



Exomorphic Characters of Seeds of Some Species of Capparaceae Family in Taif, KSA

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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ABSTRACT

Seed exomorphic characters of six species belonging to four genera of family Capparaceae were studied using light microscope (LM) and scanning electron microscopy (SEM) in order to determine the importance of seed features as taxonomic evidence. These species are *Cadaba farinosa* Forssk, *Capparis decidua* (Forssk.) Edgew, *Capparis cartilaginea* Decne, *Dipterygium glaucum* Decne, *Maerua crassifolia* Forssk and *Maerua oblongifolia* (Forssk.) A. Rich. The diagnostic characters at level of the general and specific level are shape of seed, size, color, texture and seed coat surface. There is a wide range of variations of seed shape among the studied species. LM revealed that the studied seeds are mostly varying from ovate to globose or cardiac- shape. All of the seeds lack wings except *Dipterygium glaucum* Decne. and most of the seed is coarse texture. There are six main types of seed surface sculptures revealed by SEM investigation at higher magnifications; reticulate, rugose-striate, winding undulate, ribbed and papillate.

Keywords: *Capparaceae*; *seed coat sculpture*; *LM*; *SEM*; *Saudi Arabia*.

1. INTRODUCTION

Capparaceae is a family that has 40-45 genera and 700-900 species or more because of this, it

is considered as a medium-sized family and it has a few members as horticultural or economic importance. It is pan tropical in distribution. The family inhabits the warmer parts of the world,

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mainly in the tropics and subtropics of both hemispheres and in the Mediterranean. It appears in flora of dry regions. After updating some families, Capparaceae became represented in the wild Saudi Arabia flora by 4 genera, 10 species of wide ecological and biogeographically range of distribution [1], 6 species belonging to 4 genera [2] and 8 species belonging to 5 genera [3]. Capparaceae that includes Morisonia, Crataeva, Cadaba, Boscia, and other New World and Old-World genera [4]. The different genera overlap in molecular studies [4], although they have a marked biogeographical distinction between New World and Old-World groups, recognized at the section level or subsection [4,5,6]. It is important to ultra-structural shape analysis of the seed surface showed in the SEM as a credible approach for distinguishing the tax a and assess taxonomic characteristics, as seen in works of Barthlott, [7,8,9]. The morphology of the seed surface sculpture in the SEM for this family so far. The purpose of the present work is to determine exomorphic studies of some seeds of Capparaceae family by using

LM and SEM to ascertain the structure of the seed surface considered as a taxonomic figure.

2. MATERIALS AND METHODS

Seeds collection: Mature seeds were collected from the natural habitat at different localities at Taif province (Table 1). The locations were accurately located using GPS. (Fig. 1). The external macro-morphological aspect of the seeds including seed size, general shape, seed surface, color, were investigated with the aid of light microscope (LM) and scanning electron microscope (SEM). The external macro-morphological features of the seeds in the studied species were investigated with the aid of scanning electron microscope (SEM). Dried mature seeds were mounted on brass stubs and coated by with a thin layer of gold. Coated seeds were examined and photographed on a Joel JSM 6390LA, at the Electronical Microscope Unit in University of Taif. The terminology of Barthlott [7] and Stearn [10] were adopted to describe the SEM of seed surface.

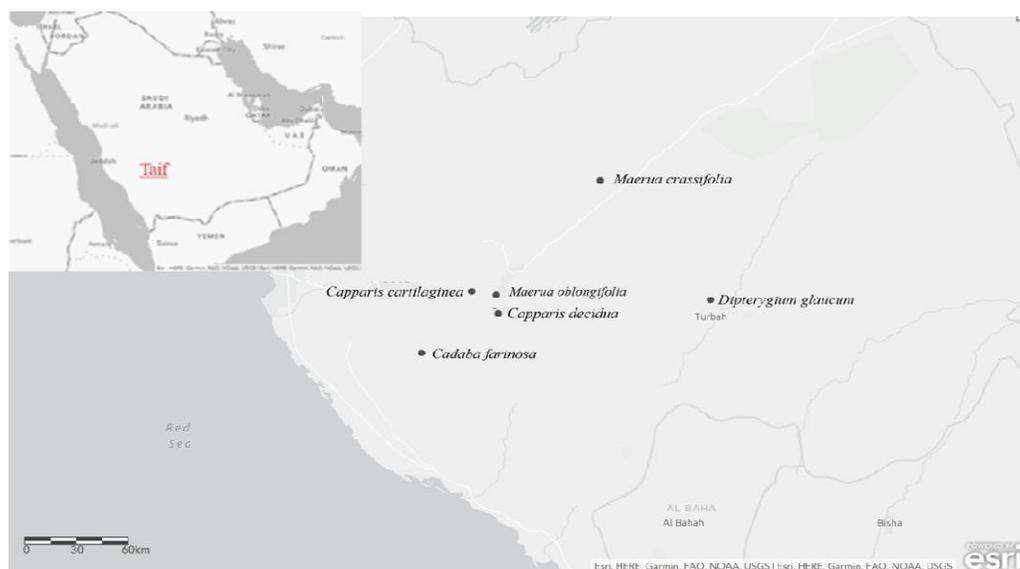


Fig. 1. Location map of the study area showing the different species at Taif Region

Table 1. Coordinates of sampled locations in the study area

Species name	Location	Latitude (N)	Longitude (E)	Altitude (m)
<i>Cadaba farinosa</i> Forssk	Taif – alhada	21°20'26.3	40°15'26.5	1370
<i>Capparis decidua</i> (Forssk.) Edgew	Taif – Makkah road	21°19'54.3	40°25'09.9	1545
<i>Capparis cartilaginea</i> Decne	Taif – alhada	21°20'58.7	40°17'32.5	2058
<i>Dipterygium glaucum</i> Decne	Taif – alkhorma	22 °10'35.4	41°36'53.5	1026
<i>Maerua crassifolia</i> Forssk	Taif – Riyadh road	21° 36'21.1	40°40'58.6	1320
<i>Maerua oblongifolia</i> (Forssk.) A. Rich	Taif	21°13'58.2	40°25'39.4	1696

3. RESULTS AND DISCUSSION

A wide range of variations of the seed shape has been shown among the species. Most of the seeds differ from ovate to cardiac-shape or globose. Nevertheless, they are ovate in the three species (*Capparis cartilaginea*, *Dipterygium glaucum* and *Maerua oblongifolia* (Forssk.)), two species cardiac-shape *Capparis decidua* and *Maerua crassifolia* were cardiac-shaped while *Cadaba farinosa* was globose. (Figs. 8 & 9). In this study we notice the seed shape appear as a diagnostic at the general level. There is no occurrence of wings in most of the seeds investigated. However, in *Dipterygium glaucum* the presence or absence of wings has a diagnostic value in distinguishing the studied species. Our data have shown significant propinquity with previous works of Kapil, *et al.* [11], Abdel Khalik, *et al.* [12], Tantawy, *et al.* [13] and Kasem, *et al.* [14].

As shown in Table 2, Seed size in this study is divided into two sizes. The small size is in the range of L: 0.3, W: 0.3 mm as *Cadaba farinosa* (0.3×0.1), *Capparis decidua* (0.3×0.3) and *Capparis cartilaginea* (0.3× 0.2). While the big size in the range of (L: 0.5, W: 0.2 mm) as *Dipterygium glaucum* Decne (0.5×0.3), *Maerua crassifolia* (0.5×0.3) and *Maerua oblongifolia* (0.5×0.2). Seed size is considered a diagnostic variable to a certain extent (Table 2). This is agreeing with the study of Tantawy, *et al.* [13] and Aniszewski, *et al.* [15].

The light microscope (LM) showed the color of seeds ranging from white, brown and dark brown to brown (Table 2 and Fig. 8.). The color of the seed is diagnostic at the generic and specific level to a certain degree. This is in corroboration with the works of Dahlgren and Clifford [16] and Barthlott [7]. Five species had coarse seeds

(*Capparis decidua*, *C. cartilaginea*, *Dipterygium glaucum*, *Maerua crassifolia* and *M. oblongifolia*) while only one species (*Cadaba farinosa*) had glabrous textured seed.

SEM examination showed 6 types of seed sculpture; reticulate, winding, rugose, undulate, papillate and ribbed. The reticulate seed surface pattern in *Capparis cartilaginea*, winding type was recorded in *Capparis decidua* rugose-striate form was noticed in *Cadaba farinosa* undulate structure was found in *Dipterygium glaucum* and ribbed structure was in *Maerua crassifolia* and papillate seed surface in *Maerua oblongifolia*. It was observed from the SEM result; surface sculpture of the seed, sides of the anticlinal and periclinal walls can be considered as diagnostic parameters at the general and specific level in this study. That is compatible with the study of Barthlott [7,17] Fayed and El-Naggar [18] and Abdel Khalik and Maesen [12] and Tantawy, *et al.* [14].

***Cadaba farinosa* Forssk:** Seeds are small, shape globose, thick, black color, Size : 0.3×0.1 mm, seed wing absent, SEM showed rugose - striate sculpture on their seed coat (Fig. 2) seeds are large, Cardiac-shape, thick, black color, globrous surface.

***Capparis decidua* (Forssk.) Edgew:** Seed size: 0.3×0.3 mm, seed wing absent, seed surface ornamentation revealed irregular ornamentation, randomly patterned surface with winding cells prominently shown (Fig. 3).

***Capparis cartilaginea* Decne:** Seeds are relatively large, light brown color, thick, seed size: 0.3× 0.2 mm seed wing absent, both the dorsal and ventral sides are ornamented with minute tubercles in regular rows. The surface in these places appears reticulately sunken (Fig. 4).

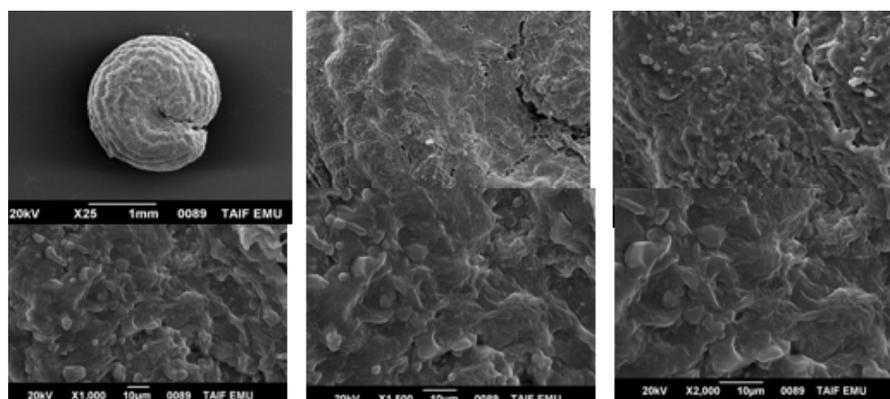


Fig. 2. SEM of *Cadaba farinosa* seed

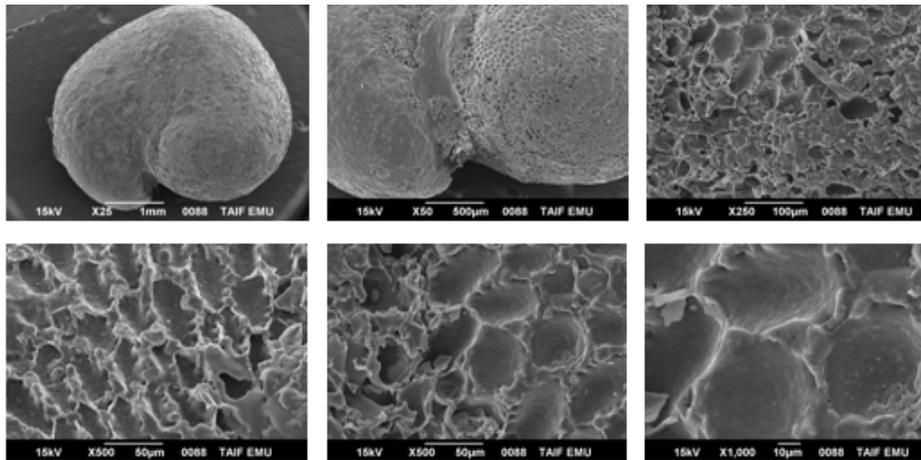


Fig. 3. SEM of *Capparis decidua* seed

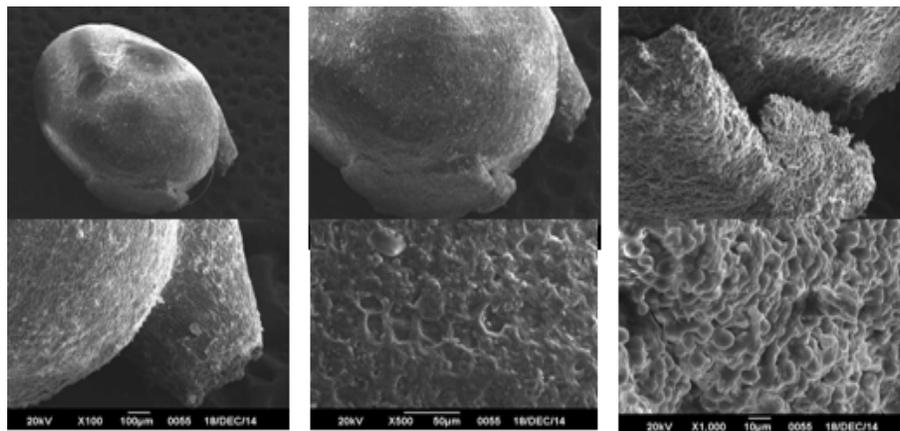


Fig. 4. SEM of *Capparis cartilaginea* seed

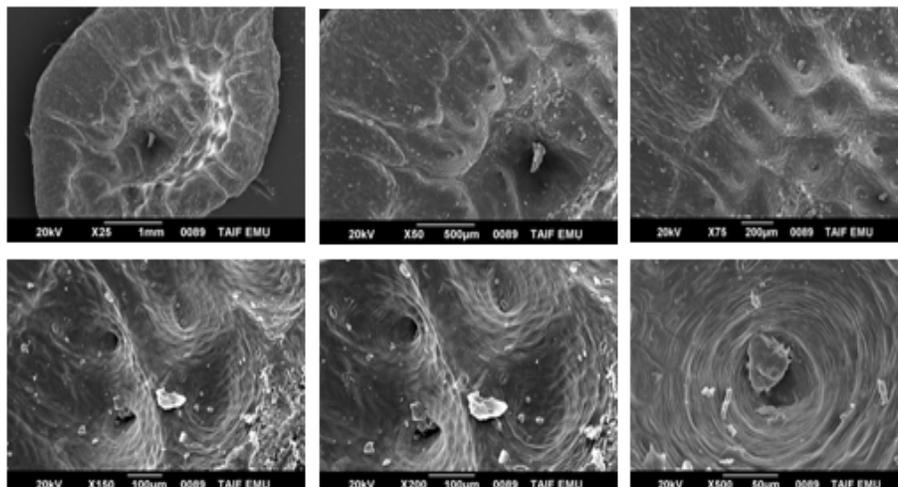


Fig. 5. SEM of *Dipterygium glaucum* seed

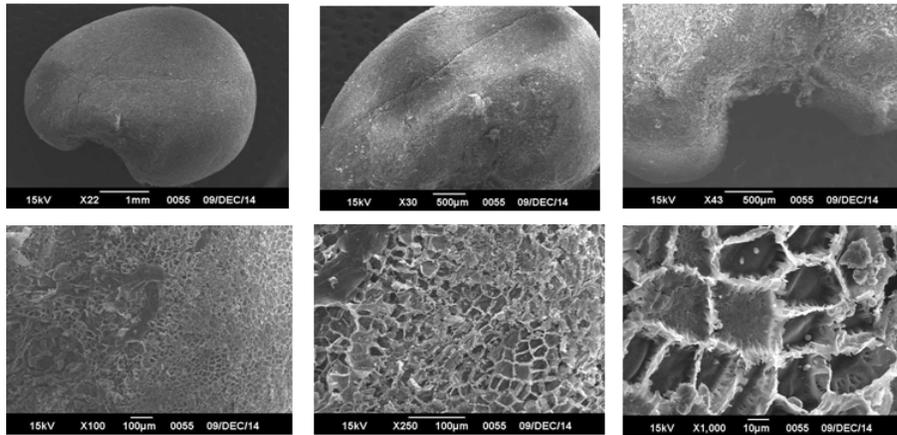


Fig. 6. SEM of *Maerua crassifolia* seed

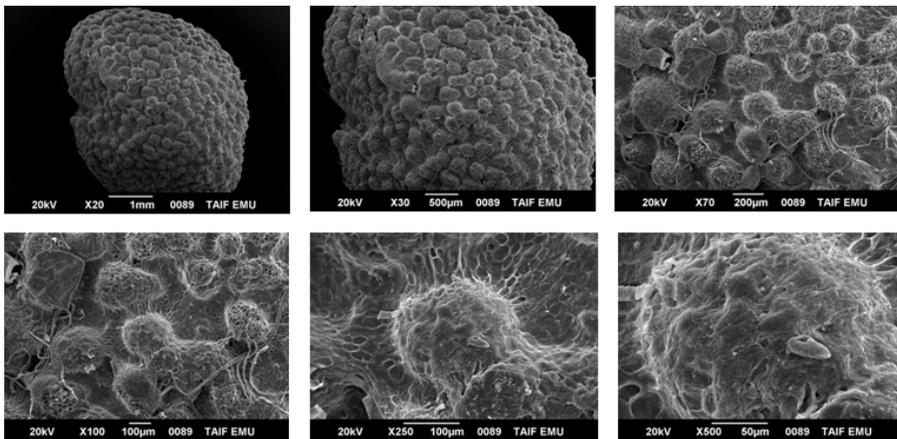


Fig. 7. SEM of *oblongifolia* seed

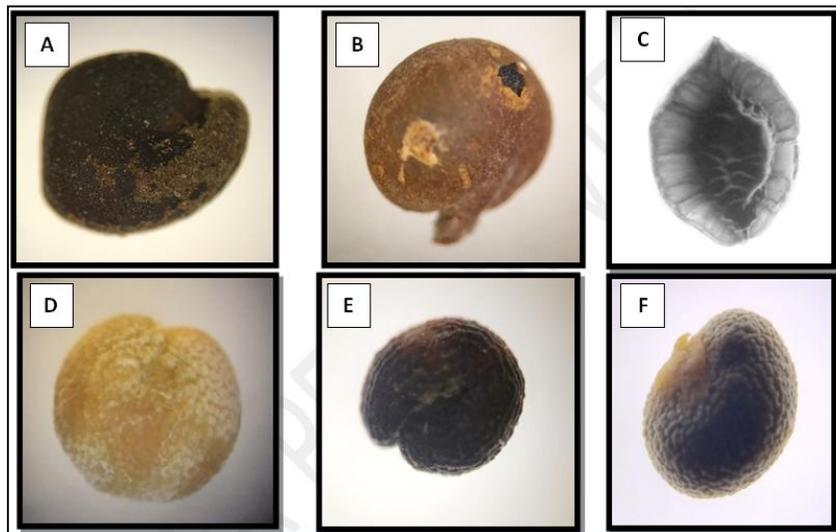


Fig. 8. General view of seeds in light microscope. A; *Capparis decidua* , B; *Capparis cartilaginea* , C; *Dipterygium gloncum* , D; *Maerua crssifolia*, E; *Cadapa farinosa* F; *Maerua oblongifolia*

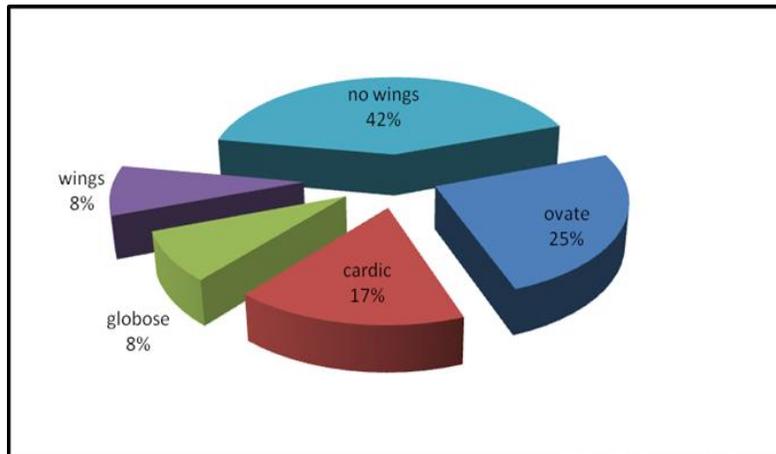


Fig. 9. Percentage Seeds shape spectra of the studied species.

Table 2. Seed morphological characters as seen by (LM) and (SEM)

Species name	L _x W	Shape	Texture	Color	Wing	Seed surface
<i>Cadaba farinosa</i> Forssk	0.3×0.1	globose	Coarse	Black	Absent	rugose-striate
<i>Capparis decidua</i> (Forssk.) Edgew	0.3×0.3	cardic	Coarse	Black	Absent	winding
<i>Capparis cartilaginea</i> Decne	0.3×0.2	Ovate	Coarse	Darck-brown	Absent	reticulate
<i>Dipterygium glaucum</i> Decne	0.5×0.3	ovate	Coarse	Brown	Present	Undulate
<i>Maerua crassifolia</i> Forssk	0.5×0.3	oblong	Glabrous	White	Absent	ribbed
<i>Maerua oblongifolia</i> (Forssk.) A. Rich	0.5×0.2	Ovate	Coarse	Brown	Absent	Papillate

***Dipterygium glaucum* Decne:** Seeds are large, shape ovate-oblong, seed Size: 0.5×0.3 mm, brown color wing present. SEM revealed undulate with globular pieces perfectly deep in the cells of epidermal and interlaced shapes were registered on the surface (Fig. 5).

***Maerua crassifolia* Forssk:** Seeds are large, Cardiac-shape, thick, white color, smooth surface. Size of seed: 0.5×0.3 mm, seed wing not present, seed surface ornamentation revealed the anticlinal walls are conformable and appeared arrange ornamentation, randomly patterned surface with ribbed cells prominently shown (Fig. 6).

***Maerua oblongifolia* (Forssk) A. Rich:** Seeds are large, thick, and ovate in shape, brown color, Size 0.5×0.2 mm, seed wing absent, the surface of lobular appears with globular central papillae. (Fig. 7).

4. CONCLUSION

There is a wide range of variations of seed shape among the studied species. LM revealed that the studied seeds are mostly varying from ovate to globose or cardiac- shape. All the seeds lack wings except *Dipterygium glaucum* Decne. and

most of the seed is coarse texture. There are six main types of seed surface sculptures revealed by SEM investigation at higher magnifications; reticulate, rugose-striate, winding undulate, ribbed and papillate.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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