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TRIFOLIUM RETUSUM, A NEW RECORD FOR THE FLORA OF IRAN, AND A SHORT NOTE ON T. SYLVATICUM

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Trifolium, with about 290 species worldwide, is a significant and the largest genus of legumes in Iran, after *Astragalus* and *Onobrychis*. The endemic rate of the genus *Trifolium* in Iran is low. *Trifolium kurdistanicum* and *T. radicosum* are the only endemic species, restricted to subalpine and alpine regions. This study aims to introduce *T. retusum* as a new record and report a rediscovery of *T. sylvaticum* for the Flora of Iran in Kurdistan Province. A detailed description, a distribution map, photographs, and an identification key for *T. retusum* from its annual related species in section *Lotoidea* are prepared.

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گونه Trifolium retusum گزارشی جدید برای فلور ایران، و یادداشتی کوتاه درباره‌ی T. sylvaticum

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Trifolium با داشتن حدود ۲۹۰ گونه در دنیا، یکی از جنس‌های مهم و بزرگ بعد از گون و اسپرس در تیره‌ی باقلاییان در ایران می‌باشد. نرخ بومزادی جنس شبدر در ایران بسیار پایین است. T. kurdistanicum و T. radicosum تنها گونه‌های انحصاری ایران هستند که به مناطق آلپی و نیمه آلپی محدود شده‌اند. اهداف این مطالعه معرفی T. retusum به عنوان گزارشی جدید و کشف مجدد T. sylvaticum از استان کردستان برای فلور ایران می‌باشد. شرح جامع، پراکنش جغرافیایی، عکس و کلید شناسایی T. retusum از گونه‌های خویشاوند یکساله‌اش در بخشه Lotoidea ارایه شده است.

INTRODUCTION

Trifolium L. is one of the most important genera of the Fabaceae Lindl., which is used as fodder, green manure crops, and nitrogen fixation (Gillet & al. 2001; Ellison & al. 2016; Sprent & al. 2001; Scoppola & al. 2016). It comprises about 290 annual and perennial species and 7 hybrids (*POWO*, 2024; Hassler, 1994-2024). This genus has a cosmopolitan distribution and is mostly widespread in the Mediterranean and its adjacent regions (Zohary & Heller 1984; Sayed Ahmed & al. 2021; Ellison & al. 2016; Scoppola & al. 2016).

Traditionally, *Trifolium* has been classified into 8 sections, of which *Vesicaria*, *Mistyllus*, *Trifolium*, *Trichocephalum*, *Choronosemium*, and *Paramesus* distributed in the Old World, sect. *Involucrarium* is restricted to the New World, and finally, *Lotoidea*

is scattered in both hemispheres (Zohary and Heller 1984). Ellison & al. (2016) based on molecular phylogeny, placed the genus *Trifolium* into two subgenera and nine sections.

In Iran, *Trifolium* is the largest genus in the Fabaceae family after *Astragalus* L. and *Onobrychis* Mill. Its endemic rate is low. *T. kurdistanicum* S.Yousefi, Assadi & Ghaderi and *T. radicosum* Boiss. & Hohen. are the only endemic species, restricted to subalpine and alpine regions (Nemati Paykani 2023; Yousefi & al. 2017).

In the present study, in addition to introducing *T. retusum* L. as a new record for the Flora of Iran, two new localities were rediscovered for the rare species *T. sylvaticum* Gérard in Kurdistan Province. The morphological diagnostic characters of *T. retusum* that differentiate from other annual species in section *Lotoidea* are given in Table 1. Additionally, an embedded identification key and a description are included to aid in distinguishing *T. retusum* from these annual related species in *Lotoidea*.

According to Zohary and Heller (1984), the sect. *Lotoidea* displays morphological heterogeneity. This heterogeneity is evident in the micro-morphology of seeds, specifically in their length and hilum shape (Salimpour & al. 2007). Nuclear and cpDNA data support this morphological heterogeneity within the sect. *Lotoidea* (Steele & Wojciechowski 2003; Ellison & al. 2016; Yılmaz & Yeltekin 2022, 2023). The traditional concept is the cosmopolitan section, which comprises over 95 species (Zohary 1972; Zohary & Heller 1984). In the flora of Iranica, 9 species were placed in this section, of which all except *T. retusum* were reported in Iran (Heller, 1984). We report it for the Flora of Iran.

Photos of *T. radicosum*, *T. nigrescens* subsp. *petrisavii* Clementi, *T. hybridum* L. and *T. repens* L. other members of section *Lotoidea*, along with *T.sylvaticum* and *T. retusum*, have also been provided (Fig. 1). The distribution map of the last two species is drawn (Fig. 2). With the addition of *T. retusum*, the number of known Iranian *Trifolium* species has now reached 51.

MATERIAL AND METHODS

While on a field trip in the western region of Iran, in Kurdistan province, we collected *Trifolium* specimens from the slopes of the Zagros Mountains. These specimens were meticulously studied and compared with relevant references (Bobrov 1945; Coombe 1968; Zohary 1970; Townsend & Guest 1974; Heller 1984; Nemati Paykani 2023). The voucher specimens were preserved at the Herbarium of Research Institute of Forests and Rangelands (TARI)

RESULTS AND DISCUSSION

***Trifolium retusum* L.**, Demonstr. PL 21 (1753). (Fig. 1: A); Fl. Turkey 3: 397 (1970): Fl. Iranica. 157: 288 (1984); Fl. Iraq. Figure 26, 3: 185 (1974).
Type: Spain

Annual, 7-15 cm high; stem 0.7-1 mm in diameter, branched at the base (rarely unbranched), smooth and ribbed in drying, erect or procumbent or ascending, not rooting at nodes. leaves glabrous, petioles c. 10-30 mm long; leaflets 5-10 mm, 2-3 times as long as broad, ovate, mostly acute and mucronate, cuneate at the base, finely serrate, generally taller than Inflorescence, 8-14 lateral veins, somewhat recurved and thickened toward leaflet margin; petiolules less than 1 mm long, ± equal; stipules 5-7 mm, broad-ovate, 2-6-veined, acuminate. Inflorescence axillary, racemose, globose, 0.8-1.0 cm diameter., pedunculated, 15-30-flowered; peduncles 0.5-1.5 cm, shorter than the leaves. Bracteoles 1-2 mm, up to half of calyx tube, subulate; flowers; sessile to subsessile (up to 1 mm), somewhat recurved at fruiting, 3-5 mm; Calyx 5-6 mm, ± glabrous or with a few scattered hairs, 10-nerved, not inflated at fruiting; throat open, with subulate, reflexed teeth 3-4 mm, the teeth unequal, narrowly triangular, recurved at fruiting but not flowering; upper 2 teeth longer than corolla; Corolla white or pink, persistent, 3-5 mm long; Pod glabrous, straight, shorter than calyx, 2-3 mm long, 2-seeded; seeds c. 1 mm diameter.
Phenology: The flowering and fruiting time from May to June.

Habitat: *T. retusum* is found in oak forests and the shade of willows near water streams. In oak communities, this species exhibits higher population density, stem branches, and canopy cover compared to willow communities. In willow communities, this species grows alongside *T. arvense* L., *T. dasyurum* C. Presl, *T. nigrescens* subsp. *petrisavii*, *Geranium dissectum* L., and *Ranunculus trichophyllus* Chaix. However, in oak communities where there is a greater diversity of *Trifolium* species rather than *Salix* communities, *T. retusum* thrives alongside *T. tumens* M.Bieb, *T. resupinatum* L., *T. tomentosum* L., *T. campestre* Schreb., *T. scabrum* L., *T. pilulare* Boiss., *T. purpureum* Loisel., *T. sylvaticum*, *T. arvense*, *T. cherleri* L., and *T. hirtum* All.
General distribution: Central and South Europe to the Caucasus, NW Africa, Iraq, and Iran.

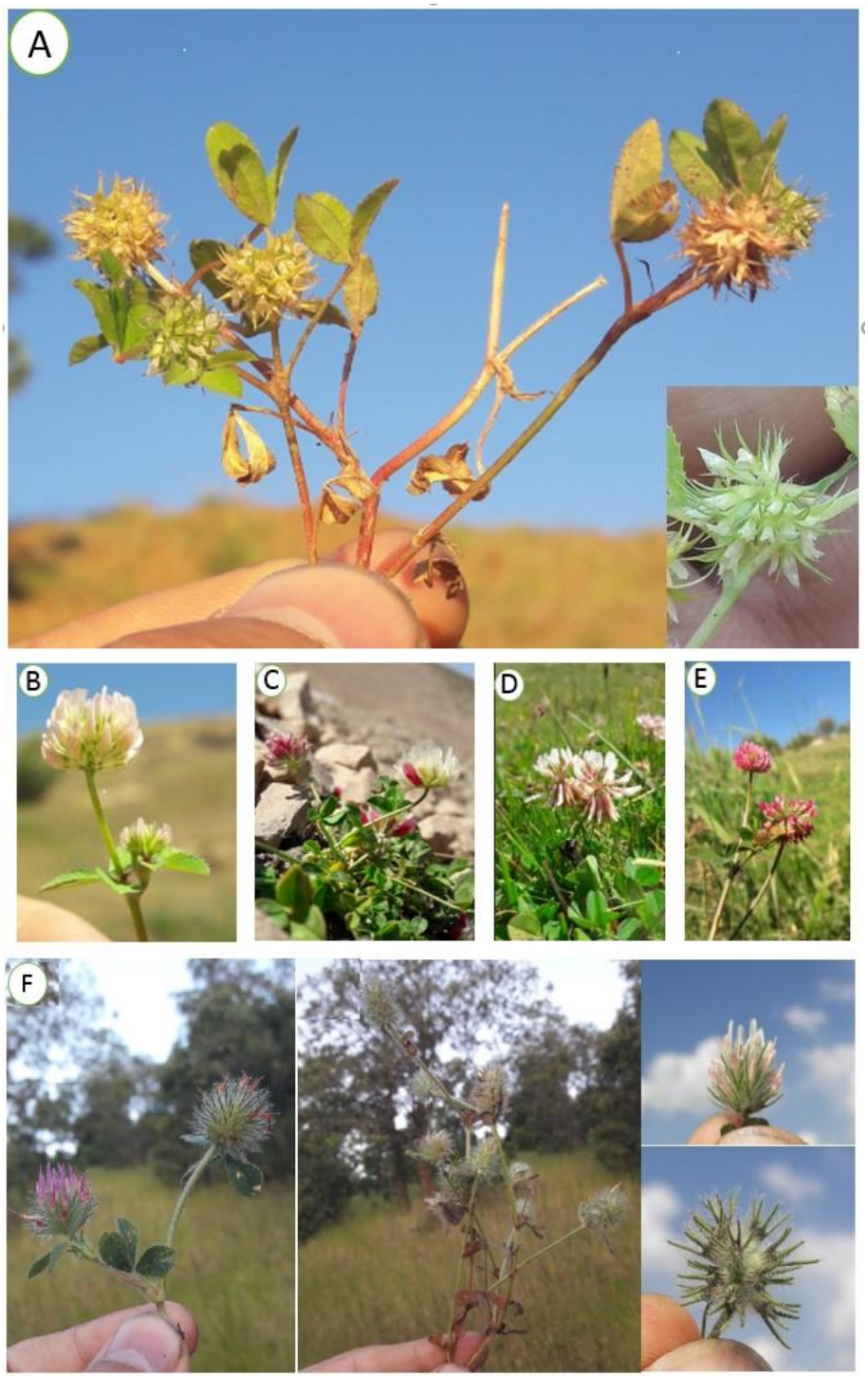

Fig 1: (A-E, section *Lotoidea*): A, *Trifolium retusum* (Habit and white flowers); B, *T. nigrescens* subsp. *petrisavii*; C, *T. radicosum*; D, *T. repens*; E, *T. hybridum*. (F, section *Trifolium*): F, *T. sylvaticum* (habit and flowers). All photos by E. Jarchi.

Fig 2: Distribution map of *T. retusum* (yellow square ■) and *T. sylvaticum* (red circle ●).

Specimens examined: Iran, Kurdistan, Saqqez to Bane, 6 km from Baneh, about 2 km after Sabadlu Village, 36°01′40″ N, 45°56′42″ E, 1668 m, 7/Jun/2024 (in *Quercus* communities), Jarchi and Mokhtari 4285; Divandarreh to Saqqez, Chenareh Village, 36°08′40″ N, 46°34′24″ E, 1534 m, 6/Jun/2024 (in *Salix* communities), Jarchi and Mokhtari, 4260.

Key to the annual *Trifolium* species of section *Lotoidea* in Iran

1. Inflorescence sessile 2
- Inflorescence pedunculated 3
2. Plants acaulescent ..... *T. suffocatum* L.
- Plants caulescent..... *T. glomeratum* L.
3. Peduncule more than 2 cm, Pedicle 3-6 mm.....
..... *T. nigrescens* subsp. *petrisavii* Clementi
- Peduncule 0.5-1.5 cm, pedicle up to 1 mm.....
.....*T. retusum* L.

Trifolium sylvaticum

Trifolium sylvaticum was first collected in Iran by Fattahi and Khaledian from 20 km north of Marivan (Nemati 2005). Two new specimens were gathered from distinct locations, one (4284) found near Baneh in the oak community, similar to *T. retususm*, and the other (4265) obtained from open and overgrazed areas in Divandareh.

Specimens examined: Iran, Kurdistan, Saqqez to Baneh, 6 km from Baneh, about 2 km after Sabadlu Village, 36°01′40″ N, 45°56′42″ E, 1668 m, 7/Jun/2024 (in *Quercus* communities), Jarchi and Mokhtari, 4284; Divandrreh, on the slopes of Chehlchesmeh Mountain, Best Village, 35°51′57″ N, 46°34′30″ E, 2071 m, 6/Jun/2024 (in an open area), Jarchi and Mokhtari, 4265.

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