

# *Erigeron sumatrensis* (Asteraceae): a recently recognized alien species in the Bulgarian flora

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**Abstract.** *Erigeron sumatrensis* is reported as a new alien species for the Bulgarian flora. It was introduced much earlier but remained unrecognised, probably confused with *E. bonariensis*. The species is described concisely, illustrated and compared with similar naturalised species in the Bulgarian flora. *E. sumatrensis* is relatively widespread in the country and so far recorded in seven out of the 20 floristic regions. It grows mainly in man-made habitats but was also found in some secondary grasslands. Field observations show that the species is invasive in the Bulgarian flora.

**Key words:** alien species, Bulgarian flora, *Conyza*, *Conyza sumatrensis*, *Erigeron*, invasive species

## Introduction

The genus *Conyza* Less. is represented by seven alien species in the European flora (Šída 2003), of which two – *C. canadensis* (L.) Cronquist and *C. bonariensis* (L.) Cronquist – have been recorded in the Bulgarian flora (e.g. Delipavlov 2003; Assyov & Petrova 2006). Studies particularly on the alien flora in Bulgaria in the past few years have revealed that a third species is represented and relatively widespread in the country.

In the recent treatment of *Compositae* for the Med-Checklist and Euro+Med Plant Base projects (Greuter 2006–2009, 2008) all species of *Conyza* have been included in *Erigeron* L. Following this taxonomic concept, the newly recorded species is reported here as *E. sumatrensis* Retz.

## Material and methods

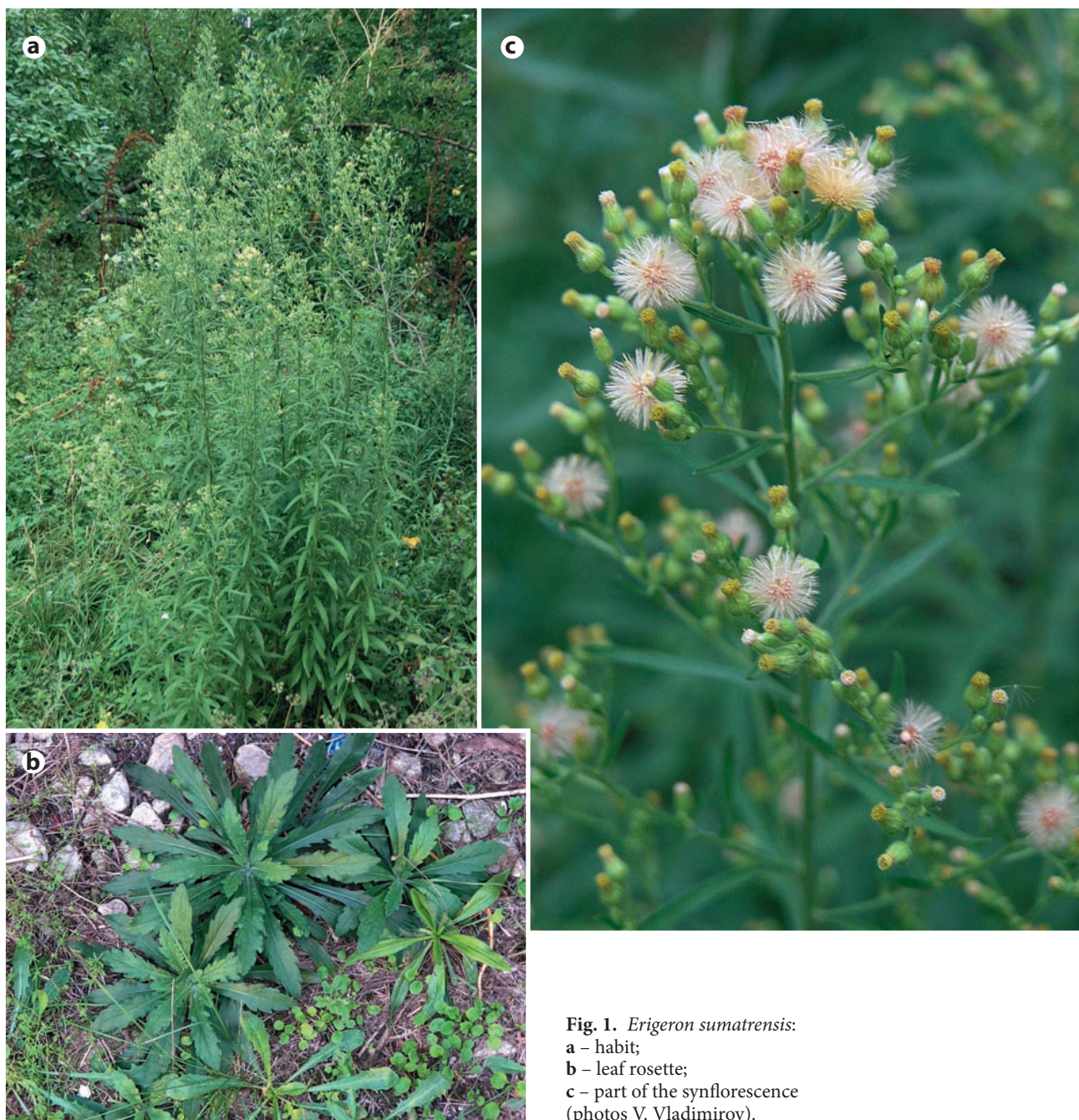
Plant material was collected from different parts of Bulgaria during field work, mainly in the summer and autumn of 2009. Morphological characters were

recorded from the collected herbarium material and compared with data from literature (e.g. Marshall 1973; Davis & al. 1988; Wurzell 1988; Milović 2004). Herbarium specimens were deposited in the Herbarium (SOM) of the Institute of Botany, BAS.

## Results and discussion

***Erigeron sumatrensis*** Retz., *Observ. Bot.* 5 (1788) 28 (syn.: *Conyza sumatrensis* (Retz.) E. Walker) (Fig. 1)

Grayish-green annual, (50)100–150(200) cm, erect, densely hairy; hairs of two types – evenly distributed, directed upward, appressed short hairs and scattered, somewhat uneven, ±patent, longer hairs. Leaves numerous, simple, alternate, the lower elliptic-lanceolate to oblong-ovate, petiolate, remotely dentate (with 3–6 teeth on each side), the middle linear-lanceolate to linear, 4–10 × 0.6–1(1.2) cm, ±entire, the upper shorter and narrower, sessile. Synflorescence rhombic in outline, 30–50 cm long, with many capitula. Involucrum 4–6 × (4)5–7 mm; bracts grayish-green, linear-lanceolate, acuminate, densely hairy. Female florets



**Fig. 1.** *Erigeron sumatrensis*:  
**a** – habit;  
**b** – leaf rosette;  
**c** – part of the synflorescence  
 (photos V. Vladimirov).

130–200, with very short (inconspicuous) whitish ligules; hermaphrodite flowers *ca.* 15, with yellow corolla. Achenes 1–1.5 mm long, with 4–5 mm long pappus of pale brown hairs.

**Phenology.** Flowering in July–September (October), fruiting in August–November.

#### **Distribution in Bulgaria:**

**1. Black Sea Coast (Northern):** along the asphalt road above the beach at the Zhurnalist Resort, N of Varna, *ca.* 20 m, 43°15'31"N, 28°01'53"E, 20.08.2005,

coll. V. Vladimirov (SOM 162433, 162434), incorrectly reported as *Conyza bonariensis* (Vladimirov 2006); along the road Varna – Free University of Varna – Zlatni Pyasatsi, at the Zhurnalist Resort, 43.26215°N, 28.03036°E, 27.08.2009, coll. V. Vladimirov (SOM 165458, 165459), *ca.* 15 individuals; Luna Camping Site near Obzor, 42°50'38.1"N, 27°52'58.2"E, 21.07.2009, coll. V. Vladimirov & A.S. Petrova (SOM 165453); railway station in Ezerovo village, Varna district, 43.19885°N, 27.77019°E, 02.10.2009, coll. V. Vladimirov & A.S. Petrova (SOM 165468);



railway station in Varna, 43.20098°N, 27.90023°E, 02.10.2009, obs. V. Vladimirov, A.S. Petrova & I. Yankov; Varna Harbour – West, 43.19436°N, 27.64658°E, 02.10.2009, coll. V. Vladimirov & A.S. Petrova (SOM 165467); Varna Harbour– East, 43.19598°N, 27.90740°E, 02.10.2009, obs. V. Vladimirov, A.S. Petrova & I. Yankov.

**2. Northeast Bulgaria:** railway station in Sindel village, Varna region, 43.12063°N, 27.59920°E, obs. V. Vladimirov & A.S. Petrova; railway station in Devnya town, 43.21782°N, 27.59544°E, 27.08.2009, coll. V. Vladimirov & A.S. Petrova (SOM 165461); along the railroad tracks at Razdelna shunting railway yard, 43.16748°N, 27.63644°E, 27.08.2009, coll. V. Vladimirov & A.S. Petrova (SOM 165460).

**3. Forebalkan (Western):** Montana – town center and eastern suburbs, FM-80, 30.08.2009, obs. V. Vladimirov.

**4. Valley of Struma River:** Petrich town, in the street and in the gardens near the building of the Regional Forestry Office, 41.39120°N, 23.20025°E, 17.08.2009, obs. V. Vladimirov, several hundred flowering and fruiting individuals; Petrich, Hristo Chernopееv St. near the town center, 41.39861°N, 23.20926°E, obs. V. Vladimirov, ca. 30 flowering and fruiting individuals; embankment of the road from Simitli to Bansko, ca. 1 km after Simitli, 41.88137°N, 23.14451°E, 25.09.2009, coll. V. Vladimirov (SOM 165462, 165463), several scores of individuals; at the field margins between river Strumeshnitsa and the road from Petrich to Strumeshnitsa village, ca. 0.5 km before the village, 41.39598°N, 23.05338°E, 10.10.2009, coll. V. Vladimirov (SOM 165471); ca. 2 km from Strumeshnitsa village along the road to the frontier checkpoint to Macedonia, 41.39602°N, 23.02677°E, 10.10.2009, coll. V. Vladimirov (SOM 165470); railway station in Kulata village, 41.38898°N, 23.36139°E, 10.10.2009, coll. V. Vladimirov (SOM 165472).

**5. Pirin Mts (Northern):** along the road from Simitli to Bansko, 3–4 km before Predela locality, 41.90644°N, 23.30307°E, 07.10.2009, coll. V. Vladimirov (SOM 165469), several flowering and fruiting individuals growing together with *Erigeron canadensis*.

**6. Rila Mts:** abandoned fields along the road from Dupnitsa to Blagoevgrad, 0.5–1 km after Usoika village, 42.18667°N, 23.05656°E, 16.08.2009, coll. V. Vladimirov (SOM 165454, 165455, 165456, 165457), many hundreds of individuals growing together with *Erigeron canadensis* and *E. bonariensis*; railway sta-

tion in Kostenets town, 42.31387°N, 23.85665°E, 16.09.2009, coll. V. Vladimirov & A. Petrova (SOM 165447); abandoned fields ca. 2–3 km after Dupnitsa town along the road to Samokov, 42.29125°N, 23.17631°E, 25.09.2009, coll. V. Vladimirov (SOM 165464, 165465, 165466), many hundreds of flowering and fruiting individuals growing together with *Erigeron canadensis*.

**7. Thracian Lowland:** along the road and railway tracks from Kostenets to Belovo towns after the road-fork to Sestrimo, 42.23526°N, 23.94749°E, 16.09.2009, coll. V. Vladimirov & A. Petrova (SOM 165448, 165449), many hundreds of flowering and fruiting individuals along the railway tracks, on the road embankment and in the adjacent secondary grasslands; railway station in Pazardzhik town, 42.16965°N, 24.32138°E, 17.09.2009, coll. V. Vladimirov & A. Petrova (SOM 165450); abandoned fields along a river flowing under the Pazardzhik–Plovdiv road, some 3–4 km off Pazardzhik, 42.18505°N, 24.39538°E, 17.09.2009, coll. V. Vladimirov & A. Petrova (SOM 165451), several flowering and fruiting individuals; railway station in Plovdiv, along the railway tracks, 42.13485°N, 24.74556°E, 17.09.2009, coll. V. Vladimirov & A. Petrova (SOM 165452), many hundreds of flowering and fruiting individuals.

*Erigeron sumatrensis* is native to South America, from where it has spread to the warmer regions of all continents, except for Antarctica (e.g. Thébaud & Abbott 1995; Pruski & Sancho 2006). In the Balkans *E. sumatrensis* has been recorded in several countries: Albania (Baltisberger & Lippert 1987), Croatia (Čarni 1996 cited by Milović 2004), Greece (Danin 1976, 1983), Serbia (Vrbničanin & al. 2004; personal observations), Slovenia (Poldini & Kaligarič 2000), European Turkey (Davis & al. 1988: 161–162).

Considering the present wide distribution and abundance of the species in Bulgaria, it has probably been introduced at least two decades ago. However, the taxon remained unrecognized from *E. canadensis* and *E. bonariensis*, mainly due to the lack of appropriate taxonomic literature, e.g. *Flora Europaea* (Cronquist 1976) gives only two species of *Conyza* for the whole of Europe. The main distinguishing characters of the three species are presented in Table 1 and Figs. 1 and 2. Additionally, *E. sumatrensis* differs from *E. bonariensis* in the larger cauline leaves (in *E. bonariensis* usually not bigger than 4–6 × 0.2–0.4 cm) and shorter peduncles, which are usually as long as, or up to twice

**Table 1.** Distinguishing morphological characters of *Erigeron bonariensis*, *E. canadensis* and *E. sumatrensis* (based on material from Bulgaria).

Characters	<i>E. bonariensis</i>	<i>E. canadensis</i>	<i>E. sumatrensis</i>
Height of stem	Up to 40–60 cm	100–150(180) cm	100–150(200) cm
Branching of stem and overall habit	Lateral branches overtopping the terminal branch; synflorescence broadest in the uppermost part	lateral branches not or seldom overtopping the terminal branch; synflorescence usually with broadly columnar or $\pm$ rhombic shape	lateral branches not overtopping the terminal one; synflorescence with clearly rhombic outline
Indumentum of stem	Densely hairy, hairs of two types – dense, evenly distributed, directed upward, appressed short hairs and scattered, appressed to erectopate longer hairs	sparsely to moderately patently hairy	densely hairy, hairs of two types – dense, evenly distributed, directed upward, appressed short hairs and scattered, patent or directed upwards longer hairs
Indumentum of leaf margin	Densely appressed pubescent with occasional, $\pm$ patent longer hairs	conspicuously hispid-ciliate	densely appressed pubescent with scattered, patent longer hairs
Diameter and indumentum of involucre	(4)5–8 mm; densely hirsute	2–4 mm; glabrous or nearly so	(4)5–7 mm; densely hirsute
Type of marginal female florets	actinomorphic	zygomorphic, with conspicuous (ca. 1 mm) white ligules	zygomorphic, with very short, inconspicuous ligules
Colour of margin of the apical part of involucre bracts	usually reddish	green	green
Colour of pappus hairs	dirty white	pale-brown	pale-brown

**Fig. 2.** *Erigeron bonariensis*: **a** – part of the synflorescence; **b** – habit; (photos V. Vladimirov).

longer than the capitula in fruiting stage (in *E. bonariensis* peduncles of most capitula are twice to sixfold as long as the capitula).

*Erigeron sumatrensis* is less thermophyllous than *E. bonariensis*, but more thermophyllous than *E. canadensis* (Wurzell 1988). This is congruent with the observed distribution patterns of the three species in Bulgaria: *E. canadensis* is most common, recorded in all 20 floristic regions, often at altitudes above 1000 m, whereas *E. bonariensis* is restricted only to the warmer regions in the country, e.g. in the Valley of River Struma and

Thracian Lowland floristic regions, at altitudes of up to 400–500 m. *Erigeron sumatrensis* grows in warm, sunny places, usually in man-made habitats: road embankments, along railroad tracks, abandoned arable land and field margins. However, it was observed also in some secondary grasslands, in close proximity to railways and roads. In the warmer regions of the country the three species often grow together.

All observed populations of the *E. sumatrensis* were viable and persistent, without further introduction or intervention by humans, which implies that the species may be considered naturalized in the sense of Richardson & al. (2000). Personal observations in the numerous localities of the species in Bulgaria suggest that it is a highly invasive taxon. Both *E. sumatrensis* and *E. canadensis* are considered the most widespread species throughout the world (Thébaud & Abbott 1995). Some reproductive traits associated with the high invasive potential of the species are the autonomous seed production, versatile mating system of self- and cross-pollination, generalized pollination system, high and rapid production of achenes, high percentage, rapid germination rate and high dispersal capability of achenes (Hao & al. 2009). Personal observations have shown that cutting of the species reduces the number of the flowering and fruiting capitula, but does not prevent the formation of ripe seeds. The plants form short branches soon after cutting and manage to produce a good amount of viable seeds. Herbicide treatment also does not seem to be very effective since glyphosate resistance has been reported for the species (Yang & al. 2006 cited by Hao & al. 2009).

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## References

- Assyov, B. & Petrova, A. (eds). 2006. Conspectus of the Bulgarian Vascular Flora. Distribution Maps and Floristic Elements. BBF, Sofia.
- Baltisberger, M. & Lippert, W. 1987. Compositen aus Albanien. – *Candollea*, **42**(2): 679-691.
- Cronquist, A. 1976. *Conyza* Less. – In: Tutin, T.G. & al. (eds), Flora Europaea. Vol. 4, p. 120. Cambridge Univ. Press, Cambridge.
- Danin, A. 1976. On three adventive species of *Conyza* (*Compositae*) in Greece. – *Candollea*, **31**: 107-109.
- Danin, A. 1983. *Conyza albida* Sprengel. – In: Greuter, W. & Raus, Th. (eds), Med-Checklist Notulae, 8. – *Willdenowia*, **13**(2): 283.
- Davis, P.H., Mill, R.R. & Tan, Kit. 1988. Flora of Turkey and the East Aegean Islands. Vol. 10, Supplement. Edinburgh Univ. Press, Edinburgh.
- Delipavlov, D. 2003. *Asteraceae*. – In: Delipavlov, D. & Cheshmedzhiev, I. (eds), Key to the Plants of Bulgaria. Pp. 376-432. Acad. Press Agrarian Univ., Plovdiv (in Bulgarian).
- Greuter, W. 2006–2009. *Compositae* (pro parte majore). – In: Greuter, W. & Raab-Straube, E. von (eds), *Compositae*. Euro+Med Plantbase – the information resource for Euro-Mediterranean plant diversity. – <http://www.emplantbase.org/home.html> (accessed on 05.10.2009).
- Greuter, W. 2008. *Compositae*. – In: Greuter, W. & Raab-Straube, E. von. (eds), Med-Checklist. A critical inventory of vascular plants of the circum-Mediterranean countries. 2. Dicotyledones (*Compositae*). OPTIMA Secretariat, Palermo, Med-Checklist Trust of OPTIMA, Gêneve, and Euro+Med Plantbase Secretariat, Berlin.
- Hao, J.-H., Qiang, Sh., Liu, Q.-Q. & Cao, F. 2009. Reproductive traits associated with invasiveness in *Conyza sumatrensis*. – *J. Syst. Evol.*, **47**(3): 245-254.
- Marshall, J.B. 1973. 522. *Conyza* taxa found in Britain. – *Watsonia*, **9**: 372-373
- Milović, M. 2004. Naturalised species from the genus *Conyza* Less. (*Asteraceae*) in Croatia. – *Acta Bot. Croat.*, **63**(2): 147-170.
- Poldini, L. & Kaligarič, M. 2000. *Bidens pilosa* and *Conyza sumatrensis*, two new naturalized species in the flora of Slovenia. – *Annales*, **10**: 77-80.
- Pruski, J.F. & Sancho, G. 2006. *Conyza sumatrensis* var. *leiotheca* (*Compositae: Astereae*), a new combination for a common neotropical weed. – *Novon*, **16**(1): 96-101.
- Richardson, D.M., Pyšek, P., Rejmánek, M., Barbour, M.G., Dane Penetta, F. & West, C.J. 2000. Naturalization and invasion of alien plants: concepts and definitions. – *Diversity and Distrib.*, **6**: 93-107.
- Šída, O. 2003. *Conyza triloba*, new to Europe, and *Conyza bonariensis*, new to the Czech Republic. – *Preslia*, **75**: 249-254.
- Thébaud, C. & Abbott, R.J. 1995. Characterization of invasive *Conyza* species (*Asteraceae*) in Europe: quantitative trait and isozyme analysis. – *Amer. J. Bot.*, **82**: 360-368.
- Vladimirov, V. 2006. Reports 83-95. – In: Vladimirov, V. & al. (eds), New floristic records in the Balkans: 1. – *Phytol. Balcan.*, **12**(1): 125-126.
- Vrbničanin, S., Karadžić, B. & Dajić-Stevanović, Z. 2004. Adventive and invasive weed species in Serbia. – *Biosistematika*, **13**(1): 1-12.
- Wurzell, B. 1988. *Conyza sumatrensis* (Retz.) E. Walker established in England. – *Watsonia*, **17**: 145-148.

