

NOTES ON THE GENUS LUZULA (JUNCACEAE) IN IRAN

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Received 2014.06.07; accepted for publication 2014.09.03

Taheri, Gh., Kirschner, J. & Amini Rad, M. 2014. 12. 31: Notes on the genus *Luzula* (Juncaceae) in Iran.- *Iran. J. Bot.* 20 (2): 165-169. Tehran.

Newly collected materials and the existing herbarium specimens belonging to the genus *Luzula* were studied. *Luzula taurica* (V.I. Krecz.) Novikov was identified and is reported as a new record for the flora of Iran. Furthermore a new distribution area for *L. spicata* subsp. *italica* is reported from Iran. *Luzula taurica* is similar to *L. multiflora* but style length and anther/filament length ratio are diagnostic. Morphological comparisons and geographical distribution are also presented, together with an identification key to the members of the genus *Luzula* in Iran.

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Key words: Juncaceae; *Luzula*; new record; Iran

نکاتی در مورد جنس *Luzula* (Juncaceae) در ایران

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در بررسی نمونه‌های تازه جمع‌آوری شده و نمونه‌های هرباریومی موجود گونه *Luzula taurica* (V.I. Krecz.) Novikov به عنوان گزارش جدید و *L. spicata* subsp. *italica* به عنوان گونه نادر با پراکنشی جدید از ایران شناسایی و گزارش می‌شوند. *L. taurica* نزدیک به *L. multiflora* است که وجه تمایز آنها در اندازه طول خامه و نسبت طول بساک به میله پرچم است. همچنین مقایسه‌های مورفولوژیکی و پراکنش جغرافیایی به همراه کلید شناسایی برای اعضاء این جنس در ایران ارائه شده است.

INTRODUCTION

Luzula DC. belongs to the Juncaceae, a family of about 440 species. *Luzula* is the second largest genus in the family with about 115 species, after *Juncus* L. with over 310 species. The genus *Luzula* is almost cosmopolitan, but rare in the mountains of the tropics, with major diversity centers in SW Europe, the Far East, W North America, temperate South America, Australia and New Zealand (Kirschner *et al.* 2002). Boissier (1884) reported *L. forsteri* (Sm.) DC. and *L. multiflora* (Ehrh.) Lej. for the first time for the territory of Iran. In Flora Iranica (Snogerup 1971), *L. spicata* (L.) DC. was reported in addition to the two other species from Iran and recently, Kirschner & Amini Rad (2006) recorded *L. stenophylla* Steud. as a new report from Iran.

The aim of this study is to give a taxonomic account of the genus *Luzula* in Iran and to present results of the

recent explorations of the genus *Luzula* in NW Iran.

MATERIALS AND METHODS

The investigation of the genus *Luzula* was performed based on newly collected specimens from West Azerbaijan (Avrin Mountain) and the existing specimens in IRAN herbarium. Plant nomenclature follows Kirschner *et al.* (2002). Morphological characters were studied by using Olympus SZH Stereomicroscope and the specimens were identified based on Kirschner *et al.* (2002) and Flora Iranica (Snogerup 1971).

RESULTS

New record

Luzula taurica (V.I. Krecz.) Novikov, Nov. Sist. Vyssh. Rast. 27: 20 (1990).

Syn.: *Luzula campestris* subsp. *taurica* V.I.Krecz.,

Žurn. Russk. Bot. Obshch. Akad. Nauk S.S.S.R. 12: 490 (1928).

Perennial, densely or rarely loosely caespitose; rhizome short, without stolon. Stem 8-20 cm tall. Basal leaves 4-8 cm long and 2-4 mm wide, obtuse, flat, densely ciliate at base; cauline leaves 1-2, 50-70 × 0.5-1 mm, ciliate at margins and base, obtuse, margins serrulate. Inflorescence suberect, composed of 1-2 sessile clusters and 2-4 pedunculate clusters, 2-2.5 × 1.5-2 cm; clusters ovoid to hemispherical; tubular prophyll to 5 mm long at base of peduncles; lowest bract herbaceous, acute to obtuse, shorter than or equaling to inflorescence; middle bracts subherbaceous or membranous, acuminate, to 10 mm long, ciliate at margins; bracteoles 1.5-2.5 mm long, membranous, ovoid, fimbriate at apex. Tepals =equal (outer and inner ones), glabrous, 2.8-3.5 mm long, acuminate or mucronate, dark to blackish brown, with margins pale brown. Stamens 6; anthers 2-2.5 as long as filament, 1-1.5 mm; filaments 0.5-0.6 mm long; style ca. 0.7 mm long; stigmas 1.8-3 mm long. Capsule obovate, pale to dark brown, 2.4-2.5 × 1.5-1.6 mm, slightly shorter than tepals, acute. Seeds 1-1.1 × 0.7-0.8 mm, ellipsoidal to widely ellipsoid, brown; appendage 0.4-0.5 mm long, yellowish (fig. 1).

Habitat: alpine meadows and grasslands.

Geographical distribution: Europe (the Balkan Peninsula, Crimea and the North Caucasus), Turkey, the South Caucasus (Armenia and Georgia) and Iran (map 1).

Materials examined: Ardabil province: 25 km from Khalkhal to Assalem, Kerman Mountains, 1800-2100 m, 11.05.1977, Termeh & Matin (22544-IRAN) and 2000-2200 m, 13.05.1977, Termeh & Matin (22545-

IRAN).

It is a very variable species and differences between populations related to a number of minor quantitative traits such as density of indumentums, width of basal leaves, anther length and values of anther/filament ratio, and even the caruncle length. The species is similar to *L. campestris* (L.) DC. and *L. multiflora*. All three belong to section *Luzula*. It differs from the former in caespitose habit and seed characters and from the latter in style length and anther/filament length ratio.

Luzula taurica is considered as a Caucasian phytogeographical element, centered in the Caucasus and extending to the Balkans and Crimea in the west and to Iran in the east. Because of its disjunct distribution, it exhibits an extensive variability. It is the true diploid with $2n=12$ (Kirschner 1993), which is an evolutionary feature clearly differentiating this taxon from the apparently similar allopolyploids (*L. multiflora*, *L. divulgata* Kirschner) or from the agmatoploid *L. stenophylla* with $2n=24BL$ (half-size chromosomes), (Kirschner 1993).

A range extension of *L. spicata* subsp. *italica* in Iran

Luzula spicata (L.) DC., in J.B.A.P. de M. de Lamarck & A.P. de Candolle, Fl. Franç., 3rd edn, 3: 161 (1805).

Syn.: *Juncus spicatus* L., Sp. Pl. 330 (1753).

-- subsp. *italica* (Parl.) Arcang., *Comp. Fl. Ital.* 713 (1882).

Syn.: *Luzula italica* Parl., Fl. Ital. 2: 309 (1857); *Luzula spicata* var. *italica* (Parl.) Rouy, Fl. France 13: 267 (1912); *Luzula spicata* f. *italica* (Parl.) H.Lindb., Acta Soc. Sci. Fenn., n. s. B 1(2): 37 (1932); *L. stilbocarpa* Kirschner & Křisa, Preslia 51: 336 (1979).



Map 1. Geographical distribution of *Luzula taurica*.

Some important characters: Perennials, caespitose. Stem 7-17 cm tall. Inflorescence nodding, rarely suberect, interrupted at base or usually lobate or seldom continuous. Capsules dark castaneous-brown, segments 2-2.8 × 1.2-1.4 mm. Seeds ellipsoidal, 1-1.1 × 0.6-0.8 mm long; appendage whitish-yellowish, ca. 0.1 mm long (fig. 2).

Habitat: alpine meadows, above 3000 m.

Geographical distribution: Europe, Turkey, Caucasus and Iran (map 2).

Materials examined: W Azarbaijan province: Khoy, Avrin Mount, N 38 34 E 44 35, 3060-3636 m, 2.7.2013, Amini Rad & Torabi (60889-IRAN). Ardabil: Sabalan Mount., dry, stony part of the north face, N 38 10 E 47 40, 21 Aug 1961, G. N. Harrington 219 (K).

In Flora Iranica (Snogerup 1971), the species has been reported based on a specimen collected by Harrington from northern slopes of Sabalan Mountains at an altitude of 3800 m in 1961 and is confirmed by Dr. Kirschner.

Taheri (1993) confirmed it from Iran but she did not examine the relevant specimens. Nevertheless, in the floristic study of the northern and eastern slopes of Sabalan Mountain by Sharifi et al (2012), this species was not recorded. Recent collection is the second report after about 50 years that shows the distribution of it in the North West of Iran.

The species has five subspecies in the world which are separated based on differences in shape and size of

inflorescence, capsule, seed size, anther length and anther/filament length ratio.

Luzula spicata subsp. *italica* covers a series of forms occurring in the mountains of Corsica, Sardinia, C Italy, the Balkan Peninsula, the Caucasus, Turkey and NW Iran.

The distribution is disjunct and each regional population is characterized by minor morphological differences, and sometimes also by different chromosome numbers (two numbers are known, both agmatoploid or partially agmatoploid at the diploid level, i.e. $2n=24$ BL and $8AL+8BL$, see Kirschner et al. 2002); this complexity resulted in publications of several specific or subspecific names for this variable species (*L. bulgarica* Chrtek & Křisa; *L. stilbocarpa* Kirschner & Křisa). The whole group of forms is in a need of taxonomic and karyological revision.

Identification key to the *Luzula* species in Iran

1. Flowers solitary on long peduncles; seed appendage apical [*L. forsteri*] 2
 - Flowers in dense clusters; seed appendage basal or almost not visible 3
2. All basal leaves conspicuously broad, (3-) 4-7 mm wide *L. forsteri* (Sm.) DC. subsp. *caspiaca* Novikov
 - Basal leaves narrow, 1.5- 4 mm wide
L. forsteri (Sm.) DC. subsp. *rhizomata* (Ebinger) Kaplan



Map 2. Distribution of *Luzula spicata* subsp. *italica*.

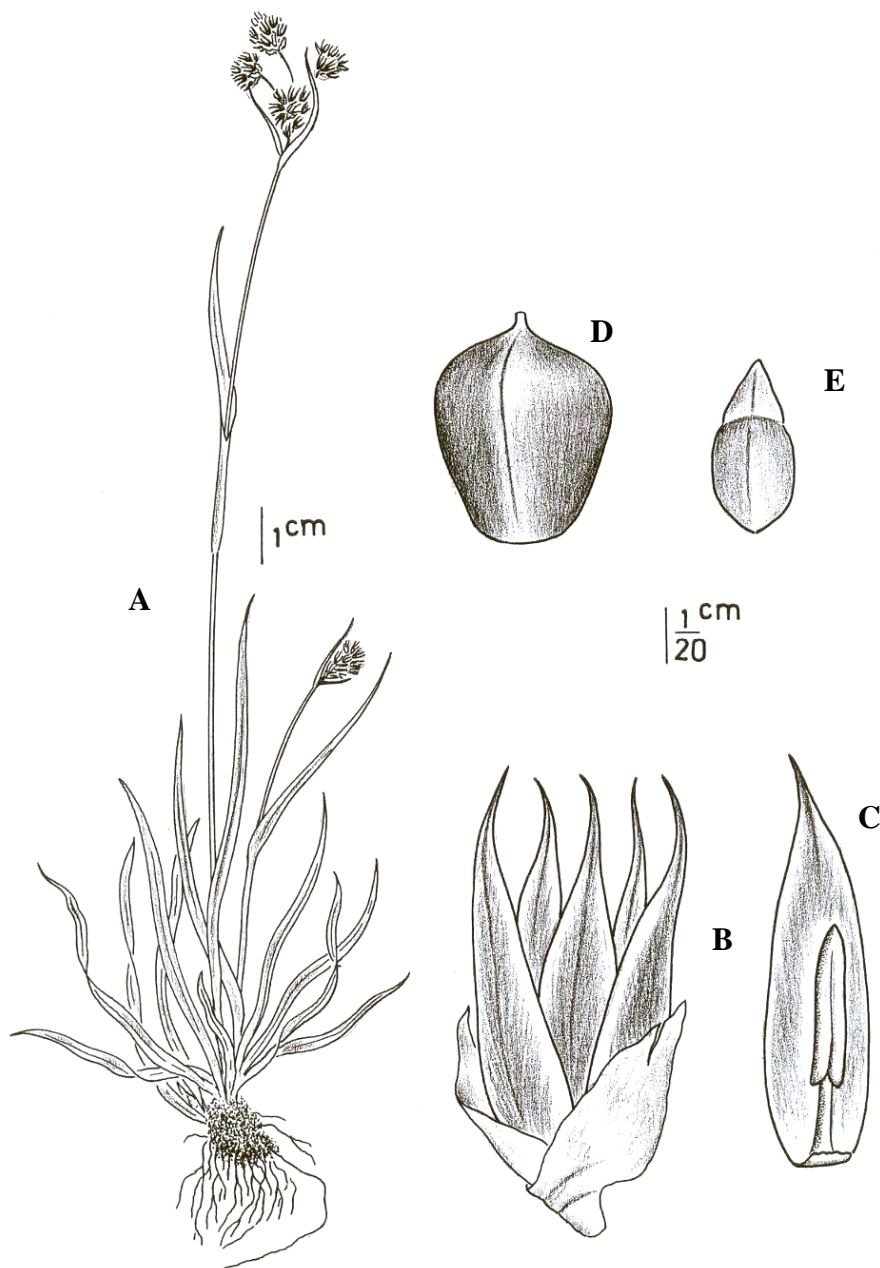


Fig. 1. *Luzula taurica*. A. habit; B. floret; C. glume ; D. stamen; capsule; E. seed.

3. Inflorescence nodding; leaf apex acute

L. spicata (L.) DC. subsp. *italica* (Parl.) Arcang.

- Inflorescence erect; leaf apex obtuse 4

4. Seed appendage ca. 0.1 mm long; ripe capsule segments 1.6-1.9 mm long; seeds 0.5-0.6 mm wide; anthers 0.5-0.7 mm long *L. stenophylla* Steud.

- Seed appendage 0.3-0.5 mm long; ripe capsule segments 2.0-3.0 mm long; seeds 0.7-0.8 mm wide; anthers longer than 0.7 mm 5

5. Lower bract much shorter than inflorescence; anther / filament length ratio ca. 2.5; style 0.7-1.1 mm long; inflorescence always without secondary branches

L. taurica (V. I. Krecz.) Novikov

- Lower bract longer than or equaling to inflorescence; anther / filament length ratio 1-2; style 0.4-0.8 mm long; inflorescence sometimes with secondary branches

L. multiflora (Ehrh.) Lej. subsp. *multiflora*

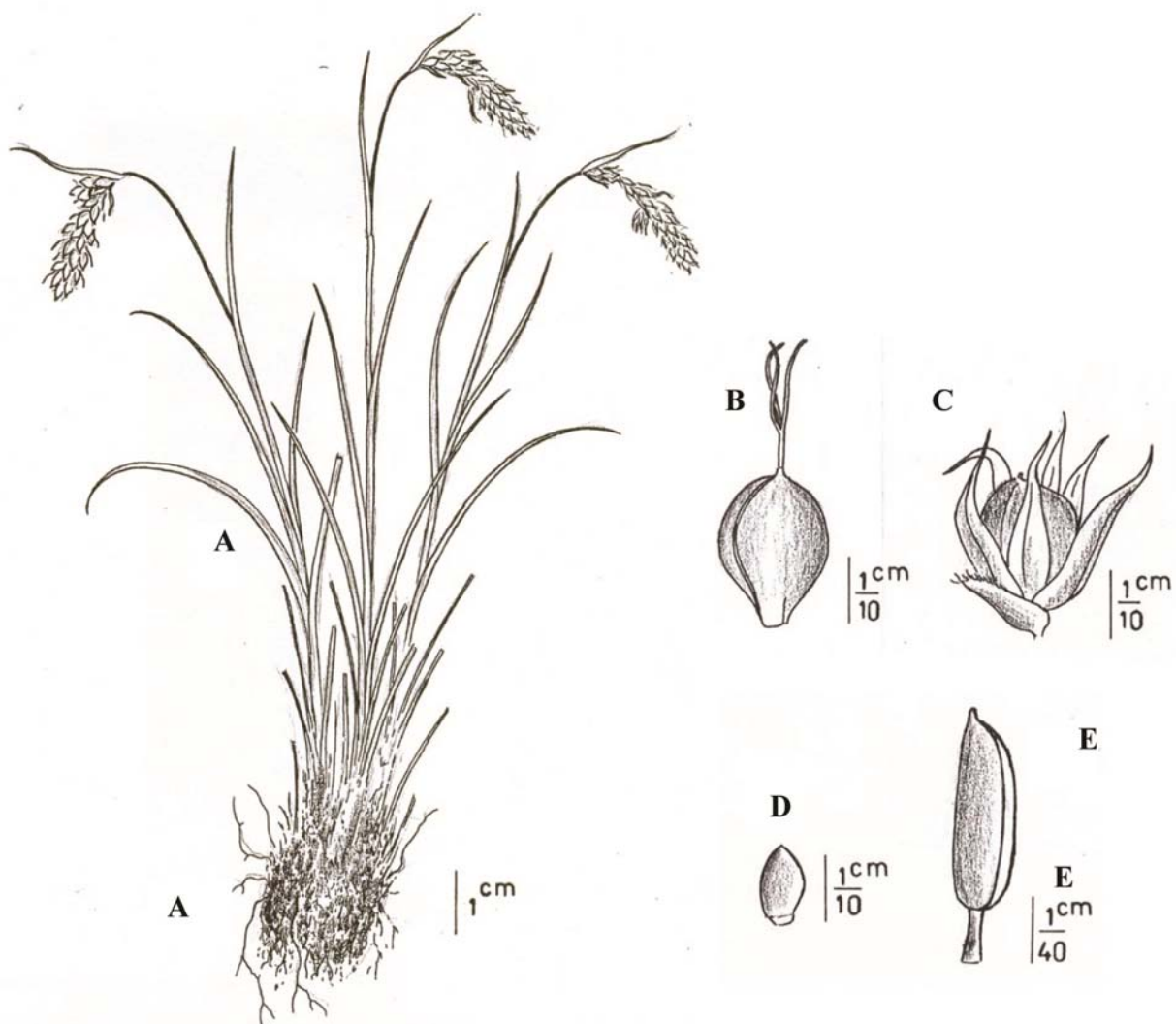


Fig. 2. *Luzula spicata* subsp. *italica*. A. habit; B. capsule; C. floret; D. seed; E. stamen.

ACKNOWLEDGEMENT

The authors would like to thank Mr. Mehranfard, the artist in the IRAN herbarium, for drawing the illustrations.

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