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RESEARCH ARTICLE

***Valeriana dacica* (Caprifoliaceae), a Carpathian endemic in Ukraine: distribution, morphology, ecology, population characteristics, and identification issues**

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Abstract. *Valeriana dacica*, a long-neglected Carpathian endemic species, is widely distributed across the Ukrainian Carpathians; it also slightly penetrates into the adjacent foothills in the Subcarpathian region north-eastwards from the mountains. A map of the species' distribution in Ukraine is presented based on a critical revision of the herbarium data, literature, and the authors' records. A drawing of *V. dacica* and identification tips, which help distinguish it from the closely related species *V. tripteris* are provided. Morphology, ecology, and population characteristics of *V. dacica* are described. The species occurs in moist habitats: stream banks, water springs, micro-depressions in montane woodlands, and herbaceous understory in *Alnion incanae* communities. The altitudinal range of *V. dacica* covers lower and upper montane forest belts and extends into the subalpine zone. While some of its local populations are prone to decline because of the thickening of the shrub-arboreal layer during the restoration succession, others undergo expansion, particularly in the subalpine zone due to climate change.

Keywords: altitudinal range, metapopulation, montane species, Ukrainian Carpathians, *Valeriana montana* group

Introduction

The Carpathian Mountains represent a biodiversity hotspot harboring many endemic taxa of vascular plants (Mráz, Ronikier, 2016; Breman et al., 2020). Though endemic Carpathian taxa have been studied with special attention by many researchers (Pawłowski, 1970; Stoyko, Tasenkevich, 1993; Chorney, 2011; Tasenkevich, 2011; Novikoff, Hurdu, 2015; Kliment et al., 2016), numerous aspects of their taxonomic identity, distribution, and ecological requirements

remain understudied and unresolved, which also refers to the Ukrainian part of the mountains (Kobiv, 2024). Studies of these problems can help explain the origin and distribution patterns of endemics. This article aims to shed light on these issues concerning one of the “critical taxa” — *Valeriana dacica* Porcius, a Carpathian endemic with a complicated nomenclatural history whose species' status has been ultimately confirmed only recently (Krahulec et al., 2023). Though our research concerns mostly the Ukrainian Carpathians, this article is also meant to draw

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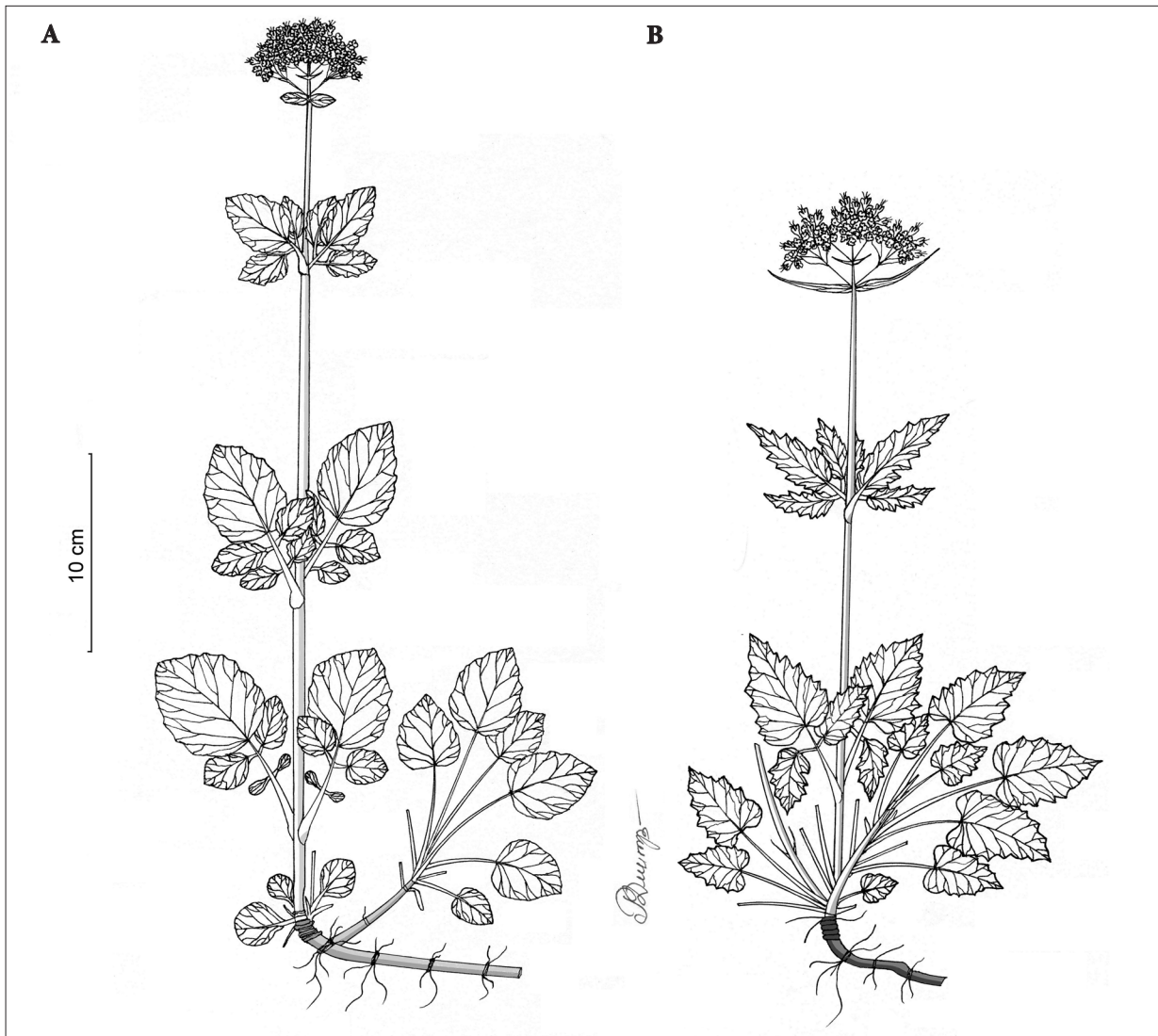


Fig. 1. Habit of *Valeriana dacica* (A) and *V. tripteris* (B). Considering that *V. tripteris* exhibits intraspecific variability throughout its geographic range (Walther, 1949), the illustration refers to the Carpathian plants

attention to *V. dacica* to encourage studies on its distribution in other countries where it occurs.

Materials and Methods

The study species: taxonomy, nomenclatural issues, and general distribution

A Carpathian species *Valeriana dacica* belongs to the *V. montana* group (Ockendon, 1976), also referred to as the infrageneric taxon, *Valeriana series Montanae* Höck (1882), which includes several species of *Valeriana* L. distributed in the mountains

of Europe (Grubov, 1958; Ockendon, 1976). Two other species of that group also occur in the Carpathians, viz. *V. montana* L. and *V. tripteris* L., whose geographic ranges are rather vast and cover the mountains of Central and Southern Europe (Meusel, Jäger, 1992). In the Carpathians, *V. montana* occurs only in Romania; its previous reports from Slovakia are considered erroneous (Bertová, 1985). Its localities closest to Ukraine are known from the Rodna Mts, Romanian Carpathians (Morariu, 1961).

Valeriana tripteris is much more common in the Carpathians and is distributed across the whole

mountain system (Meusel, Jäger, 1992). According to some authors (Walther, 1949; Bertova, 1985; Mirek et al., 2020), the Carpathian plants are referred to as *V. tripteris* subsp. *austriaca* E. Walther.

Valeriana montana and *V. tripteris* are known as distinctive species with different chromosome numbers: $2n = 32$ and $2n = 16$, respectively (Ockendon, 1976).

It has also been noticed that some Carpathian plants from that group, though sympatric with *V. tripteris*, differ from that species, particularly by the second pair of the imparipinnate leaflets of the stem leaves (Fig. 1A). The following names have been assigned to such plants (in the chronological order): *Valeriana transsilvanica* (Schur, 1866), *V. sisymbriifolia* (Schur, 1866), *V. tripteris* var. *bijuga* (Simkovics [= Simonkai], 1878), *V. dacica* (Porcius, 1885), *V. cardaminis* (Zapałowicz, 1889), *V. bijuga* (Błocki, 1892), *V. tripteris* var. *heterophylla* (Morariu, 1961), *V. tripteris* subsp. *heterophylla* (Rostański, 1967).

The name “*Valeriana transsilvanica* Schur” for the taxon in question was applied by Błocki (1896) and later accepted in the *Identification manual of Polish plants* (Szafer et al., 1924), *Flora of the Ukrainian SSR* (Katina, 1961), *Identification manual of higher plants of Ukraine* (Opredelitel..., 1987) and used in some recent articles of the Ukrainian authors (Dmytrakh, 2000, 2004, 2012, 2013, 2019, 2021; Tsybalyuk et al., 2022).

Due to the taxon's similarity to *V. tripteris*, Polish, Hungarian, and Romanian authors mostly treated it as a variety — “var. *bijuga*” (Simkovics, 1878; Raciborski, 1911), “var. *heterophylla*” (Morariu, 1961), or a subspecies — “subsp. *heterophylla*” (Rostański, 1967, 1970; Mirek et al., 2020) of that species. Other publications, e.g. *Flora of the USSR* (Grubov, 1958), *Flora Europaea* (Ockendon, 1976), *Identification manual of plants of the Ukrainian Carpathians* (Vyznachnyk roslyn..., 1977), *Flora of the European part of the USSR* (Voroshilov, 1978), *Illustrated flora of Romania* (Ciocârlan, 2009), *Vascular plants of Romania* (Sârbu et al., 2013), and some internet resources (Euro+Med, 2025–onward; GBIF, 2025–onward) do not recognize its separate taxonomic status and treat it merely as a synonym for *V. tripteris* or its subspecies *V. tripteris* subsp. *austriaca* common in the Eastern Alps, Sudety, and Carpathians (Walther, 1949; Bertová, 1985). Thus, not only nomenclature but also the taxonomic treatment of the taxon of interest has been different among authors until recently.

There is even more confusion due to numerous misidentifications of the herbarium specimens. For example, at the beginning of the 20th century, sets of herbarium vouchers collected in the Eastern Carpathians within *Flora polonica exsiccata* or *Rośliny polskie* (Raciborski, 1911) were distributed among the main European herbaria, where issue #757 allegedly presented *Valeriana tripteris* (e.g., KW013850; LW s.n.), but actually belongs to *V. dacica*, whereas issue #758 originally claimed as *V. tripteris* var. *bijuga*, which is a synonym for *V. dacica* (e.g., KW013851; LW s.n.) proved to be *Valeriana tripteris sensu stricto*. Thus, these issues were confused with each other.

The problem of the correct name for the valerian in question and its taxonomic status has been recently convincingly resolved by Krahulec et al. (2023). A thorough analysis of the abovementioned publications, as well as typification of the corresponding names and examination of authentic herbarium specimens made in that publication, showed that the correct name for the taxon is *Valeriana dacica* Porcius because it has priority over the other names listed above. In addition, the authors determined its chromosome number and described distinguishing characters. They proved that it is tetraploid ($2n = 32$) vs. diploid ($2n = 16$) *V. tripteris*, and that it deserves a species status and rank (Krahulec et al., 2023). The authors also hypothesized that *V. dacica* is a stabilized hybridogenous taxon of the *V. tripteris* × *V. montana* parentage. As a result, the name *Valeriana dacica* Porcius is accepted by *Plants of the World Online* (POWO, 2025–onward).

Valeriana dacica is distributed in the Eastern and Southern Carpathians, and the Apuseni Mts (Kliment et al., 2016), which is confirmed by numerous herbarium specimens. In addition, Rostański (1967, 1970) mentioned its localities in Poland up to 35 km westwards from the border of the Eastern Carpathians in the Beskid Niski Mts, which belong to the Western Carpathians. Thus, the species occurs in all main parts of the Carpathian Mountains and can be considered a pan-Carpathian endemic. According to the herbarium data, the main part of the species' range lies in Ukraine and Romania (mostly in the Eastern and Southern Carpathians), though its distribution extends slightly into the Beskid Niski and Bieszczady Mts in Poland (Błocki, 1892; Rostański 1967, 1970) and in the Bukovské Vrchy Mts in Slovakia (Krahulec et al., 2023). However, because the main Polish (Zajac, Zajac, 2001) and

Slovak (Bertová, 1985) publications on chorology do not recognize its separate taxonomic status, the detailed distribution of *V. dacica* in these countries remains unknown and actually might be wider.

Study region

The Ukrainian Carpathians with an area of about 21 000 km² (Kruhlov, 2008) belong to the Eastern Carpathians and form a 280 km long and 110 km wide stripe that stretches from the north-west to the south-east (Fig. 2). The Ukrainian part accounts for 10.6% of the total area of the Carpathian Mountains (Niewiadomski, 2004) and is the narrowest in that chain. Due to the specific mountain climate and rugged relief, the Carpathian flora and vegetation differ from those in the adjacent plain and lowland regions. Therefore, the Carpathian Mountains, including their Ukrainian part, are an important center of plant diversity in Europe (Centres of plant diversity..., 1994). The Ukrainian Carpathians are medium-high mountains where the high-mountain zone (that includes both subalpine and alpine altitudinal belts) covers only about 1.7% of the area (Kruhlov, 2008) while the rest belongs to the upper and lower montane forest belts. These mountains are built mostly of sandstone flysch, while other types of geological bedrock (e.g. volcanic or limestone) occur along the inner edge of the Carpathian Arch (Kondracki, 1989).

Data collection

To determine the distribution of *V. dacica* in Ukraine we performed a critical revision of the herbarium data on the *Valeriana montana* group in LW, LWS, LWKS, KW, CHER, and UU herbaria (acronyms follow *Index Herbariorum*: Thiers, 2025–onward), which were mostly labelled as *V. tripteris* but contained many specimens of *V. dacica*. We also discovered some specimens of that species among the plants originally identified as “*Valeriana simplicifolia*”. In addition, we checked out images of herbarium vouchers and plants *in situ* in the GBIF (2025–onward) and the *Ukrainian biodiversity information network* (UkrBin, 2025–onward) datasets. The authors’ records were used as well.

Morphological and morphometric data are based on field observations and studying herbarized material, whereas information on ecological and phytocoenotic requirements of *V. dacica* involved the authors’ surveys *in situ* and analysis of the herbarium labels and literature (Pawłowski, Walas, 1949; Krahulec et al., 2023).

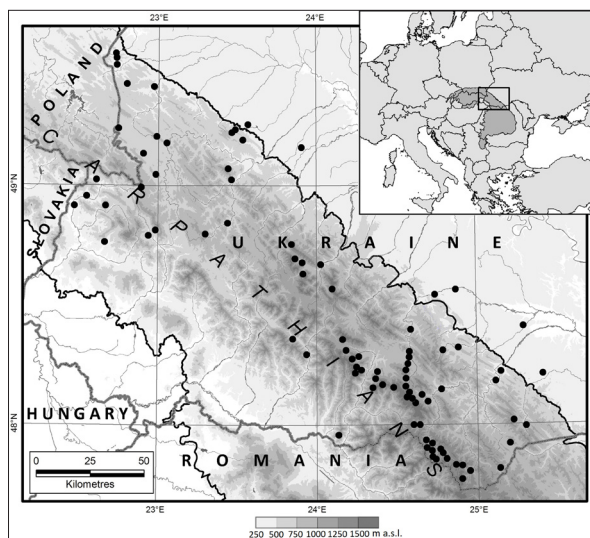


Fig. 2. Distribution of *Valeriana dacica* in Ukraine. Thick black lines — limits of the Carpathian Mountains, thick gray lines — national borders

Phytosociological relevés using Braun-Blanquet’s scale (Braun-Blanquet, 1964) were taken at 5 × 5 m plots in different altitudinal belts. Botanical nomenclature follows *Plants of the World Online* (POWO, 2025–onward); delimitation and names of the Carpathian orographic units are in accordance with Breman et al. (2020).

Results and Discussion

Morphological description of *Valeriana dacica*

Valeriana dacica is a herbaceous long-rhizomatous gynodioecious perennial (Fig. 1A). Rhizome long, creeping, branched, 4–6 mm in diameter. Its thin lateral stolon-like branches produce numerous vegetative rosette or single-leaved shoots with long-petiolate leaves rounded, truncate or subcordate at base. Flowering stem 25–65(–80) cm high, unbranched, solitary (rarely 2), ascending, cylindrical, furrowed, glabrate, bearing 3–4(–5) pairs of opposite leaves. Lower and middle cauline leaves compound, imparipinnate, usually with two pairs of unequal in size lateral leaflets (i.e. bijugate) and a wide (20–40 mm) terminal leaflet ovate or orbicular, usually obtusate. Upper cauline leaves bijugate, ternate or simple. Bracts at the inflorescence base usually oblong- or linear-lanceolate, 10–20 mm long, shorter than inflorescence width. Leaf blades glabrous. Lower and middle cauline leaves and especially those in sterile shoots setaceous on margins and petioles. Leaf



Fig. 3. Inflorescence in a hermaphrodite individual of *Valeriana dacica*, the Chornohora Mts, Ukrainian Carpathians, 23 June 2023 (photo by R. Dmytrakh)

margins entire, undulate, crenate or dentate. Inflorescence compound, thyrseoid with cymose branches, dense in female and laxer in hermaphrodite individuals. Calyx teeth poorly developed, inrolled in flower at anthesis and expanding into plumose pappus at fructification. Corolla (wide) infundibular, 4–5 mm long in hermaphrodite and 2.0–2.5 mm long in female flowers. Corolla lobes rounded, light pink (Fig. 3). Stigma and stamens (3) protruding from corolla. Fruit 3.5–5.0 mm long ribbed achene, bearing 4.5–5.5 mm long pappus. Flowering period: late May — June (July at upper elevations).

Valeriana dacica is gynodioecious (Dmytrakh, 2000), which implies the occurrence of both female and hermaphrodite individuals in each population. Gynodioecy is peculiar for many valerians, particularly those of the *Valeriana montana* group (Franzen, 1986).

Although the difference between *V. dacica* and *V. tripteris* is described by Krahulec et al. (2023), we supplemented and summarized the relevant information in Table 1 and illustrated it in Fig. 1A–B, which could be used as additional identification tools. Due to significant variability in the representatives of the *V. montana* group, some differentiating characters “work with only a majority of specimens” (Ockendon, 1976: 54). In addition,



Fig. 4. *Valeriana dacica* in the riparian habitat on Mt. Pozhyzhevska (1400 m a.s.l.) in the Chornohora Mts, Ukrainian Carpathians, 20 June 2018 (photo by R. Dmytrakh)



Fig. 5. *Valeriana tripteris* in the rocky habitat on Mt. Breskul (1700 m a.s.l.) in the Chornohora Mts, Ukrainian Carpathians, 23 June 2018 (photo by R. Dmytrakh)

contrasting habitat preferences of both species are pictured in Figs. 4, 5. It is also worth mentioning

Table 1. **Morphological and habitat characteristics distinguishing between *Valeriana dacica* and *V. tripteris***

Characteristic	<i>Valeriana dacica</i>	<i>Valeriana tripteris</i> *
Morphological characters		
Height of flowering stem (cm)	25–65(–80 at lower elevations)	20–50
Rhizomes in live plants	Greenish or light brown, up to 4–6 mm in diameter	Dark brown, 3–5 mm in diameter
Vegetative mobility (cm/year)	7–15	3–6
Structure of clones	Mat-forming	Separate clones
Number of flowering stems per individual	1(–2)	Numerous
Leaves in sterile shoots	Rounded, truncate or subcordate	Cordate
Number of pairs of cauline leaves	3–4(–5)	2–3
Middle cauline leaves	Mostly bijugate, with wide (ovate to orbicular) obtusate terminal leaflet	Mostly ternate, with lanceolate acuminate terminal leaflet
Leaf margins	Entire, undulate, crenate or dentate	Coarsely dentate
Bracts	Lanceolate, shorter than inflorescence width	Linear, longer than inflorescence width
Inflorescence	Dense thyrses	Lax thyrses
Color of flowers	Light pink	Light pink or dirty white
Female / hermaphrodite individuals ratio	~ 1/3 (Dmytrakh, 2013)	~ 1/1 (Dmytrakh, 2013)
Number of pappus rays per achene	(10–)12(–14)	14(–16)
Habitat requirements		
Preferable habitats	Riparian or semi-shadow moist sites in upper and lower montane forest zones (Fig. 4).	Open mesic sites in high-mountain and upper montane forest zones (incl. rocks, screes, clear-cuts) (Fig. 5).
Altitudinal range, m a.s.l.	(250–)600–1500(–1800)	(900–)1100–2000
Light requirements	Shade-tolerant	Heliophytic (Ellenberg et al., 1992)
Soil moisture requirements	Semi-hygrophytic	Mesophytic (Ellenberg et al., 1992)

* Considering that *V. tripteris* exhibits intraspecific variability throughout its geographic range (Walther, 1949), the data refer to the Carpathian plants.

that in the neighboring habitats, the flowering period in *V. dacica* takes place ca. half a month later than in *V. tripteris*.

Distribution in Ukraine

In the Ukrainian Carpathians, the species is distributed over a considerably wide altitudinal range but most frequently in the lower and upper montane forest belts within 800–1400 m a.s.l. Sporadically it penetrates upwards into the subalpine zone along the streambeds and occurs at 1550–1600 m a.s.l. in the Chornohora and Chyvychny Mts (Pawłowski, Walas, 1949). Noteworthy, there are multiple herbarium records (Zapyatova, 1947 — KW013845; Smirnova, 1960 — MW0525251; Mosyakin, 1985 — KW013854), which indicate its occurrence in the alpine zone of the Svydovets Mts, viz. on the rocks of Mt. Blyznytsia as high as at 1800–1850 m a.s.l. That altitude is extreme for *V. dacica*, which might be attributed to the high calcium content in the

bedrock of that locality. That factor has been reported as essential for adaptation to adverse environmental conditions in many plant species (White, Broadley, 2003).

On the other hand, the lower distribution limit of *V. dacica* in the Ukrainian Carpathians reaches the edge of the mountainous area, which is most apparent on the northeastern boundary of the Carpathian Arch (Fig. 2), where the species' localities occur at 450–600 m a.s.l. Moreover, *V. dacica* also penetrates the territory of Subcarpathia (Prykarpattia). For instance, there are herbarium samples collected within 250–450 m a.s.l. in Lviv Region (here and below, Regions refer to the main administrative regions of Ukraine, *oblasts* in Ukrainian) near Truskavets (Tkachyk, 1980 — LW8384) and Morshyn (Tkachyk, 1980 — LW8385); in Ivano-Frankivsk Region near Lanchyn (Tkachyk, 1978 — LW s.n.), Kniashdvir (Mykhaylova, 1967 — CHER s.n.), and Rudnyky (Tkachyk, 1979 — LW s.n.); and in Chernivtsi

Region near Lukivtsi (Tkachyk, 1980 — LW s.n.). Whereas most of these localities are situated only a few kilometers away from the edge of the Carpathians (Fig. 2), the one near Rudnyky extends by about 20 km, also being the lowermost. All the Subcarpathian localities are restricted to the hilly relief, where thermal-humidity conditions resemble those in the neighboring mountains. In contrast, on the opposite, Transcarpathian side of the mountains, climatic conditions are more xerophytic (Natsionalnyi atlas..., 2007), which apparently imposes limitations on the species' distribution there.

Valeriana dacica has a wide distribution in the Ukrainian Carpathians (Fig. 2), which embraces most of the main massifs / mountain ridges: the Upper-Dnister Beskydy, Stryi-Sian Verkhovyna, Skole Beskydy, Watershed Ridge, Polonyna Rivna, Polonyna Krasna, Outer Gorgany, Inner Gorgany, Zaprutski Gorgany, Svydovets, Chornohora, Pokuttya-Bukovyna Mts, Hryniava, and Marmarosh (including the Chyvchyn Mts). However, we did not find any data on the species' occurrence in the volcanic part of the Ukrainian Carpathians, i.e., along their south-western edge. The distribution map (Fig. 2) depicts the existing herbarium, literature, and authors' data on the species occurrence, which are not comprehensive, i.e., the lack or, on the contrary, high concentration of the markings might reflect merely the level of floristic exploration of a territory.

Ecology

Valeriana dacica shows a strong affinity for moist habitats (Dmytrakh, 2004; Krahulec et al., 2023), e.g. stream banks (Fig. 4), springs, micro-depressions in montane woodlands, herbaceous understory in the *Alnion incanae* communities, etc. These kinds of habitats are often mentioned on the herbarium labels as well as in the species' protologue (Porcius, 1885).

Pawłowski and Walas (1949) considered "*V. tripteris* var. *bijuga*" (= *V. dacica*) differential for the association *Doroniceto-Cratoneuretum* (*Doronicum carpaticum* et *Cratoneuron commutatum*) Pawłowski et Walas 1949, which they described in the Chyvchyn Mts, Ukrainian Carpathians. The authors argued that this endemic to the Eastern Carpathians hygrophytic community is restricted to alkaline water springs in the forest zone up to 1450 m a.s.l.

Considering the variety of the species' localities in the Ukrainian Carpathians, it often occurs on acidic

or subacidic soil with a pH(H₂O) value within 5.0–6.5, which prevails in the region (Rudneva, 1960).

Valeriana dacica is shade-tolerant and often occurs in semi-shadow moist habitats in montane forests, but it may also inhabit insolated open sites along the streams in the subalpine zone.

The following phytosociological relevés recorded in the habitats of *V. dacica* situated at different altitudinal levels in the Ukrainian Carpathians show which vegetation conditions it requires.

Relevé 1: Ivano-Frankivsk Region, the Chornohora Mts, Mt. Dantsyr, streambank in the green alder krummholz, 48°08'29.7"N, 24°32'03.7"E, 1575 m a.s.l., aspect N, slope 10°, area 25 m², 26 June 2014; E2 (30%): *Alnus alnobetula* (Ehrh.) K. Koch 3; E1 (70%): *Valeriana dacica* 3, *Cardamine amara* subsp. *opizii* (C. Presl & J. Presl) Čelak. 2, *Carex sempervirens* Vill. 2, *Caltha palustris* L. 2, *Deschampsia cespitosa* (L.) P. Beauv. 2, *Heliosperma pusillum* (Waldst. & Kit.) Rchb. 2, *Anthoxanthum nipponicum* Honda 1, *Crepis paludosa* (L.) Moench 1, *Hypericum richeri* subsp. *grisebachii* (Boiss.) Nyman 1, *Pedicularis verticillata* L. 1, *Poa annua* L. 1, *Primula elatior* (L.) Hill 1, *Ranunculus acris* L. 1, *R. carpaticus* Herbich 1, *Alchemilla glabra* Neygenf. 1, *Viola biflora* L. 1, *Achillea distans* Waldst. & Kit. ex Willd. +, *Soldanella hungarica* Simonk. +.

Relevé 2: Ivano-Frankivsk Region, the Chornohora Mts, Mt. Pozhyzhevska, moist site in the spruce forest, 48°09'39.0"N, 24°31'52.5"E, 1410 m a.s.l., aspect N, slope 4°, area 25 m², 13 June 2024; E3 (30%): *Picea abies* (L.) H. Karst. 3; E2 (10%): *Salix silesiaca* Willd. 2, *Picea abies* 1; E1 (80%): *Valeriana dacica* 3, *Caltha palustris* 2, *Deschampsia cespitosa* 2, *Jacobaea subalpina* (W.D.J. Koch) Pelser & Veldkamp 2, *Luzula sylvatica* (Huds.) Gaudin 2, *Petasites albus* (L.) Gaertn. 2, *Chaerophyllum hirsutum* L. 1, *Dryopteris dilatata* (Hoffm.) A. Gray 1, *Senecio ovatus* (G. Gaertn., B. Mey. & Scherb.) Willd. 1, *Viola biflora* 1, *Aposeris foetida* (L.) Less. +, *Vaccinium myrtillus* L. +.

Relevé 3: Lviv Region, the Skole Beskydy Mts, near the settlement of Skhidnytsia, forest edge, moist slope, 49°14'53.4"N, 23°21'14.5"E, 665 m a.s.l., aspect NE, slope 4°, area 25 m², 19 May 2004; E3 (30%): *Alnus incana* (L.) Moench 2, *Fagus sylvatica* L. 2; E2 (50%): *Alnus incana* 2, *Corylus avellana* L. 2, *Salix aurita* L. 2, *Sambucus racemosa* L. 2, *Abies alba* Mill. 1, *Acer pseudoplatanus* L. 1; E1 (70%): *Aegopodium podagraria* L. 3, *Rubus glandulosus* Bellardi 3, *Equisetum sylvaticum* L. 2, *Glechoma hirsuta*

Waldst. & Kit. 2, *Myosotis scorpioides* L. 2, *Petasites kablikianus* Bercht. 2, *Pulmonaria obscura* Dumort. 2, *Valeriana dacica* 2, *Asarum europaeum* L. 1, *Cardamine bulbifera* (L.) Crantz 1, *Carex sylvatica* Huds. 1, *Chaerophyllum aromaticum* L. 1, *Euphorbia amygdaloides* L. 1, *Geum urbanum* L. 1, *Ranunculus lanuginosus* L. 1, *Salvia glutinosa* L. 1, *Actaea spicata* L. +, *Galium intermedium* Schult. +.

Population characteristics

Valeriana dacica is a clonal species, and its populations are replenished mostly due to vegetative propagation *via* rhizome growth with annual increments up to 12–15 cm. The species often forms lax monodominant mats up to 10–20 m², which proves its rather high competitiveness and colonization ability. The density of flowering shoots in such mats mostly varies between 2–6 (Dmytrakh, 2021) but may reach 10 shoots per m². The ratio between generative and vegetative ramets usually accounts for 0.1–0.2. Seed reproduction also takes place, and seedlings occur in many localities, but apparently, it is more important for the longer dispersal and colonization of other suitable habitats. *Valeriana dacica* mostly exhibits a metapopulation pattern of local distribution, i.e., inhabits located nearby but spatially disconnected suitable moist microhabitats. For instance, such microhabitats may form intermittent chains along the streambeds. That suggests that hydrochory could be important for the species' dispersal. The area of local populations mostly varies within 2–50 m² (Dmytrakh, 2004). Their outlines are quite unstable and some of them are prone to decline or extinction because of the thickening of the shrub-arboreal layer in the course of the restoration succession.

For instance, during the last 25 years, we have been witnessing this process at the lower limit of the subalpine belt of the Chornohora Mts as a result of the overgrowth of open localities of *V. dacica* with shrubby vegetation dominated by *Alnus alnobetula* and *Salix* spp. (Dmytrakh, 2019, 2021). On the other hand, throughout the same period we have registered a gradual upward spread of *V. dacica* along the streams in two neighboring glacial cirques (Mt. Dantsyr — Mt. Pozhyzhevska and Mt. Pozhyzhevska — Mt. Breskul) in the Chornohora Mts from 1540 to 1650 m a.s.l. and from 1530 to 1580 m a.s.l., respectively. Apparently, that can be attributed to global warming (Dmytrakh, 2021) and is in line with similar data on the climate-triggered

spread of other tall-herb species in the high-mountain zone of the European mountains (Nagy, 2006; Kobiv, Kobiv, 2020).

We have noticed that riparian habitats of *V. dacica* often suffer from floods, whereas those situated on overmoistured slopes are prone to landslides, which can destroy some local populations. On the other hand, the species readily occupies vacated gaps in the vegetation resulting from such disturbances. The colonization process may involve both clonal and seed reproduction. Barren or mossy patches provide suitable microsites for seedling recruitment of *V. dacica*, which is also common for other mountainous plants including some moisture-loving species (Kobiv, 1999, 2016; Kobiv, Nesteruk, 2001).

Conclusion

Valeriana dacica is widely distributed across the Ukrainian Carpathians and slightly penetrates into the adjacent foothills in Subcarpathia north-eastwards from the mountains (Fig. 2). Its altitudinal range is also significant and covers lower and upper montane forest belts, extending into the subalpine zone. The species is related to moist habitats, which is infrequent among the endemic plants (Hobohm et al., 2014). Though some local populations of *V. dacica* are subjected to decline because of the encroachment of shrubs and trees into their habitats in the course of restoration succession, the species cannot be regarded as threatened in any part of the Ukrainian Carpathians where it occurs, and according to the IUCN (2024) criteria its conservation status can be categorized as Least Concern (LC), which agrees with the conclusion of Krahulec et al. (2023).

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ETHICS DECLARATION

The authors declare no conflict of interest.

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Карпатський ендемік *Valeriana dacica* (*Caprifoliaceae*) в Україні: поширення, морфологія, екологія, популяційні особливості, проблеми визначення

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Реферат. *Valeriana dacica* — карпатський ендемічний вид, що тривалий час не визнавався. Він широко розповсюджений в Українських Карпатах і незначно проникає у прилеглі передгір'я на Прикарпатті на північний схід від гір. Представлено мапу поширення цього виду в Україні, що базується на критичному перегляді гербарних даних, літературних джерел і спостереженнях авторів. Подано малюнок *V. dacica*, а також вказівки до визначення цього виду, що дозволяють відрізнити його від спорідненого *V. tripteris*. Описано морфологічні, екологічні та популяційні особливості *V. dacica*. Зазначено, що цей вид приурочений до вогких приструмкових і приджерельних оселищ, западин у гірських лісах і трав'яного ярусу в угрупованнях із союзу *Alnion incanae*. Його висотна амплітуда охоплює нижній і верхній лісові гірські пояси та розповсюджується в субальпійську зону. Деякі локальні популяції регресують через загушення чагарниково-деревного ярусу в ході відновної сукцесії, натомість інші зазнають експансії, зокрема в субальпійській зоні внаслідок кліматичних змін.

Ключові слова: висотна амплітуда, група *Valeriana montana*, метапопуляція, монтанний вид, Українські Карпати