

Ambrosia psilostachya DC (Asteraceae) – a new record but a potential threat to Indian flora

Recently, some farmers of M. Bevinahalli, Turuvekere taluk, Tumkur district, Karnataka approached the Weed Science Department of University of Agricultural Sciences, Bengaluru for occurrence of a new weed causing problems in agriculture, horticulture and animal husbandry since 15–20 years. Upon a visit to the villages of Muniyur, M. Bevinahalli and Srirampura, a new weed with leaves similar to *Parthenium hysterophorus* but with substantial differences in inflorescence and flower was seen in the fields covering the entire ground replacing grasses and other broadleaved species along the roadsides, bunds and crop fields. On a cursory look, the species resembled *Ambrosia artemisiifolia*, but also showed differences. In order to ascertain the spread of the species and to collect fresh specimens for the herbarium and correctly identify the plant, the authors visited the farmers' fields. Further, the authors could not see the new weed anywhere outside this locality, though the surrounding areas were thoroughly surveyed. Voucher specimens for herbarium were collected along with relevant field data for correct identification of the species. Critical examination of the specimens in the herbarium and through literature surveys revealed that the plant belongs to an altogether different species of *Ambrosia*, namely *Ambrosia psilostachya* DC, closely allied to *A. artemisiifolia* of Asteraceae, hitherto not reported from India^{1–3}. Further, the species forms a new record for Indian flora and is the second species of the genus *Ambrosia* in India. *A. psilostachya* can be differentiated from *A. artemisiifolia* as follows.

A. artemisiifolia: Annuals with shallow tap roots; plants 60–150 cm high; leaves mostly two-pinnate, appressed hairy; syn-florescence 15–30 cm long; corolla lobes five; stamens five, filaments connate; achenes woody, with 1–2 central protuberances surrounded by 3–6 shorter projections.

A. psilostachya: Perennials with deep horizontal rhizomatous root system with adventitious root buds (tubers); plants 15–50 cm high; leaves unipinnately lobed, harshly pubescent with stiff grey hairs; synflorescence 5–15 cm long;

corolla lobes mostly four; stamens 4–5, filaments inserted on the corolla tube; achenes with a short, blunt spine or projection.

The species, *A. psilostachya* is known to hybridize with *A. artemisiifolia*. The hybrids between *A. psilostachya* and *A. artemisiifolia* have been named *A. intergradiens* W. H. Wagner⁴.

How this species from North America has got introduced into such an isolated pocket near Turuvekere is a mystery. However, the probability of the species being brought from long-distance travelling migratory birds cannot be ruled out, as the nongame birds like Least Bell's Vireo, upland game birds like Common Pheasant, Blue Grouse and others use the seeds as food and weed materials for nesting⁵. The introduction of the species through contaminated food grain may not be possible, as the weed is localized only in these villages in Karnataka. The literature revealed that this weedy species has also been established in some parts of South America, Europe, New Caledonia, Japan, Taiwan and Australia^{6–10}. Perhaps, the species might have made its way to India from any of these places. It is also certain that the species is being spread by extensive vegetative reproduction through the horizontally spreading underground rhizomatous stoloniferous roots, as evident from the fact that the species is localized in these villages and has not reached other localities in spite of its existence for the last 15–20 years. In the absence of pappus, the achenes are not dispersed through wind to other far off places. As the biology of the species is not yet fully known, it is not clear whether all the achenes are viable or dormant and the period of dormancy, if any. The species is said to be responsible for causing severe allergenic diseases in human beings in the United States^{11,12}.

The purpose of this publication is not only to report the new record of the species for India, but also to draw the attention of all botanists, agronomists, weed scientists, agriculture administrators, local NGOs and others, about the serious threat the species is likely to pose to the farming sector. This species has already firmly established and has spread to vast agricultural areas in the reported locality

in Karnataka. All efforts should be made to make sure that the species does not spread to other areas and become a more aggressive invasive species adding to the farmers' woes. Otherwise, this species will certainly become the worst invasive weed of the country in the coming years.

The species is reported here along with its taxonomic citation and description.

A. psilostachya de Candolle in A. P. de Candolle and A. L. P. de Candolle, Prodr. 5:526. 1836. *A. californica* Rydberg, in Britton, N. Amer. Fl. 33: 20. 1922. *A. coronopifolia* Torrey & A. Gray, Fl. N. Amer. 2: 291. 1842. *A. rugelii* Rydberg, in Britton, N. Amer. Fl. 33: 19. 1922. *A. psilostachya* de Candolle, var. *californica* (Rydberg) S. F. Blake, in Tidestrom, Fl. Utah 580. 1925. *A. psilostachya* de Candolle, var. *Coronopifolia* (Torrey & A. Gray) Farwell ex Fernald, in A. Gray, Manual, ed. 8. 1470. 1950 (Figure 1).

Type: 'in Mexico inter San-Fernando et Matamoros legit cl. Berlandier (pl. exs. n. 2280!).'

Common names: Perennial ragweed, western ragweed (English); local farmers call this 'Sudugadu davana or Ketta davana' (in Kannada) because of the ill-effects of the species on agriculture.

The word *Ambrosia* from Greek for 'food of the gods'; *psilostachya* derived from the Greek *psilos*, 'bare' and *stachys*, 'a spike', hence a 'bare spike'.

Erect, feebly aromatic perennial herbs, perennating by horizontally spreading rhizomes (Figure 1b) with tuber-like bodies, 10–60 cm high; stems erect, glabrescent below, simple or with ascending branches from above middle; leaves petiolate below, upper sessile, proximally opposite, decussate, distally alternate harshly pubescent with stiff grey hairs; petioles 0–25 mm (often ± winged); blades deltate to ovate lanceolate, 20–60 ± 8–30 mm, once pinnately toothed to one-pinnately lobed, large segments 2–4 cm, divergent or ascending, linear or elliptic-oblong, bases cuneate to truncate, ultimate margins entire or toothed, abaxial and adaxial surfaces hirsutulous to strigose and gland-dotted; central rachis 2–6 mm wide; synflorescences terminal, nodding, spiciform, 10–20 cm long, usually surrounded by smaller

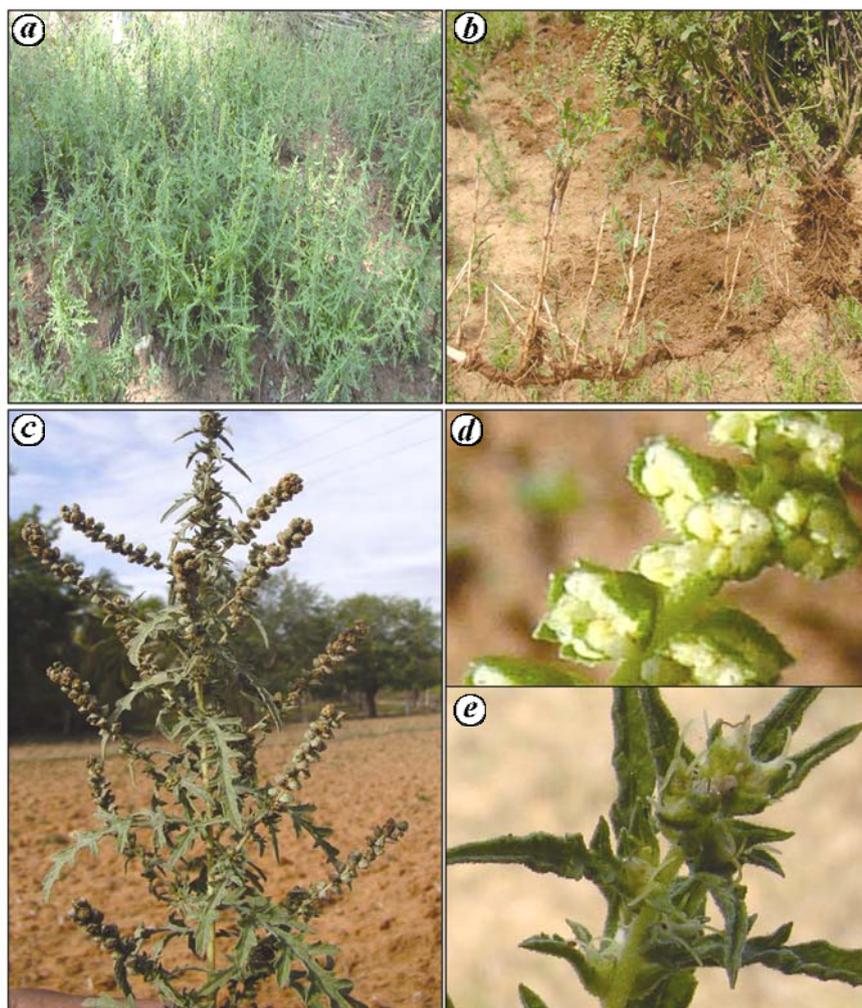


Figure 1. *Ambrosia psilostachya* DC. **a**, Habit; **b**, Horizontally running rhizome; **c**, Portion of the plant enlarged; **d**, Involucre of male flowers; **e**, Involucre of female flowers.

secondary spikes terminating axillary branches, spikes primarily of 50–100 bead-like male capitulae. Male capitula (Figure 1 *d*): nodding in spikes, 7–15 cm long, peduncles 0.5–2 mm; involucre obliquely cup-shaped or turbinate, 3–5 mm in diameter; paleae filiform, rough hairy, apices expanded and pubescent; florets 5–10; corolla pale yellow or greenish-yellow, petals 4–5, 2–2.5 mm, united to form a tube; stamens four, inserted on the corolla tube, anthers white, inflexed-subulate, bases obtuse. Female capitula (Figure 1 *e*): with an obovoid or turbinate cupule-like involucre, inconspicuous, solitary or 2–5 together in sessile leafy-bracteate axillary clusters on nodes beneath male part of spike; floret one; corolla absent, ovary one; style two-branched, two-locular with one ovule in each locule; achenes (Burs) obpyramidal to globose, 3–4 mm (including beak),

hirsutulous, spines or tubercles absent or 1–3, mostly distal, stoutly conic to acerose, 0.5–1 mm, tips straight, 2–3 mm wide, including blunt spines, spines 0.5–0.8 mm long, thick, beak tapering, 0.7–1 mm; pappus absent.

Flowers and fruits: September to December; if enough soil moisture, up to March.

Distribution: Native of temperate North America (USA, Mexico, Canada), introduced to parts of South America, Europe, Japan, Taiwan, Australia and now India – Karnataka (Tumkur district).

Notes: *A. psilostachya* closely resembles *A. artemisiifolia*, but primarily differs in the perennial nature of the weed and other characters as shown in the above key. Once established, the species can expand its distribution range primarily through its horizontally spreading root-stocks up to 1.0 m paving way for the

emergence of many shoots. *A. psilostachya* is highly competitive by having dense root ramification in top 15–25 cm soil depth and has invaded agriculture crops in the area – finger millet, mulberry, coconut, areca nut. The species has also affected pastures by occupying bunds, wastelands, roadsides, etc., totally replacing grasses and thereby affecting animal husbandry. The species has serious negative impacts like crop losses, reduction in the local flora, increased human allergic reactions and decrease in fodder availability.

This is one of the most difficult weeds to eradicate because of the extensive underground, horizontally running rhizomes with adventitious root buds. Although the species is firmly established and spread to ca. 3.0 km area all along the water course from Muniyur to Gottigere, cropped and non-cropped areas of Muniyur, M. Bevinahalli, Srirampura and Pura villages of Turuvekere taluk, it is necessary to completely eradicate the weed in the interest of Indian agriculture. All concerned agencies like the Ministries of Agriculture, Animal Husbandry, Environment and Forests and other agencies like Rural Development and Panchayat Raj, Development departments, Agricultural universities, botanists, farmers, NGOs, rural youth in the region and the concerned village Panchayats should take up this task on priority. Some of the control measures suggested are periodical manual removal, shallow plowing followed by passing cultivator in cultivated fields, spraying of post-emergence non-selective herbicides like glyphosate 41 SL (10 ml/l of water) or 71 WP (7.5 g/l of water) on roadsides, bunds, wastelands, which will effectively kill this hardy invasive alien species. Manual removal or passing cultivator facilitates root fragments to remain in the soil and thus pave way for further emergence of the species. Repeated enforcement of control measures is required to check the weed at least in another 4–5 years time. Considering this as a ‘quarantine weed’, necessary steps need to be taken to prevent its further spread to other areas through transportation of soil, plant materials, seed materials, implements, etc. There is need for having surveillance team with rural youth, village leaders and farmers of the region along with technical support from Agricultural University and Development Departments.

Specimens examined: India, Karnataka State, Turuvekere taluk, M. Bevinahalli village, R. R. Rao 4501, 11-10-2012 (specimen deposited in Herbarium, Botanical Garden, University of Agricultural Sciences, GKVK, Bengaluru).

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Grooming of sambar (*Rusa unicolor*) by rhesus macaque (*Macaca mulatta*) in Sariska Tiger Reserve, Rajasthan, India

Instances of interspecific cooperation and associations between non-human primates and other mammals, especially ungulates, are not uncommon, although certain cases have been extensively studied in many parts of Asia and Africa¹. In South Asia, the most common association is found between Hanuman langur (*Semnopithecus* spp.) and chital (*Axis axis*)^{1–4}, whereby the langur, while selecting edible parts for feeding, drops large quantities of buds, flowers and fruits from trees which are then foraged upon by chital (gleaning). Such associations further result in a more effective warning system against common predators, where the olfactory sensibility of chital is pooled with the visual acuity of langurs, thus providing an efficient vigilance system^{1–4}. Such primate–ungulate associations have also been reported between Hanuman langur and other ungulates such as nilgai (*Boselaphus tragocamelus*)³, sambar (*Rusa unicolor*)³ and hangul (*Cervus elaphus*)⁵ in Asia. In Africa the most common reported associations

are between baboon *Papio* spp. and impala (*Aepyceros melampus*), and baboon and bushbuck (*Tragelaphus scriptus*)^{6,7}. Such alliances may further go beyond just mere acceptance and association and may result in frequent physical contacts and active grooming of other mammals by the primates⁸. Here we report one such association between rhesus macaques (*Macaca mulatta*) and a sambar, which interestingly also involves grooming and riding of the sambar by the rhesus macaque (Figure 1a), observed during the large mammal survey conducted in Sariska Tiger Reserve (76°17'–76°34'E and 27°5'–27°33'N), Rajasthan, western India.

On 15 December 2010, at about 11:04 am, we came across an adult female sambar standing at a distance of about 10–12 m from the roadside near the Bandipool temple in Sariska Tiger Reserve. Close to the sambar, a troop of multimale bisexual rhesus macaques was busy in its routine activities such as basking, playing, grooming, etc. The

sambar stared at us for a few seconds and then walked towards the monkey group, made its way through and stopped at about 5 m from the troop. Meanwhile a juvenile rhesus macaque (JM1) approached the sambar and sat at a distance of about 1 m. After about 30 sec JM1 stood upright and raised itself as much as possible and started grooming the lower region of the right flank of the sambar. The sambar seemed indifferent to the moves by the macaque. After intermittent grooming for about a minute the macaque stopped for a while and then climbed upon the sambar, sat on the rear back, raised the tail of the sambar with its hands and started grooming it; soon, the macaque moved on to groom the neck and ears of the sambar. The sambar was calm and demonstrated no sign of distress. Most of the adult male troop members seemed to be least concerned with the whole happening; however, 5–6 juveniles and a few adult females were keenly observing the grooming of the sambar by JM1. When this grooming of