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Amaranthus deflexus L. (Amaranthaceae), a new addition to Indian Flora

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Abstract

Few populations of *Amaranthus deflexus* L. were observed in Kerala region (SW-India), contributing the first record of this species to the national Flora. A morphological (macro and micro) description of the species, as well as ecological data are given. A note on the phenotypic plasticity exhibited by the taxon is also provided.

Keywords

Alien species, Caryophyllales, Synflorescence, Western Ghats.

Introduction

The genus *Amaranthus* L. (Amaranthaceae Juss.) includes 65–70 species, of which approximately half are native to the Americas (1, 2). In India, the genus *Amaranthus* is represented by 19 species and peninsular India has 12 species. Some species are used as ornamentals, food or medicine and are able to escape from cultivation, negatively impacting the agricultural systems and or the natural vegetation (2-4). *Amaranthus* is a taxonomically critical genus with high phenotypic variability resulting in nomenclatural confusions and misapplication of several names (5-12).

As part of the ongoing investigation on the family Amaranthaceae from India (14-20), we found some populations of *Amaranthus deflexus* L., a species not familiar to the flora of India. Morphological notes, as well as ecological data are presented here.

Materials and Methods

The study is based on field surveys collected specimens are deposited at UCBD and TBGT taxonomic investigations of the collected specimens, analysis of relevant literature and examination of specimens preserved at AO, APP, FI, HFLA, G, GH, K, KFRI, MH, NY, RO and TSB (herbarium codes is continuously updated) (21). The description given as observed is specimens from the fields.

Results and Discussion

Three populations of *Amaranthus deflexus* were found in South India, Kerala State, Thiruvananthapuram District, at Vithura suburbs (localities Bonaccord and Palode) and Kulathuppuzha town (Fig. 1), at elevation 700-1000 m a.s.l. The first observation of *Amaranthus deflexus* was in 2019 and the populations still exist in the above mentioned sites. A total of 40-55 individuals

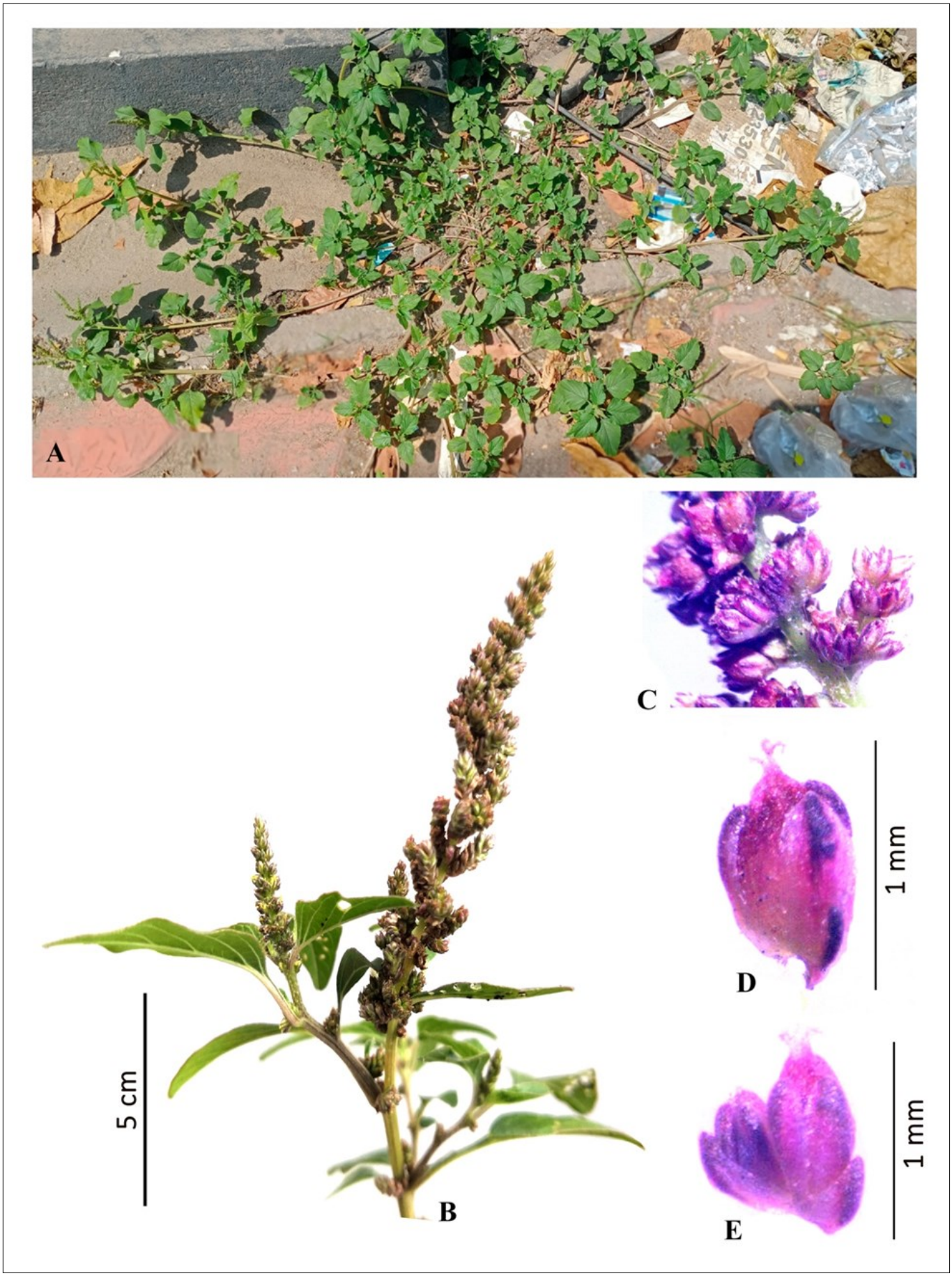


Fig. 1. *Amaranthus deflexus* L. **A.** Habit; **B.** Spike; **C.** infloresence close up; **D.** Pistillate flower; **E.** Flower cluster with bract.

were counted in these sites, occupying an area of about 3 m^2 per site. We observed the flowering and fruiting from June to February. Perusal of literature suggests these populations representing the first record of this species for the Flora of India. Since it is recently traced out and the low number of individuals found about 27-35, we consider *Amaranthus deflexus* as a casual alien species for India. However, the populations seemed fertile. Further, future moni-

toring is warranted towards possible naturalization of the species. In peninsular India there are 12 species of *Amaranthus* as per our observation. Key to the species is given below:

1a Tepals 2(3); prostrate or ascending plants; synfloresence in axillary glomerule……..……..…..2

1b Tepals 4(5); erect plants; synfloresence in panicles…..7

2a Stem white-greenish; bract spinescent…..…..…*A. albus*

2b Stem reddish brown; bracts not spinescent…….…..……..3

3a Gynoecium rough on surface; fruit subglobose ……..…….*A. viridis*

3b Gynoecium smooth; fruit ellipsoidal……4

4a Fruit dehiscent; smaller than tepal…..……*A. tricolor*

4b Fruit indehiscent; longer than tepal……..……5

5a Utricle pear shaped; twice as tepal……..…*A. deflexus*

5b Utricle subglobose; slightly longer than or equal to tepal……..……6

6aLeaf apex cordate-bilobbed often acute; fruit 0.5-1mm; slightly longer than tepal……..……*A. blitum*

6b Leaf apex acute, never bilobbed, fruit as long as tepal……..*A. graecizans*

7a Tepals 4-(5); bracts linear less than 1 mm…….....……8

7b Tepals 5; bracts ovate-deltoid, 1-2 mm……..*A. dubius*

8aTepals oblong-spathulate; equal; bract not spinscent; utricle irregular dehiscent……..*A. rajasekharii*

8b Tepals ovate-lanceolate; unequal; bract spinescent; utricle regular dehiscent……9

9a Terminal spike with spine; spine 10 mm long; gynoecium white-light green……..…..*A. spinosus*

9b Terminal spike without spine; spine 5 mm long; gynoecium lilac-dark green……..…..10

10a Pollen 22-23 µm; frequency of visible pore 26-30; fusion in ektexinuous body……..……*A. saradhiana*

10b Pollen 30 µm; frequency of visible pores more than 30; ektexinuous bodies not fused……..……11

11a Bract 2-3 per flower; lanceolate with membraneous boarders thinning to apex; bract: tepal ratio 1.5-2.0 mm……..…..*A. hybridus*

11b Bract 2 per flower; linear-lanceolate; bract: tepal ratio 1.2-2.3 mm……..……12

12a Terminal spikes and paraclade red; tepals with acute apex; bract ovate-obovate……..……*A. cruentus*

12b Terminal spikes and paraclade green; tepals with acuminate apex; bract linear-lanceolate..……. *A. powellii*

Amaranthus deflexus L., Mant. Pl. Altera: 295. 1771. - *Euxolus deflexus* (L.) Raf., Fl. Tellur. 3: 42. 1837. - *Albersia deflexa* (L.) Fourr., Ann. Soc. Linn. Lyon sér. 2, 17: 142. 1869.

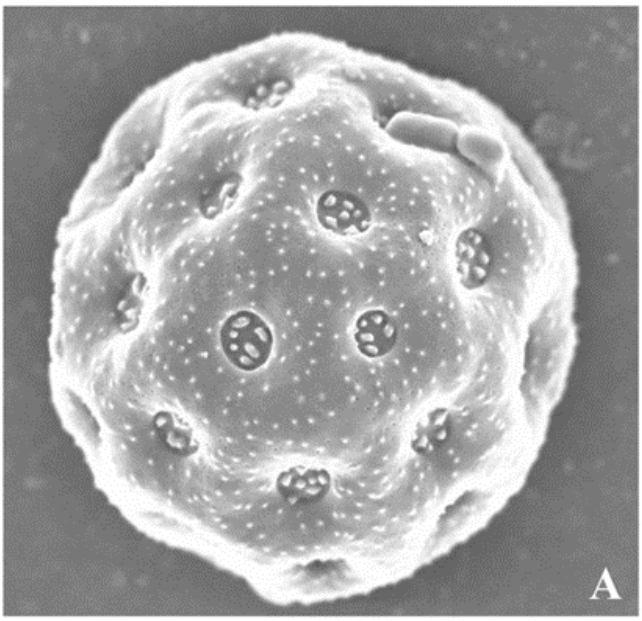
Type (lectotype designated by Aellen 1972: 7) -

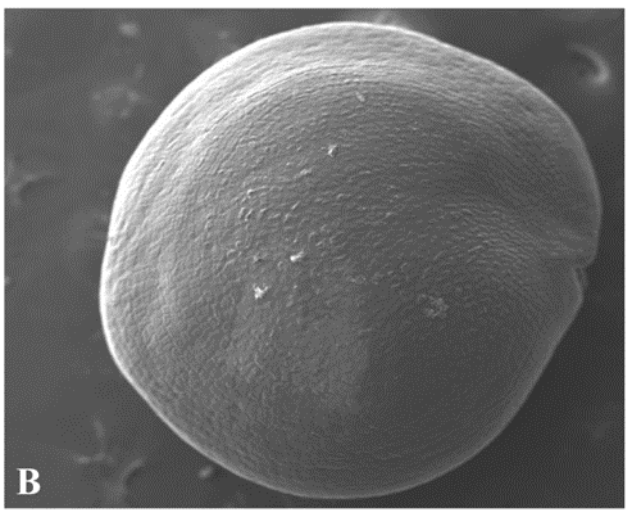
Unknown origin. Herb. Linn. No. 1117.18 (LINN, digital image!). (22).

Description (macromorphology)

Herbs 10-22 cm, monoecious, perennial, rarely annual (therophyte). Stems ascending or prostrate, glabrous often slightly pubescent in the upper part, green-light brown, branched. Leaves usually green sometimes with a central white spot, ovate or lanceolate, 1.3-5.5 × 0.9-2.3 cm, with entire margins, apex obtuse, base cuneate, glabrous sometimes pubescent on the veins, petioles 0.7-3.5 cm long. Synflorescences in axillary glomerules and terminal spike-like type, erect or slightly recurved, green or brown-reddish, 4.0-12.0 cm long. Floral bracts green to brownish, ovate to linear, 0.4-0.5 × 0.4-0.6 mm, 0.3-0.5 times shorter than the tepal, mucronate, margin entire, glabrous. Staminate flowers with 2-3 tepals, ovate-obovate; Stamens 2-3. Pistillate flowers with 2-3 tepals, linear to lanceolate 1.5-2.5 × 0.3-0.4 mm; stigmas 3. Fruits pale brown to reddish-brown, ellipsoid, 2.0-2.8 × 1.0-1.2 mm, two times longer than the tepals, smooth, indehiscent. Seed lenticular-ovoid 1.0-1.2 × 0.7-0.9 mm in diameter, black or dark-brown.

Description (micromorphology):- Roughly Subglobose with a sub-basal hilum. Towards periphery there are symmetrically organised parallel lines with more or less rectangular irruptions (Fig. 2d). Towards the centre of





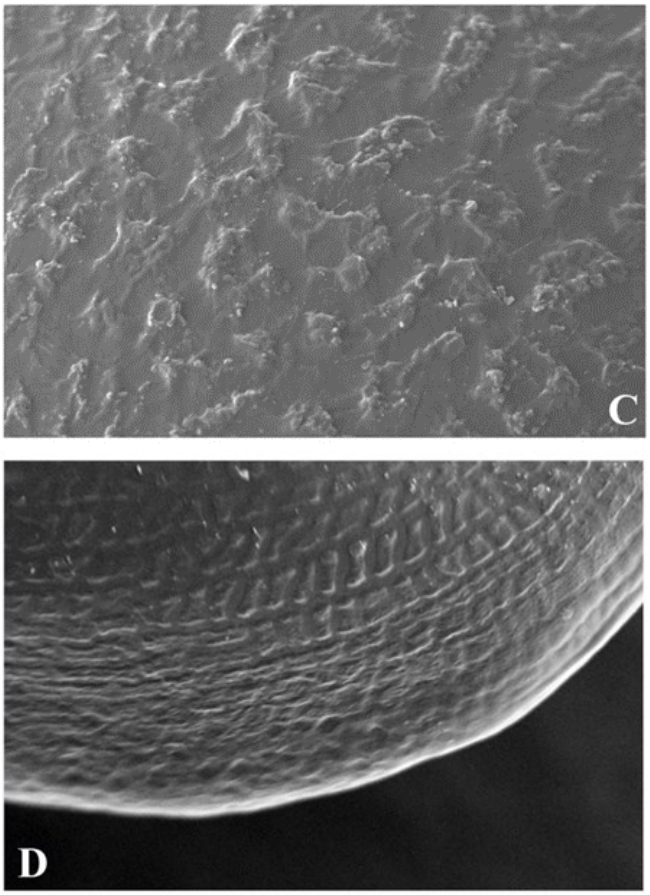


Fig. 2. Micromorphology of *Amaranthus deflexus* L. **A.** Pollen; **B.** Seed; **C.** Seed surface (middle region); **D.** seed surface (margin).

the seed the sculpturing are highly disoriented with irregularly scattered spermodermal structures. Epidermal cells ornamentation reticulate, each cell is sub-quadrangular.

Pollen grains are spheroidal, polypantoporate, each one with 8-10 pores; number of ektexinous bodies range from (12-13), not fused, prominent, extruding and spinuous; surface ornamentation microechinate, sparse, margin of pores not depressed and without conspicuous ornamentations.

Phenology-

Flowering from July to September.

Habitat

Roadsides and uncultivated land.

Elevation

0-1000 m a.s.l.

Alien status

The species is native to South America and can be considered invasive in India.

Specimen examined

INDIA. Kerala: Thiruvananthapuram District, Ulloor to Kesavadasapuram, 18 m, 27 May 2019, *Anil Kumar & Arya s.n.* (TBGT), Kollam District, Kollam town, 8 m a.s.l., 30 May 2019, *Anil Kumar & Arya* 872 (TBGT). Ernakulam District, Ernakulam-Thevara route, 4 m, 9.9312° N 76.2673° E, 3 January 2019, *Anil Kumar & Arya* 873 (CALI); Alappuzha District, Cherthala-Alappuzha region, 11 m, 9.4981° N 76.3388° E, 20 February 2019, *Anil Kumar & Arya* 874 (TBGT).

Notes on phenotypic plasticity of A. deflexus L.

The high degree of phenotypic plasticity characteristic of the genus *Amaranthus* is reflected in *A, deflexus* also, as evident from the current observations. We could find phenotypes of the taxon in varied habitats and the plants displayed crawling, small erect and branched prostrate habits. A few collections, interestingly exhibits deep purple coloration of the synflorescences. Though, initially this raised confusion, the consistency in floral traits like tepal - bract ratio, nature of bracts and tepals as well as the number of stamens highly substantiated its original species status.

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Authors contributions

Both the authors contributed equally to the work presented in the manuscript.

Compliance with ethical standards

Conflict of interest: The author strongly confirms that this research is conducted with no conflict of interest.

Ethical issues: None

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