Seed Exomorphic Characters of some Taxa from Saudi Arabia

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Abstract: Seed exomorphic characters of seven species collected from Taif province, Saudi Arabia, were investigated by the aid of Scanning Electron microscopy (SEM). The seed exomorphic characters that are diagnostic at the generic and specific level are seed shape, dimensions, epidermal cells, seed surface sculpture and aspects of anticlinal and periclinal walls. The seed coat of the studied taxa exhibit a wide range of morphological characters. Seed shapes varied from globoid, elliptic, oblong and kidney shaped. They showed either smooth or papilate surface. SEM investigation at higher magnifications revealed different types of seed surface pattern viz, is tuberculate, reticulate, scalariform and tenicostate. Seeds of *Cloeme droserifolia* and *Fagonia schweinfurthia* showed a deposition of wax on their surface. The present study is a modest contribution to previous studies on the flora of Saudi Arabia.
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Key words: SEM, seed coat, exomorphic characters, *Cloeme droserifoli*, *Fagonia schweinfurthia,* flora, Saudi Arabia.

1. Introduction:

During the present decade, nature reserves were established in Arabia and Saudi Arabia becomes among the countries that are concerned with protection of nature and conservation of biodiversity. Saudi Arabia, has a diversified higher plant flora in its varied landscapes, with about 2243 species in 837 genera and 142 families (Collenette 1998 and 1999). The variety of wild plant species has a valuable economic importance due to its usage as pharmaceuticals, nutritional, fire wood suppliers for urban and rural populations as well as its use in popular remedy.

Aspects of the plant diversity of Saudi Arabia have been documented on phytogeographical bases by Mandaville (1990), Al-Farhan (1999), Chaudhary (1999), Chaudhary & Al-Jowaid (1999) and BaZaid and Mossallam (2000).

The importance of ultra-structural pattern analysis of the seed coat observed under the SEM; as a reliable approach for identifying the species and assessing taxonomic relationships; has been well recognized (Barthlott 1981, Koul *et al*. 2000 and Gamarra *et al*. 2007). Until now, the morphology of the seed coat sculpture under the SEM for the concerned taxa in the present study has not been studied except for *Aizone carsriense* L., by Kanwal, *et al*. (2009).

The aim of the present study is to illustrate the utility of seed coat micro-and macro-morphological characters of seven species using SEM in an attempt to provide some basic data for nature conservation and other applied programs as well as for wild plants taxonomy in Al-Taif province, Kingdom of Saudi Arabia. These taxa are: *Aizone carsriense* L., *Cloeme droserifolia (Forssk.) Delile, Fagonia schweinfurthia, Fosskaolea tenacissima, Peganum harmala, Resida lutea*, *and Zygophyllum simplex* L.

2. Materials and methods

The investigated taxa were collected during May-August 2009 from different localities (table1). Voucher herbarium specimens of the studied taxa are kept in BGERU (Biotechnology and Genetic Engineering Research Unit, Taif University, K.S.A.). The external macro-morphological aspects of the seeds of the studied taxa were investigated with the aid of scanning electron microscope (SEM). For SEM observations, dried mature seeds were mounted on brass stubs and coated with a thin layer of gold. Coated seeds were examined and photographed on a Joel JSM 6390LA, at the Electron Microscope Unit in Taif University. The terminology of Barthlott (1981 and 1984) and Stearn (1983) was adopted to describe the SEM aspects of seed coat.

Table (1): List of the examined taxa and their position of collection.

No.	Taxa examined	Family	Position		
			Alt.(fe.)	N.	E.
1	*Aizone carsriense* L.	Aizoaceae	4966 fe.	N 21º □□□26.045`	E □□□040º29.520`
2	*Cloeme droserifolia (Forssk.) Delile.*	Capparaceae	4966 fe.	N 21º □□□26.045`	E □□□040º29.520`
3	*Fagonia schweinfurthia*	Zygophyllaceae	4966 fe.	N 21º □□□26.045`	E □□□040º29.520`
4	*Fosskaolea tenacissima* L.	Urticaceae	4966 fe.	N 21º □□□26.045`	E □□□040º29.520`
5	*Peganum harmala* L.	Peganaceae	5222 fe.	□□□N 21º 20.074`	E 040º □□□27.447`
6	*Resida lutea* L.	Resedaceae	4966 fe.	N 21º □□□26.045`	E □□□040º29.520`
7	*Zygophyllum simplex* L.	Zygophyllaceae	4966 fe.	N 21º □□□26.045`	E 040º29.520`

3. Results and Discussion:

Ornamentation of seeds provide important characters to distinguish some taxa (Koul *et al*., 2000), where, the microstructure details of the seed coat surface are strikingly constant from one sample to another in each species (Akbari and Azizian, 2006).

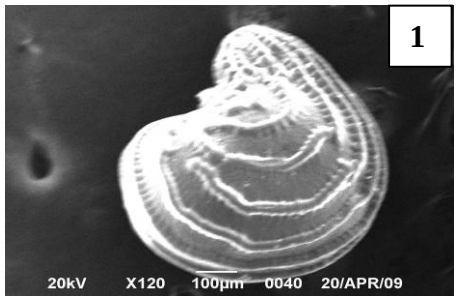
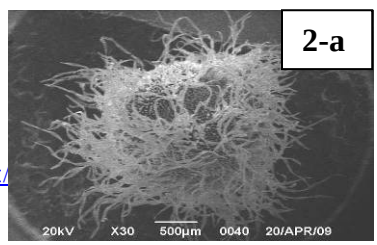
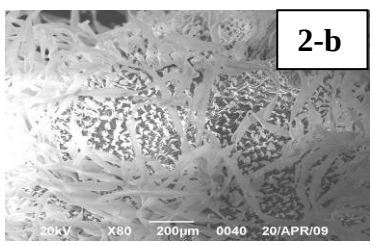


Figure 1: SEM image for *Aizone carsriense* L. seed.

As regards to the scanning electron microscopy for *Aizone carsriense* L., the seed shape as indicated in Figure (1), is kidney shaped with striated raised longitudinal and transverse striae, tenuicostate overall seed coat surface. Seed dimentions (LxW) is (0.68x0.51 mm). The anticlinal cell wall level is raised with smooth texture, thin cell wall and Anticlinal cell wall relief is straight. Periclinal cell wall is flat and it's sculpture is nearly smooth.





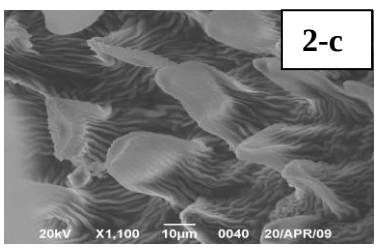


Figure 2: Different magnified SEM images for *Cloeme droserifolia* (Forssk.) Delile.

Seed shape of *Cloeme droserifolia* (Forssk.) Delile is globular and covered with dense hairs, seed coat pattern is tuberculate, tubercles. Seed size (LxW) is (1.85x1.85). The seed surface shows rugose-striate surface. Anticlinical walls sunken, straight while periclinical wall is convex, tuberculated and tuberceles surface are striate-regate with striated strips, Figure 2 (a, b & c).

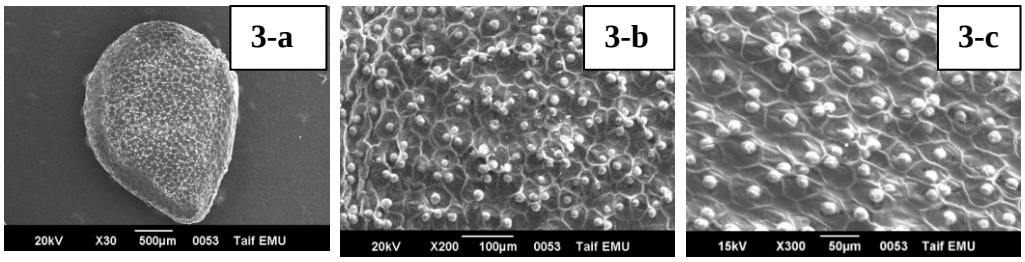


Figure 3: Dfferent magnified SEM images for *Fagonia schweinfurthia.*

Figure 3 (a, b & c) shows that, *Fagonia schweinfurthia* seed is ovate has dimentions (LxW) of 2.66 x 2.51 mm and it's overallseed coat pattern is reticulate. The Anticlinal cell wall thickness is thin with smooth texture, has raised cell wall level and it's relief is straight. The Periclinal cell wall sculpture is smooth to striated with flat cell wall level. Epicuticular wax depositions are noticed over the seed surface as globular particles.

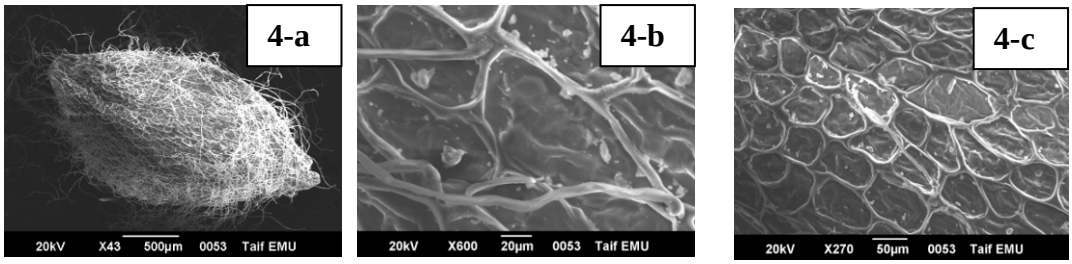


Figure 4: Different magnified SEM images for *Fosskaolea tenacissima L*

Figure 4 (a, b & c) shows that, seeds of *Fosskaolea tenacissima L.* are elliptic in shape, covered with dense, long fine unicellular and uniseriate hairs. Their dimentions (LxW) is 2.61 x 1.33 mm. SEM investigation indicated that the seed surface sculpture is typically reticulate. The anticlinal cell walls thickness are thin, straight, raised with smooth surface, whereas the periclinal walls are flat with ruminate surface. Epicuticular wax deposition is observed over the seed surface as irregular particles.

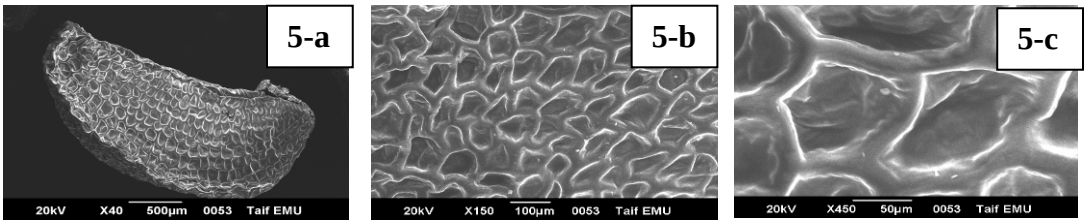


Figure 5: Different magnified SEM image for *Peganum harmala L.*

Figure 5 (a, b & c) shows that, seeds of *Peganum harmala L.* are elliptic in shape, seed dimensions (LxW) is 2.622x1.786 mm. SEM investigation indicated that the seed surface sculpture is typically regular reticulate. The anticlinal cell walls thickness are thick, straight, raised with finely striated texture, whereas the periclinal walls are concave with ruminate surface. Epicuticular wax deposition is absent.

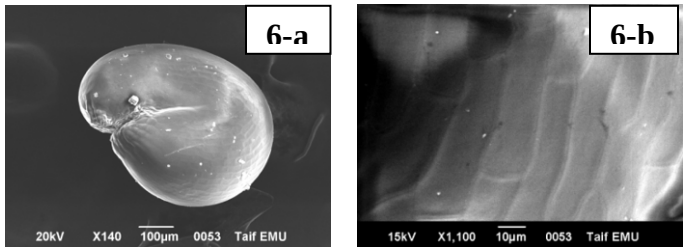


Figure 6 (A & B): Different magnified SEM image for *Resida lutea L.*

Figure 6 (a & b) shows that, seeds of *Resida lutea* L. is kidney shaped with scalariform pattern. The seed dimensions (LxW) is 0.579 x 0.442 mm. Anticlinical cell wall is raised and periclinical cell wall is flat with smooth texture.

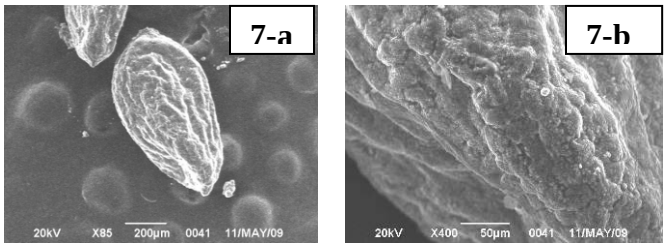


Figure 7: Different magnified SEM images for *Zygophyllum simplex L.*

Figure 7 (a & b) shows that, seeds of *Zygophyllum simplex* L. is elliptic in shaped with irregularly granulated islands pattern. The seed dimensions (LxW) is 0.833 x 0.450 mm.

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