

BOERHAVIA ERECTA L. (NYCTAGINACEAE): A NEW RECORD FOR THE FLORA OF IRAN

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Abstract

Boerhavia erecta L. (Nyctaginaceae) from Kerman province is collected and identified as an invasive plant in the flora of Iran. This species is native to tropical America and has a wide distribution throughout tropical and warm temperate regions, growing along roads, alluvial plains, and field margins. It is distinguished from *B. elegans* by having a peduncle less than one cm, and from *B. diffusa* by its obconical fruit. The population of this species is increasing in southern Iran. Because of its remarkable ability to adapt to various climates, it is likely to colonize most regions affected by human activities. Taxonomic details, color images, habitat characteristics, a distribution map, and an identification key of *Boerhavia* from the flora of Iran are provided.

Keywords: *Boerhavia*, invasive plant, Iran, Kerman, New record, Nyctaginaceae

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گونه *Boerhavia erecta* گزارشی جدید برای فلور ایران

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چکیده: گونه *Boerhavia erecta* (Nyctaginaceae) از استان کرمان به عنوان گیاهی مهاجم برای فلور ایران معرفی می گردد. این گونه بومی مناطق گرمسیری آمریکا بوده و پراکنش گسترده ای در سراسر مناطق گرمسیری و معتدله گرم داشته و در امتداد جاده ها، دشت های آبرفتی و حاشیه مزارع رشد می کند. این گونه با داشتن دمگلی کمتر از یک سانتی متر از *B. elegans* و با میوه ای واژ مخروطی از *B. diffusa* تمیز داده می شود. جمعیت این گونه در جنوب ایران رو به افزایش است و با توجه به سازش پذیری فوق العاده آن در اقلیم های متفاوت، احتمالاً اکثر مناطق تحت تاثیر فعالیت های انسانی را اشغال خواهد کرد. شرح آرایه شناسی، تصاویر رنگی، ویژگی های زیستگاهی، نقشه پراکنش و کلید شناسایی *Boerhavia* برای فلور ایران ارائه می گردد.

INTRODUCTION

The family Nyctaginaceae Juss. comprises a diverse range of woody trees, shrubs, thorny climbers, and annual to perennial herbaceous genera (Yuan & Lan, 2022). This family, with a Neotropical origin (Norman & al., 2007), comprises 33 genera and approximately 400 species found worldwide (Neto & al., 2020). The Nyctaginaceae family demonstrates adaptability by thriving in various habitats, including arid deserts and tropical rainforests across the Americas, Africa, and the Indo-Pacific regions (Haug & al., 2004; Hernandez-Ledesma & al., 2015; Douglas & Spellenberg, 2010). Numerous genera within this family have flowers that bloom in the late afternoon or early evening. This is referred to as "four o'clock" in English (Levin & al., 2001).

In the flora of Iran, the family is represented by three genera: *Boerhavia* Vail. ex L. (2 species), *Commicarpus* Standl. (2 species), and *Mirabilis* L. (1 species) (Chrték & Krísa, 1976). Some species from this family, such as *Bougainvillea glabra* Choisy, *B. spectabilis* Willd., and *Mirabilis jalapa* L., are cultivated as exotic ornamental plants in certain regions (Chrték & Krísa, 1976; Fadaie, 1998). A biosystematics study of some Nyctaginaceae species in Iran revealed that the most significant characteristics for distinguishing Nyctaginaceae species in Iran include the ratio of achene length to width, the length of the filament and style, the type of inflorescence, the number of flowers on peduncles, as well as the size, shape, and length-to-width ratio of bracts and the shortest leaf length (Pakravan & al., 2023).

The genus *Boerhavia* has 60 accepted species distributed in tropical, subtropical, and temperate regions, including Mexico, America, Africa, Asia, the Indian Ocean Islands, the Pacific Islands, and Australia (Patil & Sanjivani, 2016; POWO 2024). In most cases, *Boerhavia* species can be found near the coast and tend to spread across dunes, gravelly plains, or rocky slopes (Chen & Wu, 2007).

Boerhavia is characterized by elongated stems with prominent nodes, slender forking cymose, or rarely racemose or spicate inflorescences. These inflorescences have small, scale-like free bracts and small flowers with campanulate, cylindric, or funnel-shaped perianth limbs separated by a constriction from the sulcate, enlarged lower portion of the perigone. The anthocarps of this genus are clavate or oblong, often glandular (Fosberg, 1978).

In Iran, two perennial plants, *Boerhavia elangas* Choisy and *B. diffusa* L., have been reported from the south and southeast regions (Chrték & Krísa, 1976; Fadaie, 1998). Here, we report *Boerhavia erecta* L. as an invasive species in the flora of Iran in Kerman

province, and provide a description and distribution map for this species.

MATERIALS AND METHODS

Specimens of *Boerhavia* were collected during fieldwork from January 2022 to October 2024 in Kerman province, southeastern Iran. The specimens are deposited in the Herbarium of the University of Jiroft (HUI) and TARI (Herbarium of Research Institute of Forests & Rangelands). The specimens were first compared with the reported species (*B. elangas* and *B. diffusa*) from the flora of Iran (Chrték & Krísa, 1976; Fadaie, 1998). We observed clear differences from the known species documented in the flora of Iran, suggesting the potential presence of either a new species or a new record within the genus *Boerhavia* in the region. These specimens were examined and identified using identification keys from various regional floras (Thulin, 1993; Gilbert, 2000; Chou & al., 2004; Spellenberg 2004; Chen & Wu, 2007). Photos of Morphological characteristics and other information were taken with a Dino-Lite digital microscope AM413T (Fig. 1). A distribution map of this species in Iran was created using Google Maps (Fig. 2).

RESULTS

Boerhavia erecta L., Sp. Pl. 3. 1753. Fig.1.

Annual or perennial herb, erect to suberect, up to 1m tall. Stems are ribbed, glabrous, or shortly hairy, pigmented purple; base woody, and swollen at the node. Leaves simple, opposite in unequal pairs, glabrous, or with septate hairs along veins, deltoid, lanceolate, or ovate; apex apiculate, acuminate, acute, or obtuse; base shortly attenuate, obtuse, or truncate; margins entire, sinuate. Inflorescence lax, glabrous to puberulous, axillary or terminal or at the forks of dichotomic branches, with 2-3-flowered cymose panicles. Flowers bisexual, hypogynous, actinomorphic; pedicels slender, glabrous, green, bracteate; bracts leafy, 1-2, lanceolate, acute, entire, hairy, light pink, persistent. Perianth gamopetalous, the lower part of the perianth-tube sepaloid, slightly 5-ribbed, surrounding the ovary; upper part of perianth petaloid, pink, purple, or white, funnel-shaped; 5-lobed. Stamens 1-3; filaments slender, glabrous, ca. 0.16-0.26 cm long, exserted, white; anthers 2-celled, ovoid to broadly ovoid, monomorphic, dorsifixed, longitudinal. Carpel 1; ovary superior, elliptic, glabrous, 0.04-0.06 x 0.02-0.03 cm, white; style 1, terminal, filiform, 0.18-0.25 cm long, white; stigma 1, capitate or discoid, exserted. Anthocarps obconical, sharply 5-sided/5-ribbed, with a truncate tip, 3.5-4 mm long and 1.5 mm wide, completely glabrous, the ribs undulate.

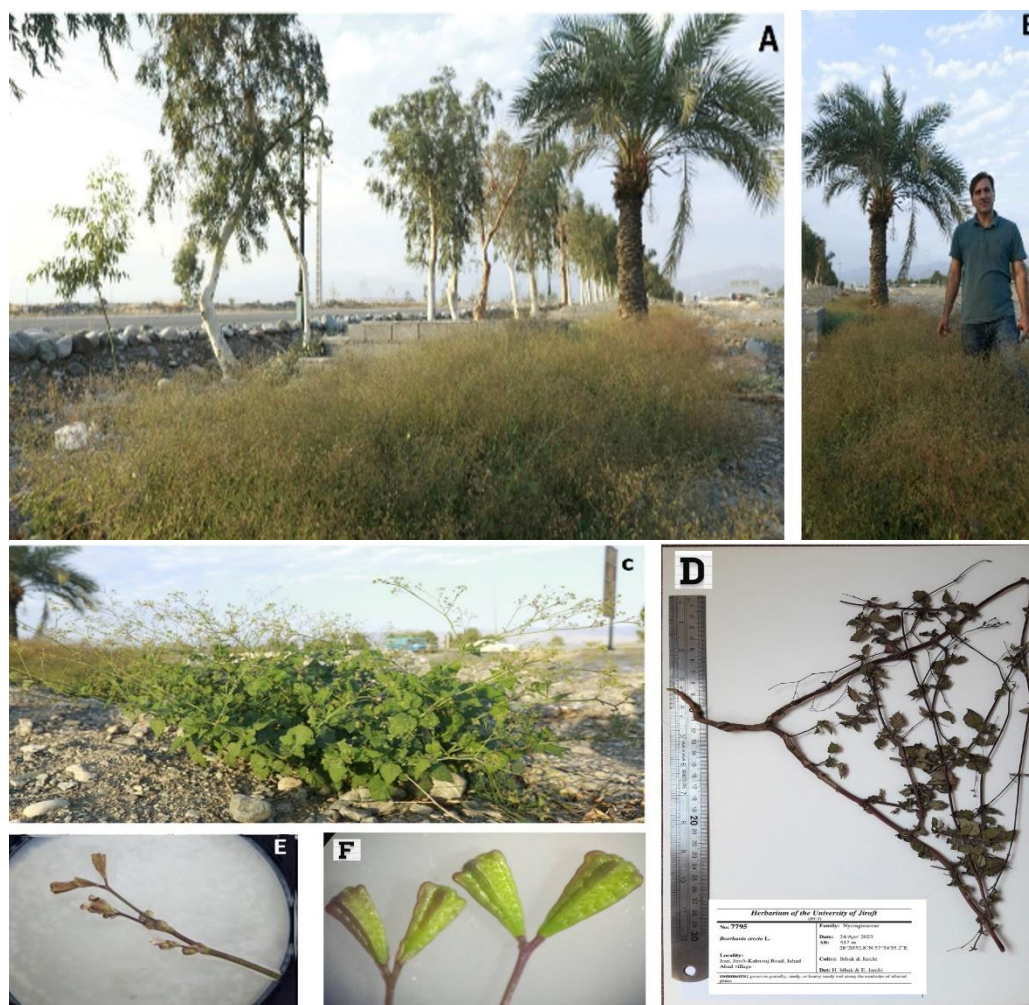


Fig. 1: *Boerhavia erecta*: A-B, habitat; C, habit; D, herbarium specimen; E, lax Inflorescence; F, capsules (All photos by H. Bibak).

Specimens examined: Iran, Kerman province, border roads of Jiroft city, 28°42'40.1"N 57°45'37.3"E, 732m, 13/2/2022, Bibak & Jarchi, (HUI-7780). Iran, Jiroft-Kahnouj Road, Jahad Abad village, 28°20'52.8"N 57°54'55.2"E, 617m, 24/4/2023, Bibak & Jarchi, (HUI-7795). Iran, Kahnouj- Faryaab Road, 28°06'10.0"N 57°41'13.9"E, 910m, 19/9/2024, Bibak & Jarchi, (HUI-8010). Iran, Jiroft-Kahnouj Road, Jahad Abad village, 28°20'52.8"N 57°54'55.2"E, 617m, 24/4/2023, Bibak & Jarchi, (TARI-7795).

Distribution: *Boerhavia erecta* L. is native to tropical America and has been widely distributed throughout tropical and warm-temperate regions, including parts of Asia (Taiwan, Yemen, India, Malaysia, Philippines, China, Turkey) and Africa. (Patil & Sanjivani 2016).

Habitat and Phenology

In Iran, this study indicates that it grows in gravelly, sandy, or loamy sandy soil along the roadsides of

alluvial plains in southern Iran (Fig. 2). The flowering period of this plant occurs throughout the entire year.

Based on the morphological differences between the new record and other species (*B. elangas* and *B. diffusa*) from the flora of Iran, a diagnostic key is provided below:

- 1- Flowers solitary; pedicle more than 1 cm, usually leaf length is more than three times its width, narrowly ovate *B. elegans*
- Flowers 2 or more; sessile or pedicle less than 1 cm, usually leaf length is less than 2 to 2.5 times its width, broadly ovate 2
- 2- Anthocarp club-shaped, top rounded, roundish in cross section, with glandular hairs *B. diffusa*
- Anthocarp obconical, top truncate, star-shaped in cross section, without glandular hairs *B. erecta*



Fig. 2: Geographical distribution of *Boerhavia erecta* in Iran.

DISCUSSION

This species has been reported in recent decades from several Asian countries, including Taiwan, Yemen, and Turkey (Chou & al., 2004; Al-Hawshabi, 2015; Ulus & Bolat, 2024). These studies indicated that *B. erecta* grows along roadsides, alluvial plains, and field edges. Likewise, our observations of this species were conducted in similar habitats, particularly along the roadsides. Mochanla and Aluri (2021) studied the reproductive ecology of *B. erecta* and *B. diffusa*, highlighting their widespread global distribution. This widespread distribution results from their year-round flowering and fruiting, alternating cycles. Furthermore, the gelatinous nature of the single-seeded indehiscent fruits aids in their dispersal by birds, insects, water, and humans (ornithochory, zoochory, hydrochory, and anthropochory), enabling the plant to colonize new areas and preserve its genetic diversity. The southern

Kerman region is an important agricultural area in Iran. The extensive use of imported seeds, combined with its location on a migration route for birds, could explain the presence of this species in the area. We have noticed a rise in the population of this species in the region. It seems that it will likely spread further in southern Iran.

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