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A NEW REGISTRATION IN THE VASCULAR FLORA OF MOLDOVA (EASTERN ROMANIA): *ALLIUM INAEQUALE*

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Abstract: The presence of species *Allium inaequale* in the flora of Moldova (eastern Romania), has been reported in this paper, based on specimens collected by authors on the field, as well as on specimens stored in public herbaria. The species has been identified in arid grasslands of two nature reserves from the Central Moldavian Plateau (Vaslui County), namely: "Coasta Rupturile" Tanacu and "Movila lui Burcel" Miclești. This is a very rare plant species in Romania, found at the most western limit of its general range, and should be included, as vulnerable, in the Romanian Red List of Vascular Plants. We have also found that the registration of the species *A. moschatum* in the flora of Moldova was due to misidentification. Based on the current data, *A. moschatum*, should be replaced in the flora of this historical province by *A. inaequale*.
Keywords: Coasta Rupturile, Movila lui Burcel, Red List of Vascular Plants, section *Scorodon*

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Introduction

Allium inaequale Janka, Linnaea 30, 603 (1860), is a Central Asian - West Pontic plant species (Vvedenskii 1968). It is distributed in the Aralo-Caspian basin (Central Asia) (Vvedenskii 1968; Fedorov 1979), the Southern and Central European Russia (Vvedenskii 1968; Fedorov 1979; Didukh *et al*. 2018), Ukraine (Donetsk, Crimea) (Prokudin *et al*. 1987), the Republic of Moldova (Fedorov 1979; Negru 2007; Ghendov & Ciocârlan 2015; Pînzaru & Sîrbu 2016; Cassir *et al*. 2020) and Romania (Ciocârlan 1994, 2009; Sârbu *et al*. 2013).

Towards the western limit of its natural area, *A. inaequale* is more and more rare and, as a consequence of isolated populations and the destruction of habitats, increasingly vulnerable (Ghendov 2014; Ghendov & Ciocârlan 2015). Accordingly, it has been listed in the *IUCN Red List categories of vascular plant species of the Ukrainian flora*: Least-concern (LC) (Onyshchenko *et al*. 2022); the *Red Book of the Republic of Moldova*: Vulnerable (VU) (Ghendov 2014; Ghendov & Ciocârlan 2015; Cassir *et al*. 2020), and the *European Red List of Vascular Plants*: Data deficient (DD) (Bilz et al. 2011).

Regarding ecological preferences, *A. inaequale* is known (Sârbu *et al*. 2013) as heliophilous, thermophilous, xerophilous and saxicolous (calciphilous) – $L_9T_8U_1R_8$ (see also Ciocârlan 1994).

Beyond the eastern border of Romania, this species grows on dry rocky steppe grasslands (on limestone, chalk, and sands) (Vvedenskii 1968; Fedorov 1979; Ghendov

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2014; Ghendov & Ciocârlan 2015), as well as in steppe areas with loess soils (Ghendov 2014; Ghendov & Ciocârlan 2015; Cassir *et al*. 2020). Within the areas of Don and Volga River basins, *A. inaequale* is a diagnostic species for the EUNIS Habitat type R15 – *Continental dry rocky steppic grassland and dwarf scrub on chalk outcrops* (Chytrý *et al*. 2020), with usually open vegetation of the ord. *Thymo cretacei-Hyssopetalia cretacei* Didukh 1989 (see Didukh *et al*. 2018).

In Romania, *A. inaequale* has been known so far on stony, calcareous places, from only a few localities in Dobrogea (Constanța and Tulcea Counties) and Muntenia (Prahova County). Although Zahariadi (1966) stated that it is possible for *A. inaequale* to be present in Romania (Dobrogea), evidences were brought only since 1994, when Ciocârlan first reported *A. inaequale* in the country, from Baltăgești (Constanța County), on the Alah Bair Hill (Herb. Inst. Agron. București, no. 22711). According to the cited author, in this locality *A. inaequale* is accompanied by other saxicolous species such as *A. saxatile*, *Agropyron brandzae*, *Hedysarum grandiflorum*, etc. Subsequently, Negrean (2011) reported *A. inaequale* in three other localities as follows: Tulcea County, at Greci (Herb. GN, Măcin Mountains, *in saxosis*, 08.1963, *legit. et det*. G. Negrean, as *A. moschatum*) and north of Baia (Herb. GN no. 3136, *cariera vetusta, in saxosis calcareis, legit. et det*. G. Negrean, 23.08.2002); Prahova County, at Stânca Tohanilor (Herb. GN, *in saxosis calcareis, legit. et det*. G. Negrean, as *A. moschatum*, 03.10.1966 and 06.08.1967). According to Sârbu *et al*. (2013), in Romania, *A. inaequale* is diagnostic for the alliance *Pimpinello-Thymion zygioides* Dihoru et Doniță 1970, which includes xerophilous rocky steppic dwarf-shrub rich grasslands on steep calcareous slopes of Dobrogea and north-eastern Bulgaria (see Coldea 2012 and Mucina *et al*. 2016).

Among the 25 indigenous species of *Allium* reported from Romania so far (Sârbu *et al.* 2013), *A. inaequale* is most similar to *A. moschatum* L. (a species with a native range in the Mediterranean region) (Zahariadi 1966; Vvedenskii 1968; Stearn 1980; Ciocârlan 1994), with which it was actually misidentified, in some cases, as already shown by Negrean (2011). Related to this, it is worth noting that, according to Vvedenskii (1968), "The typical *A. inaequale* occurs beyond the Volga. The form growing to the west in the southern part of the European USSR displays characteristics of transition towards *A. moschatum*, although still closer to *A. inaequale*". The two species are the only representatives of sect. *Scorodon* Koch in the flora of Romania (Stearn 1980).

The botanical description of both species and the differences between them are presented (including by identification keys), in numerous relevant references, such as: Vvedenskii (1968); Fedorov (1979); Stearn (1980); Prokudin *et al*. (1987); Ciocârlan (1994, 2009); Sârbu *et al*. (2013). According to these authors, *A. inaequale* is characterized by pedicels of 10-30 (-40) mm, very unequal, (2) 3-6 (-10) times as long as perianth; tepals of 4-5 (-6) mm long; stamens ca. 2/3-3/4 as long as tepals; leaves wilting before anthesis (*versus* pedicels of 10-15 mm, ± equal, up to 2 times longer than perianth; tepals of 6.5-7.5 mm long; stamens ca. 1/2-2/3 as long as tepals; leaves persistent nearly to fruiting, in *A. moschatum*).

The purpose of this paper is to document the presence of *A. inaequale* in Moldova (eastern Romania), and to demonstrate that this species has been previously reported as *A. moschatum* within THE NAME OF province.

Material and methods

Species has been identified by analysing herbarium specimens collected during our own field work (2018), but also of existing specimens in public herbaria in Romania: I, IAGB, IASI, CL, BUC, BUCA (abbreviations according to Holmgren *et al*. 1990).

The geographic coordinates were recorded on the field using the OsmAnd application, available at https://osmand.net/.

Species identification and nomenclature followed main references on the genus *Allium*, such as: Vvedenskii (1968); Fedorov (1979); Stearn (1980); Prokudin *et al*. (1987); Ciocârlan (2009); Sârbu *et al*. (2013).

Voucher specimens were deposited in the Herbarium of the University of Life Science "Ion Ionescu de la Brad" of Iași (IASI).

Results and discussion

As a result of field research carried out in 2018, we identified the species *A. inaequale* Janka in two nature reserves in the Central Moldavian Plateau, Vaslui County, namely:

- "Coasta Rupturile", east of the Tanacu Village (N 46.66698, E 27.85064): xerophilous grassland, on arid southerly slope (Herb. IASI, no. 18050, *legit. et det*. C. Sîrbu, 10.08.2018);

- "Movila lui Burcel", northwest of the Micleşti Village (N 46.84154, E 27.80215): xerophilous grassland, on arid, steep, westerly – north-westerly slope (Herb. IASI, no. 18049, *legit. et det.* C. Sîrbu, 19.08.2018).

All specimens collected by us have characteristics that undoubtedly fit within the variability range of the species *A. inaequale*. Even though pedicels are somewhat shorter (max. 17 mm, versus max. 30 (-40) mm), these are very unequal (the variation coefficient calculated for 5 specimens = 32.3%) and exceed the length of the perianth up

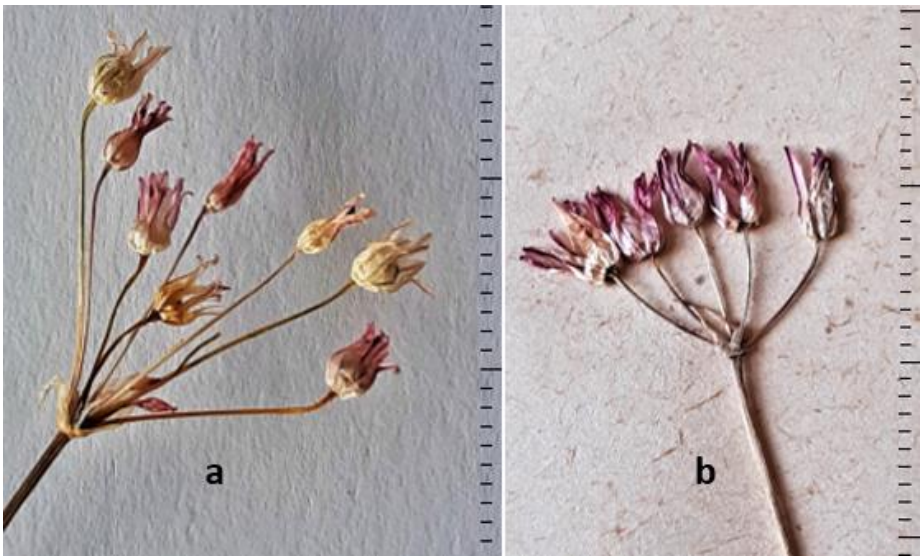

Fig. 1. Umbels of: **a)** *Allium inaequale* ("Movila lui Burcel" Nature Reserve, Herb. IASI, no. 18049, *legit. et det.* C. Sîrbu, 19.08.2018); **b)** *A. moschatum* (Ghiaur Suiciuc-Caliacra, Herb. I, no. 89889; *legit. et det*. P. Enculescu, 09.09.1934). Scales are expressed in mm. Photos: C. Sîrbu.

to 3.8 times; tepals of 4.3-4.5 mm long; stamens of ca. 3/4 as long as tepals (*Fig. 1a*); leaves dried up at flowering. An umbel of *A. moschatum* is shown for comparison in *Fig. 1b*.

Within the above mentioned two nature reserves, the species is represented by small populations (several tens of individuals), scattered in arid grasslands of ass. *Taraxaco serotini-Festucetum valesiacae* (Răvăruț *et al*. 1956) Sârbu *et al*. 1999 subass. *bothriochloetosum ischaemi* Chifu *et al*. 2006 (all. *Jurineo arachnoideae-Euphorbion steposae* Dobrescu (1971) Coldea & Sârbu 2012; see Coldea 2012), on steep slopes, with eroded chernozems and exposed loessoid deposits (Habitat type – Nature 2000: 62C0* *Ponto-Sarmatic steppes*; see Gafta & Mountford 2008).

From the same localities, the closely related species *A. moschatum* L. was previously reported, as follows: "Tanacu on the «Coasta Rupturile», in the grassland with *Bothriochloa ischaemum*" (Ghișa & Vițălariu 1969); "in stony, strongly eroded ecotopes, on the south-eastern promontory of the «Movila lui Burcel» Nature Reserve" (Dobrescu & Leocov 1982). Beldie (1979) also reported *A. moschatum* from two other localities, namely Unțești and Satu Nou-Solești (Vaslui County), the second one located in the vicinity of the "Movila lui Burcel" Nature Reserve.

However, Ciocârlan (2009) suggested the possibility that in the cited localities from the Vaslui County there is rather *A. inaequale* instead of *A. moschatum*. Following this suggestion, during the year of 2022, we undertook a study in public herbaria (I, IAGB, IASI, CL, BUC, BUCA), in order to identify possible specimens of *A. moschatum* collected from the Vaslui County, and to verify whether the respective specimens do not actually belong to the species *A. inaequale*. As a result of this study, we found a total of five herbarium sheets, with several specimens collected from "Coasta Rupturile" and "Movila lui Burcel" Nature Reserves, all labelled as *A. moschatum* L. All these specimens have the same characteristics as those collected by us (see above) and consequently undoubtedly fit to *A. inaequale*. The five herbarium sheets are as follows:

- Herb. CL, no. 507648: Tanacu (Vaslui County), dry, arid slopes (*legit. et det*. Gh. Vițălariu & E. Ghișa, 18.08.1967, as *A. moschatum* L.; *rev.* C. Sîrbu, 25.11.2022);

- Herb. I, no. 69029 and 69036: Miclești (Vaslui County), "Movila lui Burcel" Nature Reserve (*legit. et det*. C. Dobrescu, 02.08.1972, as *A. moschatum* L.; *rev.* C. Sîrbu, 05.10.2022);

- Herb. I, no. 69017: *idem* (*legit. et det.* C. Dobrescu, 04.08.1972, as *A. moschatum* L.; *rev.* C. Sîrbu, 05.10.2022);

- Herb. IAGB, no. 18477: *idem* (*legit*. I. Căpălnășan, *det*. I. Sârbu, 09.08.1973, as *A. moschatum* L.; *rev*. C. Sîrbu & A. Oprea, 05.10.2022).

No specimen of *Allium* collected from the two localities mentioned by Beldie (1979) has been identified in the mentioned herbaria. Considering the above, we assume that Beldie's data must be reported rather to *A. inaequale* instead of *A. moschatum*.

Considering the rarity of the species *A. inaequale* in Romania, at the western limit of its general range of distribution, the small, isolated populations and the vulnerable habitats, we consider that it should be included in the Red List/ Book of vascular plants in Romania, as *Vulnerable* (VU).

Note. We also found *A. inaequale* to the west of Palazu Mic Village, Constanța County (N 44.44375, E 28.51748): xerophilous grassland, on eastern slope, with

calcareous substrate (Herb. IASI, nr. 18051; *legit. et det.* C. Sîrbu & A. Oprea, 08.08.2021).

Conclusions

Based on our own field research and the review of some specimens stored in public herbaria in Romania, we report in this paper the species *A. inaequale* for the first time in the vascular flora of Moldova (eastern Romania).

This is a very rare plant, found here at the western limit of its general range of distribution, and should be included, as vulnerable, in the Red List of vascular plants in Romania.

Based on the current data, the species *A. moschatum*, which has been previously reported from Moldova as a result of misidentification, must be changed in the flora of this historical province by *A. inaequale*.

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