

# A NEW SPECIES OF LINARIA SECT. DIFFUSAE (SCROPHULARIACEAE) FROM IRAN

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*Linaria boushehrensensis* (*Scrophulariaceae*) is described as a new species from Boushehr and Khuzestan provinces. This species belongs to the section *Difusae*. The new species is compared with its closest relative *Linaria albifrons*. *Linaria boushehrensensis* differs from *L. albifrons* in having longer bracts, corolla and spur and also smaller capsules and different microsculpturing pattern of the seed and capsule surfaces.

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## گونه جدید *Linaria boushehrensensis* از ایران

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گونه جدید *Linaria boushehrensensis* (*Scrophulariaceae*) از ایران معرفی و شرح داده می شود. این گونه متعلق به بخش *Diffusae* است و با گونه نزدیک خود *Linaria albifrons* مقایسه می شود. گونه جدید با گونه مذکور در داشتن برگه های بلندتر، جام گل بلندتر، مهمیز بلندتر و همچنین کپسول کوچک تر و داشتن الگوی متفاوت سلولهای سطحی دانه و کپسول تفاوت دارد.

## Introduction

The genus *Linaria* Mill. is widely distributed throughout the northern hemisphere with its centre of distribution in the Mediterranean basin and eastern Asia. It comprises annual or perennial herbs growing in a wide variety of habitats including dry and sandy soils as well as rocky slopes. Sutton (1988) recognized some 150 species worldwide, of which 25 occur in Iran (Boissier 1867; Davis 1982; Hamdi & al. 2005; Parsa 1950; Sutton 1988). They are including *Linaria elymatica* (Boiss.) Kuperian, *L. fastigiata* Chav., *L. kurdica* Boiss. & Hohen. in Boiss, *L. lineolata* Boiss., *L. michauxii* Chav., *L. nurensis* Miller, *L. odora* (M. Bieb.) Fischer, *L. pyramidalis* (Vent.) F. G. Dietr., *L. remotiflora* Patzak in Rech. f., *L. striatella* Kuprian, *L. albifrons* (Sibth. & Sm.) Steudel, *L. simplex* (Willd.) DC. in Lam. & DC., *L. micrantha* (Cav.) Hoffmanns, *L. arvensis* (L.) Desf., *L. chalepensis* (L.) Miller, *L. armeniaca* Chav., *L. genistifolia* (L.) Miller, *L.*

*dalmatica* (L.) Miller, *L. grandiflora* Desf., *L. vulgaris* Miller, *L. leptoceras* Kuperian. and the recently described *L. karajensis* Hamdi & Assadi, *L. mazandaranensis* Hamdi & Assadi, *L. golesanensis* Hamdi & Assadi and *L. khorasanensis* Hamdi & Assadi (Hamdi & al., 2005a, b, 2006, 2007, 2008). The genus of *Linaria* is most diversified in South-West Asia. During the course of preparing a revision of the genus for the on going project of the Flora of Iran (Assadi & al. 1986-2005), many specimens preserved in Iranian herbaria (TARI, IRAN, TUH, FUMH), as well as new collections of fresh material were examined. We collected some materials of *Linaria* from the mountainous regions of Boushehr and Khuzestan that did not correspond to any of the species known in the genus. These specimens are described as *Linaria boushehrensensis*. In *Antirrhineae* the seed coat features have been reported to have paramount importance for the establishment of the systematic

relationships between taxa at different ranks and even for species delimitation (Elisens 1985; Sutton 1988), therefore these studies were carried out.

### Material and Methods

This study was mainly based on plant materials deposited in different Iranian herbaria, namely: FUMH, IRAN, TARI and TUH (abbreviations according to Holmgren & Holmgren 1998) and also new materials collected in different parts of Iran and were deposited in TARI. Measurements of vegetative and floral parts as well as from the seeds were carried out under a stereomicroscope (Olympus SZH). To investigate the seed coat sculpturing mature seeds were mounted directly on 12.5 mm diameter stubs attached with sticky tape and then coated in a sputter coater with a layer of approximately 25 µm thick of gold/palladium. Morphological observations were carried out in LEO 440I Scanning Electron Microscope. The terminology used for describing the seed coat features followed Sutton (1988) and Segarra & Mateu (2001). To check for the stability of the morphological characters and their putative use as taxonomically informative several specimens from the same and from different populations were examined.

### Results and discussion

***Linaria boushehrensensis*** S. M. M. Hamdi & M. Assadi, **sp. nov.**

*Holotypus.* Iran, Boushehr prov. Boushehr, Shabankareh, 20.02.1964, 100 m, *Pabot* 29747 (TARI). – Figs. 1, 3.

Planta annua, herbacea, glauca, glabra, erecta; caules fertiles 10-15 cm longi, supra ramosi. Folia calina fertilia 10-11×3 mm, alterna, ad basem opposita, lineari-lanceolata, acuta, inferiora opposita vel subopposita. Inflorescentia 1-3 cm longa, floribus 2-5. Bracteeae 5×1 mm, apice obtusae, glandulosae, lanceolata. Pedicelli 1.5-2 mm longi, glanduloso-villosi. Calycis lobi inequales, 5.5-6×1 mm, lineari-lanceolati, obtusi, non scariosi, glanduloso-villosi. Corolla 7-7.5 mm longa, flava; tubus ad osem 2.5 mm latus; sinus labii 0.2-0.3 mm longi; calcar 2-2.5 mm longum, ad basem 0.3 mm latum, rectum. Capsula 3.5-4×3-3.2 mm. Stylus 1.5-1.7 mm longus. Semina 0.7-0.8×0.5-0.6 mm, alata, trigona vel tetrahedra, atro-grisea.

Glauous annual herb, glabrous, erect; fertile stems 10-15 cm long, branched. Leaves of fertile stems 10-11×3 mm, alternate, linear-lanceolate; lower leaves opposite or nearly opposite. Inflorescence 1–3 cm long with 2–5 flowers. Bracts 5×1 mm, obtuse, lanceolate, glandular-villous. Pedicels 1.5–2 mm long, glandular-villous. Calyx lobes unequal, 5.5-6×1mm, linear-lanceolate,

obtuse, not scarios, glandular-villous. Corolla 7–7.5 mm long, yellow; tube 2.5 mm width at mouth; adaxial lip sinus 0.2-0.3 mm long, the distance between lip tops 0.5-0.7 mm; spur 2-2.5 mm long, 0.3 mm width at base, straight, equaling to the rest of corolla. Capsule 3.5-4×3-3.2 mm. Style 1.5-1.7 mm long. Seeds 0.7-0.8×0.5-0.6 mm, winged, triangular or tetrahedral, dark grey.

*Etymology.* The new species is named after the name of province Boushehr in S. Iran.

*Distribution and habitat.* *Linaria boushehrensensis* occurs at an altitude ranging from 50-300 m. It is distributed across the regions between Boushehr and Khuozestan provinces (Fig. 4). From a phytosociological point of view, it is part of a grassland community.

### Comparison of the new species with its relative

Morphological differences between the two taxa studied are presented in Table 1. and partly are shown in Figs. 1-3. Despite the overall close morphology, the two taxa can be distinguished from each other by a number of morphological traits.

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Table 1. Morphological comparison of the new species with *Linaria albifrons*.

Characters	<i>L. bushehrens</i>	<i>L. albifrons</i>
Stem (cm)	10-15	9-10
Leaves (mm)	10-11×3	9-10×3
Pedicel (mm)	1.5-2	1-1.5
Bracts (mm)	5×1	3.5-4×0.2-0.3
Calyx lobes (mm)	5.5-6×1	5-5.5×1
Corolla (mm)	7-7.5×2.5	6.5-7×1
Spur (mm)	2-2.5×0.3	1.5-1.7×0.6
Adaxial lip sinus of corolla (mm)	0.2-0.3	1-1.2
Distance between two tops of adaxial lips (mm)	0.5-0.7	2-2.3
Style (mm)	1.5-1.7	2-2.3
Tall stamen (mm)	3.7-4	3-3.3
Short stamen (mm)	2.8-3	2-2.2
Staminode (mm)	0.3	0.3
Capsule (mm)	3.5-4×3-3.2	4-5×3-4
Seed size (mm)	0.7-0.8×0.5-0.6	0.8-0.9×0.4-0.8
Seed shape	Trigonus, tetrahedral	Trigonus, tetrahedral
Shape of seed surface cells	elliptic-polygonal	elliptic
Size of seed surface cells (μm)	20-26×16-20	26-28×16-17
Ornamentation of periclinal walls	smooth	convex- verrucate
Anticlinal walls of seed surface cells	raised- smooth	raised -verrucate
Shape of capsule surface cells	hexagonal	Regular & irregular polygonal
Anticlinal walls of capsule surface cells	raised-convex	shallow-concave
Size of capsule surface cells (μm)	35-40×30-35	50-60×25-30

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## Appendix

Additional specimens revised.

### *Linaria albifrons*

Representative material. Iran: Boushehr prov., Bandare-Deilam, 150 m, 8.02.1986, Soltani s. n.

(TARI); Dalaki, 12 km to Borazjan, 100 m, 18.04.1984, Maasoumi & Abuhameh 51875 (TARI); Boushehr, 30 km to Bandare-Amir, 20 m, 27.06.1972, Runemark & Mozzafarian 26985 (TARI); Boushehr, 43 km to Borazjan, 5.03.1976, Termeh & Moosavi 34494 (TARI); Khark, 5 m, 10.03.1976, Termeh & Mousavi 34508 (TARI). Khuzestan prov., Handijan, 50 m, Mozzafarian 62401 (TARI); Haft Gel to Masjed Soleiman, 6.03.1972, Iranshahr & Termeh s. n. (IRAN); Mahshahr to Ganaveh, 43 km to Ganaveh, 200 m, 29.02.1972, Iranshahr & Termeh 15025 (IRAN); Mahshahr, 12 km to Ganaveh, 28.02.1972, Iranshahr & Termeh 15026 (IRAN); Masjed Soleiman, to Ahvaz, 75 km to Ahvaz, 9.03.1972, Iranshahr & Termeh s. n. (IRAN).

### *Linaria boushehrens*

Representative material. Iran: Boushehr prov., Ganaveh, Sooiereh, Ghaleh Olia, 100 m, 28.02.1972, Foroughi 3100 (TARI); Boushehr, 43 km to Ganaveh, 180 m, 29.02.1972, Foroughi 3107 (TARI). Khuzestan prov., Behbahan, 320 m, 30.03.1983, Rouhipoor 150 (TARI); Susangerd, Bostan, Allah Akbar, 16.03.1986, Mozzafarian 62672 (TARI).

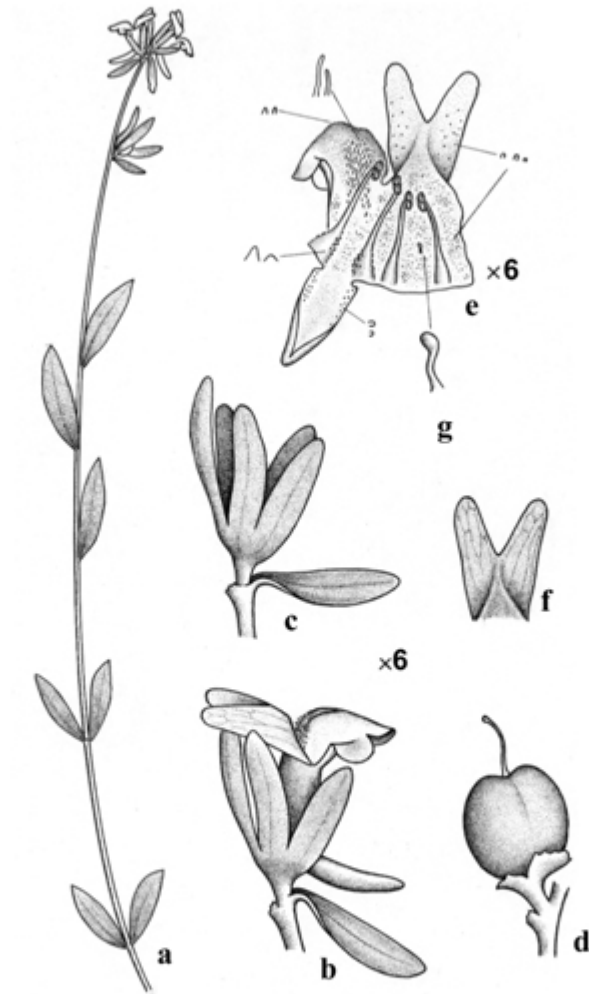


Fig. 1: *Linaria boushehrens* -a: habit, x1; b: flower, x6; c: calyx, x6; d: capsule, x6; e: stamen, x6; f: adaxial lip sinus, x6; g: sterile stamen, x6; -drawn from Foroughi 3107 TARI by M. Mehranfard.

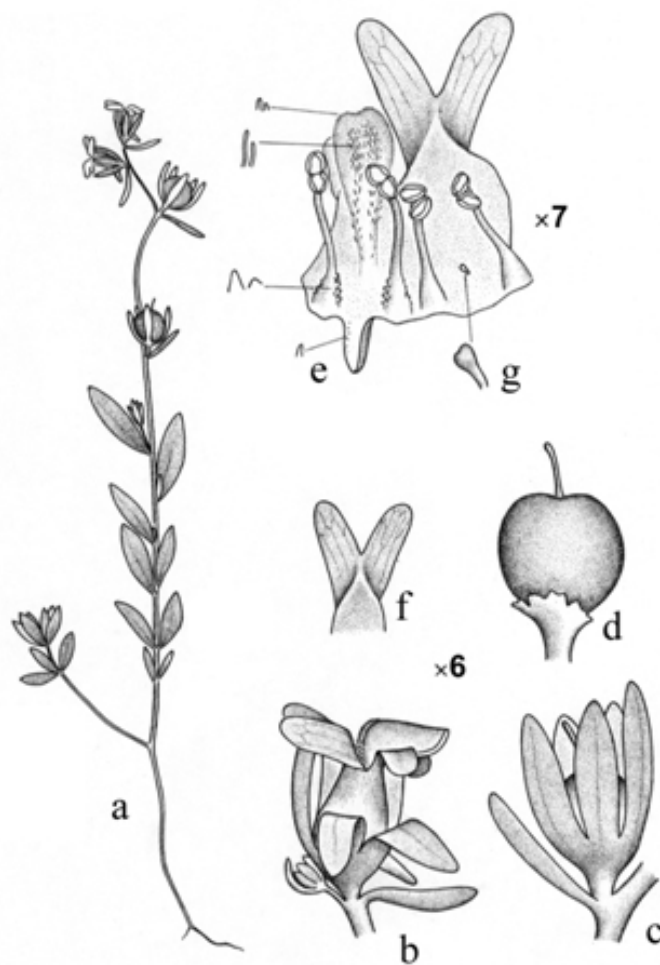


Fig. 2: *Linaria albifrons* -a: habit, x1; b: flower, x6; c: calyx, x6; d: capsule, x6; e: stamen, x7; f: adaxial lip sinus, x6; g: sterile stamen, x7; -Drawn from A.A. Maasoumi & M. Abouhamzeh 51875.

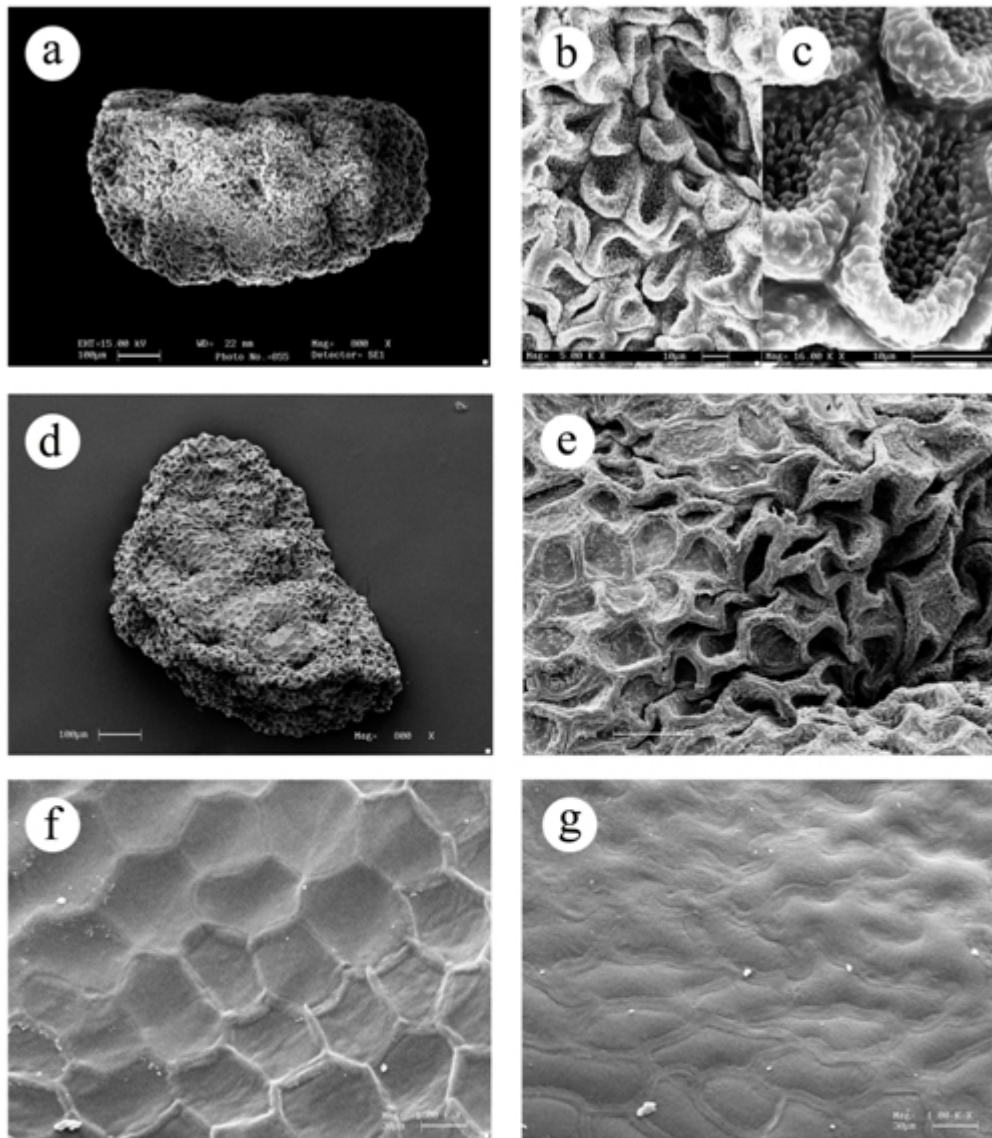


Fig. 3: Scanning electron micrographs of seeds of *Linaria*. a-c & g: *L. albifrons* (Maassoumi & Abouhamzeh 51875), overview (a), seed surface cells (b & c), surface of the inside wall at the base of opened capsule (g). -d, e & f: *L. boushehrensensis* (Foroughi 3107), overview (d), seed surface cells (e), surface of the inside wall at the base of opened capsule (f). Scale bars: a=100  $\mu\text{m}$ , b=10 $\mu\text{m}$ , c=10 $\mu\text{m}$ , d=100 $\mu\text{m}$ , e=30 $\mu\text{m}$ , f=30 $\mu\text{m}$  and g=30 $\mu\text{m}$ .

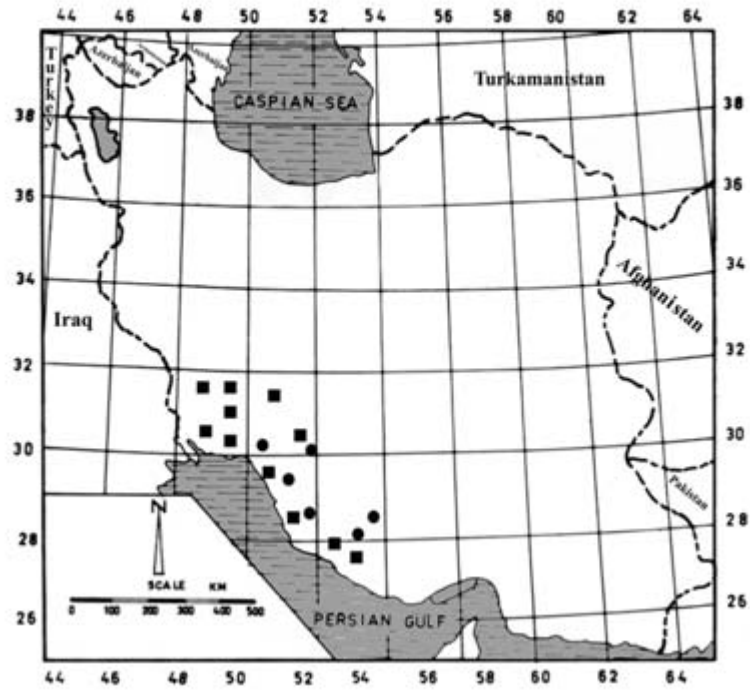


Fig. 4. Distribution map of: ●*Linaria boushehrensensis*. ■*Linaria albifrons*.