

PLANTE STRĂINE NOI ÎN ROMÂNIA

NEW ALIEN PLANTS TO ROMANIA

Paulina Anastasiu¹, Gavril Negrean

Cuvinte cheie: plante străine, noi înregistrări, naturalizat, ocazional, Poaceae, Euphorbiaceae, Asteraceae, România.

Keywords: alien plants, new records, naturalized, casual, Poaceae, Euphorbiaceae, Asteraceae, Romania.

Rezumat

Bromus madritensis, *Bromus wildenowii*, *Senecio inaequidens* and *Euphorbia prostrata* sunt prezentate ca specii străine noi pentru România. *Bromus wildenowii* a fost colectat în portul Constanța, *Euphorbia prostrata* și *Senecio inaequidens* au fost colectate în București, în timp ce *Bromus madritensis* a fost colectat atât în București, cât și în Constanța. Modul de introducere a acestora a fost accidental, favorizat probabil de transporturi. Răspândirea este limitată în prezent la câteva localizări (București și Constanța), pe terasamentul căilor ferate sau în locuri ruderales. Toate speciile se află depozitate în Herbarul Universității din București [BUC].

Abstract

Bromus madritensis, *Bromus wildenowii*, *Senecio inaequidens* and *Euphorbia prostrata* are reported as new alien species to Romania. *Bromus wildenowii* was collected in Constanța Harbour, *Euphorbia prostrata* and *Senecio inaequidens* were collected in București, while *Bromus madritensis* was collected in both București and Constanța. Their mode of introduction is accidental, perhaps favoured by transportation. At this moment occurrence is still limited to few locations, on railway ground and ruderal places. All the specimens are deposited in Herbarium of University of Bucharest [BUC].

INTRODUCTION

The alien flora of Romania currently includes 435 species, 384 of which are neophytes introduced after the discovery of America (Anastasiu & Negrean 2005). Species of alien origin make up about 11.5 % of the total flora of the country (Ciocârlan 2000). New alien species are continuously reported (Ciocârlan & Costea 2004, Sîrbu & Oprea 2008) further increasing the number of non-native taxa in the national flora.

According to Illustrated Flora of Romania (Ciocârlan 2000) genus *Bromus* is represented in our country by 15 native species: *B. arvensis*, *B. benekenii*, *B. commutatus*, *B. erectus*, *B. hordeaceus*, *B. inermis*, *B. japonicus*, *B. pannonicus*, *B. ramosus*, *B. riparius*, *B. scoparius*, *B. secalinus*, *B. squarrosus*, *B. sterilis* and *B. tectorum*. Any alien species of *Bromus* was reported for Romania before 2005 (Anastasiu & Negrean 2005). *Senecio* genus has 25 spontaneous species in Romania: *S. aquaticus*, *S. cacaliaster*, *S. capitatus*, *S. carniolicus*, *S. carpaticus*, *S. doria*, *S. erraticus*, *S. erucifolius*, *S. germanicus*, *S. glaberrimus*, *S. grandidentatus*, *S. integrifolius*, *S. jacobaea*, *S. ovatus*, *S. paludosus*, *S. papposus*, *S. rivularis*, *S. sarracenicus*, *S. squalidus*, *S. subalpinus*, *S. sylvaticus*, *S.*

¹ Universitatea din București, Facultatea de Biologie, Catedra de Botanică & Microbiologie, Intr. Portocalelor nr 1-3, 060101-București, România, anastasiup@yahoo.com

umbrosus, *S. vernalis*, *S. viscosus* and *S. vulgaris* (Ciocârlan 2000). Subsection Chamaesyce of genus *Euphorbia* has five representatives in our flora, two of them native – *E. peplis* and *E. canescens*, and three of them alien – *E. humifusa*, *E. maculata* and *E. nutans* (Ciocârlan 2000).

In this paper, short descriptions based on literary data and examined herbarium specimens, information about occurrence, mode of introduction and ecology of the new alien plant species to Romania (*Bromus madritensis*, *Bromus willdenowii*, *Senecio inaequidens* and *Euphorbia prostrata*) are presented.

MATERIAL AND METHODS

In the period 2004-2008, during field work on invasive plants done in different places from Romania, we recorded new alien taxa such as: *Bromus madritensis*, *Bromus willdenowii*, *Senecio inaequidens* and *Euphorbia prostrata*. Geographic coordinates using WGS 84 system, some ecological features and plant species associated were registered for each taxon. Digital photographs were taken in field. Voucher specimens are deposited in Herbarium of University of Bucharest [BUC]. The taxonomy and nomenclature of species follow Tutin et al. (1964-1980; 1993) and the definition of invasive status is that used by Richardson et al. (2000) and Pyšek et al. (2004).

RESULTS AND DISCUSSION

Bromus madritensis L., *Cent. Pl.* 1: 5(1755) (Fig. 1)

Synonyms: *Anisantha madritensis* (L.) Nevski, *Zerna madritensis* (L.) Panz., *Bromus villosus* Forssk.

Family: Poaceae (Gramineae)



Fig. 1 *Bromus madritensis* L. in București Triaj, June 2005

Bromus madritensis belongs to section GENEAE Dumort that includes annuals or rarely biennials species of *Bromus*, with lanceolate spikelets only when young, then becoming cuneate, wider at the top, having lower glume 1-veined, the upper 3-veined and awn longer than the lemma, usually flattened and scabrid (Smith 1980). The stems of *Bromus madritensis* is up to 60 cm, erect or ascending, glabrous except sometimes near the panicle. Leaves are up to 20 cm × 2-4 mm, linear, acute, flat, glabrous or pubescent, the lower with hairy sheaths and the upper often with glabrous sheaths. Panicle is erect when young, with branches shorter than spikelets; the spikelets are cuneate, wider at the top, lax, with 6-10 florets. Lower glume is 5-10 mm, while the upper is 10-15 mm. Lemma is narrowly oblong-lanceolate, with apical teeth of 2-3 mm and margins somewhat inrolled at maturity. Awn is 12-20 mm, straight or weakly divaricate. Palea is shorter than lemma (Smith 1980).

In Romania two species of section GENEAE Dumort are native: *Bromus sterilis* and *Bromus tectorum*. These are characterized by a drooping panicle, usually lax, with branches as long as or longer than the spikelets.

According to USDA, ARS, National Genetic Resources Program (2008), the native distribution range of *Bromus madritensis* covers Northern Africa (Algeria, Egypt, Libya, Morocco, Tunisia), Macaronesia (Azores, Madeira Islands, Canary Islands), Western Asia (Afghanistan, Iran, Iraq, Israel, Jordan, Lebanon, Syria, Turkey) and Europe (Ukraine – Krym, Albania, Bulgaria, Former Yugoslavia, Greece, Italy, France, Portugal, Spain). As alien it was reported from Switzerland (Lauber & Wagner 2000), but could be found as naturalized elsewhere (USDA, ARS, National Genetic Resources Program, 2008).

Occurrence in Romania: București Triaj, railways embankment, 4 VI 2005, leg. G. Negrean; București Triaj, railways, 44°29'01"N, 26°00'37"E, 19 VI 2005, leg. P. Anastasiu & G. Negrean; Constanța Harbour, railways, 44°10'08"N, 28°39'33"E and 44°10'01"N, 28°38'33"E, leg. G. Negrean & P. Anastasiu.

The mode of introduction is not sure. It is possible that it happened accidentally, with containers transport.

In its native distribution *Bromus madritensis* grows in sunny and dry places. We found it on the embankment of railways, to București Triaj associated with *Acer negundo*, *Ambrosia artemisiifolia*, *Ambrosia trifida*, *Antirrhinum majus*, *Apera spica-venti* s. l., *Artemisia austriaca*, *Bromus tectorum*, *Capsella bursa-pastoris*, *Cardaria draba* subsp. *draba*, *Carex hirta*, *Celtis australis*, *Clematis vitalba*, *Crepis nicaeensis*, *Cynodon dactylon*, *Dactylis glomerata* subsp. *glomerata*, *Echium vulgare*, *Erigeron annuus* subsp. *annuus*, *Erysimum diffusum*, *Erysimum repandum*, *Festuca valesiaca*, *Fraxinus pennsylvanica*, *Galium aparine*, *Galium album* subsp. *pycnotrichum*, *Hordeum distichon*, *Lappula squarrosa* subsp. *squarrosa*, *Lepidium densiflorum*, *Lepidium virginicum*, *Lolium perenne*, *Misopates orontium*, *Papaver rhoeas*, *Papaver somniferum*, *Plantago lanceolata*, *Prunus cerasifera*, *Prunus spinosa*, *Raphanus raphanistrum*, *Rapistrum perenne*, *Rumex patientia* s. l., *Sambucus ebulus*, *Senecio vernalis*, *Sonchus oleraceus* subsp. *oleraceus*, *Triticum aestivum*, *Ulmus pumila*, *Vulpia myuros*. At Constanța *Bromus madritensis* is associated with *Ambrosia artemisiifolia*, *Ailanthus altissima*, *Artemisia vulgaris*, *Capsella bursa-pastoris*, *Celtis australis*, *Galium album* subsp. *pycnotrichum*, *Lepidium perfoliatum* and *Sonchus oleraceus*.

Bromus willdenowii Kunth, Révis. Gram. 134 (1829) (Fig. 2, 3)

Synonyms: *Zerna uniolooides* (Kunth) Lindm., *Bromus uniolooides* Kunth, *Bromus schraderi* Kunth, *Ceratochloa uniolooides* (Willd.) P.Beauv., *Serrafalcus uniolooides* (Kunth) Samp., *Bromus catharticus* Vahl, *Ceratochloa haenkeana* C.Presl.

Family: Poaceae (Gramineae)

Bromus willdenowii belongs to section CERATOCHLOA (Beauv.) Griseb. that includes perennial species of *Bromus* with ovate or ovate-lanceolate spikelets, strongly compressed, having lower glume 3- to 5-veined, the upper 5- to 7-veined, lemma and

glumes strongly keeled on the back and awn much shorter than lemma or often absent (Smith 1980). *Bromus willdenowii* is a laxly caespitose plant, with erect or ascending stem, up to 100-150 cm high. Leaves, 10-20 cm × 3-12 mm, are glabrous or thinly hairy. The sheaths of upper leaves are glabrous, while those of lower leaves are shortly hairy. The spikelets are grouped in large panicles, with patent or nodding branches, often longer than spikelets. The spikelets have 20-40 × 5-10 mm, are lanceolate to ovate, very strongly compressed, glabrous or scabrid, with 6-12 closely imbricate florets. Glumes are acuminate, unequal, sharply keeled on the back. Lemma has 14-18 × 5-7 mm, is broadly lanceolate, keeled on the back, rather corneous, with awn usually absent or up to 1 mm and weak. Palea is about half as long as lemma. Anthers are up to 4 mm, shorter in cleistogamous florets (Smith 1980).

No representative of the section CERATOCHLOA (Beauv.) Griseb. is spontaneous in our country and *Bromus willdenowii* cannot be confused with other species of *Bromus* from Romanian flora.



Fig. 2 *Bromus willdenowii* Kunth in Constanța Harbour, May 2008.

The native distribution range is South America, but it can be found widely naturalized elsewhere (USDA, ARS, National Genetic Resources Program, 2008). Smith (1980) indicates *Bromus willdenowii* as occasionally cultivated for fodder and locally naturalized in Southern Europe (Azores, France, Portugal, C,W and E Russia).

Occurrence in Romania: For first time we recorded this plant to Constanța Harbour, on 23 of September, 2004. This year we found it in the same place: Constanța Harbour, ruderal, near a wall, 12 V 2008, 44°10'12"N 28°39'08"E, leg. G. Negrean & P. Anastasiu.

Mode of introduction: possible with cereals, its location being very close of the berth for cereals.

Bromus willdenowii grows in ruderal places. Only three species we recorded around: *Echinochloa crus-galli*, *Sonchus oleraceus* and *Taraxacum officinale*.



Fig. 3 *Bromus willdenowii* Kunth, detail on spikelets

Senecio inaequidens DC., *Prodromus Systematis naturalis Regni vegetabilis. Parisiis*, 6: 401 (1838) (Fig. 4, 5)

Synonyms: *Senecio burchellii* DC.

Family: Asteraceae (Compositae)

Senecio inaequidens belongs to section Fruticulosi DC. that includes perennial plants with narrow leaves, simple, not divided. It is up to 110 cm high, spherically shaped, with erect stems, more or less glabrous, often numerous branched from the woody base. Leaves are alternate, bright green, simple, slightly thick, usually with clasping stems at the base (occasionally petiolate), becoming reduced in size from the base, very variable, from 3 to 14 cm long and 0.3 to 1 cm wide, with margins denticulate to coarsely and irregularly-toothed. Upper leaves are occasionally pinnately-lobed, shortly petiolate, sessile or sessile (EPPO 2006). Capitula range from 18 to up to 25 mm diameter, with 12 to 14 bright yellow ligules and numerous disc florets. A single plant could have about 100 capitula. Achenes are 2 mm long, cylindrical, pubescent, with a white pappus, 2 to 3 times as long as achenes, readily detached. They are produced in large numbers.

The native distribution of *Senecio inaequidens* is to South Africa (Heger & Böhmer 2006), but this species occurs widely as naturalized or invasive: Europe, America, Australia (EPPO 2006, Heger & Böhmer 2006). In Europe *Senecio inaequidens* occurs throughout: Belgium, France and Italy (Chater & Walters 1976), Switzerland (Lauber & Wagner 2000), Germany (Haeupler & Muer 2000), Austria (Negrean 2003, 2004, pers. comm., EPPO 2006), Czech Republic, Denmark, Finland, Hungary, Netherlands, Norway, Poland, Spain, Sweden, United Kingdom (EPPO 2006).

Occurrence in Romania: București Triaj, railways ground, 4 VI 2005, leg. G. Negrean; București Triaj, railways ground, 44°28'57"N, 26°00'41"E, 19 VI 2005, leg. P. Anastasiu & G. Negrean.



Fig. 4 *Senecio inaequidens* DC. in București Triaj, June 2005



Fig. 5 *Senecio inaequidens* DC., detail of inflorescences

Senecio inaequidens was introduced into Europe with imports of wool from South Africa. Its presence was first recorded in 1889 in Germany (EPPO 2006). In Romania its introduction was accidental, possibly carried by rail vehicles.

Considering the ecology, *Senecio inaequidens* adapts to a wide range of environments (EPPO 2006), but prefers well-drained and disturbed soils. It can be found from coastal to mountain areas (up to 1900 m altitude). It grows along roads and railways, river banks, wastelands. It is also found in forests (in open places after logging or a fire), in crops (particularly grapevine), fallows, pastures. It can survive in most soils (even salty), it can stand hot and dry summers and overwinter in areas where temperatures reach - 15°C. To București Triaj, *Senecio inaequidens* grows vigorously on railway embankment. Around its location we recorded the following plants: *Acer negundo*, *Ambrosia artemisiifolia*, *Apera spica-venti* s. l., *Artemisia austriaca*, *Bromus tectorum*, *Calamagrostis epigejos*, *Capsella bursa-pastoris*, *Cardaria draba* subsp. *draba*, *Carduus nutans* s. l., *Carex hirta*, *Clematis vitalba*, *Crepis nicaeensis*, *Cynodon dactylon*, *Dactylis glomerata* subsp. *glomerata*, *Echium vulgare*, *Erigeron annuus* subsp. *annuus*, *Erysimum diffusum*, *Erysimum repandum*, *Festuca valesiaca*, *Fraxinus pennsylvanica*, *Galium aparine*, *Hordeum distichon*, *Lappula squarrosa* subsp. *squarrosa*, *Lepidium densiflorum*, *Lolium perenne*, *Misopates orontium*, *Parthenocissus inserta*, *Plantago lanceolata*, *Prunus cerasifera*, *Prunus spinosa*, *Raphanus raphanistrum*, *Rapistrum perenne*, *Rubus caesius*, *Rubus canescens*, *Rumex patientia* s. l., *Sambucus ebulus*, *Senecio vernalis*, *Sonchus oleraceus* subsp. *oleraceus*, *Verbascum speciosum* subsp. *speciosum* etc.

Senecio inaequidens has a high reproductive potential. It is estimated that up to 29,000 achenes are produced per plant and per year, and seeds may remain viable in the soil for 30-40 years (Ernst 1998 cf. Heger & Böhmer 2006). Achenes are mainly transported by wind, but also by water, animals and human activities (especially railways). In addition, vegetative propagation can occur by rooting of stems that touch the ground (Ernst 1998 cf. Heger & Böhmer 2006). Germination is rapid and massive, and can take place during most of the year. Germination is also favoured by compacted soils.

According to EPPO (2006), *Senecio inaequidens* is a poisonous plant containing pyrrolizidine alkaloides. It is also considered to be the most invasive in Europe.

Euphorbia prostrata Aiton, Hort. Kew. 2: 139 (1789) (Fig. 6, 7)

Synonyms: *Chamaesyce prostrata* (Aiton) Small, *Tithymalus prostratus* (Aiton) Samp.

Family: Euphorbiaceae

According to Smith & Tutin (1968), *Euphorbia prostrata* belongs to subgenus *Chamaesyce*. It is a procumbent annual plant, with branches up to 20 cm. Stem is usually glabrous below, pubescent above, but to the material collected in București the stem is all over pubescent. Leaves are 6-10×4-6 mm, ovate, obtuse, with asymmetrical base, serrulate to subentire, sparsely pubescent on both surfaces. Petiole is shorter than 1 mm, Stipules are also shorter than 1 mm, triangular, the upper free, the lower connate. Glands are transversely ovate, with small appendages. Capsule are 1.5×1.2-1.5 mm, shallowly sulcate, sharply keeled, smooth, glabrous except the keels that are ciliate. Seeds are about 1 mm, ovoid-quadrangular, deeply transversely furrowed, grayish.

Euphorbia prostrata is a Northern American species. According to Flora Europaea (Smith & Tutin 1968), in Europe is naturalized as a weed and ruderal, occurring in Portugal, Spain, Italy, Sicily and Greece.

Occurrence in Romania: București, Ionel Budișteanu Str., ruderal, near a wall, 44°26'36"N, 26°05'23"E, alt. 82 m, 18 X 2008, leg. G. Negrean.

The mode of introduction is unknown, possible accidentally with some ornamental plants.



Fig. 6 *Euphorbia prostrata* Aiton, București, October 2008



Fig. 7 *Euphorbia prostrata* Aiton, detail of branches with leaves and capsules

Ecology: It grows in ruderal places, with *Digitaria sanguinalis* subsp. *sanguinalis* in the site from București.

For *Euphorbia* species, subgenus Chamaesyce, occurring in Romania, a dichotomous key is presented below:

- 1a Seeds smooth 2
1b Seeds rugulose 3
- 2a Seeds 3 mm; leaves entire or almost so 1. *Euphorbia pepilis* L.
2b Seeds less than 1.5 mm; leaves serrulate 2. *Euphorbia humifusa* Willd.
- 3a Capsule glabrous or patent pubescent 4
3b Capsule hairy 5
- 4a Capsule glabrous; leaves 10-30 mm, serrate 3. *Euphorbia nutans* Lag.
4b Capsule patent-pubescent; leaves 3-7 mm, entire or obscurely serrate
..... 4. *Euphorbia chamaesyce* L.
- 5a Capsule hairy all over; hairs closely appressed 5. *Euphorbia maculata* L.
5b Capsule hairy on the keels only 6. *Euphorbia prostrata* Aiton

CONCLUSIONS

Four new alien plants are reported from Romania: *Bromus madritensis* – Mediterranean element, *Bromus willdenowii* – native in South America, *Senecio inaequidens* – native in South Africa, and *Euphorbia prostrata* – native in North America. Their occurrence is limited to few locations in București and Constanța cities, growing in ruderal places or on railway ground. The species of *Bromus* and *Senecio inaequidens* are naturalized, but the last one could become invasive. This species is known from different European countries as one of the most invasive alien plants penetrating even the natural and seminatural habitats. *Euphorbia prostrata* is a casual species.

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