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The seed coat and pollen morphology of *Gypsophila pilosa* (*Caryophyllaceae*)

Abstract

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Gypsophila pilosa Hudson was recently recorded as a weed in reclaimed farmland east of Assiut town (Egypt), previously known from Libya, Palestine, Turkey and Iran. The occurrence of this species in the Nile region of Egypt fills the gap of its distribution between Palestine (Southwest Asia) and Libya (North Africa) and represents the southernmost limit of its distribution. Seed coat sculpture and pollen morphology of *Gypsophila pilosa* Hudson are investigated by LM and SEM. Epidermal cell patterns, anticlinal cell boundaries, and periclinal cell walls as seen by SEM as well as pollen shape, size, aperture and exine sculpture and structure proved to be of high diagnostic value.

Introduction

The genus *Gypsophila* L. was previously reported to be represented in Egypt by 4 species: *Gypsophila capillaris* (Forssk.) C. Chr., *G. viscosa* Murray, *G. arabica* Barkoudah and *G. antari* Post & Beauverd (Täckholm 1974; Hosny 1989; Danin & al. 1985; Hosny & El Hussein 1995; Boulos 1995, 1999; Hosny & El Hadidi 2000). *Gypsophila pilosa* Hudson is recently added to the flora of Egypt (El Nagggar 2002).

Seed coat sculpture as well as pollen morphological characters have been used as diagnostic characters in many taxa of *Caryophyllaceae* (Mc Neill 1979; Prantice & al. 1984; Hosny & El Hussein 1995).

Mature seeds and pollen grains of *Gypsophila pilosa* were studied by Light and Scanning Electron Microscopes. The distribution of this taxon as well as a key to the *Gypsophila* species occurring in Egypt is provided.

Materials and methods

Seeds were examined by light and scanning electron microscopes. Seven to ten seeds were selected to cover the range of variation. Voucher specimens are kept in CAI, E, (acronyms according to Holmgren & al. 1990) and ASTUE (Herbarium of Botany Department, Faculty of Science, Assiut University, proposed acronym).

Pollen material for light microscopy were acetolyzed according to Erdtman (1960). The

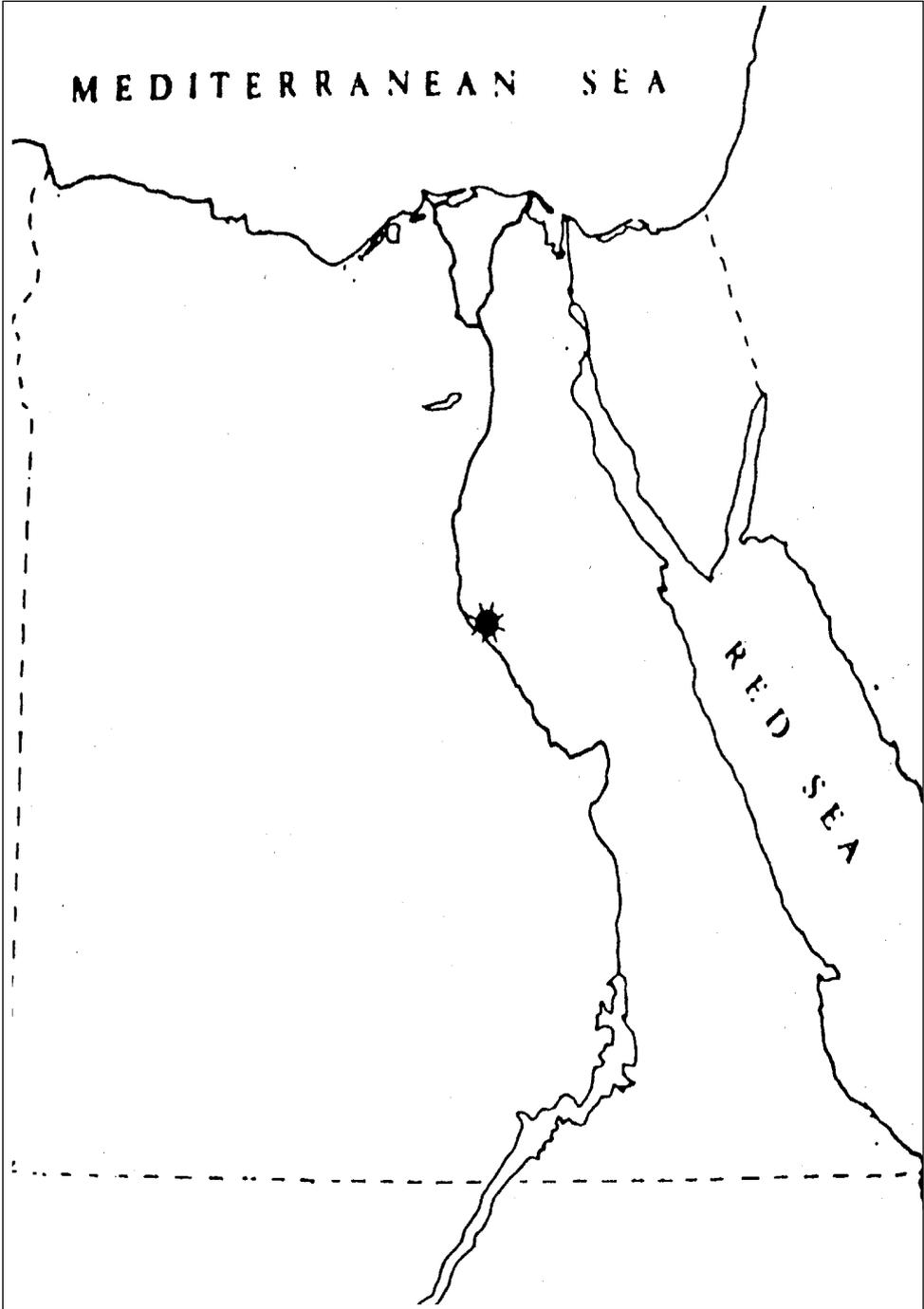


Fig. 1. Shows the present distribution (*) of *Gypsophila pilosa* in Egypt.

acetolyzed pollen were mounted in glycerin jelly onto glass slides and examined by light microscope. Material for SEM were prepared by mounting dry seeds or acetolyzed pollen onto clean stubs using double-sided adhesive tape. The stubs were coated with gold in a JEOL JFC 1100 E ion-sputtering Device. These stubs were then examined in a JEOL JSM 5400LV Scanning electron microscopy, which is operated at accelerated voltage of 15 kV, at Electron Microscopy Unit, Assiut University. The terminology used here for pollen description follows Erdtman, (1952), Reitsma, (1970) and Punt & al. (1994), while those of seeds are that of Cutler (1979) and Barthlott (1981, 1984).

Results and discussion

Gypsophila pilosa Hudson in Phil. Trans. Roy. Soc. Lond. (B) 56: 252 (1767).

Hagenia filiformis Moench, Meth. 51 (1794).

Gypsophila porrigens (Gouan ex L.) Boiss. Fl. Or. 1: 557 (1867).

Annual herb, to 120 cm. Stem erect, dichotomously branched, thick below, villous or hispid in the middle. Leaves 3.5-11 x 1-3 cm, lanceolate to linear or triangular, acuminate, 3-5 veined, with long glandular hairs, opposite, sessile, entire. Inflorescence of dichasial cymes. Bracts linear-lanceolate, hairy. Pedicels, 3-5 cm., filiform, becoming deflexed, glabrous. Calyx, 5-8 mm, campanulate-tubular, glandular-hispid, teeth triangular to sub-spherical with white margins. Petals 7-13 mm, white to pinkish, linear-oblong, emarginate to shallowly bilobed, clawed. Capsule about as long as calyx or longer, globular, deflexed (Fig. 2, a & b).

SEEDS numerous, 1.5-2 mm, reniform-orbicular, black with obtuse tubercles. Epidermal

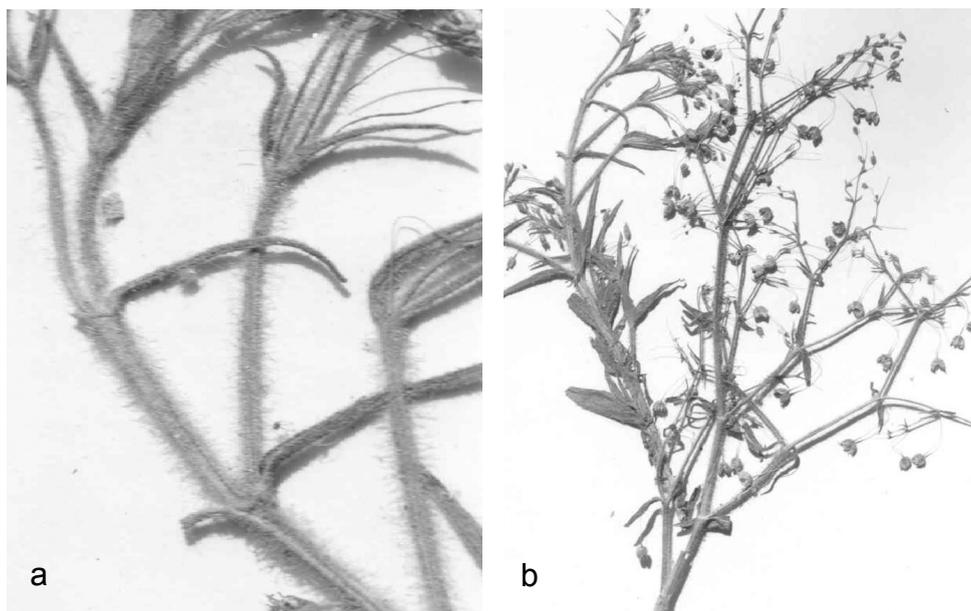


Fig. 2. *Gypsophila pilosa* Hudson: a) part of stem with pilose hairs; b) flowering and fruiting plant.

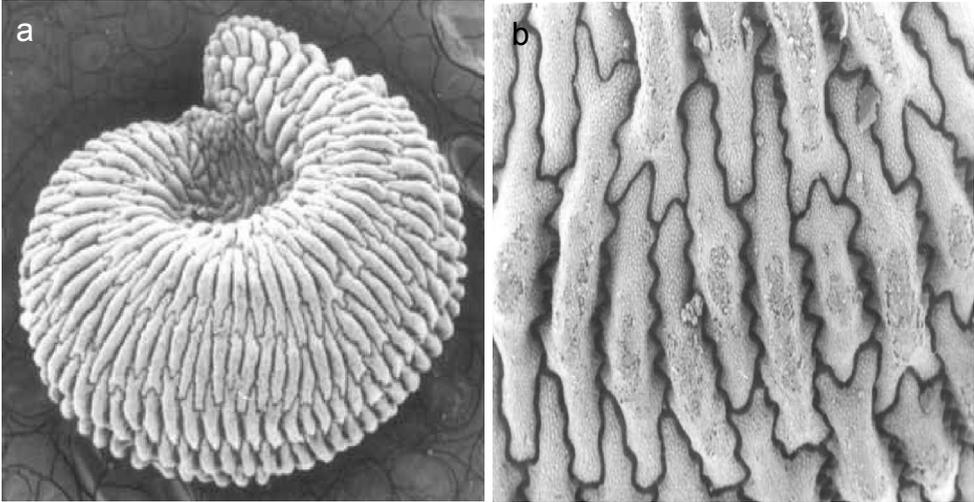


Fig. 3. SEM micrographs of seed coat sculpture of *Gypsophila pilosa*: a) mature seed; b) seed coat sculpture.

cell 4-6-gonal, elongated in one direction. Anticlinal cell boundaries thin, sinuate to s-shape channelled. Periclinal cell walls domate-convex or tuberculate, smooth to granulate (Fig. 3, a & b).

POLLEN GRAINS monade, apolar, hexagonal-polyhedral or spheroidal, 18-19 x 18-19 μm . Aperture pantoporate. Pores circular, 3-4 μm . in diameter, annulate. Annulus smooth or rarely with granules, operculate. Operculum beset with angular to rounded, usually pointed elements; deciduous. Exine 1.6-2 μm ., thick, sexine thicker than nexine, tectate. Tectum

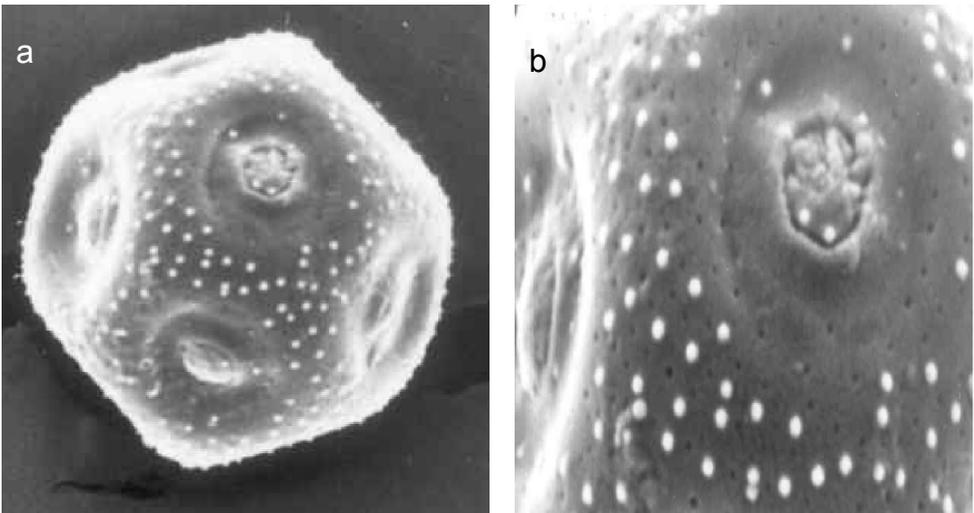


Fig. 4. Pollen morphology and exine sculpture of *Gypsophila pilosa*: a) pollen grain; b) exine sculpture at aperture.

perforate. Perforation \pm circular, varying in size; spinulate to granulate. Granules with broad bases and pointed apices, sparsely distributed on the surface (Fig. 4, a & b).

EXAMINED MATERIAL Northeast of Assiut town, reclaimed desert land; April, 2000, El Naggar, s.n.) (CAI, E & AST)

Gypsophila pilosa is a distinct species characterized by its stout hispid or villous long stems; large, linear or triangular and sessile leaves; filiform and glabrous pedicels and relatively large pink and emarginate-bilobed and clawed petals. Barkouda, (1962) classified this species in sect. *Hagenia* A. Braun.

In the present work five species of *Gypsophila* are recognized in Egypt viz.: *G. pilosa*, *G. viscosa*, *G. capillaries*, *G. antari* and *G. arabica*.

No specimens of *Gypsophila linearifolia* (Boulos 1999) have been seen by the author, therefore the presence of this species in Egypt is considered uncertain.

Gypsophila pilosa can be separated from the other *Gypsophila* species occurring in Egypt by the following key.

- | | | | |
|---|----|--|----------------------|
| 1 | a. | Plants with glandular hairs or sessile glands on at least one part. | 2 |
| - | b. | Plants glabrous throughout. | 3 |
| 2 | a. | Plants villous or hispid in the middle, glabrous above and below; leaves sessile or subsessile lanceolate to triangular, 3.5-11 x 1-3 cm | <i>G. pilosa</i> |
| - | b. | Plants viscous with sessile glands at the internodes; leaves narrowly ovate to ovate oblong, 1.5-6 x 0.5-1.5 cm. | <i>G. viscosa</i> |
| 3 | a. | Annual or biennial herbs, basal leaves elliptical or lanceolate | <i>G. antari</i> |
| - | b. | Woody perennial, basal leaves narrow | 4 |
| 4 | a. | Calyx persistent in fruiting; capsule globoid, opens by 4 valves to about 1/2 of its length | <i>G. capillaris</i> |
| - | b. | Calyx deciduous in fruiting; capsule turbinate, 4 angular, opens by 4 valves till the base of capsule | <i>G. arabica</i> |

Gypsophila pilosa grows as a weed in the reclaimed desert east of Assiut town. It is probably introduced with new crop plants or/and manures. The occurrence of this taxon in Assiut (Upper Egypt) fills the gap in its distribution between Palestine (Southwest Asia) and Libya (North Africa). The record of *Gypsophila pilosa* in Assiut (Upper Egypt) is considered to be the southernmost limits of its distribution (Fig. 1).

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