

Zygophyllum coccineum (Zygophyllaceae): a new record to the Flora of India from Kachchh, Gujarat

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Abstract: *Zygophyllum coccineum* L. (Zygophyllaceae) is reported for the first time in India from Kachchh, Gujarat. A detailed morphological description of the plant species, its habitat preferences, distribution, a photographic plate, and the main morphological differences with its closely related species, *Z. simplex*, occurring in India are provided to validate this new distribution record to the Flora of India and facilitate its field identification.

Keywords: Distribution, Gujarat, Kachchh, New record, Zygophyllaceae

Introduction

The Zygophyllaceae family is represented worldwide by 22 genera and over 285 species, while the genus *Zygophyllum* consists of approximately 117 species (POWO, 2024). The name *Zygophyllum* is derived from the Greek words ‘Zygon’ meaning joined, and ‘Phyllon’ meaning leaf. Linnaeus (1753) first recognized this genus with six species based on growth habits, androecium, and fruit dehiscence features. Globally, the genus is adapted to hot climates and typically comprises succulent plants (Hammoda *et al.*, 2013; El-Amier *et al.*, 2016).

From India, only one species of this genus, *Z. simplex* L. has been reported to date (Hajra *et al.*, 1997; Shawky *et al.*, 2019), and is restricted to semi-arid to arid climates in the country in states of Gujarat, Haryana, and Rajasthan (Hajra *et al.*, 1997; Bhandari, 1990; Shah, 1978). During a recent field survey in Kachchh, Gujarat,

specimens of an interesting plant species of *Zygophyllum* were collected. After a critical examination of the collected specimens using available literature (Hooker, 1872; Cooke, 1901; Ghazanfar & Osborne, 2015; Batanouny, 2005) and digital images of herbarium specimens housed at different herbaria (K and BARO). Given no prior record of this species in India, *Z. coccineum* is reported as a new distribution record to the Flora of India from Kachchh, Gujarat.

Materials and Methods

The first author observed and collected plant specimens during a field survey conducted between September and October 2023. Herbarium collection and preparation were employed following Rao and Sharma (1990). The specimen was photographed using a DSLR camera (Sony Alpha a58), dissected, and examined under a stereo microscope (Metlab PST-901). Detailed morphological observations were recorded and described. The Botanical Survey of India, Jodhpur confirmed the identification, where the herbarium specimen (Accession no. 53375) has been deposited. The soil samples were collected from the study area and maintained at room temperature. The pH of the samples was determined using a pH meter (Systronics 361), and salinity using a salinity refractometer (Atago MASTER-S/MillM) following the procedure outlined by Gupta (2009). Each sample was analyzed in triplicates and the mean values were considered.

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Taxonomic Treatment

Zygophyllum coccineum L., Sp. Pl. 1: 386. 1753. *Lectotype*: Illustration by Rev. Thomas Shaw 1738: 41, 231, f. 231. **Figs. 1 & 2**

Perennial undershrubs, 45–65 cm tall, 100 cm wide. Stem largely herbaceous, erect, branches ascending, initially covered with hairs, later glabrous, pubescence around the nodes, older stems slightly woody, with whitish green bark. Stipules ovate-lanceolate, 0.8–1 × 1.5 mm, ciliate at margin. Leaves petiolate, 2-foliolate; leaflets terete, 5–12 × 1–2 mm, base oblique, apex rounded, glabrous; petiole terete, 12–15 mm, as long as or longer than leaflets. Flowers axillary, bisexual, usually solitary, occasionally 2 at each node, white and slightly greenish-yellow in color; pedicels 7–9 mm long. Sepals 5, ovate, 4–6 × 2–3 mm, margin membranous, cucullate, apex obtuse, pubescent outside, glabrous inside, fleshy, green. Petals 5, spatulate, 5–7 × 2–2.5 mm, longer than sepals, margin slightly undulate, apex rounded, glabrous, thin, white. Stamens 10, 3.5–4 mm long, anthers bi-lobed, oblong-ovate, dorsifixed, bright yellow, dehiscence septical; scales ovate to lanceolate, 2–3 mm long, entire. Disk cup-shaped, 8–10 lobed, dark green, glabrous. Ovary oblong, c. 1 mm long, pubescent, penta-locular; style single, c. 1 mm long, pubescent, persistent in fruit. Fruit capsule, oblong or obovoid, 7–9 × 3–4 mm, base truncate, apex obtuse, sparsely pubescent or glabrous, with 5 faint lobes. Seeds 4–7 in each lobe, elliptic, 1–2 mm, tip acute, tuberculate, brown.

Flowering & fruiting: Flowering from October to January and fruiting from April to May.

Habitat & ecology: A population of this plant species was found growing on an abandoned roadside land to Kandla Port, Gujarat. More than 10 individuals were observed at two nearby sites within the area. The soil type was saline loamy, recorded salinity and pH values were 6.66 parts per thousand and 7.25 respectively. These sites also shared the characteristic of being low-lying depressions that

are inundated with water seasonally, thereby creating a marshy habitat.

Hooker (1872) documented this species in the rocky plains of Sindh, Pakistan. Ghazanfar and Osborne (2015) described its habitat as sandy and gravel deserts in Egypt and sandy shorelines in Jeddah, Saudi Arabia. Similarly, Alzahrani and Albokhari (2018) reported its habitat in the salt marshlands of Jeddah, while El-Amier *et al.* (2016) reported its presence in the limestone wadis of Egypt. From this, it seems that this species can withstand a range of soil conditions. The present study area fulfills the habitat preferences of this species. It is reported to be non-palatable, hence it has lesser chances of seed dispersal by animals. Further research is required to understand its survivability in habitats with different salinity levels, and also its effects on the existing regional flora in the near future, as it seems to be a highly adaptable species.

Associated growing species include *Phragmites karka* (Retz.) Trin. ex Steud. (Poaceae), *Suaeda fruticosa* Forssk. ex J.F.Gmel. (Amaranthaceae), *Suaeda monoica* Forssk. ex J.F.Gmel. (Amaranthaceae), *Aeluropus lagopoides* (L.) Thwaites (Poaceae), and *Heliotropium curassavicum* L. (Boraginaceae).

Distribution: The species is distributed in countries, such as Egypt, Eritrea, Iraq, and Pakistan, and the Gulf States like Kuwait, Lebanon-Syria, Palestine, Saudi Arabia, Sudan, and Yemen (POWO, 2024). With this report, the distribution of *Z. coccineum* now extends to India.

Specimens examined: INDIA, **Gujarat**, Kachchh District, Gandhidham, Kandla, N 23°01'26", E 70°11'33", 10.10.2023, *Rakesh Poptani, Bhagirath Paradva* 53375 (BSJO!). Kandla, *Ibid.* N 23°01'21", E 70°11'39", 17.02.2024, *Vivek Chauhan, Jayesh Bhatt* GUIDE1012 (Herbarium GUIDE, Bhuj). PAKISTAN, **Sindh province**, Hyderabad, near Jacob tank, N 25°25'01", E 68° 21' 36", 09.03.1940, *S. V. Shevade* 630 (BARO123450004372 image!).



Fig. 1. *Zygophyllum coccineum* L. **a–c.** Plant in a natural habitat.



Fig. 2. *Zygophyllum coccineum* L. **a.** Flowering twig; **b.** Bi-foliate leaves; **c.** Stipule; **d.** Flower-side view; **e.** Flower-top view; **f.** Sepal-adaxial view; **g.** Petal; **h.** Stamen with scale; **i.** Gynoecium; **j.** Fruiting twig; **k.** Capsule; **l.** Capsule with septical dehiscence; **m.** Seeds (Photos by V. U. Chauhan & R. A. Poptani).

Table 1. Morphological comparison of *Zygophyllum coccineum* with its close related species.

Characters	<i>Z. coccineum</i> L.	<i>Z. simplex</i> L.
Habit	Perennial	Annual
Stem	Erect	Procumbent or sub-erect
Leaf	Compound (bi-foliolate), petiolate	Simple, sessile
Flowers	White, sometimes greenish-yellow	Yellow
Fruits	Oblong-obovoid	Turbinate
Seed	Elliptic	Oblong

ERITREA, **Massawa**, Green Island, 28.07.1988, O. Ryding 1347 (K000865520 image!). EGYPT, **Al Fayoum province**, Giza, Qasr Qaroun, N 29° 24' 20.31", E 30° 25' 5.97", 03.01.1983, *Monier Abd El Ghani* 4885 (K [K005031480] digital image!).

Notes: *Zygophyllum coccineum* is known to possess medicinal properties (El-Gamal *et al.*, 1995; Mohammedi, 2021). It is being used in traditional medicine for gout, rheumatic pain, cough, hypertension, asthma, flatulent colic, and diuretic, and also the juice from the fresh leaves and stem is used as an abrasive cleanser, and in certain skin diseases (Batanouny, 2005). It is also reported to furnish ecosystem services such as accumulating toxic heavy metals (Osman & Badawy, 2013; El-Sherbiny *et al.*, 2019). Given its diverse medicinal as well as ecological benefits, the plant species propagates through cuttings and therefore can be promoted in the surrounding industrial areas.

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