

# A NEW SPECIES OF THE GENUS SAPONARIA L. (CARYOPHYLLACEAE) IN IRAN

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*Saponaria* species are very similar morphologically so that their taxonomy has been challenging subject for a long time. In order to clarify the taxonomy of the genus, materials deposited in the herbaria (TARI, IRAN and FUMH) of Iran were examined. The Micromorphological characters of the seed and pollen grains were studied and evaluated as possible taxonomic characteristics of the genus. Among the studied specimens a new species (*Saponaria iranica*) to the science was identified which will be described here. This new species has been collected from Kerman Province and is closely related to *S. orientalis* and *S. viscosa*. An identification key to the species of the genus *Saponaria* in Iran is presented.

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**Key words:** Caryophyllaceae; *Saponaria*; SEM; new species; Iran

گونه جدید از جنس *Saponaria* L. از میخکیان در ایران

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گونه‌های جنس *Saponaria* L. از نظر ریخت‌شناسی شباهت زیادی به هم دارند به طوری که تاکسونومی این جنس از دیر باز موضوعی چالش برانگیز بوده است. به منظور روشن شدن وضعیت تاکسونومی این جنس در ایران نمونه‌های هرباریوم‌های TARI (هرباریوم مرکزی ایران)، IRAN (مؤسسه تحقیقات گیاهپزشکی) و FUMH (مشهد) به دقت مورد بررسی قرار گرفت. صفات میکرومورفولوژیکی از جمله دانه و دانه گرده نیز مورد مطالعه و ارزیابی قرار گرفت که به عنوان ابزار کمکی مناسبی برای تاکسونومی این جنس بشمار می‌رود و در این میان یک گونه جدید به دنیای علم گیاهشناسی معرفی شد. این گونه از استان کرمان جمع‌آوری شده و خیلی نزدیک به گونه‌های *S. orientalis* و *S. viscosa* است. علاوه بر این منطقه انتشار گونه جدید با دو گونه دیگر نیز متفاوت است. در این تحقیق کلید شناسایی جدیدی نیز برای گونه‌های جنس *Saponaria* در ایران ارائه شده است.

## INTRODUCTION

Distribution of the Caryophyllaceae family is mainly holarctic with a diversity centre in the Mediterranean and the Irano-Turanian regions (Bittrich 1993). It includes about 3000 species distributed among 88 genera (Rabeler & Hartman 2005). In the most common classification (Pax & Hoffman 1934; Bittrich 1993), Caryophyllaceae includes three subfamilies: Alsinoideae Burnett, Caryophylloideae Arn. and Paronychioideae A. St. Hil. ex Fenzl (Bittrich, 1993).

Fenzl (1840) Divided Caryophyllaceae family into three tribes: tribe Caryophlleae, tribe Drypideae Fenzl, and tribe Sileneae DC. *Saponaria* L. is a member of Caryophylloideae subfamily with about 40 species, found in temperate Eurasia, mainly in the Mediterranean region and formerly represented in Iran by 8 species. (Rechinger 1988). Later, *Saponaria esfandiarii* Assadi was described as a new species from S. Iran (Assadi 1989).

The genus is very closely related to *Gypsophila* L.

but is distinguished by the cylindrical, not campanulate calyx and the absence of commissural veins. (Barkoudah 1962). The fleshy rhizomes and leaves of some species contain saponin and are used as a substitute for soap (Korkmaz & Ozcelik 2011).

*Saponaria* is distributed in north (Gilan, Mazandaran and Golestan), north east (Khorasan), north west (Azarbaijan, Zanjan) and west (Hamedan and Kurdesdhan), south (Kerman, Hormozgan and Sistan va Baluchestan) and in centre (Tehran, Markazi, Yazd and Qazvin Provinces).

A new species will be described in this paper and a new identification key to the accepted species of the genus *Saponaria* L. in Iran will be presented. This finding is part of the thesis project of the first author entitled biosystematic study of the genus *Saponaria* L. (Caryophyllaceae) in Iran, for a Master Degree.

## MATERIALS AND METHODS

The herbarium materials deposited in TARI, IRAN and FUMH were studied using Flora Iranica (Rechinger 1988), Flore de l'Iran (Parsa 1951), Flora of Turkey (Hedge 1967), Flora of the USSR (Gorshkova 1936), Flora Europaea (Chater, 1964), Monographie der Gattung *Saponaria* (Simmler 1910). Some qualitative and quantitative morphological characters of the specimens of the new species and its close relative species i.e. *Saponaria orientalis* and *S. viscosa* are presented in table 1.

Pollen grains and seed characters were studied using SEM microscopy. From each herbarium specimen three pollen grains and seeds were studied. Pollen grains and seeds were stabilized on aluminum stubs and coated with a thin layer of gold. Then the specimens were studied using scanning electron microscope, model EM 3200. Micro-morphological measurements were performed using Carnoy, a digital measurement software (Scholes et al. 2002). Terminology of pollen grains and seeds are according to Moore et al. (1978) and Punt et al. (1995).

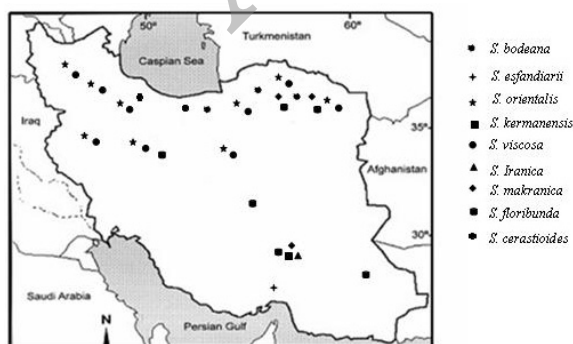


Fig. 1. Distribution map of the *Saponaria* species in Iran

## RESULTS

### New Species

*Saponaria iranica* Dashti, Assadi & Sharifnia, **sp. nov.** (fig. 2.)

Type. Iran, Kerman: Baft, 7 km SE. Ghaleh Asghar, Hararan village, 3200 m., Yazdani 4956 (holotype IRAN).

Annual, divaricately branched at base, 25-30 cm high, with lax indumentum, glandular pubescent, not pilose. Leaves 20-25 mm long, 4-5 mm broad in the lower half, smaller at the top of stem, oblong-lanceolate, punctuate (denser around the midrib); petioles 5-10 mm long. Bracts ca. 17 mm long and 3 mm broad, elliptic. Inflorescence paniculate (five times divided). Pedicels 13-17 mm long, laxly glandular-pubescent (not pilose). Calyx 4-6 mm long, tubiform, narrow at base; intervals very narrowly membranous. Petals 5, purple or pale purple, striate, 6-7 mm long, emarginate at the apex; coronal scales absent. Stamens 10, unequal, half or as long as the petals; anthers 0.5 mm long. Ovary ovoid, 5 mm long. Styles 2, stigma incurved at the apex, stigmatose all around in the upper half and in the lower half only at the inner side. Ovules 9-10. Pollen grains spheroidal; pore ornamentation protuberant. Seeds elongated, reniform with cord-like appendage.

The new species is closely related to the *S. orientalis* L. but differs from it by the length of plant, 25-30 cm (not 8-25) tall, petioles 5-10 mm (not 3-6 mm) long, pedicel 13-17 mm (not 5-10 mm) long, the upper leaves 20-25x4-5 mm (not 15-20x1-2.5 mm), the anthers 0.5 (not 0.3 mm) long. The new species is also very similar to *S. viscosa* C. A. Mey. but differs from it by different characters. The three species are compared in tables 1-3 based on morphological, seed and palynological characters (figs. 3-4). The geographical distribution of the three species are shown in fig. 1.

### Identification key to the species of *Saponaria* in Iran.

- |  |                        |
|--|------------------------|
| 1. Plants perennial. Coronal scales present                | 2                      |
| - Plants annual. Coronal scales absent                     | 3                      |
| 2. Petals red. Calyx $\pm$ 13 mm long                      | <i>S. bodeana</i>      |
| - Petals pink or white. Calyx 16-22 mm long                | <i>S. officinalis</i>  |
| 3. Stem leaves 6-25 mm wide                                | 4                      |
| - Stem leaves 1-5 mm wide                                  | 5                      |
| 4. Petals rounded at the apex                              | <i>S. cerastioides</i> |
| - Petals crenate-dentate at the apex                       | <i>S. esfandiarii</i>  |
| 5. Calyx 7-12 mm long                                      | 6                      |
| - Calyx up to 6 mm long                                    | 7                      |
| 6. Plant densely viscid glandular-pilose. Leaves pubescent | <i>S. viscosa</i>      |

- Plant laxly viscid glandular-pilose. Leaves glabrous  
*S. orientalis*
- 7. Petioles 5-10 mm long. Plant 25-30 cm high  
*S. iranica*
- Petioles 1-2 mm long. Plant up to 18 cm long 8
- 8. Leaves narrowly linear -lanceolate *S. floribunda*
- Leaves oblanceolate 9
- 9. Plant pubescent, without glandular hair. Petals crenate-dentate at the apex. Calyx teeth 1.5 mm long  
*S. makranica*
- Plant glandular-pilose . Petals crenate-dentate or deeply emarginate at the apex. Calyx 4-5 mm long  
*S. kermanensis*

Table 1. Comparison of morphological characters of *Saponaria iranica* with relative species.

Characters	<i>Saponaria iranica</i>	<i>S. orientalis</i>	<i>S. viscosa</i>
Petiole length(mm)	1-3	3-5	5-10
Calyx length(mm)	9-11	7-9	4-6
Pedicels length(mm)	3-5	5-10	13-17
Petal tip	Emarginate	Deeply emarginate	Emarginate
Pedicel indumentum	Laxly pubescent	Glandular hairs	Sparsely glandulose
Upper leaf length(mm)	14-16	15-20	20-25
Upper leaf width(mm)	2-3	1-2.5	4-5
Anthers length(mm)	0.5	0.3-0.4	0.4-0.5
Plant length(cm)	6-18	8-22	25-30
Number of flowers per inflorescence plant	35-73	80-200	50-70
Ovule number	13-14	13-14	9-10
Type of inflorescence	Dense corymbose	Laxly corymbose	Not corymbose

Table 2. Comparison of pollen data in *Saponaria iranica*, *S. orientalis* & *S. viscosa*.

Characters	<i>S. viscosa</i>	<i>S. orientalis</i>	<i>S. iranica</i>
Polar axis length (µm)	28.20 (28.98±0.064) 29.34	29.78 (30.1±0.259) 30.37	33.02 (32.05±0.015)33.05
Equatorial axis diameter(µm)	28.29 (28.68±0.57) 29.34	27.2 (26.87±0.020) 29.19	29.29 (29.78±1.99) 33.05
Number of pores in 10 µm <sup>2</sup>	13-15	4-7	9-11
Pore diameter (µm)	5.21 (5.35±0.17) 5.55	5.5 (4.37±0.11) 5.36	8.5 (8.96±0.66) 9.73
Pore diameter without ring (µm)	2.99 (3.47±0.46) 3.93	3.05 (3.26±0.06) 3.17	8.5 (8.61±0.15) 8.79
Annulus diameter (µm)	1.6 (1.65±0.24) 1.93	1.5 (1.4-0±0.15) 1.49	2.45 (2.60±0.21) 2.85
Number of puncta in 10 µm <sup>2</sup>	13-16	9-5	7-9
Pollen shape	Spheroidal	Polyhedral	Spheroidal
Pore ornamentation of pollen grains	Protuberant	Excavated deep	Protuberant

Table 3. Comparison of seed micromorphological data in *Saponaria iranica*, *S. orientalis* & *S. viscosa*.

Characters	<i>S. viscosa</i>	<i>S. orientalis</i>	<i>S. iranica</i>
Seed length (mm)	1.1 (1.8±0.025) 1.15	1.05 (1.7±0.02) 1.09	0.91 (0.93±0.025) 0.96
Seed width (mm)	0.82 (0.84±0.032) 0.88	1.01(1.03±0.02) 1.05	0.89 (0.91±0.025) 0.94
Cell length (CL) (µm)	148.02 (149.02±1.005) 150.03	148.05 (149.02±0.99) 150.03	150.05 (151.31±1.42) 152.86
Cell width(CW) (µm)	63.05 (64.36±1.38) 66.02	83.00 (85.03±2.08) 87.00	39.09 (41.13±1.85) 42.72
CL/CW ratio	2.13 (2.23±0.094) 2.27	21.09 (1.15±0.060) 1.27	2.99 (3.25±0.025) 3.57
Cell distance (µm)	2.3 (2/50±0.16) 2.47	26.1 (27.34±1.17) 28.43	5.5 (6.04±1.49) 6.34
Cells number for 0.5 µm <sup>2</sup>	8.00	5.00	6.00
Seed shape	Elongated reniform	Rounded reniform	±Rounded reniform



Fig. 2. *Saponaria iranica* (x1); calyx (x3); petal (x2); stamen (x2); ovary (x2).

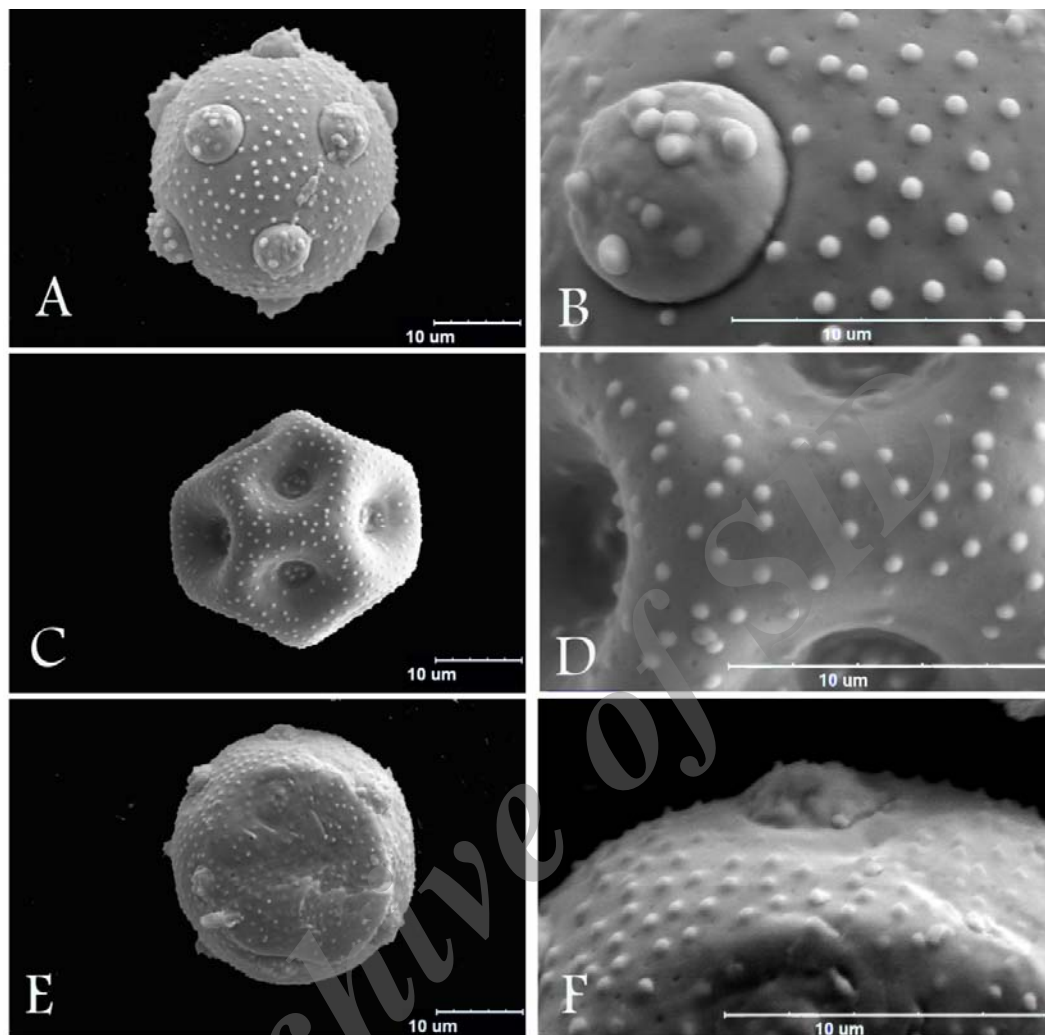


Fig. 3. SEM micrographs of pollen grains in *Saponaria viscosa*: A, general appearance, B, pore and ornamentations; *Saponaria orientalis*: C, general appearance, D, pore and ornamentations; *Saponaria iranica*: E, general appearance, F, pore and ornamentations.

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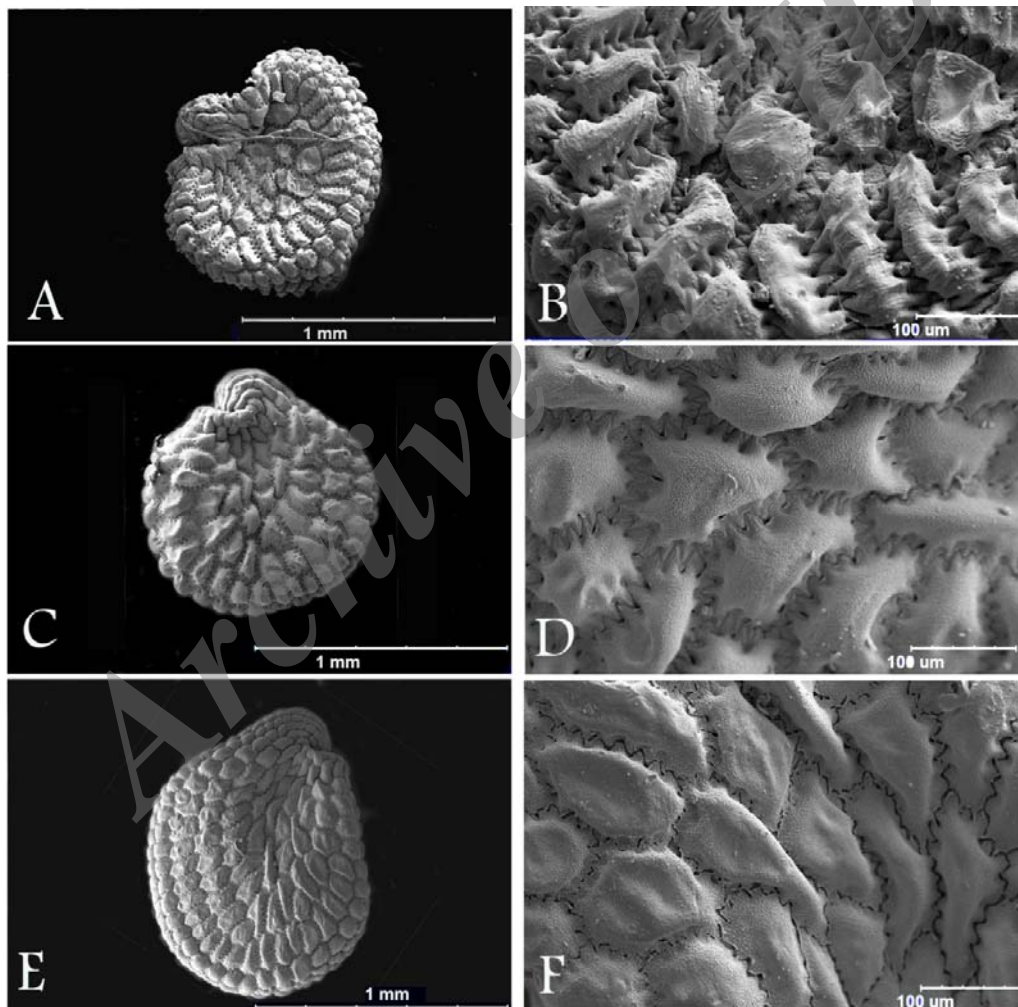


Fig. 4. SEM micrographs of seeds in *Saponaria viscosa*, A, general appearance, B, testa cells; *S. orientalis*, C general appearance, D testa cells; *S. iranica*, E, general appearance, F, testa cells.