

EREMURUS ALBERTI, A NEW ADDITION OF MIDDLE ASIA TO THE FLORA OF IRAN

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Eremurus alberti is introduced as a new record for the flora of Iran from the Khorasan-e-Razavi Province in northeast Iran. It grows on marl hills and rocky slopes in arid or semiarid areas and distinctly differs from the other Iranian *Eremurus* species by its fleshy red petals. Its remarkable features, such as impressive rosette leaves, and eye-catching inflorescence during flowering and fruiting periods, make it a sought-after choice for ornamental purposes. This species is mainly distributed in Middle Asia and Afghanistan. A detailed description, pictures, and distribution map for the species are presented.

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گونه *Eremurus alberti*. گزارشی جدید از گونه‌های آسیای میانه برای فلور ایران

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در این مطالعه گونه *Eremurus alberti* به عنوان گزارشی جدید برای فلور ایران از استان خراسان رضوی معرفی می‌شود. این گونه در تپه ماهورهای مارنی و دامنه‌های صخره‌ای مناطق خشک و نیمه خشک کپه داغ در شمال شرقی کشور رشد می‌کند. گونه‌ی یادشده با داشتن گل‌های قرمز گوشتی از سایر گونه‌های سریش در ایران بسیار متفاوت است. این گونه با داشتن برگ‌های قاعده‌ای چشمگیر، گل‌آذین بسیار زیبا در دوره‌ی گلدهی و میوه، می‌تواند یکی از گونه‌های بسیار زیبا برای اهداف تزئینی باشد. این گونه خاص مناطق آسیای میانه و افغانستان است. در این مقاله شرح جامع گونه، تصاویر و نقشه‌ی پراکندگی آن ارائه می‌گردد.

INTRODUCTION

Eremurus M. Bieb., consists of 59 species and 6 hybrids (POWO 2024; Hassler 2024). It is undeniably one of the most stunning genera in Asphodelaceae Juss. This genus has adapted remarkably well to the harsh conditions of arid and semiarid regions in Middle and West Asia. (Hedge & Wendelbo 1963; Xinqi & al. 2000). The remarkable features of *Eremurus* species, such as impressive rosette leaves, eye-catching inflorescence during flowering and fruiting periods, sociability, and ability to thrive in dry and low-water

areas, make them a sought-after choice for ornamental purposes. There are 10 taxa of *Eremurus* in Iran, with two of these being endemic (Assadi & al 2023), Including *E. alberti* Regel as a new record, the number of species increases to 11.

The taxonomic treatment of *Eremurus* divides the genus into two subgenera and three sections. The subgenus *Hennigia* (Kar. & Kir.) Baker is characterized by a single nerve, erect or recurved tepals, and flowers subrotate. In contrast, the subgenus *Eremurus* is characterized by having 3-5 nerves, incurved or rolled-

up tepals, and tubular or campanulate flowers (Wendelbo 1982). Both subgenera have monad and oblate pollen grains, with mono-furrow and reticulate surface ornaments. (Fallah & al. 2019).

Based on morphological and molecular data, *Eremurus* is a monophyletic genus (Naderi Safar & al. 2009; Naderi Safar & al. 2014; Makhmudjanov & al. 2022). Combining nuclear and cpDNA data on *Eremurus* indicates that the subgenus *Eremurus* is monophyletic. In contrast, the subgenus *Henningia* is paraphyletic. *Eremurus persicus* (Jaub. & Spach) Boiss., which was classified under subgenus

Henningia, was placed outside this subgenus; in fact, this species is sister to other *Eremurus* species (the two mentioned subgenera), (Wendelbo 1982; Naderi Safar & al. 2009; Naderi Safar & al. 2014; Assadi & al. 2023).

In the present study, we have reported *Eremurus alberti* for the flora of Iran from the slopes of Kopet Dag Mountains and developed a description and distribution map for this species. In addition, we present photographs of *E. alberti* and other Iranian *Eremurus* species (Figs. 1 & 2).



Fig. 1: *Eremurus alberti* Regel: A1, habitat; A2-A3, habit; A4, fascicled roots; A5, transverse section of leaves; A6, flowers; A7, white-membranous bracts; A8, tri-lobed capsules and winged seeds (photos: A1-A3, F. Sahragard; A4-A5 and A8, E. Jarchi; A6-A7, A.R. Mokhtari).

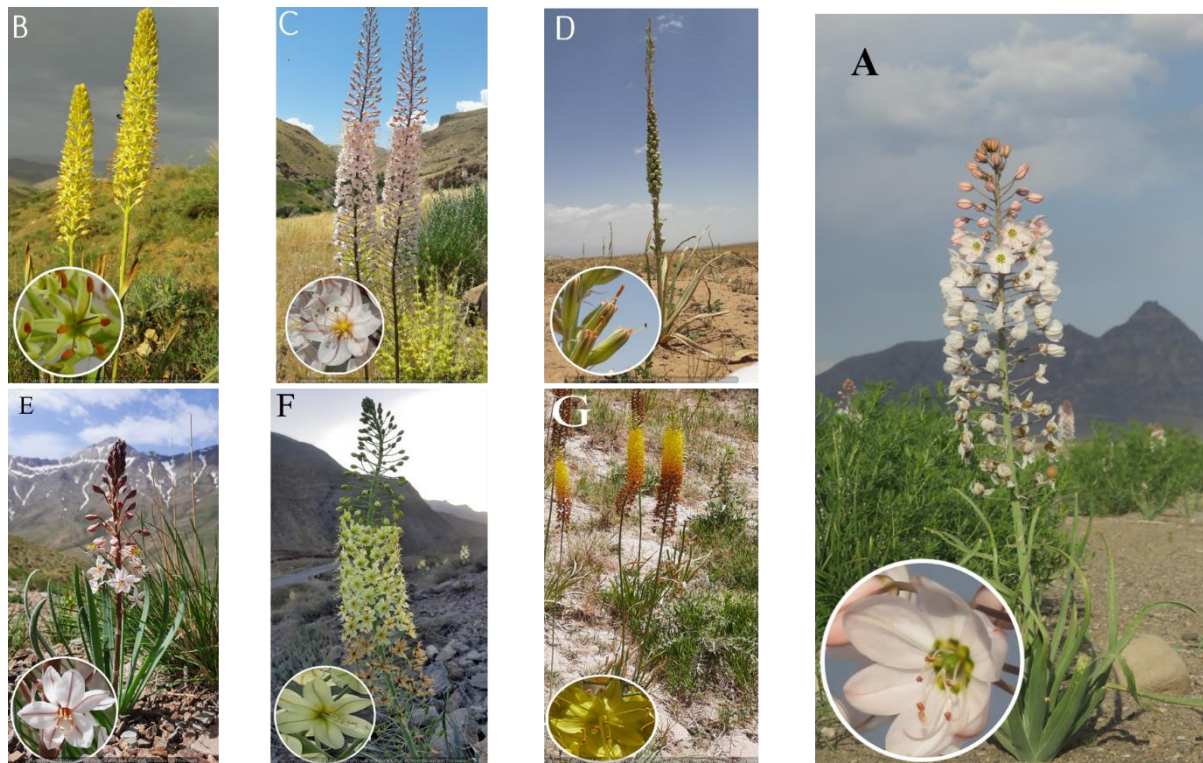


Fig. 2: Images of *Eremurus* species in Iran. A, *E. kopetdaghensis* Karrer; B, *E. spectabilis* M.Bieb.; C, *E. olgae* Regel; D, *E. inderiensis* (M.Bieb.) Regel; E, *E. persicus* (Jaub. & Spach) Boiss.; F, *E. luteus* Baker; G, *E. stenophyllus* (Boiss. & Buhse) Baker; (photos: B-D, E. Jarchi; E-G, A.R. Mokhtari; A, A. Talebi).

MATERIAL AND METHODS

During the botanical field trip in northeastern Iran, in the Khorasan-e-Razavi province, we observed two strikingly beautiful *Eremurus* on the slopes of the Kopet Dagh Mountains. One of them, *E. luteus* Baker, is a well-known and commonly found species with yellow flowers easily recognizable in this region. The second species, which had pale fleshy red flowers, was unfamiliar. We collected two specimens of this unknown *Eremurus* species. Specimens were studied, compared, and identified with relevant references (Fedchenko 1968; Wendelbo 1982; Makhmudjanov & al. 2022; Assadi & al. 2023) and images of related species in E and P herbaria (acronyms according to Thiers 2016). The voucher specimens are preserved at

the Herbarium of the Research Institute of Forests and Rangelands (TARI).

RESULTS AND DISCUSSION

Eremurus alberti Regel, with its rotate-subrotate flower, recurved and 1-nerved petals belongs to the subgenus *Heninngia*. *Eremurus alberti* is closely related to *E. kopetdaghensis* Karrer and *E. luteus* Baker (Hedge & Wendelbo 1963). This species is recognizable by its oblanceolate tepals, three-lobed capsules, smooth leaf margins, and wider leaves compared to the two related species. Furthermore, the anthers and flower color differ from *E. kopetdaghensis* and *E. luteus* (Table 1).

Table1. Comparison of diagnostic traits of *Eremurus alberti* and its closely related taxa.

species	Tepal color	Tepal shape	Capsule shape	Leaf margin	Leaf width	Anthers color
<i>Eremurus alberti</i>	Rosy-red	Oblanceolate	Tri-lobed and ovoid-globose	Smooth	17-25 mm	Red
<i>E. luteus</i>	Yellow	Elliptic	Smooth and elliptic	Rough	2-10 mm	Yellow
<i>E. kopetdaghensis</i>	Pale pink to almost white, at the base yellow	Elliptic	Smooth and subglobose	Rough	2-16 mm	Yellow

Eremurus alberti Regel; Act. Hort. Petrop. 8: 668 (1883). Fig.1 (A1-A8).

Types: In eastern Bukhara to the south Kulab city to the Chodscha Mumyn mountain, alt. 3000 foot (915 m). April, A. Regel LE and K.

Perennial, 60-100 cm high. Roots fascicled, fleshy, obconic, yellow in living roots to brown or black brown in preserved specimens, 5-17 mm in diameter, 10-17 cm long; collar densely clothed in fibrillose remnants of old leaves and membranous sheaths. Stem 7-12 mm in diameter, smooth and ribbed in drying. Leaves basal (15-23), crowded, narrowly linear-lanceolate, boat-shaped, glabrous, smooth in margins, 20-36 cm long, 1.7-2.5 cm wide, with parallel veins. Raceme somewhat remote to narrowly dense, 30-50 cm long, 10-15 cm wide, glabrous; bracts white-membranous, with obvious nerve, lanceolate, and at the end filiform, ciliate in margin, 17-22 mm long; pedicels slender in flower, 20-35 mm long (30-45 mm in fruit), glabrous, divergent, finally thickening, horizontally spreading. Tepals subrotate, segments pale red, oblanceolate, 16-18 mm long and 2.5-3.5 mm wide, bend backward until fruiting period; androecium with 6 stamens, shorter than tepals and style, unequal, 10-16 mm, s-shaped, filament pale red, glabrous, anthers 2.3-2.7 mm; Pistillode with 3 carpels, with 1 style; style 13-15 mm, glabrous, permanent. Capsule, glaucous to peachy, loculicidal, trivalve, three-lobed, ovoid-globose, approximately 23 mm long and (17) 20 mm wide, glabrous, with thick walls, every locus with (7)8 seeds (22-26 seed per capsule). Seeds trilobate, 8-10 mm×3-5 mm, winged, and wings to 2-3 mm wide.

Specimens examined: Iran, Khorasan-e-Razavi, 70 km NE Mashhad, next to Negin-e-Sabz rest area, near TaherAbad village, 36°35'03" N, 60°01'07" E, 1100-1200 m, 18 April 2024, Sahragard, Mokhtari, and Jarchi (TARI-4222, 4223).

Phenology: The flowering and fruiting seasons in late March to May.

Habitat: *Eremurus alberti* grows in arid areas with marl hills and prefers the rocky slopes of the mountains. *Eremurus luteus*, *Iris kopetdagensis* Vved., *Chesneya kopetdaghensis* Boriss., and *Phlomooides labiosa* (Bunge) Adylov, Kamelin & Makhm. are indicator companion species that are seen with *E. alberti* in the same habitat.

General distribution: Iran, Afghanistan, Middle Asia (Pamir-Alay): Kyrgyzstan, Tajikistan, Uzbekistan.

Notes: Kope Dagh is a mountain range that extends from Turkmenistan into Iran and represents one of the key floristic provinces within the Irano-Turanian region. This province is recognized as a significant center of endemism within Iran (Noroozi & al. 2019; Memariani & al. 2016a). The region serves three key functions: firstly, it acts as a vital corridor for species migration from Middle Asia and Afghanistan to the Iranian plateau and elsewhere (Memariani & al. 2016b) and vice versa; secondly, its marl soil conditions provide an ideal habitat and refuge for certain species; lastly, it functions as a barrier that inhibits the growth, establishment, and migration of species (seeds). In different genera, several middle Asian species have settled in this mountain range and have not migrated to the inner plateau of Iran, some of which include *Scutellaria luteocaerulea* Bornm. & Sint., *Phlomooides regeliana* (Aitch. & Hemsl.) Adylov, Kamelin & Makhm., *Dracocephalum subcapitatum* (Kuntze) Lipsky, *Hypogomphia turkestanica* Bunge (Jamzad 2012), *Limonium sogdianum* (Popov) Ikonn.-Gal., *Cephalorhizum turcomanicum* Popov, *Acantholimon raddeanum* Czerniak. (Assadi 2005). The patterns of migration of the Middle Asian species in the Kope Dagh Mountain range are probably similar to *Eremurus alberti* (Fig. 3).



Fig. 3: Geographical distribution of *Eremurus alberti* Regel in Iran-Afghanistan-Middle Asia (yellow triangle).

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