



**VERBESINA ALTERNIFOLIA –
A NEW ALIEN PLANT IN ROMANIA'S FLORA**

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Abstract: In the recent decades, there was reported, with an increasing frequency, the presence of more and more alien plant species in Romania. These newly arrived species are added to the inventory of wild, spontaneous/subspontaneous species of Romania. In this regard, the authors signaled out the presence of a new alien plant species of genus *Verbesina* in Romania, namely *Verbesina alternifolia*, identified during the year of 2016, along the Mureș river floodplain, in Simeria town (Hunedoara County).

Key words: new alien species, *Verbesina alternifolia*, Simeria, Romania, identification key.

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Introduction

The genus name of *Verbesina* L. is considered to be derived from the genus name *Verbena* (*Verbenaceae* family) and the ending Latin *-ina*, meaning resemblance, with reference to the similarity of the leaves of some species of *Verbesina* genus, with those of *Verbena* genus (Robinson & Greenman 1899).

The genus *Verbesina* is now on the whole accepted to be exclusively an American one, naturally distributed from southern parts of Canada in North to Argentina in South (Coleman 1977), except so far as those plant species which have been introduced or/and naturalized in some parts of the Old World (Robinson & Greenman 1899). For instance, the current distribution of *V. encelioides* (Cav.) A. Gray includes North America, Central America, South America, Africa, Asia, Oceania, and Europe, including Romania, though the origin of this species is North America (Hansen 1976, Anastasiu et al. 2009).

Over the time, to this genus have been assigned more and more species, as they are: 109 species (Robinson & Greenman 1899); ca 150 species (Corell & Johnston 1970); 250 specii (Coleman 1977); over 300 species (Flann 2009+).

Among the species of *Verbesina*, over 70 are strictly located but over 90% of them are distributed in several regions of the America's (Robinson & Greenman 1899), as follows: S. E. of United States of America (S Carolina to Florida, and Alabama) = 3 species; Region of Lower Rio Grande Sonora = 4 species; Region Sonoran (W Texas to S California and N. W. Mexico) = 16 species; Central and S Mexico = 44 species; - Central America = 9 species; N part of S America (Colombia to Guyana) = 4 species;

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Brasil, Uruguay, Paraguay, and Argentine = 11 species; Region of Andes (Ecuador to Chili) = 8 species; W Indies = 2 species.

However, it is thought that the highest specific diversity of this genus is to be met in uplands of Central and Southern Mexico (Coleman 1977), where ca 40% of its species are endemics (Robinson & Greenman 1899).

One of the species of this genus, is *V. alternifolia*, whose name has been given by the Swedish naturalist Carl Linnaeus, as *Coreopsis alternifolia* (Linnaeus 1753), this name being the basionym (the specific epithet *alternifolia* is referring to the alternate leaf pattern of this species, other species within the genus having opposite leaves). In the 1st half of the 19th century, to this name have been awarded others, such as: *Actinomeris squarrosa* (heterotypic synonym), by the English botanist Thomas Nuttall (Nuttall 1818); *Pterophyton alternifolium* (heterotypic synonym) by the French botanist Alexandre Henri Gabriel de Cassini (in Cuvier 1826), but this one is an unresolved name (<http://www.theplantlist.org>); *Actinomeris alternifolia* (homotypic synonym), by the Swiss naturalist Augustin Pyramus de Candolle (de Candolle 1836); *Ridan alternifolius* (heterotypic synonym), by the American botanist and taxonomist Nathaniel Lord Britton (in Britton & Brown 1913).

Botanical description of this species was made in a book of the American botanist John Torrey (Torrey 1843), basen on a previous description made by Th. Nuttall (Nuttall 1818), preserving also the name as *Actinomeris squarrosa* of Nuttall. Later on, who gave the actual name of the species by transferring it from genus *Actinomeris* (Nuttall 1818) to *Verbesina* L. (Linnaeus 1753) is the American botanist Thomas Henry Kearney (Kearney 1893).

Summarizing, the names of this species are:

Verbesina alternifolia (L.) Kearney 1893. *Bull. Torrey Bot. Club*, **20**(12): 485.

- basionym: *Coreopsis alternifolia* L. (1753, Sp. Pl. **2**: 909)
- homotypic synonym: *Actinomeris alternifolia* (L.) DC. (1836, Prodr. **5**: 575)
- heterotypic synonyms: *A. squarrosa* Nutt. (1818, Gen. **2**: 181); *Pterophyton alternifolium* Cass. (Dict. Sci. Nat., ed. 2. [F. Cuvier], **44**: 49. 1826); *Ridan alternifolia* (L.) Britton (1913, Fl. N. U. S. ed. 2, **3**: 487, fig. 4487) /*R. alternifolius* in orig./

Other authors transferred the name *V. alternifolia* (L.) Kearney to *Actinomeris squarrosa* (L.) DC., keeping this last name and authority as valids (Robinson & Greenman 1899).

Material and methods

A field work in Simeria Arboretum (Hunedoara county, Romania) led us to identify a newcomer, unknown plant species for Romania's flora. The time of that trip was in the 2nd half of August, 2016. At the time of our arrival, this newly alien species was in full blossom, with many flower heads but no any mature fruit (achenae). Later on, in November, mature achenae were collected in the field. Both, the herbarium sheets and achenae were examined using a stereomicroscope (BEL, model STMPRO-T) and were photographed, using a camera Nikon Coolpix P330. In order to identify this plant, the collected specimens were examined using several local North American floras books, as: *An illustrated flora of the Northern United States, Canada and British possessions* (Britton & Brown 1913), *Manual of the vascular plants of Texas* (Corell &

Johnston 1970), *Flora Europaea* (Hansen 1976), *Seed Identification Manual* (Martin & Barkley 1961/1973/), *Synopsis of the genus Verbesina* (Robinson & Greenmann 1899), *A flora of the State of New York* (Torrey 1843). To document our paper, there were taken several digital pictures of living plants, inserted in here. The collected voucher specimens were deposited in the herbaria of the Botanic Garden "Anastase Fătu", University "Alexandru Ioan Cuza" in Iași (IAGB) (abbreviation according to Thiers 2009), sheets no 47695 and 47696, and University of Agricultural Sciences and Veterinary Medicine "Ion Ionescu de la Brad" (I), sheets no 17978 and 17979, also in Iași, Romania. We also asked the forestry engineer, Corina Coandă, for a possible introduction on demand of this species in Simeria Arboretum plant collections. There were also examined all seed indexes, edited ceaselessly by the same institution, between 1955 and 2015 (*Index Seminum*, Simeria Arboretum 1955-2015).

The current taxonomy and nomenclature of *V. alternifolia* follow *Flora Europaea*, a database continuously updated, edited at Botanischer Garten und Botanisches Museum in Berlin (Greuter 2006+).

Results and discussion

Verbesina alternifolia (L.) Kearney (commonly called wingstem or yellow ironweed) is included currently in tribe *Heliantheae*, subtribe *Ecliptinae* (Lessing 1831); other treatments included *Verbesina* genus under tribe *Verbesininae* (Karis & Ryding 1994).

Short description of the species, according to some of the America's Florae (Britton & Brown 1913, Corell & Johnston 1970): perennial, weedy, (30-) 100-200+ cm in height, ± erect or horizontal rhizomes, perennating bases; stems ± erect, stiff (Fig. 1), glabrous at least proximal but soft haired in upper part, slightly branched (except in the upper 10-40 cm); internodes narrow winged (Fig. 2); leaves all or mostly alternate (those proximal are sometimes opposite), with lance-elliptic or lanceolate to lance-linear blades, of 10-25+ × 2-8+ cm, bases narrowly cuneate and decurrent along the stem (hence the common name as the wingstem), margins coarsely toothed to subentire, apices attenuate, faces scaberrulous; flower heads (3-) 8-25 (-50+) in corymbiform to paniculiform arrays (Fig. 3); receptacle ± saucerlike at beginning, becoming ± conical or round shape later, 10-12+ mm in diameter; phyllaries 8-12+ in 1 (-2) series, ± spreading to reflexed, squarrous, spatulate or lance-linear to linear, 3-8+ mm long; ray florets (2-) 6-8+, bright yellow, laminae 15-25+ mm long, neutral, reflexed, shallowly 3-toothed distal; disc flowers 40-60+, with slightly darker yellow corollas (Fig. 4); achenes dark brown to blackish, oblanceolate to ± orbiculate, 4.5-5.5 mm, squarrous at maturity, sparsely hirtellous to glabrate faces, with prominent wings around, laterally compressed; pappus 1.5-2 mm long, with 2 divergent, stiff, persistent awns (Fig. 5). Obs.: the flower heads sometimes appear rayless, with only disk flowers, hence the common name as the yellow ironweed (<http://www.missouribotanicalgarden.org>).

Origin: it is native in eastern and central North America: Texas (presumably adventitious there !), Missouri, Louisiana, Florida, Iowa, Kansas, New Jersey, in North to Ontario (Corell & Johnston 1970).

Chromosome number: $2n = 34$ (Heiser & Smith 1954, Coleman 1977) or $2n = 68$ (Strother 2016); it seems to be a tetraploid species (Coleman 1977).

Hybridization between species of *Verbesina* naturally occurs in USA, as *V. alternifolia* × *V. helianthoides*, and *V. alternifolia* × *V. walteri* (Coleman 1977), and

according to the cited author, *V. alternifolia* could result from hybridization between *V. walteri* and *V. helianthoides* or between *V. walteri* and *V. occidentalis*.

Flowering time: from August to October.

Seed ripening: October to November.

Ecology: alluvial flats, in woods, forest edges, on meadows, or in thickets, along streams, sloughs and ditches, throughout most of the range (Steiermark 1963), between 10 and 600 m a.s.l. in USA (Strother 2016), on rich, alluvial wet soils.

Occurrence in Europe:

France: 1969 – Sessenheim toward Schirrhoffen (Charpin 1971, 1972, 1973); after 1969: "...«pont de l'Arve à Bonneville», Haute-Savoie, mais cette localité s'est éteinte après 1970" (Charpin 1972, 1973); an important colony between Kauffenheim and Forstfeld (Schneider 1973); Soufflenheim, "...jusqu'au petit pont sur le Landgraben..." (Geissert 1988); Kauffenheim (Geissert 1988); river Sambre in Marpent (Dép. Nord) (Geissert 1988).

The occurrence of the species in France is also documented in some review papers, as an introduced one: naturalized, or introduced: adventitious (casual) plant (Kerguelen 1993, Anonymous 2007-2014).

Germany: 1972 - Wiesbaden (Weimer 1972).

Belgium: It is a very rare, locally, introduced and more or less naturalized species, escaped from cultivation (Verloove 2002); 1984 - Oud-Heverlee alongside river Dijle (Verloove 2002, Blink & Harle 2012); 1986 - a forest at Paal near Beringen (Verloove 2002).

Czech Republic: commonly cultivated (Slavík et al. 2004).

Romania: Simeria town, Hunedoara county, in Arboretum (parcels no 27, 37, and 41), where it seems to grow "in abundance", especially in parcel no 41 (Corina Coandă, pers. comm.)

This new alien species was identified in those parcels, where the vegetation is a natural one, consisting of riverside coppices, with white (*Populus alba* L.) and black (*Populus nigra* L.) poplars, willows (*Salix alba* L.), but also there are some fragments of the former forest glades of elms (*Ulmus glabra* Huds.) and oaks (*Quercus robur* L.), along the Mureș river banks, installed on recent alluvial deposits and/or alluvial soils (Coandă 2015).

In other European countries (listed above), *Verbesina alternifolia* is sometimes cultivated as a honey producer plant, and at least the populations in north-eastern France have been introduced on this purpose, thanks to the late flowering period. They said there are a harvest of one tone honey/ha/normal climatic year (Geissert 1988). Also, due to the fact the seeds are attractive to birds, a possible way to transport seeds/fruits is this (<http://www.missouribotanicalgarden.org>).

The ways of introduction of *Verbesina alternifolia* in Romania are still unclear. We suppose this species could be grown as an ornamental one upstream on the Mureș river, from where, the seeds were carried downstream by waters, setting up on Mureș river banks, within the Simeria Arboretum. It has natural tendencies of invasion across the natural vegetation (Coandă pers. comm.)

An other species in *Verbesina* genus, present as an already alien naturalised in Romania, is *Verbesina encelioides* (Cav.) Benth. & Hook. fil. ex A. Gray, identified quite recently in central parts of Dobrogea (Anastasiu et al. 2009).

Below, it is presented a key identification of those genera within the tribe *Heliantheae* Cass., reported so far in Romania's flora (compilation according to Barkley et al. 1993+, Corell & Johnston 1970, Moore et al. 2010, Nyárády 1964), including those two species of *Verbesina* (i.e. *V. alternifolia* and *V. encelioides*):

- 1a All florets unisexual; ligules of ray florets absent 2
- 1a At least the disk florets bisexual, ray florets female, fertile or infertile; ligules of ray florets present 4
- 2a Capitula campanulate, bisexual (female florets marginal, the male ones central); the involucre bracts \pm smooth, hairy *Iva*
- 2b Capitula unisexual; the female florets tightly closed by the concrescent involucre bracts 3
- 3a Leaves alternante; the female capitula with 2 florets; involucre bracts in fruit with numerous uncinata, stiff thorns *Xanthium*
- 3b Leaves opposite; the female capitula with 1 floret; involucre bracts in fruit \pm spiny-toothed, without uncinata, stiff thorns *Ambrosia*
- 4a Outer involucre bracts linear to linear-spatulate, patent, much longer than the capitulum, with dense stipitate glands *Sigesbeckia*
- 4b Involucre bracts with other features, never with stipitate glands 5
- 5a Disk florets bisexual but infertile, functionally staminate (only ray florets produce achenes); leaves strongly connate (plants only in culture) *Silphium*
- 5b Disk florets fertile; leaves not connate 6
- 6a Ligulae of ray florets sessile, persistent on the achenes, becoming papery 7
- 6b Ligulae of ray florets seldom sessile, never persistent on the achenes, never becoming papery 9
- 7a Achenes not flattened; leaf margins toothed (plants only in culture) *Heliopsis*
- 7b Achenes flattened or 3-4 angled; leaf margins entire or nearly so 8
- 8a Receptacle conic (plants in culture or casual alien) *Zinnia*
- 8b Receptacle nearly flat (plants only in culture) *Sanvitalia*
- 9a Disk pappus of 15-20 narrow minutely fimbriate persistent scales *Galinsoga*
- 9b Disk pappus of few scales, setae, teeth, or a small corona, or absent 10
- 10a All achenes flattened dorsiventrally 11
- 10b At least the disk achenes flattened laterally 14
- 11a Pappus of 2 barbless awns or teeth, a mere crown or absent 12
- 11b Pappus of retrorsely or antrorsely barbed or hispid awns or teeth 13
- 12a Plants with underground tubers. Ligulae of ray florets unicolor, red to pink or purple, or white; achenes \pm fusiform; pappus absent (plants only in culture) *Dahlia*
- 12b Plants without underground tubers. Ligulae of ray florets usually yellow, sometimes red-brown to purple proximally, or wholly purple or pink to white; achenes orbiculate to oblong; pappus present or absent (plants in culture or casual alien) *Coreopsis*
- 13a Achenes beaked, \pm 4-angled, not winged (plants in culture or casual/naturalised alien) *Cosmos*
- 13b Achenes not beaked, dorsiventrally flattened or unequally 3-4-angled, sometimes winged *Bidens*

- 14a Chaff of the receptacle linear-filiform. Corollas white or whitish *Eclipta*
 14b Chaff of the receptacle of concavo-convex or folded pales. Corollas of other colours 15
 15a Receptacle strongly conic or columnar 16
 15b Receptacle flat or slightly convex 17
 16a Receptacle conic; receptacular pales with stout subuliferous apices; leaves alternate (plants only in culture) *Echinacea*
 16b Receptacle conic or columnar; receptacular pales acute; leaves alternate or the extreme basal ones opposite (plants in culture or naturalised-invasive alien) *Rudbeckia*
 17a Disk achenes somewhat flattened but not winged (plants in culture or naturalised-invasive alien) *Helianthus*
 17b Disk achenes obvious winged *Verbesina* (18)
 18a Annual; internodes not winged; leaves mostly alternate (proximalmost usually opposite); stems and leaves (especially on the underside) greyish-green; ray florets 3-toothed or 3-lobed distal, with teeth/lobes of 1.5-3 (-4) mm long *Verbesina encelioides*
 18b Perennial; internodes winged; all leaves alternate (rarely opposite); stem and leaves green; ray florets shallowly 3-toothed distal *Verbesina alternifolia*

It is mentioned that *Chrysopsis graminifolia*, *Solidago erecta*, and *Verbesina alternifolia* were identified as rubber-producing species with 0.4-0.7% hydrocarbon (Carr & Bagby 1987).

The other species of *Verbesina* genus identified in Romania (*V. encelioides*), was previously investigated from anatomically and histologically points of view, concluding that the only structural features of vegetative organs cannot explain the invasive potential of this last species (Smarandache & Mihai 2011).

Conclusions

There is reported the presence of a newcomer, an alien plant species in Romania, namely *Verbesina alternifolia*, a member of the Asteraceae family.

It is originated in eastern and central North America, being naturally spreaded in Texas (presumably adventitious over there), Missouri, Louisiana, Florida, Iowa, Kansas, New Jersey, toward North on to Ontario (Canada).

Verbesina alternifolia was identified in Romania, in Simeria town (Hunedoara county), along the Mureş river floodplain, in August, 2016. It seems to be abundant (in terms of the number of individuals) on the field, at least in some of the parcels of the Simeria Arboretum. It has natural tendencies of invasion across the natural vegetation along the Mureş river, in Simeria Arboretum.

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Fig. 1. Verbesina alternifolia in Simeria Arboretum: general habitus (orig.).
Scale bar: 25 cm



Fig. 2. Verbesina alternifolia in Simeria Arboretum: stem details (orig.).
Scale bar: 1 cm



Fig. 3. Verbesina alternifolia in Simeria Arboretum: heads in corymbiform to paniculiform arrays (orig.). Scale bar: 1 cm



Fig. 4. Verbesina alternifolia in Simeria Arboretum: heads (orig.). Scale bar: 0.5 cm



Fig. 5. Verbesina alternifolia in Simeria Arboretum: achenes (orig.). Scale bar: 0.5 cm

