

RIPGUT BROME (*BROMUS DIANDRUS*) IN ROMANIA'S VASCULAR FLORA

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Abstract: The paper refers to *Bromus diandrus*, a vascular plant species identified in the spontaneous flora of the historical province of Muntenia, namely at the Buzău railway station during the summer of 2022 and autumn of 2023. Both the ecological conditions of the habitat, as well as some taxonomic and coenotaxonomic aspects of the species are presented in the paper. A key is also included to help identify the other species from the sect. *Genea*, *Bromus* spp., known so far in the flora of Romania.

Key words: identification key, natural distribution, relevées, ruderal vegetation, spontaneous plants.

Introduction

It is not uncommon for different sources to provide varying estimates of the number of species within a particular taxonomic group, as the exact number of species can be difficult to determine and can depend on factors such as the specific criteria used to define a species and the methods used to identify and classify them. So, estimates in the scientific literature of the number of species in *Poaceae* Barnhart (*Gramineae* Juss.) family is ca. 8,000, belonging to ca. 700 genera [BUIA & al. 1965; NYÁRÁDY & BELDIE, 1972]. Others estimates a number between 7,000 and 8,000 species [CRISTEA, 2014], while according to other sources, family of *Poaceae* includes 9,000-10,000 species [<https://ro.wikipedia.org/wiki/Poaceae>]. It is important to note that these estimates are based on current knowledge and understanding of the group, and as research continues and new species are discovered, these estimates may change in the future.

Bromus L. [LINNÆUS, 1753] have ranged from 100 to 400 species, but plant taxonomists currently recognize around 160-170 species [<https://ro.wikipedia.org/wiki/Poaceae>]. The romanian botanist I. Todor stated that the genus *Bromus* consisted of more than 100 species worldwide distributed [TODOR, 1972].

Etymology of *Bromus*: 1. gr. bróma = food; 2. gr. bromos = the vernacular name of cultivated oat species (a name cited in this form for the first time appeared in Theophrastus's work, which is accessible to us in Italian [TEOFRAST, 1549]).

The genus *Bromus* is part of the cool-season grass lineage (subfamily Pooideae, which includes about 3,300 species). Within Pooideae subfamily, *Bromus* is classified in tribe Bromeae (the only genus in the tribe). *Bromus* species occur in many habitats worldwide, mostly in temperate regions, including Europe [CLAPHAM & al. 1952; SMITH, 1980; KON & BLACKLOW, 1989; SOMLYAY, 2001; STACE, 2010; https://euoplusmed.org/cdm_dataportal/taxon/897057], Asia [CLAPHAM & al. 1952; COPE, 1982; KON &

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BLACKLOW, 1989; NADERI & al. 2012; MALIK & MOHAMMAD, 2015; NADERI & RAHIMINEJAD, 2015], Africa [CLAPHAM & al. 1952; KON & BLACKLOW, 1989; MEJRI & al. 2010; <https://www.cabi.org/isc/datasheet/31167/>], North America [CLAPHAM & al. 1952; KON & BLACKLOW, 1989; SAARELA, 2008], Central America [O'CONNOR, 1990], South America [<https://www.cabi.org/isc/datasheet/31167/>], Australia [CLAPHAM & al. 1952; KON & BLACKLOW, 1989; MICHAEL & al. 2010; BORGER & al. 2021], and New Zealand [CLAPHAM & al. 1952; KON & BLACKLOW, 1989; BURGHARDT & FROUD-WILLIAMS, 1997; <https://www.cabi.org/isc/datasheet/31167/>].

Bromus diandrus Roth

The most common vernacular name in English literature of *B. diandrus* is “the ripgut brome”, according to WILLIAMS (1986). Other names are: great brome, ripgut grass, giant brome, slands grass, jabbers, Kingston grass, spear grass, brome grass [BOWCHER & al. 2019].

It is a species native to the Irano-Turanian, Pontic, and Mediterranean regions [CABI, 2020], but it has been widely introduced elsewhere (Europe, Asia, Africa, North America, South America, Australia, and Oceania) as an alien weed [KUNEV, 2021; BORGER & al. 2021; CABI, 2022]. Close to Romania, *B. diandrus* has been reported as a naturalized species in Bulgaria [KUNEV, 2021; STOYANOV & al. 2022], and Hungary, as doubtfully introduced there, perhaps only cultivated [https://euoplusmed.org/cdm_dataportal/].

Among other locations with *B. diandrus* in the proximity of Romania, are the next ones: the coastline of the Black Sea and its surroundings, including “Insula Șerpilor” and Crimea, as well as Southwestern Russia and Georgia [GBIF, 2023; <https://www.gbif.org/species/2703760>]. Also, it has also been identified in the European part of Turkey [WEBB, 1966], Greece [GBIF, 2023], Montenegro [GBIF, 2023], and North Macedonia [KOSTADINOVSKI & al. 2019].

B. diandrus and *B. rigidus* Roth belong to the sect. *Genea* Dumort. [SALES, 1993; SAARELA & al. 2007; SAARELA, 2008; STACE, 2010; LLAMAS & ACEDO, 2019], and differ from the other species of this section mainly by their longer lemma and awn, which are of at least 20 and 30 mm, respectively [SMITH, 1980]. They are morphologically very similar and are often difficult to distinguish from each other [SALES, 1993; STOYANOV & al. 2022; VERLOOVE, 2022; <http://alienplantsbelgium.be>]. Some authors consider them to be conspecific [VELDKAMP & al. 1991; SALES, 1993; SAARELA, 2008], but their exact taxonomic classification is still under debate and subject to ongoing research [BORGER & al. 2021].

According to literature data [SMITH, 1980; SALES, 1993; STACE, 2010; BOWCHER & al. 2019; KUNEV, 2021], *B. diandrus* differs from *B. rigidus* mainly by the following combination of features: panicle usually lax, with branches spreading laterally or pendent, at least some branches being longer than spikelets; callus scar ovate or almost circular, rounded at the ends; presence of a conspicuous constriction at the base of lemma, in side-view; anthers longer than 0.7 mm (vs. panicle usually dense, stiff [BOWCHER & al. 2019], with erect, shorter branches than spikelets; callus-scar elliptic, pointed/acute at the ends; lemma straight at base; anthers up to 0,7 mm long, in *B. rigidus*). However, ecological conditions can induce variations in the features, which makes it difficult to correctly differentiate between the two species, and, in some cases, there can be significant overlap in their morphology. For instance, SALES (1993) observed in population with other *diandrus*-like features all variations from dense and stiffly erect panicles to lax and spreading ones. The same author reduced these two taxa to varietal rank, and pointed out that the differences between them are subtle enough that identification of many specimens beyond *B. diandrus sensu lato* is often impossible.

Therefore, a careful examination of multiple diagnostic features and a comparison with reliable reference specimens may be necessary for an accurate identification.

Even the ecology differs; while *B. diandrus* is a tolerating species to a wide range of climates, growing both on acidic and alkaline, sandy or loamy soils, on those soils plenty in nitrogen (N) and phosphorus (P), *B. rigidus* prefers the sandy calcareous soils [KON & BLACKLOW, 1995].

As a result of molecular and phylogenetic studies on populations of those 2 species collected from France, was stated that *B. diandrus* and *B. rigidus* are genetically similar, seeming to have a common maternal genome, while the paternal genomic background still remains unclear for now [FORTUNE & al. 2008].

The aim of the current paper is to: i) to bring evidences on the presence of *B. diandrus* in Romania, ii) made considerations upon the features to discriminate to the closely related species in sect. *Genea*, iii) to underline the phytosociological aspects of the species *B. diandrus* in Buzău railway station, aspects that can further help our understanding of the ecology of this species in Romania.

Material and methods

The plant names follow the well-known work *Flora Europaea* [TUTIN & al. 1968-1980; TUTIN & al. 1993], including the on-line *Flora Europaea* [<http://euromed.luomus.fi/>; <http://ww2.bgbm.org/europlusmed>]. For those species lacking in Europe, other floras were used, as: *Flora of the Northern United States and Canada* [BRITTON & BROWN, 1970], on-line floras of the *United States of America* [[www.efloras.org/Flora of North America](http://www.efloras.org/Flora%20of%20North%20America)], the flora of Republic of China [[www.efloras.org/florataxon ... Flora of China](http://www.efloras.org/florataxon...Flora%20of%20China)], or the flora of ex-URSS area [TZVELEV, 1976, 1983].

The author's name(s) of each plant species are abbreviated according to BRUMMITT & POWELL (1992).

The distribution of the taxa within Europe follow the same on-line *Flora Europaea* [[http://euromed.luomus.fi/euromed map.php](http://euromed.luomus.fi/euromed%20map.php)].

All the plant specimens collected were deposited in public herbaria, as: IAGB (located within the Botanical Garden “Anastasiu Fătu”, “Alexandru Ioan Cuza” University of Iași), and IASI (located within the University for Life Sciences “Ion Ionescu de la Brad”, Iași).

Other herbaria collections were checked to have a complete view of the distribution of *B. diandrus* in Romania. The acronyms for herbaria collections follow THIERS (2022+).

Fieldwork was conducted in the summer of 2022 and early fall of 2023; the coordinates were registered in WGS84 system, using a Garmin's GPSMAP 60CSx and digital photos were taken.

Results

Bromus diandrus Roth (syn. *Anisantha diandra* (Roth) Tutin; *A. gussonei* (Parl.) Nevski; *Bromus gussonei/gussonii* Parl.; *B. maximus* Desf. subsp. *gussonei* (Parl.) Arcang.; *B. rigidus* Roth subsp. *gussonii* (Parl.) Maire; *B. rigens* L. subsp. *gussonei* (Parl.) Cout.; *Zerna gussonei* (Parl.) Grossh.) [<http://ww2.bgbm.org/EuroPlusMed>].

Analyzed specimens in public herbarium collections in Romania:

Herb. (Herbarium) I, no. 182824, collected in county of Timiș: Timișoara North railway station, *in ruderatis, ad viam ferream*, 45°45'00.83"N, 21°12'06.39", alt. (altitude) ca.

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91 m a.s.l. (above sea level), *leg. et det.* G. Negrean, 30 May 2014 (labelled as *Bromus rigidus* Roth);

Herb. I, no. 183800, collected in county of Mehedinți: Drobeta-Turnu Severin railway station, *in ruderalis*, 45°37'18.58"N, 22°38'03.39", alt. ca. 52 m a.s.l., *leg. et det.* G. Negrean, 25 June 2013 (labelled as *Bromus rigidus* Roth);

Herb. CL, no. 665457, collected in county of Mehedinți: Drobeta-Turnu Severin railway station, *in ruderalis*, 44°37'18.58"N, 22°38'03.39", alt. ca. 52 m a.s.l., *leg. et det.* G. Negrean, 25 June 2013 (labelled as *Bromus rigidus* Roth);

Herb. IAGB, no. 47735-47738, collected in county of Buzău: Buzău - railway station, between the railway tracks and the associated disturbed sites, N 45.14222/E 26.82994, *leg.* A. Oprea, 9 July 2022; *det.* A. Oprea & C. Sirbu;

Herb. IASI, no. 18044, collected in county of Buzău: Buzău railway station, between the railway tracks and the associated disturbed sites, N 45.14222/E 26.82994, *leg.* A. Oprea, 9 July 2022; *det.* A. Oprea & C. Sirbu;

Herb. IASI, no. 18045-18046, collected in county of Buzău: Buzău railway station, between the railway tracks and the associated disturbed sites, N 45.14237, E 26.83085, *leg. et det.* A. Oprea & C. Sirbu, 31 July 2022.

Discussion

The presence of *B. diandrus* in the spontaneous flora of Romania was cited under this name for the first time in 1979, in a field identification book, as: "...? ...quoted from Banat, but unconfirmed...". This citation is "blind", without any reference given in there. But, following the features included in the identification key to the genus *Bromus* ["erect spikelets; lemma of 2-3 cm long, with a 3-5 cm awn long"] one can see that at as a matter of fact, the author actually referred to an other species, which it is now accepted as *B. rigidus* Roth (in fact, the author placed the latter name as a synonyme for the first one) [BELDIE, 1979].

Later works did not included *B. diandrus* as being present in Romania's flora [POPESCU & SANDA, 1998; CIOCÂRLAN, 1990, 2000, 2009; SÂRBU & al. 2013]. Until, in 2022, when STOYANOV & al. (2022), as a result of the revision of some specimens, previously identified by Gavril Negrean as *B. rigidus* Roth, collected from the harbour of Constanța (Herb. SOM, no. 177292) and from Drobeta-Turnu Severin railway station (Herb. CL, no. 665457) reported the presence of this species in Romania's flora. In the Herbarium of the University "Alexandru Ioan Cuza" in Iași (I), there are other similar specimens collected from Drobeta-Turnu Severin railway station (I, no. 183800, *leg. et det.* Negrean, at 25 June 2013, labelled as *B. rigidus* Roth) and from Timișoara North railway station (Herb. I, no. 182824, *leg. et det.* Negrean, at 30 May 2014, labelled as *B. rigidus* Roth).

B. diandrus was fully described as a species new to science by A. W. Roth [ROTH, 1787].

Within this paper, the species is presented taking into account the characteristic features observed on the specimens collected in the Buzău railway station (Romania), in the summer of 2022 and the beginning of autumn, 2023: an annual plant, therophyte, 30-90 cm high, stem hairy below panicle, with leaves up to 10 mm wide, rough, with some long hairs; ligule prominent, 3-6 mm long, membranous, and jagged tipped; panicle loose, nodding, over 25 cm long, pale green becoming purple-red, ± lax, wide-ovate (Figure 1); branches of 1-7 cm long, laterally extended or ± pendulous when mature, with 1-2 (-3) spikelets each; spikelet branches longer than spikelet itself; spikelets pendulous, at maturity of 25-40 mm long, with 5-

8 flowers (even, 4-11 flowers/spikelet [[http://beta.floranorthamerica.org /Bromus_diandrus](http://beta.floranorthamerica.org/Bromus_diandrus)]); glumes unequal, 1 (-3) nerved, lower glume of 15-25 mm, upper one of 25-35 mm (Figure 2); lemmas of 20-35 mm long, involute, with non-tangent edges, finely 2-toothed, with awn of 30-65 mm long, straight, flattened, scabrous; abscission scar/callus-scar (at the base of the lemma) subcircular-ovate, rounded at the end (Figure 3a) in accordance with GILL & CARSTAIRS (1988), STACE (2010) and BORGER & al. (2021), < 1 mm in accordance with KON & BLACKLOW (1989); lemma, at the base, with an obvious constriction (in lateral view) (Figure 3b) in accordance with SALES (1993); anthers of 0.7-5.9 mm [SALES, 1993]; grain of 9-11 mm long, hairy at the tip, in accordance with CLAPHAM & al. (1952) and CABI (2022).

Obs.: though the epithet *diandra* means “two male flowers” (or stamens) in fact, the number of stamens of *B. diandrus* vary from 2 [ROTH, 1787] up to 2-3 [SMITH, 1980; SALES, 1993; MALIK & MOHAMMAD, 2015]. The examined specimens collected from Buzău railway station had always 3 stamens; also, the length of the anthers was of ± 1.3 mm. SMITH (1980) refers to anther lengths between 1 and 5 mm.

The chromosome number: $2n=8x=56$; it is an octoploid species [SMITH, 1980; GILL & CARSTAIRS, 1988; KON & BLACKLOW, 1988; OJA & LAARMANN, 2002]. The flowering period of *B. diandrus*, in Buzău railway station: June; the maturation of grains: August-September.

The chromosome number of *B. rigidus*: $2n=6x=42$; it is a hexaploid species [GILL & CARSTAIRS, 1988; KON & BLACKLOW, 1988].

Regarding the general/worldwide distribution area of *B. diandrus*, there are several points of view, as the following:

- Mediterranean-Southwest Europe [SMITH 1980; https://euoplusmed.org/cdm_dataportal/taxon/897057]
- Mediterranean region & South and Central-Western Europe [MALIK & MOHAMMAD, 2015]
- Mediterranean-Eurasiatic [CLAPHAM & al. 1952; KON & BLACKLOW, 1989; BORGER & al. 2021]
- Irano-Turanian, Pontic, and Mediterranean regions [KUNEV, 2021; CABI, 2020], but introduced elsewhere as an alien weed [<https://www.cabi.org/isc/datasheet>].

Within the native areas, *B. diandrus* grows in cultivated fields, vineyards, orchards, and roadsides, or various disturbed sites [CLAPHAM & al. 1952; KON & BLACKLOW, 1989]. Outside of the native area, *B. diandrus* is met in various habitats, including coastal sand dunes, pastures, hilltops, croplands, fallows, wastelands, roadsides, even in national parks and nature reserves [BOWCHER & al. 2019].

We were able to analyze specimens collected by Gavril Negrean in 2013 and 2014, which are preserved in the various official herbaria of Romania (CL, I). All these specimens have panicle dense, with erect branches, which explains why Negrean labelled them as *B. rigidus*. However, by the presence of conspicuous constriction at the base of lemma, more or less rounded callus scar, and anthers of about 1 mm long, they can be attributed to *B. diandrus*.



Figure 1. *Bromus diandrus* – panicle (a specimen photographed in Buzău railway station)
Photo: C. Sîrbu, 31 July 2022

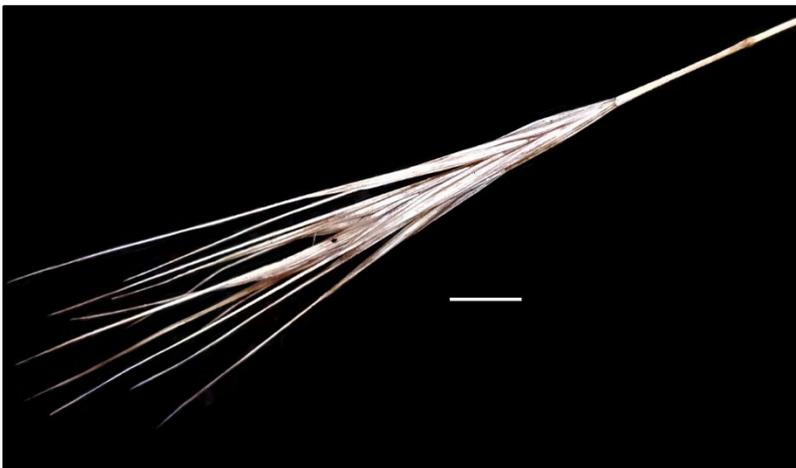


Figure 2. *Bromus diandrus* – spikelet. Scale: 0.5 mm
Photo: C. Sîrbu, 31 July 2022



Figure 3. *Bromus diandrus* – callus scar (a) and base of lemma (b). Scale: 0.5 mm
Photo: C. Sîrbu, 22 September 2022

B. diandrus has been identified by us in Buzău railway station (N 45.14237, E 26.83085, ≈ 95 m a.s.l.): *leg. et det.* Adrian Oprea, 9 July 2022; a second collecting: Adrian Oprea & Culiță Sîrbu, 31 July 2022; voucher specimens: IAGB, no 47.735-47.738; IASI, no. 18044-18046. At the first date of registration, on 9 July 2022, the plants were at the anthesis stage, while at the later one, on 31 July 2022, they were already at the fruiting stage (it was at the same stage of development at the beginning of autumn 2023).

The specimens collected at Buzău railway station show all the specific traits of *B. diandrus* above mentioned from the literature, including loose and nodding panicle, spreading, with pendulous spikelets, and at least some branches longer than spikelets.

At the above mentioned place, *B. diandrus* grows abundantly (thousands of specimens), between the railway tracks in the railway station and the associated disturbed sites, along the entire extent of railway station area.

The EUNIS habitat type for ripgut brome in Romania's flora is identified as J4.3 *Rail networks* and E5.1 *Anthropogenic herb stands* [SCHAMINÉE & al. 2012], unlike the preferred habitats in Bulgaria, where *B. diandrus* species grows in habitat type identified as B1.324 *Pontic white dunes*, between non-vegetated sand beaches, at the foot of sea cliff slopes [KUNEV, 2021; STOYANOV & al. 2022].

This is the first report of *B. diandrus* from Muntenia (in Buzău county) and the fourth from Romania.

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Place: Buzău railway station;
Vegetation: ruderal, between the railway lines;
Habitats: railway embankments;
Altitude: ≈ 95 m a.s.l.;
Surface: flat land;
Soils: superficial, usually acid;
Surveying date: 31 July 2022;
Fruits/caryopses collection: 10 September 2023.

For the purpose of this paper only two relevées are given (a more detailed phytosociological study will be carried out soon):

Relevé no. 1 - surface: 9 sq. m, vegetation height: 40 cm, vegetation cover: 85%.

N 45.14269, E 26.82876, ≈ 95 m a.s.l.

Bromus diandrus 4, *Euphorbia davidii* 1, *Erigeron canadensis* 1, *Ambrosia artemisiifolia* 1, *Amaranthus albus* +, *A. powellii* +, *Lepidium densiflorum* +, *Xanthium italicum* +, *Euphorbia maculata* +, *Chenopodium album* sensu lato +, *Erodium cicutarium* +, *Polygonum aviculare* +, *Echium vulgare* +, *Artemisia scoparia* +, *Tribulus terrestris* +, *Lactuca serriola* +, *Salsola kali* subsp. *ruthenica* +, *Portulaca oleracea* +, *Taraxacum officinale* +, *Fraxinus pennsylvanica* juv. +, *Ailanthus altissima* (juv.) + ...

Relevé no. 2 - surface: 9 sq. m, vegetation height: 45 cm, vegetation cover: 95%.

N 45.14237, E 26.83085, ≈ 95 m a.s.l.

Bromus diandrus 5, *Euphorbia davidii* 1, *Parthenocissus inserta* +, *Potentilla argentea* subsp. *argentea* +, *Echium vulgare* +, *Melilotus officinalis* +, *Tribulus terrestris* +, *Cephalaria transsylvanica* +, *Chondrilla juncea* +, *Geranium purpureum* +, *Eleusine indica* +, *Bassia scoparia* + ...

Identification key for *Bromus* (sect. *Genea*) in the flora of Romania is proposed as follow:

- 1a Lower glume 1 (rarely incompletely 3) veined, the upper one 3 (rarely incompletely 5) veined. Lemmae not aristate or aristate, with the arista inserted between 2 terminal teeth or below the level of the teeth 2
- 1b Lower glume 3-5-veined, upper (5-) 7-9-veined. Lemmae aristate, with the arista inserted on the back, slightly below its terminal teeth 2
- 2a Annual plants, spikelets dilated towards the tip. Arista longer than lemma 3
- 2b Perennial plants, spikelets with parallel edges. Arista shorter than the lemma or missing 3
- 3a Lemma over 20 mm long. Panicle ± dense. Stamens 2-5 4
- 3b Lemma up to 20 mm long. Panicle loose. Stamens 2 or 3 5
- 4a Dense panicle, erect, 15-20 cm. Lemma 22-25 mm, deeply bifid, with a 30-50 mm arista. Stamens 2, with anthers of 0.7-1 mm long. Scars ± elliptical.
B. rigidus Roth (*Anisantha rigida* (Roth) Hyl.) – Annual, T, 20-40 cm, VI-VII. Cited from Timișoara North railway station (Herb. I, leg. G. Negrean 2014), Caraș-Severin county - along the Danube river banks [JAVORKA, 1925; CIOCĂRLAN, 2000, 2009] and the Constanța harbour [ANASTASIU & al. 2009; MEMEDEMİN & al. 2016]. 2n=42. *Festucetalia valesiacae*. Medit.-pont.
- 4b Panicle ± lax, ± pendulous, over 25 cm. Lemma 20-35 mm, deeply bifid, with 4-5 mm teeth, with a 30-65 mm arista. Stamens 2-5, with anthers of 0.7-5.9 mm long. Scars almost circular.

- B. diandrus*** Roth (*Anisantha diandra* (Roth) Tutin) – Annual, T, 30-90 cm, VI-VII. Ruderal. 2n=56. Pont.-iran.-turan.-medit. (Locations: above in this work, in sect. Analyzed specimens)
- 5a Panicle erect, lax, with branches of about 10 mm or more, shorter than the spikelets, 2-3 at a node. Spikelets loose, with 6-10 flowers. Lemmas of 12-20 mm, narrowly oblong-lanceolate, with the edges sometimes involute when mature and a 12-20 mm arista, straight or slightly divaricate. Stamens 2.
- B. madritensis*** L. (*Anisantha madritensis* (L.) Nevski) – Annual, T, -60 cm, VI-VII. Very rare. Cited from Bucharest – railway station “Triaj” [ANASTASIU & NEGREAN, 2008], Chitila South – the railway station “Triaj” and Constanța harbour [ANASTASIU & NEGREAN, 2008; ANASTASIU & al. 2009]. 2n=28, 42. S & W Eur.
- 5b Panicle pendulous, with branches of the same length or longer than the spikelets 6
- 6a Stem pubescent below the panicle. Panicle unilateral, with flexible and ramified branches. Lemma of 8-12 mm, lanceolate, inconspicuously veined, with a 10-18 mm arista. Stamens 3.
- B. tectorum*** L. (*Anisantha tectorum* (L.) Nevski) – Annual, T, 20-50 cm, V-VI. Frequently, from steppe area to beach belt of vegetation, on dry, ruderal and sandy places. Cont. euras.
- 6b Stem glabrous below panicle. Panicle multilateral, lax, pendulous at the end, with simple and rough branches. Lemma linear-subulate, 12-20 mm, obviously veined, with a 15-30 mm arista. Ligule of about 4 mm. Stamens 3.
- B. sterilis*** L. (*Anisantha sterilis* (L.) Nevski) – Annual, T, 20-90 cm, V-VI. Frequently, from steppe area to beach belt of vegetation, in acacia plantations, on ruderal places, sands or loess. Euras. (submedit.)

Regarding the possible provenance of *B. diandrus* in Romania's flora, it is reasonable to assume that it could be a contaminant of cereals or other goods transported via railways or arriving through the Black Sea harbours of Romania (also G. Negrean himself identified this species in railway stations of Timișoara, Drobeta-Turnu Severin, and Constanța harbour). This idea is also supported by other authors [GLEICHSNER & APPLEBY, 1989; MICHAEL & al. 2010].

Considering the location of the species in disturbed habitats and the possible ways of arrival, through harbours or railways, it can be assumed that *B. diandrus* is an adventitious species in the spontaneous flora of Romania.

For the time being, *B. diandrus* does not seem to extend beyond the spaces of railway stations or harbours in Romania; however, preventive measures must be considered to control the invasion of this species outside the current ruderal areas. Some management measures as weed control, could include, for instance: a) burning residues on site, as it is already practiced in Australia and USA [HEENAN & al. 1990; SWEET & al. 2008; BOWCHER & al. 2019], b) complete inversion of the soil as it is practiced in Spain [GARCIA & al. 2013; RECASENS & al. 2016], c) biological control as it is practiced in Tunisia and United Kingdom [LAWRIE & al. 1998; MEJRI & al. 2010], d) non-selective herbicide as it is practiced in Spain [ROYO-ESNAL & al. 2018], e) pre-emergence herbicide as it is practiced in Australia and New Zealand [DASTGHEIB & al. 2003; KLEEMAN & GILL, 2008; KLEEMAN & al. 2016], f) post-emergence herbicide as it is practiced in Australia and Spain [GILL & BOWWRAN, 1990; KLEEMAN & GILL, 2009; GARCIA & al. 2014; ROYO-ESNAL & al. 2018], g) spray-topping as it is practiced in Australia [BOWCHER & al. 2019], h) grazing as it is practiced in Australia and New Zealand [TOZER & al. 2007; BOWCHER & al. 2019], i) weed seed harvesting for

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seed control as it is practiced in Australia [WALSH & POWLES, 2014; BORGER & al. 2020], and so forth.

Conclusions

The natural distribution of ripgut brome (*Bromus diandrus*) in the Romania's flora is presented here, in synthesis. This species was recorded in the fourth known place in Romania, namely Buzău (it is the first location in the historical province of Muntenia), in the city's train station. At the site, *B. diandrus* was estimated to grow in the thousands along and inbetween the railway tracks and the associated disturbed sites, throughout the railway station area.

Considering the habitat, ecology, and the ruderal behavior, it can be assumed that the ripgut brome is an adventitious species in Romania's flora.

An identification key of the species of the genus *Bromus*, sect. *Genea*, known up to now in the Romania's flora was compiled and included in this work.

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How to cite this article:

OPREA A. & SÎRBU C. 2023. Ripgut brome (*Bromus diandrus*) in Romania's vascular flora. *J. Plant Develop.* **30**: 33-45. <https://doi.org/10.47743/jpd.2023.30.1.931>
