

## *Evolvulus filipes* (Convolvulaceae): A new record for Asia from Gujarat, India

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**Abstract:** *Evolvulus filipes* Mart. (Convolvulaceae), a species native to the neotropics is reported here as a first record in the Asian continent based on collections from Rampara Wildlife Sanctuary, Morbi district and grasslands of Rajkot district in the Saurashtra peninsula, Gujarat state, western India. A detailed taxonomic description, SEM analysis, habitat and ecological notes are provided along with a colour photoplate, distribution map and taxonomic notes for easy identification. Additionally, a taxonomic key to all Indian species of the genus *Evolvulus* L. is provided.

**Keywords:** Biogeography; floristic record; range extension; Western India; Saurashtra Peninsula; taxonomy.

### Introduction

The genus *Evolvulus* L. (Convolvulaceae) comprises approximately 106 accepted species of non-twining morning glories primarily distributed across the tropical and subtropical regions of Americas. The Neotropical realm represents the primary center of diversity of the genus, with Brazil alone hosting 74 valid species (Santos *et al.*, 2024; POWO, 2026). In contrast, the representation of the genus in the Old World is remarkably depauperate; across East, South, and Southeast Asia, the genus has historically been represented by only two widely distributed, pantropical species *Evolvulus alsinoides* (L.) L. and *E. nummularius* (L.) L. (Das, 1962).

In the present communication, we document the first confirmed occurrence of *Evolvulus filipes* Mart. in the Asian continent, marking a significant, highly disjunct biogeographical divergence from its previously established native range. Originally recognized as an endemic element of the Neotropics, *E. filipes* exhibits a well-documented distribution spanning Mexico, Central America, and broad tracts of tropical South America, including Brazil, Colombia, and Paraguay (Ooststroom, 1934; Felger *et al.*, 2012). Its unexpected discovery within the seasonally dry ecosystems of the western India introduces a novel phytogeographical element to the region and underscores the vulnerability of dry grasslands habitats to undetected colonization by non-native flora. The genus strongly prefers semi-arid regions, especially seasonally dry open habitats, sandy soils, grasslands, and rocky outcrops (Santos & Buril, 2020). Morphologically, the genus *Evolvulus* is characterized by non-twining herbs with entire, alternate leaves with highly variable indumentum. Flowers are solitary or arranged in few flowered axillary dichasia, bearing five free sepals and a small rotate corolla. The ovary is usually 2-locular with two ovules per locule, supporting two styles that are free or shortly connate at the base and bifid into filiform to slightly clavate stigmas. The fruit is a 4-valved capsule containing 1–4 small seeds, typically smooth to faintly verrucose (Ooststroom, 1934;

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Choisy, 1845; Woodson *et al.*, 1975). Within this group, *E. filipes* belongs to *E. sect. Alsinoidei*. It is easily differentiated from common Old-World *E. alsinoides* by its exceptionally delicate, thread-like (filiform) axillary peduncles that drastically exceed the length of the leaves, and its remarkably small pale-blue corollas (< 5 mm in diam.). Globally the genus exhibits a strong ecological preference for semi-arid zones, seasonally dry open habitats, sandy soils, grasslands, and exposed rocky outcrops environmental conditions that are strongly mirrored across the microhabitats of the Saurashtra Peninsula.

The present continental record is the outcome of extensive seasonal botanical field explorations conducted during 2024–2025 across multiple distinct ecosystems including the Rampara Wildlife Sanctuary (Morbi district) and open grasslands of Rajkot district in Gujarat state, western India. To confirm its identity and distribution of this record, comprehensive review of historical, and contemporary regional floristic literature spanning South, East, and Southeast Asia was systematically performed. This targeted bibliographical audit evaluated all authoritative regional and national treaties across India, China, Japan, Thailand, Peninsular Malaysia, Bangladesh, Sri Lanka, and Pakistan (Clarke, 1883; Cooke, 1905; Gamble, 1921; Das, 1962; Stewart, 1972; Shah, 1978; Austin & Ghazanfar, 1979; Austin, 1980; Khan, 1985; Bole & Pathak, 1988; Shetty & Singh, 1987; Bhandari, 1990; Biju, 1997; Fang & Staples, 1997; Ohwi, 1965; Staples & Traiperm, 2010; Staples, 2018; Staples & Syahida-Emiza, 2015; Iqbal *et al.*, 2020). This exhaustive literature evaluation firmly established the absolute historical absence of *E. filipes* from all authoritative Asian floristic accounts, thereby validating that the populations discovered in Gujarat constituent the verified first occurrence of this Neotropical species for the continent.

The unexpected emergence of a breeding population of *E. filipes* in Western India introduces critical

ecological and phytogeographical inquiries. Given that the species has successfully bypassed localized colonization barriers to establish within the xeric microhabitats of the Saurashtra Peninsula, its presence raises compelling questions regarding its vector of introduction. This occurrence may reflect either a recent, trade-mediated anthropogenic introduction via Gujarat's active maritime routes or an unrecorded, long-distance natural range expansion into South Asia, a phenomenon that demands serious biogeographical contextualization and ongoing scientific monitoring. All relevant voucher specimens collected during this study have been securely deposited at the Blatter Herbarium (BLAT!), St. Xavier's College, Mumbai, Maharashtra, India.

### Key to the Indian species of *Evolvulus*

1. Stems prostrate, rooting at the nodes; leaves broadly-ovate, elliptic, or orbicular, glabrous or sparsely pilose; peduncle absent or obsolete; flowers sessile or subsessile; sepals ovate-oblong; corolla white, rotate to slightly funnel-shaped ..... *E. nummularius*
1. Stems erect or ascending, not rooting at nodes; leaves linear-lanceolate to elliptic-ovate; peduncles present, axillary, filiform; flowers pedicellate; sepals lanceolate; corolla pale blue to blue, rotate ..... 2
2. Leaves narrowly linear-lanceolate, sparsely pilose or glabrous above; sepals sparsely pilose, ciliate; corolla pale blue, 3–4.5 mm in diam.; seeds ovoid, black, with raised and smooth anticlinal walls on the testa, and flat, smooth periclinal walls under SEM ..... *E. filipes*
2. Leaves elliptic, ovate or oblong to linear-oblong, more densely hairy with long spreading hairs; sepals more densely pilose; corolla blue, (5–)7–10 mm in diam.; seeds elliptic, black to brown, with smooth, raised-fluted anticlinal walls on the testa, and concave, smooth periclinal walls appearing folded under SEM ..... *E. alsinoides*

## Taxonomic Treatment

**Evolvulus filipes** Mart., Flora 24(2) Beibl. II(7): 100. 1844. *Type*: BRAZIL, Bahia, Rio Sao Francisco near Joazeiro, *Martius s.n.* [Schedulae No. 2313] (B, BR!, M).

**Figs. 1–3**

Annual herbs, erect or decumbent, 35–40 cm long, spreading on ground, much branched and woody at base at maturity. Stems terete, slender, thin and wiry; internodes 1–1.5 cm long, sericeous to pilose with sparse, thin hairs, becoming glabrescent on older branches. Leaves sessile or shortly petiolate; petioles c. 1 mm long in lower leaves; laminae generally narrowly lanceolate, lanceolate to elliptic,  $0.5\text{--}2.5(-3) \times 0.1\text{--}0.7$  cm, broader in middle, narrow towards both ends, base acute, margins flat, apex acute to subacute, mucronate (less than 1 mm) or obtusish, chartaceous, concolorous, sparsely pilose or slightly glabrous adaxially, densely pilose abaxially with spreading hairs; midrib prominent beneath; upper leaves becoming smaller, linear-lanceolate,  $0.5\text{--}1 \times 0.1\text{--}0.3$  cm. Inflorescence axillary or paniculate, 1–2-flowered at apex; peduncles variable in length, rarely shorter than, as long as, or commonly exceeding the floral leaves by three or four times, filiform, 1–3(–4) cm long, sericeous; extra-axillary peduncles 0.4–12 mm long; bracteoles small,  $1\text{--}2.5(-3) \times 0.5$  mm, broader at base, margins entire, apex acute, lanceolate to subulate, sometimes linear, sericeous. Pedicels 0.5–7 mm long, filiform, sericeous, erect or perpendicular to peduncle, always reflexed in fruit. Sepals 5, equal in length, ovate-lanceolate,  $2\text{--}2.5 \times 0.5\text{--}1(-1.5)$  mm, broader at base, apex acute to acuminate, tips often spreading with hairs, sparsely pilose outside, glabrous inside, margins ciliate. Corolla rotate, 3–4 mm (< 5 mm) in diam., twice as long as sepals, pale blue with white throat; tube very short, < 1 mm long; limb slightly 5-lobed with 5 sericeous bands outside. Stamens 5; filaments 1–1.2 mm long, glabrous; anthers sagittate, c. 1 mm long, white. Ovary globose, c. 0.5 mm long, as long as broad, yellow, glabrous; styles 2, free, c. 0.5 mm

long; stigmas c. 2 mm long, lobes clavate, white. Capsules globose or ovoid, slightly exceeding persistent sepals, 4-valved. Seeds 3–4, ovoid, c. 1 mm long, brownish-black, smooth.

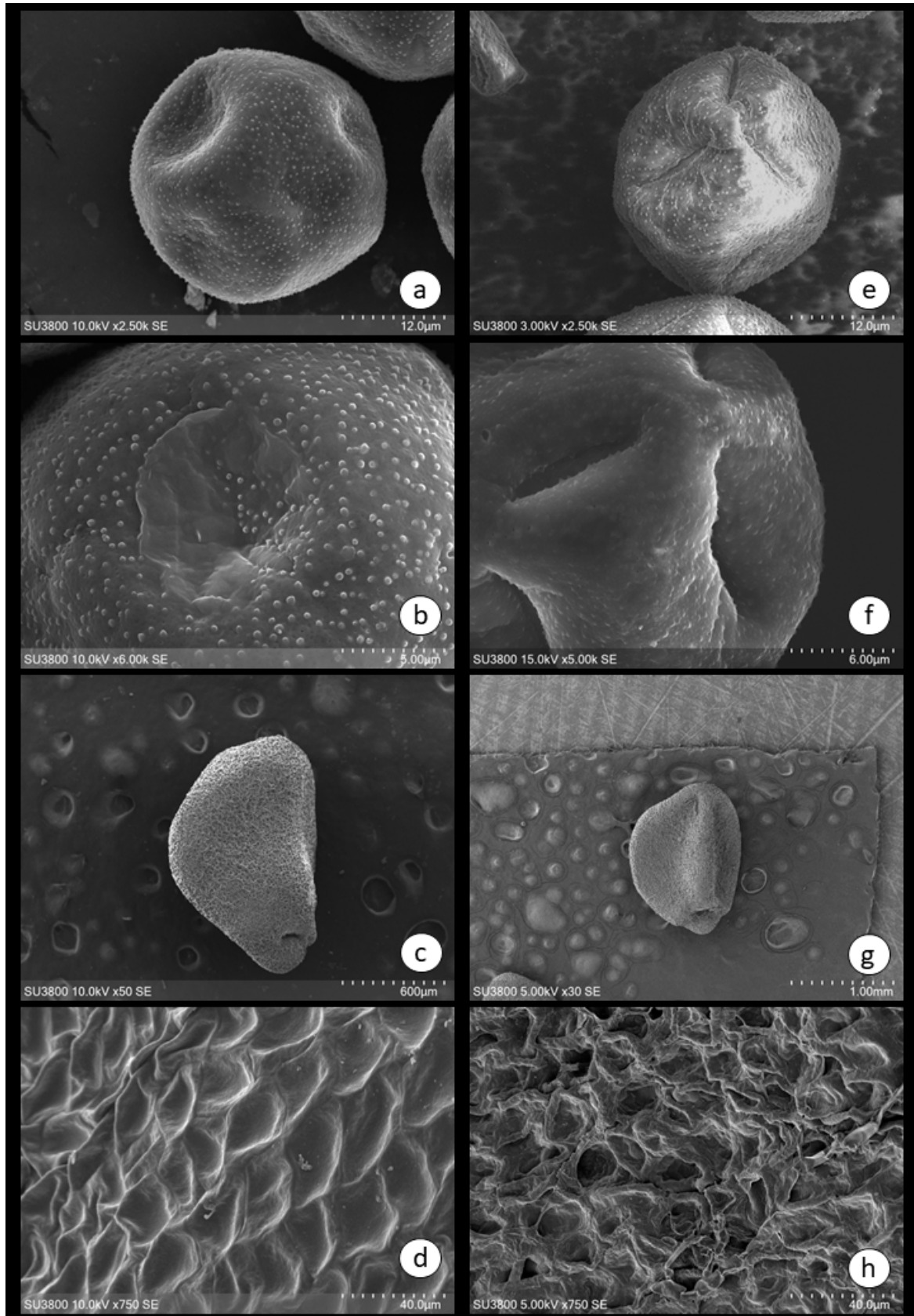
**Flowering & fruiting:** Flowering from August to October and fruiting from December to January.

**Habitat:** *Evolvulus filipes* in India is currently documented from two districts of Saurashtra Peninsula of Gujarat, viz. Rajkot and Morbi, where the species was collected in three main habitat types representing open grasslands, savannah forest, and dry pond margins. In Rampara Wildlife Sanctuary, Morbi district, the species occur in plateau grasslands dominated by *Aristida funiculata* Trin. & Rupr. and *Apluda mutica* L. with *Tridax procumbens* L. and *Indigofera cordifolia* B. Heyne ex Roth as the dominant herbaceous species. It is also found in open thorn scrub vegetation dominated by *Acacia senegal* (L.) Willd.

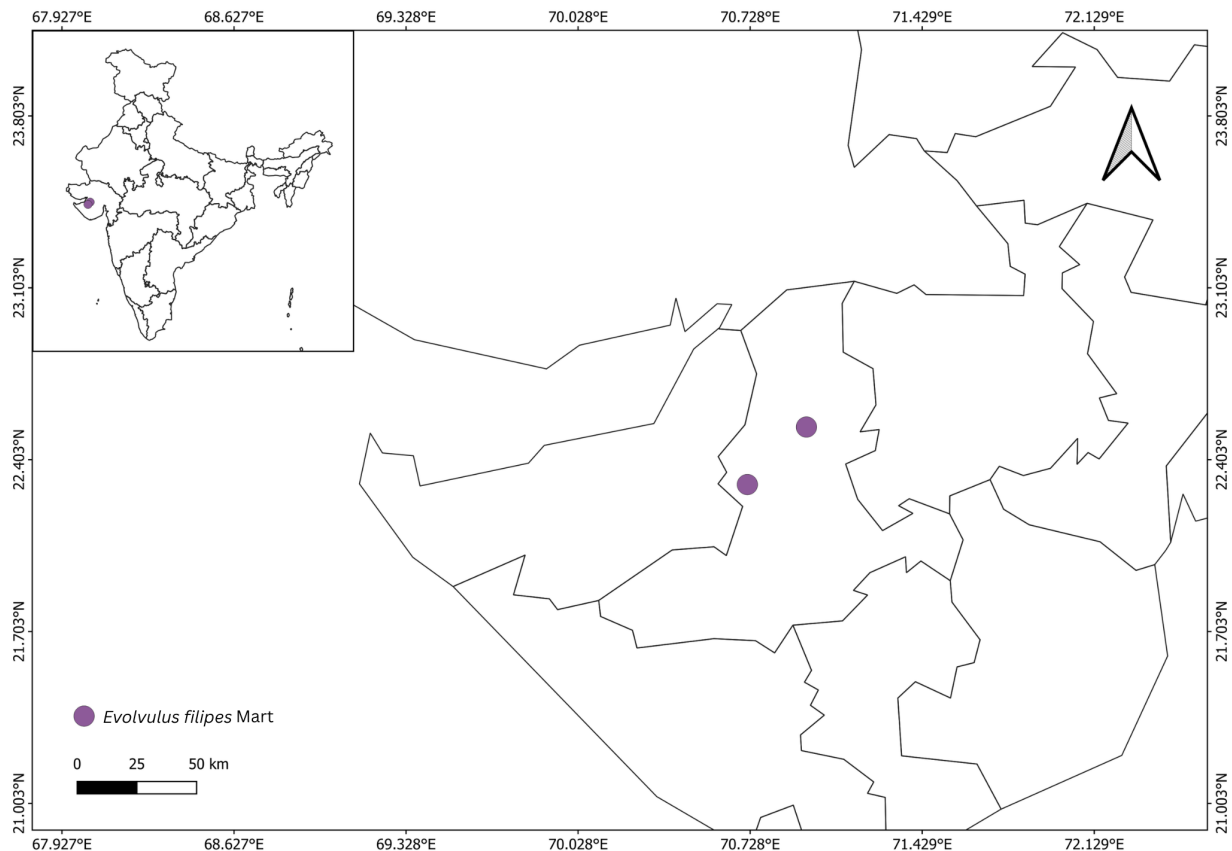
Outside the sanctuary, the Rajkot collections represent three distinct habitats. In the first habitat, *E. filipes* grows in open, seasonally dry grasslands on black soil, dominated by *Apluda mutica* L., *Sehima nervosa* (Rottler) Stapf, *Cymbopogon* spp. and *Dichanthium* spp., with scattered small shrubs of *Mimosa hamata* Willd., *Ziziphus nummularia* (Burm.f.) Wight & Arn. and *Grewia hirsuta* Vahl. In the second locality, the species occurs sparsely among exposed basaltic and lateritic angular rocks along dry pond margins, on stony soil with minimal organic matter and shallow seasonal water, and is strongly associated with *Tridax procumbens* L. and *Mesosphaerum suaveolens* (L.) Kuntze. The third locality comprises undulating hills, where all individuals grow on gently to moderately sloping basaltic hillsides, occurring on exposed rocky surfaces and in shallow soil pockets along upper and mid-slope positions at around 190 m elevation. Here the substratum consists of weathered basalt and coarse gravel with a thin layer of sandy to sandy loam soil, creating extremely well-drained xeric microsites. Taken together,



**Fig. 1.** *Evolvulus filipes* Mart. **a.** Habit; **b.** Flowering & fruiting twigs; **c.** Sericeous stem; **d** & **e.** Basal leaves—adaxial and abaxial surfaces; **f** & **g.** Upper leaves—adaxial and abaxial surfaces; **h.** Flower—side view; **i.** Flower—top view; **j.** Flower—back view with 5 sericeous bands and sepals with acuminate apex; **k** & **l.** Sepals—adaxial and abaxial views with ciliate margins; **m.** Bracteoles; **n.** Androecium; **o.** Gynoecium; **p.** Immature capsule; **q.** Mature dehiscent capsule; **r.** Seeds (from Kishan Prajapati 114811, 114813 (BLAT); photographed by Kishan Prajapati; prepared by Vivek Chauhan & Kishan Prajapati).



**Fig. 2.** Pollen and seed under scanning electron microscopy (SEM) of *Evolvulus alsinoides* (L.) L. (a–d): **a.** Pollen–polar view; **b.** Pollen surface showing microechinate ornamentation; **c.** Seed–ventral surface; **d.** Testa cells–enlarged view. *Evolvulus filipes* Mart. (e–h): **e.** Pollen–polar view; **f.** Pollen surface showing microechinate ornamentation with magnified aperture; **g.** Seed–ventral surface; **h.** Testa cells–enlarged view (from Kishan Prajapati 114811, 114813).



**Fig. 3.** Map showing distribution of *Evolvulus filipes* Mart. in India (prepared using QGIS software version 3.44.14).

these observations indicate that *E. filipes* tolerates a broad range of structurally different, but consistently open, rocky, and drought-prone habitats in western India, paralleling its preference for seasonally dry grasslands and rocky substrates in its native Neotropical range.

**Distribution:** North America (Mexico), Central America (Guatemala, Nicaragua, Costa Rica, Panama), South America (Colombia, Venezuela, Guiana, Ecuador, Peru, Brazil, Paraguay), now in South Asia (India).

**Specimens examined:** INDIA, **Gujarat**, Morbi District, Wankaner Taluka, Rampara Wildlife Sanctuary, Rabari galo, 50 m, N 22° 32' 20.5", E 70° 57' 24.2", 30.11.2025, Kishan Prajapati 114810 (BLAT); Rampara Wildlife Sanctuary, Pata galo, 70 m, N 22° 32' 09.3", E 70° 57' 25.9", 30.11.2025, Kishan Prajapati 114811, 114812 (BLAT); Rajkot District, way to Veja gam, N 22° 18' 06.6", E 70° 42' 59.9", 31.08.2025, Kishan Prajapati, 114813

(BLAT); Rajkot District, way to Veja gam, N 22° 18' 06.6", E 70° 42' 59.9". 17.10.2025, Kishan Prajapati 114814 (BLAT); Rajkot District, Avad Road, N 22° 17' 20.6", E 70° 43' 02.8", 26.10.2025, Kishan Prajapati 114815 (BLAT); Rajkot District, Bhichari Mata Temple, 190 m, N 22° 17' 58.5", E 70° 52' 04.7", 19.10.2025, Kishan Prajapati 114816 (BLAT).

**Taxonomic note:** *Evolvulus filipes* is closely allied to the pantropical and highly polymorphic *E. alsinoides*, through previous assessment have noted weak differentiation between these two taxa. In South America the species appear distinctive, while in Mexico they are not always separable (Felger *et al.*, 2012) reflecting environmental plasticity in *E. alsinoides* versus the stable Neotropical phenotype narrow-leaved, small-flowered phenotype of *E. filipes*. Recent field collections from India consistently maintain this delicate morphotype rather than the variable morphology typical of Old-World *E. alsinoides*, supporting recognition as a well-

defined geographic species. The flower of *E. filipes* tends to be smaller, and the entire plant is more delicate in appearance than *E. alsinoides* (Woodson *et al.*, 1975). The original description emphasizes a delicate habit with thin filiform peduncles which is almost three to four times longer than leaf and consistently small flowers, as reflected in the epithet *filipes* (thread-stemmed) (Martius, 1844). Additionally, taxonomic descriptions historically document corolla color in *E. filipes* as either pale blue or white (Martius, 1844; Woodson *et al.*, 1975; Felger *et al.*, 2012; Santos *et al.*, 2023); however, in the present investigation, all Indian populations examined consistently exhibited pale blue corollas, with no white-flowered individuals observed.

Scanning Electron Microscopic studies of seeds confirms the characteristics of *E. filipes* that are documented by Santos *et al.* (2024): seeds are black, ovoid with two flat ventral faces and one convex dorsal face, featuring irregular polygonal epidermal cells with sinuous, raised, smooth anticlinal walls and flat, smooth periclinal walls (Fig. 2). In contrast, *E. alsinoides* as described by Ketjarun *et al.* (2016) and summarized by Santos *et al.* (2024) has black to brown elliptic seeds (two flat ventral faces, one convex dorsal face) with irregular polygonal testa cells, sinuous smooth raised-fluted anticlinal walls and concave but smooth periclinal walls that appear folded in SEM (Fig. 2). Pollen grains of *E. filipes* are monad, apolar, radially symmetrical, circular and pantocolpate with 12 apertures; the exine is tectate and columellate, and SEM shows a microreticulate pattern overlaid by numerous small echinae, giving a microechinate ornamentation (Romeiro *et al.*, 2023; Fig. 2). Typical *E. alsinoides* pollen is likewise monad, spheroidal and pantocolpate with microechinate ornamentation, but with 15 apertures rather than 12, as reported by Ketjarun *et al.* (2016), so that *E. filipes* and *E. alsinoides* share the pantocolpate, microechinate pollen type but differ in aperture number and seedcoat micromorphology.

## Discussion

The unexpected discovery of *Evolvulus filipes* in Western India presents a compelling phytogeographical puzzle that can be explained by three potential introduction pathways. First, given that our collection sites in the Morbi and Rajkot districts are located near Gujarat's active maritime trade routes, maritime-mediated anthropogenic dispersal via the Mundra or Kandala mega-ports stands as most probable vector. The plant's minute seeds (nearly 1 mm long) could easily enter undetected as hidden contaminants in international shipping cargo or machinery coming from the Neotropics. Second, an agriculture or fodder contamination pathway is highly reasonable, as rangeland management initiatives in the Saurashtra Peninsula's pastoral tracts have historically utilized important bulk forage seed-mixes that may have harbored foreign seeds. Third, long-distance natural dispersal via high-altitude cyclonic winds or migratory birds' flyways remains a standard control hypothesis, though less likely due to the dense, non-winged nature of Convolvulaceae seeds. Ultimately, its successful establishment was driven by ecological climate mirroring. The hyper-seasonal, xeric microhabitats of the Saurashtra Peninsula featuring exposed basaltic or lateritic rocky outcrops, shallow soil pockets, and dry pond margins dominated by *Aristida funiculata* and *Sehima nervosa* perfectly duplicate the species' native Neotropical savannah environments, allowing *E. filipes* to bypass local environmental barriers and establish stable breeding populations.

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