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TROPAEOLACEAE: A NEW FAMILY RECORD FOR THE FLORA OF SAUDI ARABIA

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Abstract

The family Tropaeolaceae was reported for the first time in Saudi Arabia. The new record (*Tropaeolum majus* L.) from the Tropaeolaceae family was found in damp and exposed semi-shaded habitats between roughly 1800 and 2132 m elevation in southwestern Saudi Arabia. Illustrations, photos, taxonomic description, distribution map, key and information about the habitat of the plant were given. This study suggests that the new record is an introduced alien plant into Saudi Arabia.

Introduction

The number of genera in Topaeolaceae (neotropical family) is three (Sparre and Andersson, 1991) or one genus (*Topaeolum*, 110 species) of two sections (Andersson and Andersson, 2000). The genus *Tropaeolum* has heteromorphic ciliated petals on the margin. Its leaf is peltate either deeply incised or entire and each flower has a prominent calycine spur (Bulacio, 2013).

Tropaeolum majus (Nasturtium) which is native to South America (Negi and Joshi, 2018) is the most commonly grown species of the family Tropaeolaceae and can spread across gardens. It is possibly the plant originates as a hybrid of two species; *T. minus* and *T. ferreyrae* which are native to Ecuador and Peru (Sparre and Andersson, 1991). The plant was introduced into many countries such as Albania, Bangladesh, Lebanon – Syria, Mauritius, France, Bolivia, Bulgaria, Jamaica, Cuba, Korea, Romania, Algeria, Tunisia, Eritrea, and Ethiopia (POWO, 2021). *T. majus* is an annual climbing or creeping plant growing in shady habitats and does not need highly fertile soil (Garzón and Wrolstad, 2009; Jakubczyk *et al*., 2018). Different varieties of *T. majus* having different structures, sizes and colours of flowers have been reported in previous studies (Jakubczyk *et al*., 2018). It is easy to distinguish *T. majus* from other species because it has a circular or oblate leaf, a peltate petiole, a slightly lobed leaf margin or entire and a large flower (Sparre and Andersson, 1991). The plant is rich in bioactive compounds such as phenolic acids, flavonoids, carotenoids, anthocyanin, cucurbitine and scorbic acid (Bazylko *et al*., 2013). Therefore, it is commonly used in the food industry or for human health (as anti-hypertensive, anti-inflammatory, antiseptic and anti-depressive) (Garzón and Wrolstad, 2009; Melo *et al*., 2018). Checking and revising of the published texts of the flora of Saudi Arabia (Chaudhary 1999, 2000, 2001) and other systematic resources revealed that the family Tropaeolaceae is not reported in the Kingdom before this study. Therefore, the collected plant described in this study is the first record of the species *Tropaeolum majus* L., genus *Tropaeolum* L., and family Tropaeolaceae Juss. ex DC. in Saudi Arabia.

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Materials and Methods

The plant was collected during a surveying course of floristic study in the southwestern area of Saudi Arabia (20°03′N, 41°28′E). A herbarium specimen was kept in Biology Department, Faculty of Science, Albaha University.

Results and Discussion

***Tropaeolum majus* L.** Sp. Pl. 1: 345; 2: errata (1753) (IPNI, 2022) (**Fig. 1**)

Synonyms: Cardamindum majus (L.) Moench; *Nasturtium indicum* Garsault; *Tropaeolum atrosanguineum* Gordon; *T. chaixianum* É. Morren; *T. elatum* Salisb.; *T. hybridum* L.; *T. naudinii* É. Morren; *T. pinnatum* Andrews; *T. quinquelobum* P.J. Bergius; *T. repandifolium* Stokes; *T. scheuerianum* É. Morren; *T. schillingii* B.Verl.; *T. zanderi* A. Dietr.; *T. atrosanguineum* (Gordon) Kuntze; *T. chaixianum* (É. Morren) Kuntze; *T. majus* (L.) Kuntze; *T. naudinii* (É. Morren) Kuntze; *T. pinnatum* (Andrews) Kuntze; *T. scheunerianum* (É. Morren) Kuntze; *T. zanderi* (A. Dietr.) Kuntze (POWO, 2021)

Diagnosis: Leaves circulate to oblate, entire to slightly undulate, the petioles attached near the centre of the lamina; flowers with the upper petals 2 – 3 cm.

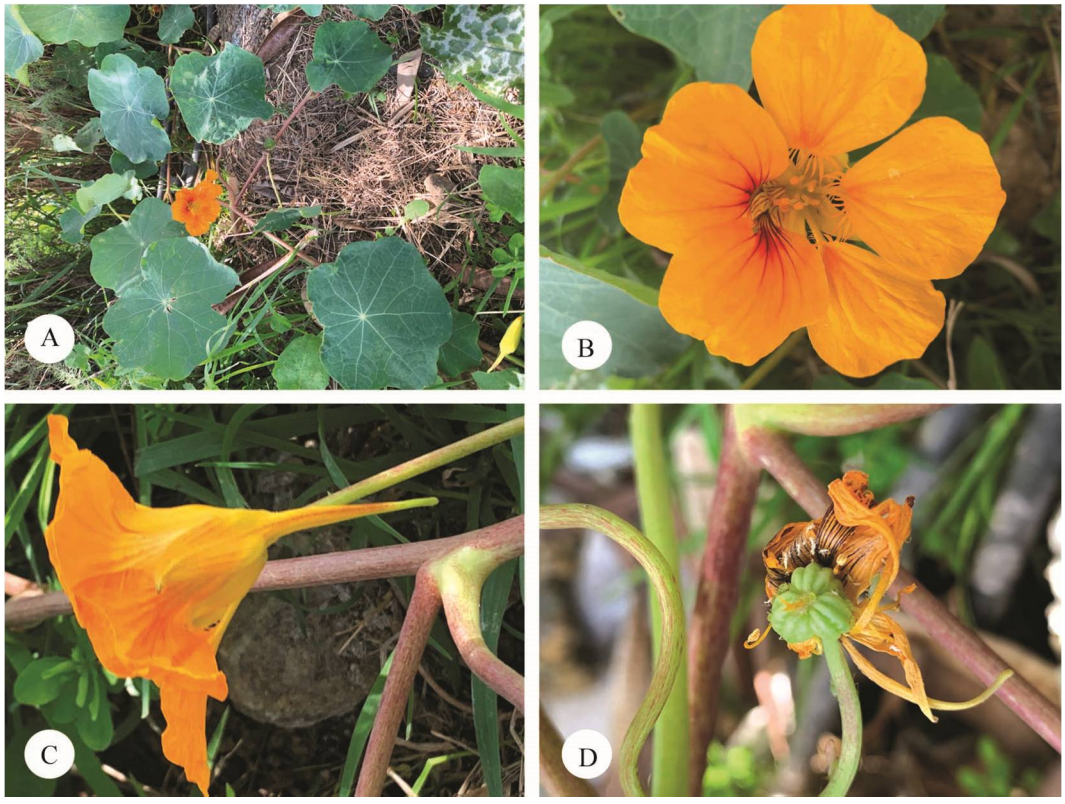

Fig. 1: A. *Tropaeolum majus* in humid bushy and grassy habitat. B. A solitary flower showing orange petals with coronal appendages and nectar guides. C. A flower with a prominent spur. D. A tricarpel fruit.

Taxonomic Description: Herb, somewhat fleshy, glabrous, climber or procumbent, pale green or coloured, up to 100 cm long, up to 6 mm thick. Leaves: peltate, shield-shaped more or less circular, exstipulate, slightly lobbed margin, alternate arrangement, peppery flavour, upper surface dark green-glaucous, lower surface pale green, digitately pinnate, straight or coiled long-petiole (7 – 17 cm) pilose at the base served as a tendril, 6 – 8 prominent veins per blade. Flowers: perfect, zygomorphic, orange trumpet-shaped, hypogynous, unscented, at the axil of the leaf, solitary with spiral arrangement on the stem, peduncle 10 – 22 cm long, flowering time most of the year. Calyx: gamosepalous, elliptic, yellow or green, obtuse or acute apex, quincuncial aestivation, conspicuously curved spur (1 – 3 cm long) on the posterior sepal, green or orange, up to 3 cm long. Petals: heteromorphic, unequal, 5 petals up to 3.5 cm in length, 3 clawed ciliated petals and 2 spathulate petals bear honeyguides. Stamens of 8 different sizes (1 – 1.5 cm long), anther creamy yellow bi-lobed (2 – 6 mm long). Style: short style (2.2 – 2.7 mm) with 3 unequal branches at the apex. Ovary: superior, green, ovoid-shaped, tri-lobed, 3 locules joined on the basis, 1 ovule per locule, ovule bitegmic, apical placentation. Fruits: dark or pale green, ribbed on one side, schizocarpic, indehiscent, tri-carpels, one-seeded carpel, 1.5 – 2.5 cm in diameter, apical placentation (Figs 1–2).

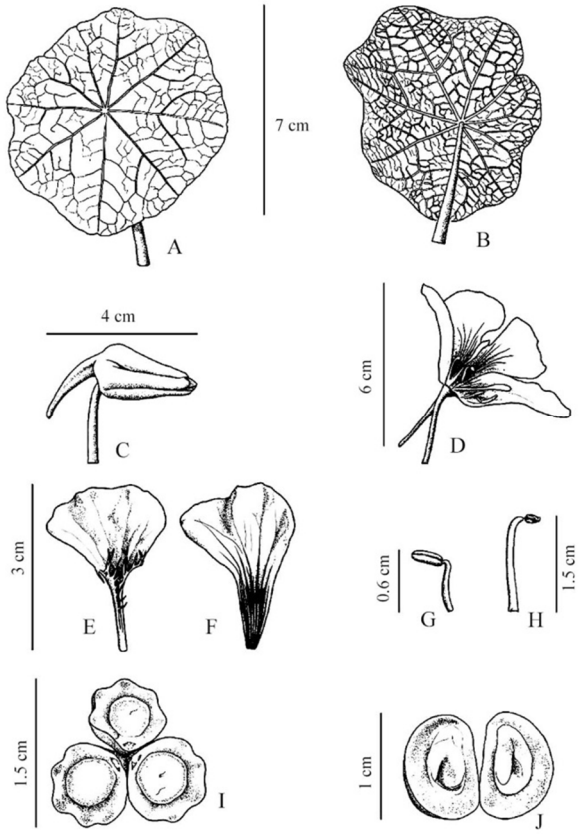

Fig. 2. (A) ventral surface of the leaf, (B) dorsal surface of the leaf with conspicuous veins, (C) A flower bud showing a prominent spur, (D) A longitudinal section in a flower, (E) A clawed ciliated petal, (F) A spatulate petal bearing honey-guides, (G) A short stamen with large anther, (H) A long stamen with small anther, (I) A transfer section in schizocarpic fruit showing the three carpels with seeds, (J) A longitudinal section in a carpel.

Habitat and distribution: The new taxon was found growing on disturbed waste places rich in decaying leaf litter near roadsides of Albaha city, southwestern Saudi Arabia (Fig. 3). The associated and surrounding vegetation consist of herb plants such as *Rumex steudelii, Euphorbia helioscopia, Tripteris vaillantii, Erodium cicutarium, Avena barbat* and *Lepidium virginicum.* The plant has restricted geographic distribution, scattered only in highland places under the canopy of small and large tress such as *Ficus palmate* and *Trema orientalis.*

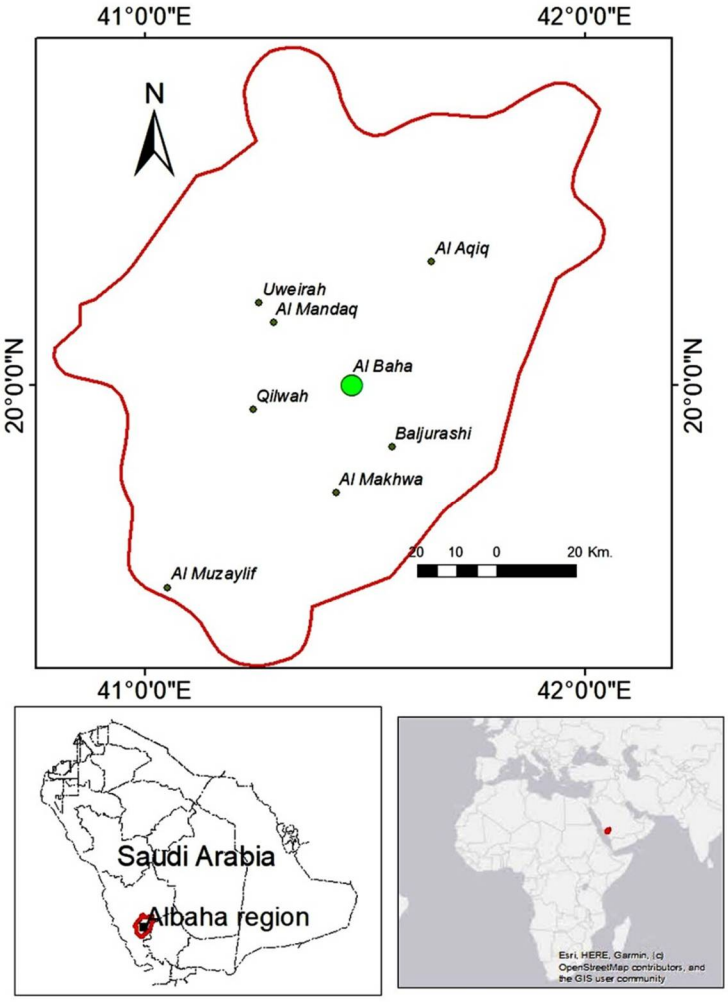

Fig. 3. Distribution map of *Tropaeolum majus.*

Conservation status: T. majus was observed distributed in a few locations at high altitude places in Albaha region. Only a few individuals were found scattered in wetter, waste, and disturbed sites. The plant is not recorded as endangered species in IUCN (2019) and detailed data regarding its conservation status is not available. More field works are necessary for accurately assessing the rareness and vulnerability of this species.

The southwestern region of Saudi Arabia, in which the new record was spreading, receives more rainfall during almost all seasons when compared to other regions of the country. It is exposed to moist air masses coming from the Red Sea and Mediterranean Sea (Al-Ahmadi and Al-Ahmadi, 2014). This region is characterized by its high plant species diversity and many new taxa and records have been reported in this region (Al-Zahrani and El-Karemy, 2007; Fayed and Al-Zahrani, 2007; Thomas *et al*., 2014, 2015; Al-Robai *et al*., 2018; El-Shaboury *et al*., 2018; Remesh *et al*., 2019; Basahi and Masrahi, 2019; Alharbi and Al-Qthanin, 2020).

In central and South America, *T. majus* is considered as a perennial plant because it grows very well in the mountains of these regions. Due to its economic value as an edible and medicinal plant, it has been intensively cultivated in many countries. It is readily naturalized from these cultivations and has been reported as a naturalized plant on the north coast of Madeira and as an alien invasive species in some countries (Christenhusz, 2012). Because the new taxon has a high ability to grow fast in moist habitats and is widely used in folk medicine and as a decorative plant worldwide (Bazylko *et al*., 2013); it is expected to spread widely in highland localities in southwestern regions of Saudi Arabia.

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