperture-colpus long, narrow, not sunken, colpi with vestibuli. Colpal membrane scabrate.
- Exine: Sexine thicker than nexine.
- Outline: ± triangular in polar view and elliptic in equatorial view.

Ornamentation: Tectum scabrate, sparsely punctate.

Measurements: Polar length P(17.7-22.4) µm. P/E ratio: 1.08. Colpi (15.25-) 21.41 ± 0.56 (-27.51) µm long. Meso-colpium (10.1-) 15.05 ± 0.32 (-20.5) µm. Apocolpium 2.25 (6.11 ± 0.14) 7.5 µm. Exine (1.25-) 1.75 ± 0.35 (-2.25) µm thick.

Species included:

- *Aizoon canariense* L., *Trianthema triquetra* Rotll. & Gill., *Sesuvium sesuvioides* (Fenzl) Verde

Table 1. General pollen characters of species found in pollen type *Aizoon canariense*

<table>
<thead>
<tr>
<th>Name of taxa</th>
<th>Shape</th>
<th>Polar length</th>
<th>Equatorial diameter</th>
<th>Colpus length</th>
<th>Meso-colpium</th>
<th>Apocolpium</th>
<th>Exine thickness</th>
<th>Tectum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aizoon canariense</td>
<td>P-E sph</td>
<td>22.5(25.71 ± 0.72)</td>
<td>20.11(24.38 ± 1.10)</td>
<td>17.51(21.2 ± 1.23)</td>
<td>15.11(16.75 ± 0.61)</td>
<td>2.51(3.18 ± 0.60)</td>
<td>1.25(2.26 ± 0.08)</td>
<td>Scb-punc</td>
</tr>
<tr>
<td>L</td>
<td>29.75</td>
<td>25.11</td>
<td>27.50</td>
<td>20.12</td>
<td>5</td>
<td>2.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trianthema triquetra</td>
<td>Ob-sph</td>
<td>17.71(20.9 ± 1.80)</td>
<td>17.51(20.12 ± 1.58)</td>
<td>15.21(17.98 ± 0.72)</td>
<td>10.11(14.31 ± 1.01)</td>
<td>2.55(01 ± 2.50)</td>
<td>1.25(1.75 ± 0.14)</td>
<td>Sp/pun</td>
</tr>
<tr>
<td>Rottl. &amp; Gill.</td>
<td>22.51</td>
<td>25.11</td>
<td>20.11</td>
<td>16.25</td>
<td>7.51</td>
<td>2.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sesuvium sesuvioides</td>
<td>P-E sph</td>
<td>22.51(24.38 ± 1.49)</td>
<td>22.51(24.10 ± 0.51)</td>
<td>17.71(20.59 ± 0.14)</td>
<td>15.01(16.51 ± 0.31)</td>
<td>2.25(2.72 ± 0.31)</td>
<td>1.5(2.08 ± 0.81)</td>
<td>Sp/punc</td>
</tr>
<tr>
<td>Verde</td>
<td>27.51</td>
<td>25.11</td>
<td>22.5</td>
<td>46.62</td>
<td>29.97</td>
<td>6.66</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2. General pollen characters of species found in pollen type *Zaleya pentandra*

<table>
<thead>
<tr>
<th>Name of taxa</th>
<th>Shape</th>
<th>Polar length</th>
<th>Equatorial diameter</th>
<th>Colpus length</th>
<th>Meso-colpium</th>
<th>Apocolpium</th>
<th>Exine thickness</th>
<th>Tectum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gisekia pharnaceoides</td>
<td>Ob-sph</td>
<td>19.75(20.71 ± 0.72)</td>
<td>20.11(22.54 ± 0.39)</td>
<td>15.71(17.72 ± 0.74)</td>
<td>12.51(14.51 ± 0.47)</td>
<td>1.25(2.81 ± 0.59)</td>
<td>2.25(2.42 ± 0.04)</td>
<td>Scb</td>
</tr>
<tr>
<td>L</td>
<td>22.51</td>
<td>25.01</td>
<td>20.11</td>
<td>17.51</td>
<td>3.75</td>
<td>2.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corbichonia</td>
<td>Pr-sph</td>
<td>25.75(28.9 ± 1.05)</td>
<td>21.51(27.12 ± 1.14)</td>
<td>21.51(22.71 ± 0.65)</td>
<td>21.5(22.2±0.41)</td>
<td>1.79(3.4±0.19)</td>
<td>0.72(1.25±0.12)</td>
<td>Sp/punct</td>
</tr>
<tr>
<td>decumbens (Forssk) Exell.</td>
<td>34.11</td>
<td>32.31</td>
<td>26.91</td>
<td>25.13</td>
<td>9.4</td>
<td>1.79</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limeum indicum</td>
<td>Pr-sph</td>
<td>16.61(19.6 ± 0.36)</td>
<td>16.61(19.6 ± 0.36)</td>
<td>12.61(15.33 ± 0.71)</td>
<td>11.21(13.31 ± 0.47)</td>
<td>1.14(2.26 ± 0.46)</td>
<td>1.41(1.63 ± 0.07)</td>
<td>Punct-scb</td>
</tr>
<tr>
<td>Socks</td>
<td>22.4</td>
<td>21</td>
<td>19.6</td>
<td>16.81</td>
<td>3.03</td>
<td>2.24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zaleya pentandra</td>
<td>Sub-pr</td>
<td>35.91(38.41 ± 0.71)</td>
<td>28.75(30.91 ± 0.86)</td>
<td>28.71(31.4 ± 1.13)</td>
<td>23.06(25.31 ± 0.42)</td>
<td>3.59(6.01 ± 0.05)</td>
<td>0.36(1.22 ± 0.03)</td>
<td>Sub-punct</td>
</tr>
<tr>
<td>L. Jeffrey</td>
<td>41.21</td>
<td>35.9</td>
<td>35.9</td>
<td>28.7</td>
<td>3.95</td>
<td>1.43</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 1. Scanning Electron and Light micrographs of pollen grains. 
Corbichonia decumbens: A, Equatorial view; B, Polar view. 
Limeum indicum: C, polar view; D, Exine pattern. 
Aizoon canariense: E, Equatorial view; 
Exine: Sexine thicker than nexine.

Outline: ± triangular in polar view and elliptic in equatorial view.

Ornamentation: Tectum spinulate.

Measurements: Polar length $L_p(16.81-37.35\pm0.45\,\mu m)$, and equatorial diameter $E(16.81-26.35\pm0.56\,\mu m)$. $P/E$ ratio: 1.08. Colpi $(12.61-24.25\pm0.56\,\mu m)$ long. Meso-colpium $(11.1-20.05\pm0.32\,\mu m)$. Exine $(0.36-1.55\pm0.35\,\mu m)$ thick.

Species included:

- Corbichonia decumbens (Forssk.) Exell.
- Limeum indicum Stocks
- Gisekia pharnaceoides L.
- Zaleya pentandra (L.) Jeffrey.

Key to the species

1. + Polar length of pollen 25.5-41.2 $\mu m$ ......... 2
   - Polar length of pollen 16.8-22.5 $\mu m$ ......... 3
2. + Colpi length 21.5-26.9 $\mu m$ .................Corbichonia decumbens
   - Colpi length 28.7-35.9 .......Zaleya pentandra
3. + Tectum finely scabrate ..........Gisekia pharnaceoides
   - Tectum punctate-scabrate .. Limeum pentandra

Conclusion

The Aizoaceae are stenopalynous family [11]. They are fairly uniform in pollen morphology, generally oblate-spherooidal prolate-spherooidal, tricolpate with scabrate-punctate to spinulose tectum. On the basis of exine patterns, 2 distinct pollen types are recognized, viz., Aizoon canariense - type and Zaleya pentandra - type. Pollen type-I: Aizoon canariense is readily distinguished by its spinulose tectum [11, 12]. Three genera each representing a single species, are included in this type, namely, Aizoon L., Trianthema L., and Sesuvium L. These genera are similar in their tectum but they show little variation in their polar length, which is helpful for delimiting the species into one group the Aizoon canariense group (Aizoon canariense L., Sesuvium sesuvioides (Fenzl) Verde) and a single species, Trianthema triquetra Rotl.

Pollen type II: Zalyea pentandra is characterized by scabrate tectum. Four genera are included in this pollen type, each representing a single species, namely, Corbichonia Scop., Limeum L., Gisekia L. and Zaleya Burm. f. These species are easily delimited by their tectal surface and colpi length (See key to the species).

Acknowledgements

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References


