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RARE SPONTANEOUS ALLIACEAE SPECIES FOR THE RED BOOK OF REPUBLIC OF MOLDOVA

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The paper presents the results of the study on spontaneous rare vascular plant species from the Alliaceae J. Agardh family, proposed for the inclusion in the 4th edition of the Red Book of the Republic of Moldova. These include 7 endangered species, evaluated according to IUCN criteria as critically endangered, endangered and vulnerable: 4 critically endangered species (*Allium fuscum* Waldst. et Kit., *A. guttatum* Steven, *A. montanum* F.W.Schmidt, *A. podolicum* (Aschers. et Graebn.) Błocki ex Racib.), one threatened (*Allium sphaeropodum* Klokov) and two vulnerable (*Allium inaequale* Janka and *Nectaroscordum bulgaricum* Janka). For these taxa the following data are indicated: Latin, Romanian and Russian names, synonyms, rarity category and criteria, biological characteristics (including the plant habitus), beneficial features, common and local distribution (with maps of common distribution and distribution in the Republic of Moldova), habitat, protection status and recommended protection measures in the republic.

Keywords: *Republic of Moldova, spontaneous flora, rare species, Alliaceae, red book.*

SPECII RARE SPONTANE DE ALIACEE (ALLIACEAE) PENTRU INCLUDEREA ÎN CARTEA ROȘIE A REPUBLICII MOLDOVA

În articol sunt expuse rezultatele studiului asupra speciilor de plante vasculare spontane rare din familia Alliaceae J.Agardh, propuse pentru includerea în a IV-a ediție a Cărții Roșii a Republicii Moldova. Aceasta include 7 specii rare evaluate, conform criteriilor UICN ca fiind critic periclitate, periclitate și vulneravile: 4 specii critic periclitate (*Allium fuscum* Waldst. et Kit., *A. guttatum* Steven, *A. montanum* F.W.Schmidt, *A. podolicum* (Aschers. et Graebn.) Błocki ex Racib.), o specie periclitată (*Allium sphaeropodum* Klokov) și două vulnerabile (*Allium inaequale* Janka and *Nectaroscordum bulgaricum* Janka). Pentru acești taxoni sunt indicate următoarele date: denumirea în limbile latină, română și rusă, sinonimia, criteriile și categoria de raritate, caracteristicile biologice, aspecte de utilizare, răspândirea generală și locală, habitatul, starea și măsurile de protecție recomandate în republică.

Cuvinte-cheie: *Republica Moldova, flora spontană, specii rare, Aliacee, Cartea Roșie.*

Introduction

One of the features of the flora of Republic of Moldova is the presence in it of a high number of rare and endangered species. Rare species of vascular plants now account for over a third of the total composition of the flora of different categories of rarity. In accordance with the rarity categories and criteria, all these species are threatened with extinction due to the small number of populations and limited distribution across the territory [9, 11, 13].

The rarest taxa are included in the regional Red Lists – List of Species Protected by the State and in the Red Book of the Republic of Moldova. Regional Red Lists represent a report on the threatened state of species in that or another country or region. Regional Red Lists estimate the risk of extinction of species within the unit of political management and, therefore, can directly influence national planning. This project is coordinated by the International Union for Conservation of Nature (IUCN) and partners in national governments around the world. Regional Red Lists can help countries in: 1) determination of conservation status and species survival trends; 2) the identification of species that are under the greatest threat. The estimation of the state of rarity is carried out using regional categories and criteria of the IUCN; 3) informing about plans and measures for the preservation of species and 4) increasing awareness of endangered species [9, 18, 21].

The Red Book is an official document that includes a list of critically endangered, endangered and vulnerable species of the Republic of Moldova, as well as general information about their status, condition, range of occurrence, methods of their protection, conservation and dissemination. The study on species

to be included into the 4th edition of the Red Book of the Republic of Moldova are currently underway to identify threatened species.

Material and methods

During our investigation concerning rare species of the Alliaceae family in the spontaneous flora of the Republic of Moldova, in order of their inclusion into the 4th edition of the Red Book of the Republic of Moldova, we performed all necessary research. Initially, all published information on the presence of species in the territory was reviewed [2-8, 10, 12, 15, 19, 24, 25, 28] and consulted specimen materials in different scientific herbaria (Herbarium of the National Botanical Garden (Institute) from Republic of Moldova, Herbarium of Moldova State University, Herbarium of National Museum of Ethnography and Natural History etc.).

Rare species are identified on the basis of their local distribution in the Republic of Moldova. The following symbols are used to denote the spread: ○ – locality, where the species has grown in the past (before 1974 i.e. 50 years ago) and ● – locality, where the species grows in the present time (from 1974 to 2024). The general distribution is given according to literature data [14, 16, 17, 22, 23]. The maps of distribution were used from the resource of the Kew Royal Botanic Garden [14].

The taxonomy of Alliaceae family species followed by the recent taxonomical literature [14, 27]. Data on useful properties of plants are indicated by literature data [20]. The rarity of species is assessed by the IUCN categories and criteria [9]. The measures for the conservation of species at the national level [11, 2-8], in the territory of neighboring countries and in Europe are shown [1, 26].

Results and Discussions

As part of scientific research at the Laboratory of Spontaneous Flora and Herbarium of the National Botanical Garden (Institute) of MSU, it was established that the Alliaceae family in the flora of the Republic of Moldova includes 18 species from 2 genera [8, 12, 19]. According to IUCN criteria [9], 7 species are assessed as rare and threatened with extinction. Of these, 4 critically endangered species (*Allium fuscum* Waldst. et Kit., *A. guttatum* Steven, *A. montanum* F.W.Schmidt, *A. podolicum* (Aschers. et Graebn.) Błocki ex Racib.), one endangered (*Allium sphaeropodum* Klokov) and 2 vulnerable (*Allium inaequale* Janka and *Nectaroscordum bulgaricum* Janka). They differ in the number and vitality of populations, local distribution and, along with the types of relatively low risk of extinction, are extremely rare.

In the article rare plants of the Alliaceae family are given in alphabetical order, each with the indication of the following characteristics: Latin, Romanian and Russian names, synonyms, rarity category and criteria, biological characteristics (including the plant habitus), beneficial features, common and local distribution (with maps of common distribution and distribution in the Republic of Moldova), habitat, protection status and recommended protection measures.

Allium fuscum Waldst. et Kit. **– Ceapă brună – Лук бурый**

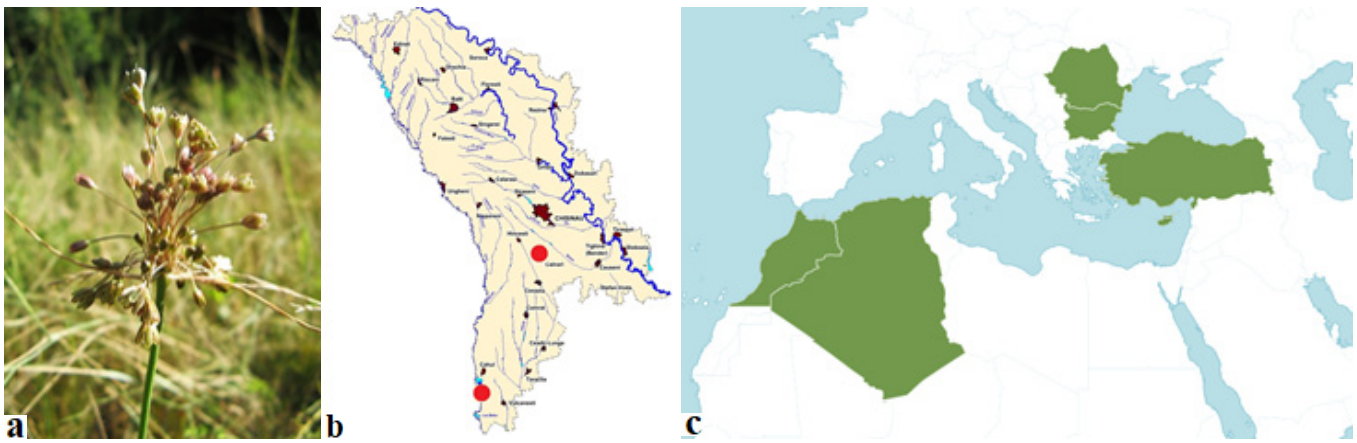

Figure 1. Allium fuscum Waldst. et Kit.: a – plant appearance, b – distribution in the Republic of Moldova, c – distribution worldwide

Critically Endangered species [CR]. A4ce; B2ab(i,ii,iii,iv); D2. Perennial, bulbous plant (Fig. 1a). It is an ornamental plant [20]. Blooms in July; fruiting in August. It is propagated by seeds and vegetatively. Steppe xerophilous species. In the Republic of Moldova it occurs in the vicinity of st. Zloți (Cimișlia district) and comm. Vadul lui Isac (Cahul) (Fig. 1b). It is located on the eastern edge of its distribution area. Outside the country it occurs in Central Europe (Romania), Balkan peninsula (Bulgaria), Asia Minor (Turkey, Cyprus) and north-west Africa (Algeria, Morocco) (Fig. 1c). [14, 16, 22]. Plants grow solitarily or in small groups in sunny eroded and steep slopes; the steppe grasslands; in the glades of downy oak forests. The largest population occupies an area of about 0,5 ha, with an abundance of 1-2. Stable population, represented by individuals of different ages, plant density reaching up to 2-5 mature plants per 1 m^2.

Territorially protected in the “Cărbuna” landscape reserve. Inclusion in the State Protected Species List and *ex-situ* conservation is recommended.

Allium guttatum Steven – **Ceapă gutulată** – **Лук крапчатый**

Figure 2. Allium guttatum Steven: a – plant appearance; b – distribution in the Republic of Moldova; c – distribution worldwide

Critically Endangered species [CR]. A4ce; B2ab(i,ii,iii,iv); D2. Perennial, bulbous plant (Fig. 2a). It is a decorative and medicinal plant [20]. Blooms in July-August; fruits in August-September. It is propagated by seeds and vegetatively. Steppe xerophilous species. In the Republic of Moldova it occurs in the vicinity of vill. Ciumai (Taraclia), Vulcănești town, comm. Congaz (UTAG); comm. Ghidighici, Chișinău sity; between comm. Slobozia Mare and Văleni (Cahul) (Fig. 2b). The species is at the northern limit of natural range of distribution. Outside the country it occurs in Central (Romania), eastern (Ukraine, Crimea), Balkan peninsula and Asia Minor (Cyprus, Turkey, East Aegean Is.) (Fig. 2c) [14, 16, 22]. Species grow in small groups or, sometimes in patches of different sizes, in sunny eroded and steep slopes; the steppe grasslands; on loessoid substrate with steppe vegetation. Isolated specimens are also found. The largest population is located between comm. Slobozia Mare and Văleni, occupies an area of about 1 ha, with an abundance of 1-2 (3). Stable population, represented by individuals of different ages, plant density reaching up to 60 mature plants per 1 m^2.

Species included in the Red Book of the Republic of Moldova (3rd ed.) [3]. Territorially protected in the multifunctional management area – a representative sector with steppe vegetation in the south of Bugeac (Ciumai village).

Allium inaequale Janka – **Ceapă inegală** – **Лук неравный**

Vulnerable species [VU]. B2ab(ii,iii). Perennial plant, geophytes (Fig. 3a). It is a medicinal plant [20]. Blooms in August-September; fruits in September-October. It is propagated by seeds and vegetatively. Steppe xerophilous species. In the Republic of Moldova it occurs in the vicinity of Camenca and Grigoriopol towns, comm. Goian, Taşlâc, UATSN; comm. Bugeac, Dezghingea, UTA Găgăuzia; comm. Topala (Cimişlia); comm. Slobozia Mare (Cahul) (Fig. 3b). On the territory of the republic, it is located at the southern limit of the area. Beyond the borders of the Republic of Moldova, it is spread in Central (Romania) and Eastern Europe (center

and south), the North Caucasus, Central Asia (Fig. 3c) [14, 16, 22]. Species grow in primary steppes in the south of the country alone or in groups of 3-5 mature individuals. Forms scattered groups of 1-2 m^2, with an abundance of 1-2. Stable populations, represented by individuals of different ages, plant density reaching up to 10-15 mature plants per 1 m^2 [4]. Prefers rocky steppe hills, but also the steppe sectors with loessoid soils.

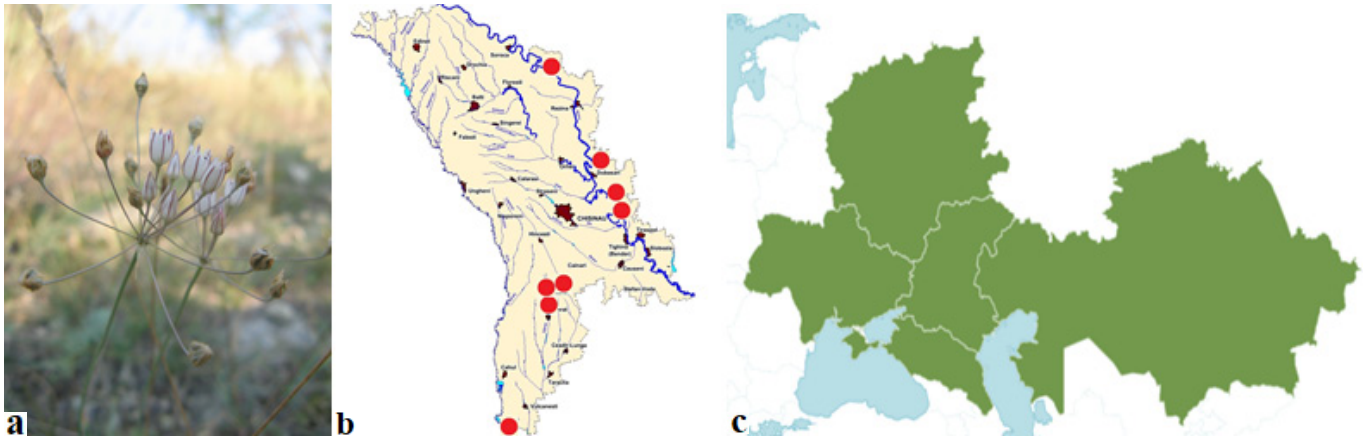

Figure 3. Allium inaequale Janka: a – plant appearance, b – distribution in the Republic of Moldova, c – distribution worldwide

Species is protected by law (category IV) [11], included in the Red Book of the Republic of Moldova (3rd ed.) [4]. Territorially protected within the State Scientific Reserve "Iagorlîc", in the areas with steppe vegetation in the north of Bugeac – "Bugeac" and "Dezghingea". Included in the Red List of Europe as a species with data deficient (category DD) [1].

Allium montanum F. W. Schmidt (=*A. senescens* L. p. p., *A. senescens* L. subsp. *montanum* (F.W.Schmidt) Holub) – **Ceapă montană – Лук горный**

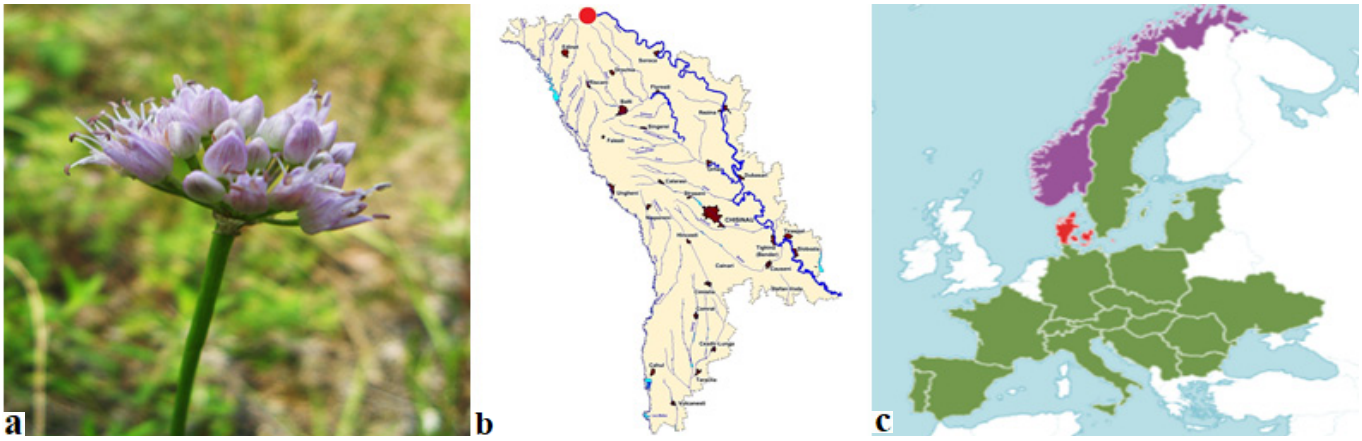

Figure 4. Allium montanum F. W. Schmidt: a – plant appearance, b – distribution in the Republic of Moldova, c – distribution worldwide

Critically Endangered species [**CR**]. A4ae; B2ab(i,ii,iii,iv); D2. Perennial plant, geophytes (Fig. 4a). It is a medicinal and ornamental plant [20]. Blooms in July-August; it bears fruit in August-September. It is propagated by seeds and vegetatively. Rocky, calcareous mesoxerophilous species. In the Republic of Moldova it is found near the comm. Naslavcea (Ocniţa) (Fig. 4b). The species is at the southern limit of its natural range of distribution. Beyond the borders of the republic, it is spread in Scandinavia (Sweden, introduced to Norway), Central and Eastern Europe (Baltic States, Ukraine), the Mediterranean; extinct in Denmark (Fig. 4c) [14, 16, 22]. Species grow in groups of 5-7 individuals, isolated at the top of the grassy slope, forming clumps of 1-2 m^2, with an abundance of 1(2), on rocky place on limestone substrate; the glades and undergrowth of the pine and acacia plantations. The stable population, represented by individuals of different ages [5].

Species included in the Red Book of the Republic of Moldova (3rd ed.) [5]. Territorially protected within the Geological and Paleontological Natural Monument “Tectonic fault near comm. Naslavcea” (“Stânca” forest body).

Allium podolicum (Aschers. et Graebn.) Błocki ex Racib. (=*A. paniculatum* L. var. *podolicum* Aschers. et Graebn.) – **Ceapă podoliană** – **Лук подольский**

Figure 5. Allium podolicum (Aschers. et Graebn.) Błocki ex Racib.: a – plant appearance, b – distribution in the Republic of Moldova, c – distribution worldwide

Critically Endangered species [CR]. B2ab(ii,iii,iv). Perennial plant, geophyte (Fig. 5a). It is a medicinal plant [20]. Blooms in July-August; fruits in August-September. It is propagated by seeds and vegetatively. Rocky, calcareous xerophilous species. In the Republic of Moldova it is found near the comm. Văratic, Horodişte (Rîşcani) (Fig. 5b). Pontic endemic. Beyond the borders of the Republic of Moldova, it is spread in Central (eastern Hungary, Romania) and Eastern (central and southern) Europe (Fig. 5c) [14, 16, 22]. Species grows solitarily or in groups of 3-10 specimens, rarely forming clumps with an abundance of 1-2, on arid calcareous slopes with petrophilic vegetation; the clearings of the pine plantations. The population is stable, represented by individuals of different ages; plant density reaching up to 10 per 1 m^2 [6].

Species included in the Red Book of the Republic of Moldova (3rd ed.) [6]. In the Republic of Moldova territorially protected within the Geological and Paleontological Natural Monument “Văratic Gorge”. Included in the Red List of Europe as a species with data deficientt (category DD) [1].

Allium sphaeropodum Klokov – **Ceapă sferopodă** – **Лук круглоногий**

Figure 6. Allium sphaeropodum Klokov: a – plant appearance, b – distribution in the Republic of Moldova, c – distribution worldwide

Endangered species [EN]. A4cde; B2ab(i,ii,iii,iv). Perennial plant, geophytes (Fig. 6a). It is a medicinal

plant [20]. Blooms in June; fruiting in August. It is propagated by seeds and vegetatively. Steppe species, xerophilous. In the Republic of Moldova it is found near the comm. Slobozia Mare (Cahul), between comm. Chirsova and Ferapontievca, UTA Gagauzia; comm. Goian, UATSN (Fig. 6b). Beyond the borders of the Republic of Moldova, it is spread in Romania and Ukraine (Fig. 6c) [14, 16, 22]. Species grows in primary steppes in the south of the country solitarily or in small groups of 2-3 individuals, on the rocky steppe hills, the steppe sectors with loessoid soils in the Bugeac steppe. Forms dispersed groups of 1-2 m^2, with an abundance of 1. Populations represented by individuals of different ages, plant density reaching up to 2-10 mature plants per 1 m^2.

In Republic of Moldova it is territorially protected within the "Iagorlîc" State Scientific Reserve. Included in the Red Book of Ukraine as a vulnerable species (vulnerable category) [26].

Nectaroscordum bulgaricum Janka (=*N. dioscoridis* (Sibth. et Smith)Zahar., *Allium dioscoridis* Sibth. et Smith) **– Ceapă bulgărească – Нектароскордий болгарский**

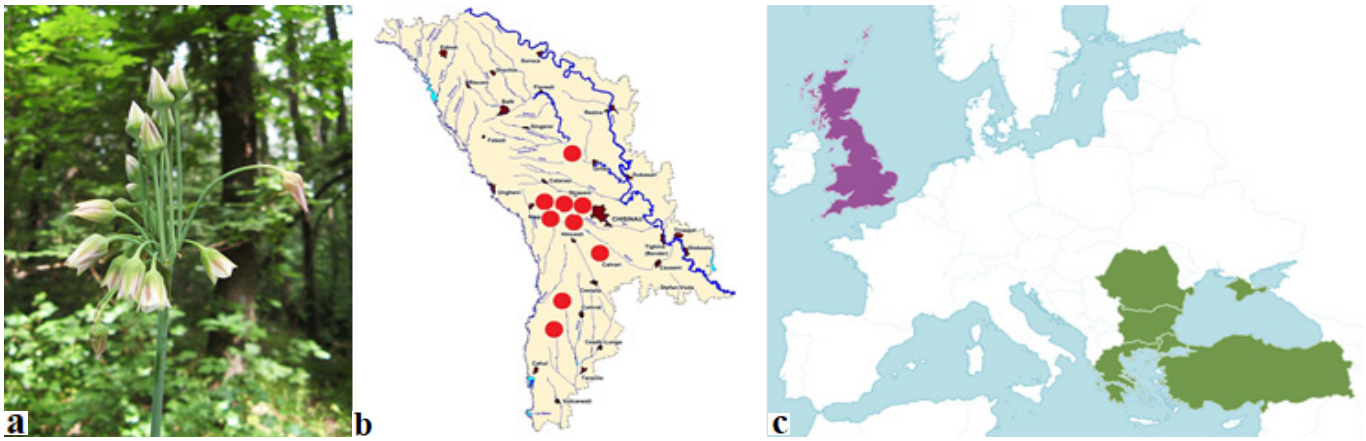

Figure 7. Nectaroscordum bulgaricum Janka: a – plant appearance, b – distribution in the Republic of Moldova, c – distribution worldwide

Vulnerable species [VU]. B2ab(ii,iii). Perennial plant, geophytes (Fig. 7a). It is an ornamental and medicinal plant [20]. Blooms in May-June; fruits in June-July. It is propagated by seeds and vegetatively. Forest mesophyllous species. In the Republic of Moldova it grows in the vicinity of comm. Budăi (Teleneşti); comm. Căpriana, Lozova, vill. Stejăreni (Strașeni); Zloți station (Cimișlia); comm. Tigheci (Leova); comm. Loganesti, vill. Horodca (Hînceşti); comm. Baimaclia (Cantemir) (Fig. 7b). The species is at the northern limit of the its Ponto-Balkanic area of distribution. Beyond the borders of the Republic of Moldova, it is spread in Central (Romania) and Eastern Europe (Crimea), the Balkan Peninsula (Greece, Bulgaria), Asia Minor (Turkey); introduced into Great Britain (Fig. 7c) [14, 17, 23]. Species grow in small isolated scattered groups of 5-10 mature individuals or in clumps of 200-500 m^2, in phytocoenoses of the oak forests with lindens, ash, hornbeam and those of downy oak. Populations are stable, represented by individuals of different ages, plant density sometimes reaches up to 20 mature plants per 1 m^2 [7].

Species protected by law (category III) [11], included in the Red Book of the Republic of Moldova (3rd ed.) [7]. In the Republic of Moldova territorially protected in the Scientific Reserve "Codru", in the landscape reserves "Hîncești", "Căpriana-Scoreni", "Cărbuna" and in the Natural Reserve of medicinal plants "Logănești". Included in the Red Book of Ukraine [26].

Conclusions

We propose to include in the list of species protected by law additionally 5 species from Alliaceae family: *Allium fuscum* Waldst. et Kit., *A. guttatum* Steven, *A. montanum* F.W.Schmidt, *A. podolicum* (Aschers. et Graebn.) Błocki ex Racib. and *A. sphaeropodum* Klokov. In the 4th edition of the Red Book of the Republic of Moldova, we propose to include 7 species of different categories of rarity: 4 critically endangered species

(*Allium fuscum* Waldst. et Kit., *A. guttatum* Steven, *A. montanum* F.W.Schmidt, *A. podolicum* (Aschers. et Graebn.) Błocki ex Racib.), one endangered (*Allium sphaeropodum* Klokov) and two vulnerable (*Allium inaequale* Janka and *Nectaroscordum bulgaricum* Janka) species.

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