MINUARTIA SABALANICA (CARYOPHYLLACEAE), A NEW SPECIES FROM NW IRAN

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A progressive revision of the Iranian material belonging to *Minuartia* L. (*Caryophyllaceae*) led to the recognition of a new species *Minuartia sabalanica* based on the material from NW Iran. The new species is morphologically related to *M. rimarum,* an endemic only known from the central and southern Turkey, and *M. umbellulifera* known from Turkey and Iran. Diagnostic characters of the new species are discussed. In addition, a Latin diagnosis, description and illustration of the new species are given.

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گونه جدید Minuartia sabalanica (Caryophyllaceae) از شمال غربی ایران

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مطالعه برای بازنگری جنس *Minuartia* درایران، منجر به معرفی گونه جدید *Minuartia sabalanica* به دنیای علم شد. این نمونه که از شمال غربی ایران جمع آوری شده، از نظر ریخت شناسی به *M. rimarum*، گونه‌ای انحصاری مناطق مرکزی ترکیه، و نیز *M. umbellulifera* که قبلا از ترکیه و ایران شناخته شده بوده، نزدیک است. صفات تشخیصی گونه جدید بحث شده است. هم چنین دیاگنوز لاتین، شرح و تصویر گونه جدید آورده شده است.

INTRODUCTION

The genus *Minuartia* L. (*Caryophyllaceae* - *Alsinoideae*) comprises ca. 120 usually dwarf, annual or perennial herbaceous species throughout the northern hemisphere (Bittrich 1993). Its members, especially the perennial ones grow usually in inhospitable extreme conditions such as rocky ledges, stony soils and alpine environments (McNeill 1962, 1963). It occurs in Europe with over 50, former U.S.S.R with 44 and Turkey with 42 species (Kamari 1997; Halliday 1964; Meikle 1977; Schischkin 1936; Mc Neill 1967). Parsa (1951) has introduced 24 species for Iran some of which were reduced as synonyms in Flora Iranica (Rechinger 1988). According to Rechinger (1988), Iran with 21 species belonging to six sections, is one of the biodiversity centers of the genus. Although, Assadi (1984) recorded *M. umbellulifera* (Boiss.) Mc Neill from NW Iran, it was not mentioned in Flora Iranica (Rechinger 1988). More than half of *Minuartia* species in Iran are reported from northwestern part of the country (Rechinger 1988).

Turkey, the NW neighbouring country of Iran, with more than 40 species is one of the most important diversification centers of the genus (McNeill 1967).

During herbarium studies of *Minuartia* material deposited at TARI (abbreviations according to Holmgren & Holmgren 1998), we found a herbarium specimen from Azerbaijan province (NW Iran) which morphologically conformed to the description of neither the species mentioned in Flora Iranica (Rechinger 1988) nor Flora of Turkey (Mc Neill 1967). More studies displayed that this herbarium material is related to two species i.e. *M. rimarum* (Boiss. & Bal.) Mattf., a narrow endemic to central and southern Turkey, and *M. umbellulifera* (Boiss.) Mc Neill, known from Iran (Assadi 1984) and Turkey (Mc Neill 1962). Further studies showed that the material represent a new species; differ from two above species mainly in vegetative characters (Table 1).

MATERIALS AND METHODS

Measurements of the morphological characters were made on the dried herbarium specimens. Pollen grains and ripe seeds were taken from the herbarium material deposited at TARI and were studied using SEM microscopy. Pollen grains and seeds were stabilized on aluminium stocks and coated with a thin layer of gold using coating equipments. Then, the specimens were studied using Scanning Electron Microscope, model LEO 440 at Islamic Azad University, Research and Science Branch. Micro-morphological measurements were performed using Carnoy, a digital measurement software (Schols et. al. 2002).

RESULTS AND DISCUSSIONS

Morphology

Minuartia sabalanica Assadi & Mostafavi, **sp. nov.** Fig. 1.

Holotypus. Iran, Azerbaijan, Sabalan Mts., 2900 m, 27. Jul. 1972, Foroughi 6120 (TARI).

Species nova differt a *M. umbellulifera* caulibus glabris (nec parte superioribus glanduloso pilosis), foliis linearibus, planis (nec setaceis), 3- nervis (nec uninervis), distantibus (nec densis), petalis oblanceolato-obovatis (nec oblanceolatis), pedicellis 3.5-6.5 mm longis (nec 6-11), seminibus 5 (nec 9-16), a *M. rimarum* caulibus in parte inferioribus glabris (nec glanduloso pilosis), 7.5- 11 cm longis (nec usque ad 8 cm longis), foliis glabris (nec glanduloso pilosis), pedicellis 3.5-6.5 mm longis (nec 5-14.5).

Perennial, 7-11 cm high, glandular-pubescent on the inflorescence. Stems erect. Leaves linear-canaliculate, apiculate, distinctly 3-veined, with narrow membranous margin toward the base. Inflorescence 2-5- flowered,

Table1. Comparison of some morphological characters in *Minuartia sabalanica, M. umbellulifera* and *M. rimarum*.

Characters / Species	Stem indumentum	Height (cm)	Leaf shape	Leaf indumentum	Leaf veins	Stem leaves length (mm)	Leaf desity	Number of flowers	Petal shape	Pedicel length (mm)	Seed number per capsule
M. umbellulifera	not hairy	6.5- 11	setaceous- terrete	not hairy	1	3.2-6	dense	1-10	oblanceolate	6-11	9-16
M. rimarum var. *multiflora*	glandular-hairy	up to 8	linear to linear oblong, straight, flat	densely glandular-hirsute	3	ca. 4	dense	2-5	obovate	ca. 5-11	unknown
M. rimarum var. *rimarum*	glandular-hairy	up to 8	linear to linear oblong, flat, slightly curved	sub glabrous to moderately glandular	3	ca.3.5-7.5	almost loose	1-2	oblanceolate	ca. 5-14.5	unknown
M. sabalanica	glandular hair on the inflorescence	7.5- 11	Linear, canaliculate, flat, slightly curved	not hairy	3	5-8.5× 0.4-1	loose	2-5	oblanceolate-obovate	3.5-6.5	5

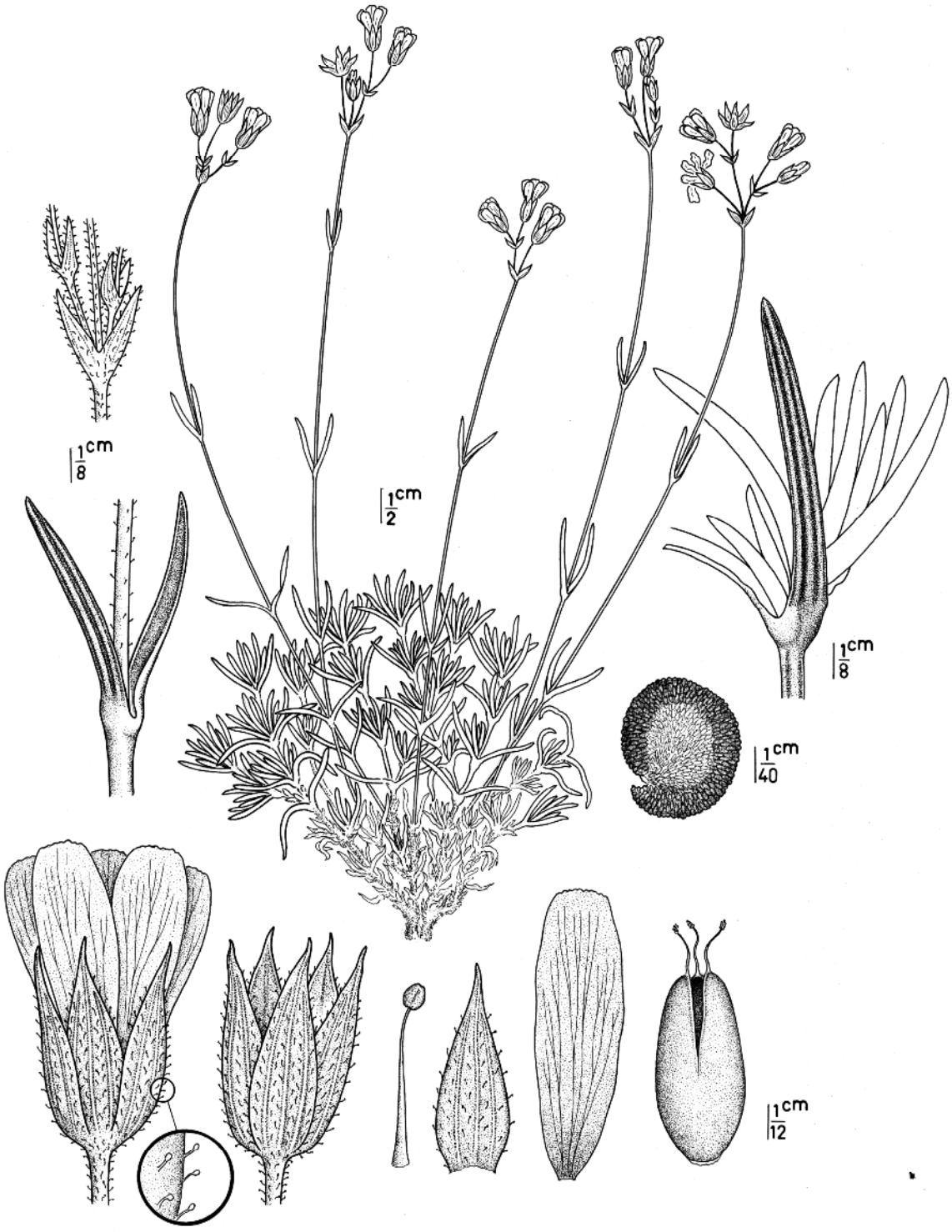

Fig. 1. *Minuartia sabalanica.*

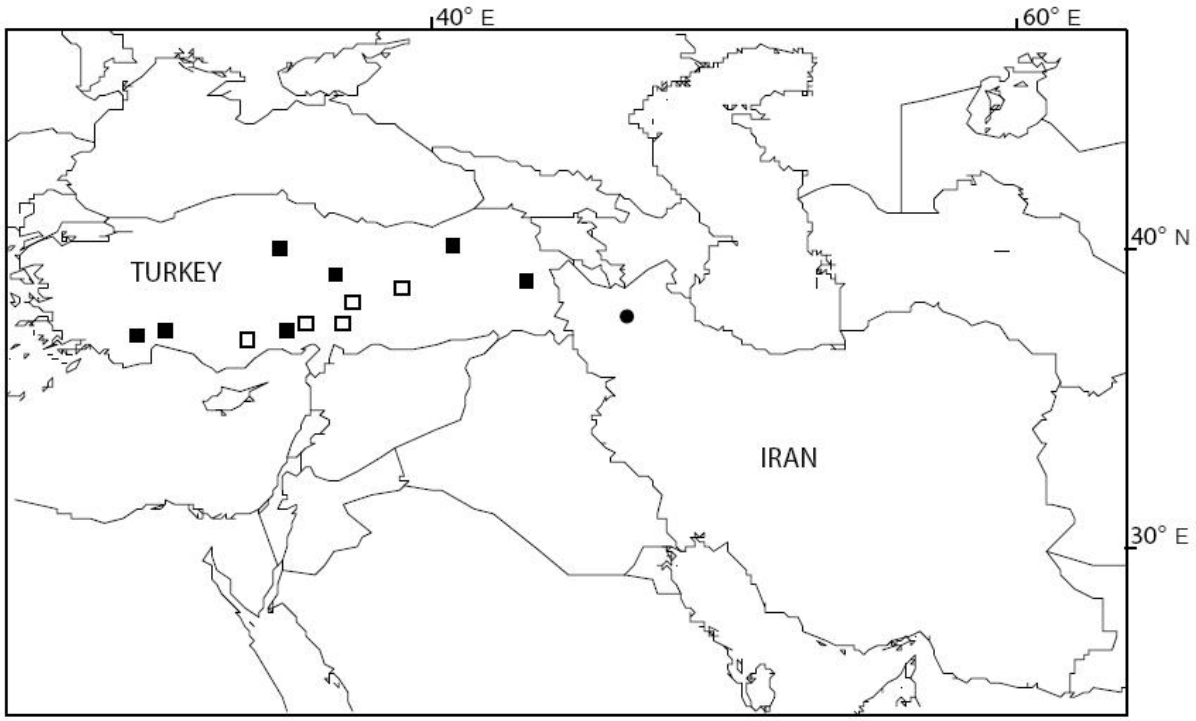

Fig. 2. Distribution of *Minuartia sabalanica* (●), *M. rimarum* (□) and *M. umbellulifera* (■).

not contracted. Pedicels 3.5-6.5 mm long. Bracts 1.8-3× 0.5-1.1mm long, ovate-lanceolate to lanceolate, obtuse to apiculate, distinctly 3-veined, with a narrow membranous margin at the base. Sepals 3.5-5×0.6-1.5 mm long; outer sepals slightly longer than the inners, ovate-lanceolate, distinctly 3-veined, with narrow membranous margin toward the base, incurved. Petals much longer than sepals, 5.1-6.1× 1-1.7 mm, oblanceolate-obovate, cuneate at the base, without claw, white. Stamens yellow. Capsule slightly shorter to slightly longer than sepals, 3.8-4.8×1.9-2 mm, cylindrical. Styles 1.2 mm long. Seeds 5 per capsule, 0.9-1×0.6-0.7 mm long, reniform, light brown, verrucate on the surface.

Minuartia sabalanica is morphologically related to *M. umbellulifera*, but differs from it mainly following characters: leaf shape, leaf veins, pedicel length (Tab.1; Mc Neill 1962, 1967; Assadi 1984). The new species is also related to *Minuartia rimarum*, known only from the central and south parts of Turkey differs from it in having following characters which also listed in Table 1: leaf veins, leaf shape (Mc Neill 1967; Rechinger 1988). In addition, a quite long distance is observed between the distribution of *M. sabalanica* and *M. rimarum* (Fig. 2). Considering the obvious geographical distances between *M. rimarum* and *M. sabalanica*, and differences in some diagnostic characters listed in Table 1, *M. sabalanica* should be mentioned as a distinct species.

Micromorphology

Pollen grain

The results of palynological studies is represented in table 2. Some characters such as, pollen shape, ornamentations, pore number, pore diameter, annulus diameter, were examined in this study (terminology according to Punt & Hoen 1995; Perveen & Qaiser 2006). The observations displayed that pollen grains of both species *M. sabalanica* and also *M. umbellulifera* have rather rounded polyhedral pollen grains (Fig. 3-a,b). Their measures for the quantitative characters plus states of the qualitative characters are listed in Table 2.

The pollen grains in *M. sabalanica* and *M. umbellulifera* are pantoporate with respectively seven and six detectable pores on the equatorial view, and also with scabrate-punctate ornamentations (Table 2, Figs. 3-a,b,c,d).

Seed

The results of seed micro morphology are presented in table 3. Qualitative characters including seed shape, cell shape , cell ornamentation, cell ornament insertion, cell margin shape and also quantitative characters including length and width of seed, length and width of

Table 2. Comparison of palynological data in *Minuartia sabalanica* and *M. umbellulifera*. Abbreviations used: E: equatorial diameter; P: polar axis length; D: pore diameter (annulus included); R: pore diameter; d: shortest distance between the pores; N: number of pores

Characters / species	E(µm)	P(µm)	D(µm)	R(µm)	d(µm)	N(µm)	D/d(µm)	Ornamentation
M. sabalanica	20.287	23.943	4.155	3.153	5.047	7	0.823	Scabrate-punctate
M. umbellulifera	23.674	26.801	5.074	4.227	5.901	6	0.859	Scabrate-punctate

Table 3. Comparison of seed micr-omorphological data in *Minuartia sabalanica* and *M. umbellulifera*. Abbreviations used: SL: seed length; SW: seed width; CL: cell leng

CW: cell width; CD: cell distance; SS: seed shape; CS: cell shape CO: cell ornamentation; COI: cell ornament insertion; CMS: cell margin shape.

Characters / Species	SL(µm)	SW(µm)	SL/SW(µm)	CL(µm)	CW(µm)	CL/CW(µm)	CD(µm)	SS	CS	CO	CMS
M. sabalanica	1027.347	648.33	1.584	72.593	30.694	2.365	1.821	reniform	polygonal	verrucate	incised
M. umbellulifera	1062.086	905.228	1.172	111.374	34.53	2.225	2.808	reniform	oblong	verrucate	incised

cell and distance between cells, were examined (terminology according to Bittrich 1993).

Minuartia sabalanica has an almost reniform seed shape covered with irregular polygonal cells (Fig. 1-k, Fig. 4-a, c). Cell shape is a diagnostic character for distinguishing *M. sabalanica* from *M. umbellulifera* (Table 3, Fig. 4- c,d). Cell margin shape in *M. umbellulifera* is quite incised (Fig. 4-d).

The results indicate that seed micromorphology provides more effective characters for distinguishing these two species from each other.

It should be mentioned that the species *M. rimarum* does not occur in Iran. Therefore, *M. umbellulifera*, the closest species found in Iran, was studied micro-morphologically.

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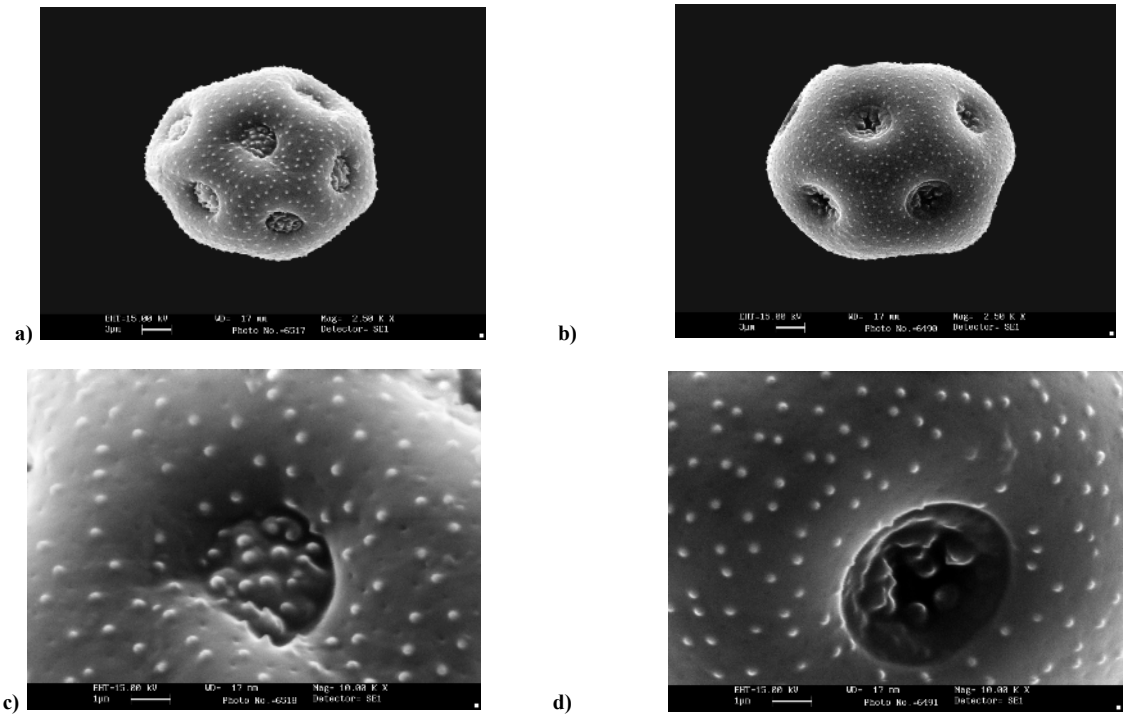

Fig. 3. SEM micrographs of pollen morphology of *Minuartia sabalanica*: a) general view c) pore and ornamentations. scales: a = 3 µm b =1 µm. *M. umbellulifera*: b) general view d) pore and ornamentations. scales: a= 3 µm. b=1 µm.

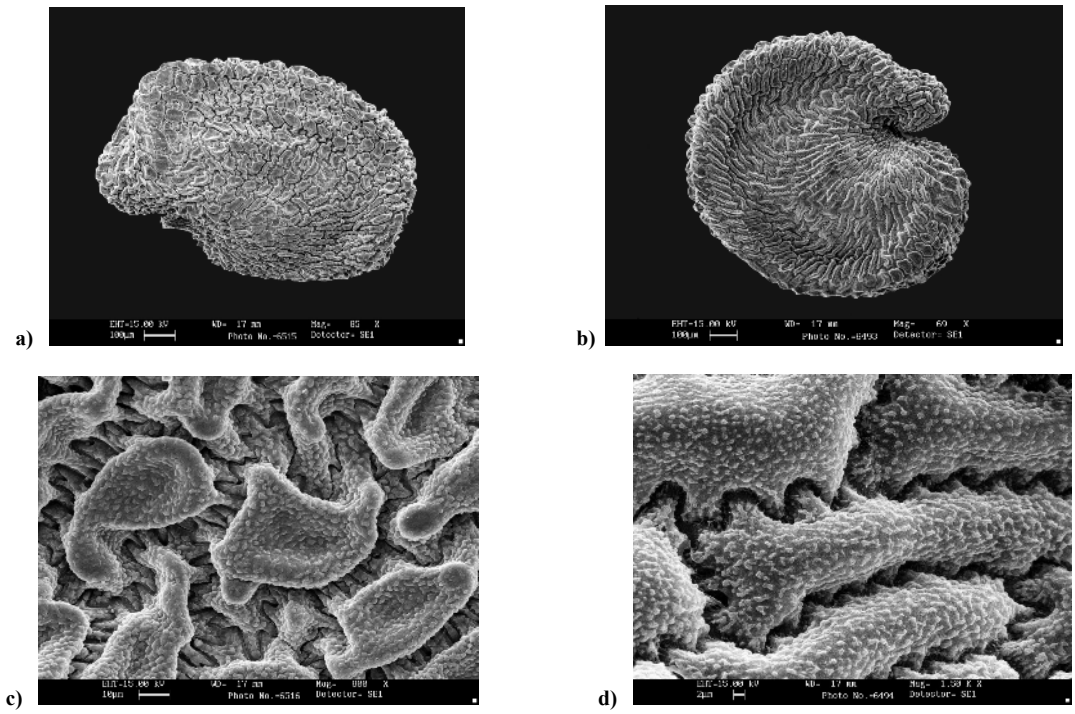

Fig. 4. SEM micrographs of seed morphology: *Minuartia sabalanica*: a) general view c) testa cells. scales: a= 100 µm. c= 10 µm. *Minuartia umbellulifera*: b) general view d) testa cells. scales: a= 100 µm. d= 2 µm.