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Contributions to recent occurrence and phytosociology of *Chenopodium chenopodioides* (L.) AELLEN in Slovakia

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Abstract
Recent occurrence of critically endangered species *Chenopodium chenopodioides* (L.) AELLEN in Slovakia was studied. The study was performed in Pannonian phytogeographical region (the Podunajská nížina district) in 2006–2009. Only three localities were found: Tvrdošovce, Bajč and Iža. We also present data about a halophytic association Atriplici prostratae – Chenopodietum crassifolii SLAVNIĆ 1948 corr. GUTERMANN et MUCINA 1993 as new to Slovakia. The stands were only found in a single locality in the village of Tvrdošovce, therefore this association belongs to the most endangered in Slovakia.

Összefoglalás: A *Chenopodium chenopodioides* (L.) AELLEN előfordulása és társulásviszonyai Szlovákiában
A tanulmány a Szlovákiában ritka és veszélyeztetett *Chenopodium chenopodioides* (L.) AELLEN előfordulásait és társulásviszonyait tárgyalja 2006–2009 közötti kutatások alapján. A faj ebben az időszakban mindössze három lelőhelyen került elő, Tvrdošovce (Tardoskedd), Bajč (Bajcs) és Iža (Izsa) mellett. A vizsgálatok során az ország területére új társulásként (mindössze egyetlen lelőhelyen) megerősítést nyert a Atriplici prostratae – Chenopodietum crassifolii SLAVNIĆ 1948 corr. GUTERMANN et MUCINA 1993 asszociáció előfordulása is – a faj a további lelőhelyeken másodlagos lágyszárú növényzetben él.

Introduction

Chenopodium chenopodioides (L.) AELLEN [Syn: *Ch. botryoides* SM.] is an annual herb. Stems are erect or lying down, 10–50 cm tall, much branched, green striate, ribbed, usually not farinose. The leaves are fleshy, blade green abaxially, dark green adaxially, broadly triangular. Inflorescences are lateral glomerules sessile on lateral branched spikes, glomerules subglobose, bracts are oblanceolate to linear, 0,2–1,5 cm long. Perianth is connate almost to apex into 0,5–0,8 mm tube, lobes are deltate, membranous, apex is acute, occasionally keeled-corniculate (CLEMANTS – MOSYAKIN 2004).

The species is native probably to Middle and Southwest Asia and Europe, whereas the occurrence in North Africa and South and North America is considered adventive (AELLEN 1927, 1979). It grows on coastal and inland salt-marshes on salty clay and sandy soils (HOLUB 1999, LOVRIĆ – RAC 2003) and it is relatively rare in Central

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Europe (HOLUB 1999, NIKLFELD – SCHRATT-EHRENDORFER 1999, FERÁKOVÁ et al. 2001, KIRÁLY 2007).

The species was found in several communities of the Thero – Suaedetea class, but it usually dominates in the association Atriplici prostratae – Chenopodietum crassifolii SLAVNIĆ 1948 corr. GUTERMANN et MUCINA 1993, which was first described by SLAVNIĆ (1948) in Vojvodina (NW Serbia). At present, the association is only known from the territory of former Yugoslavia, Hungary and Austria (MUCINA 1993, KOJIĆ et al. 1998, BORHIDI 2003). The occurrence in Moravia (the Czech Republic) is uncertain. HUSÁK (in MUCINA 1993) mentioned it there, but it lacks in the vegetation survey of the Czech Republic (ŠUMBEROVÁ 2007). No data were known from Slovakia yet (VICHEREK 1973, MUCINA – MAGLOCKÝ 1985, STANOVÁ – VALACHOVIČ 2002).

The current paper aimes to report data about recent occurrence of *Chenopodium chenopodioides*. It also includes information about the rare association Atriplici prostratae – Chenopodietum crassifolii as new to Slovakia.

Methods

The study was carried out during 2006–2009. Herbarium specimens collected during field research are stored in herbarium NI. Herbarium abbreviation was used according to HOLMGREN et al. (1990). The vegetation relevès were sampled according to the Zürich-Montpellier approach using the adapted Braun-Blanquet scale (BARKMAN et al. 1964). All relevès were stored using the TURBOVEG database software (HENNEKENS – SCHAMINÉE 2001).

The nomenclature of flowering plants follows MARHOLD – HINDÁK (1998), the names of syntaxa are used in accordance with MUCINA (1993) and MOLNÁR – BORHIDI (2003). Phytogeographical divisions of FUTÁK (1980) are also used.

Results

Chenopodium chenopodioides was recently confirmed at three localities in Slovakia (Fig. 1). We point out short description of those sites:

Tvrdošovce, the Ráczovo jazierko pool [7974/1]: a single primary locality in Slovakia, occurrence of some *Ch. chenopodioides* individuals was found first in 2006. Presence of the halophytic association Atriplici prostratae – Chenopodietum crassifolii SLAVNIĆ 1948 corr. GUTERMANN et MUCINA 1993, a plant association new to Slovakia, was clearly confirmed here in 2007 (Tab. 1, relevès 4–8). The community occupied area of aproximately 50 m^2 and it is slightly ruderalised. included some ruderal species, too. Due to unfavorable ecological conditions (high water level in the pond and lack of suitable habitat) the community has not been recorded at the same stand in 2008 and 2009. Only sporadical occurrence of characteristic species *Ch. chenopodioides* was found.

Bajč, Chrasť farmstead [8075/4]: the locality was found in 2009. Population of the species was located in a field depression, which did not exceed area of 100 m^2. The depression was flooded by sewage water from a manure deposition, so that in vegeta-

tion were found only species of the Chenopodiaceae family. In addition to *Chenopodium chenopodioides* we recorded also *Ch. ficifolium*, *Ch. glaucum* and *Atriplex tatarica*. The site was ploughed at the beginning of August.

Iža, Bokroš farmstead [8275/2]: largest recent population. As in the previous case, the site was found in 2009. *Ch. chenopodioides* occupied drying bottom of slurry pit (area ca. 0,5 ha), and created monocoenoses (Tab. 1, relevès 1–3). Unlike the previous sites, the destruction of this place is not likely.

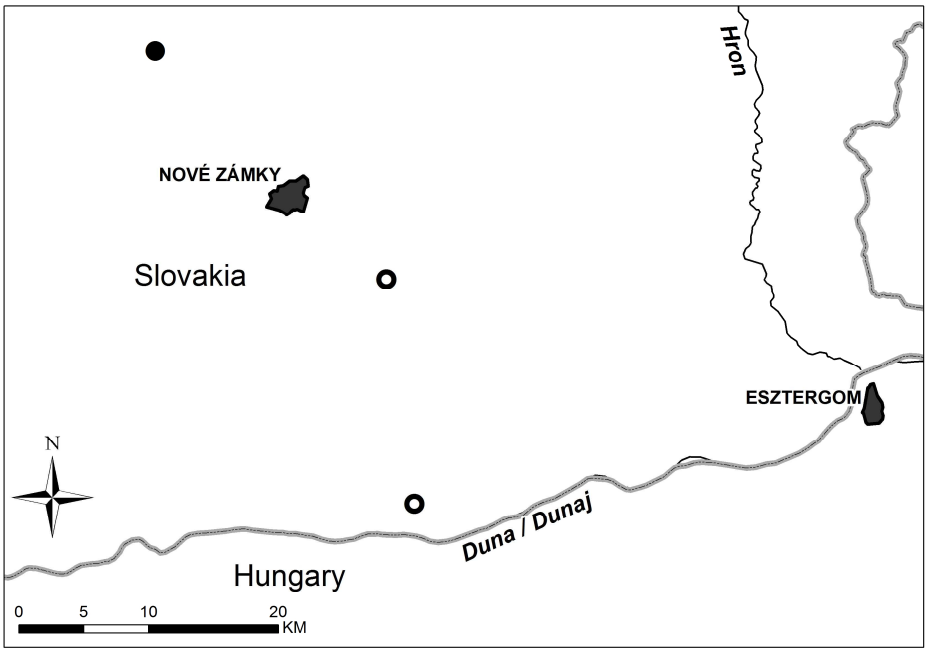

Fig. 1. Recent occurence of *Chenopodium chenopodioides* in SW Slovakia: ● – a primary locality of Atriplici prostratae – Chenopodietum crassifolii , ○ – secondary localities of the species (orig. R. ŠUVADA).

1 ábra. A *Chenopodium chenopodioides* előfordulása DNy-Szlovákiában. ● – Atriplici prostratae – Chenopodietum crassifolii társulásban, ○ – másodlagos élőhelyeken (térkép: R. ŠUVADA).

Tab. 1. Relevès of *Chenopodium chenopodioides* (L.) AELLEN communities recorded in Slovakia
1 táblázat. *Chenopodium chenopodioides* (L.) AELLEN állományok szlovákiai cönológiai felvételei

Locality of relevès (locality, altitude, number of relevè, exposition, inclination, sampling date): **1–3.** Iža, Bokroš farmstead, dry bottom of strongly ruderalized pool, 105 m a. s. l., 24. 09. 2009, exp. /; **4–8.** Tvrdošovce, Ráczovo jazierko pool, denuded bottom of fish pond, 115 m a. s. l., 18. 09. 2007, **4**: exp. SE, incl.. 2°; **5**: exp. SSE, incl. 1°; **6**: exp. SE, incl.. 1°; **7-8**: exp. /.

Number of relevè	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Plot (m^2)	16	16	16	16	16	16	16	16
Coverage E_1 (%)	100	85	85	10	15	10	50	30
Number of species / relevè	3	3	3	12	12	12	12	7
Chenopodium chenopodioides	**5**	**4**	**5**	**a**	**a**	**a**	**3**	**b**
Atriplex prostrata	a	b	a	+	r	+	a	+
Chenopodium glaucum	r	1	+	1	a	1	1	.
Bolboschoenus maritimus	.	.	.	+	r	1	+	+
Sonchus arvensis	.	.	.	r	+	+	+	+
Crypsis aculeata	.	.	.	+	r	1	.	.
Heleochloa schoenoides	.	.	.	r	.	.	r	1
Xanthium strumarium	.	.	.	.	r	+	1	.
Agrostis stolonifera	.	.	.	.	.	r	1	a
Persicaria lapathifolia	.	.	.	.	.	r	+	+

Species recorded in two relevès only: *Echinochloa crus-galli* r (5), + (7); *Juncus compressus* + (4), r (5); *Potentilla anserina* r (4,6); *Sonchus oleraceus* r (4), + (5).
Species recorded in one relevè only: *Aster tripolium* subsp. *pannonicus* r (4); *Bidens tripartitus* r (7); *Cirsium arvense* r (5); *Cynodon dactylon* r (5); *Phragmites australis* r (4); *Rumex palustris* r (7); *Rumex stenophyllus* r (6); *Solanum nigrum* r (5).

Discussion

Chenopodium chenopodioides belongs to the very rare species of the Slovak flora, only seven historical localities are known (HEJNÝ 1960, HOLUB 1999). It was considered to be probably extinct (EX?) in the beginning of the 21st century (FERÁKOVÁ et al. 2001). However, it was again found in 2006 (ELIÁŠ jun. 2007) and therefore should be included in the category of „critically endangered" (CR) species. This finding has prompted efforts to check other localities, which succeeded in 2009. We expect that the discovery of other sites is only a matter of time.

We suppose that theese three reasons could cause lack of older community data from Slovakia – the habitat of saline pools is very rare here (ELIÁŠ jun. et al. 2008), development of the community is periodical, strongly dependent on the weather during the common year (HEJNÝ 1960, our observation), and *Chenopodium chenopodioides* has not been strictly distinguished from *Ch. rubrum* (KRIST 1940, HEJNÝ 1960, MUCINA 1993, MELZER – BARTA 2000). Nevertheless, the only reference of possible occurrence of the association in the territory of Slovakia was published by HEJNÝ (1960). Author noted the vegetation of *Ch. chenopodioides* near villages Mužla and

Gbelce (NW Slovakia). The species grew there together with *Atriplex hastata*, *Chenopodium glaucum* and *Heleochloa schoenoides*. Species composition more or less corresponds to the association Atriplici prostratae – Chenopodietum crassifolii, however, it is impossible to detect whether it actually was this syntaxon because the author did not publish any relevè and both sites were already destroyed.

Stand of the Atriplici prostratae – Chenopodietum crassifolii association was located on soloncak soils of periodic muddy shores of shallow alkaline lakes. The dominance of Chenopodiaceae taxa in this community indicates higher nitrogen content in the soil. A typical stand of this association on well-preserved sites is characterized by occurrence of halophilic terophytes. In addition to the above mentioned species there are also *Crypsis aculeata*, *Suaeda prostrata*, *S. pannonica*, *Spergularia media*, *S. salina* and *Aster tripolium* subsp. *pannonicus* present (SLAVNIĆ 1948, MUCINA 1993, BORHIDI 2003). On the other hand, the vegetation sampled in Slovakia shows some differences (Tab. 1). This has been caused by both absence of some halophytic species in Slovakia (e.g. *Suaeda* spec. div.), and also by habitat ruderalisation. Ruderalisation is related to the soil desalination (DÍTĚ et al. 2008, ELIÁŠ jun. et al. 2008), which started in this site after land reclamation in eighties of the 20th century (SVOBODOVÁ 1990). It is also documented by the presence of weeds such as *Cirsium arvense*, *Echinochloa crus-galli*, *Solanum nigrum* and *Sonchus oleraceus*. Similar vegetation found SCHMIDT (2007) on destructed salt marshes around Győr (NW Hungary). Like in our case, communities were characterized by presence of a greater number of weeds with a relatively high dominance (e.g. *Hyoscyamus niger*). *Chenopodium chenopodioides* dominated only in one locality (Töltéstava: "Temető-dűlő"), therefore, this vegetation could be regarded as ruderalised association Atriplici prostratae – Chenopodietum crassifolii (the author has classified all sampled communities only at the level of the Cypero – Spergularion alliance). At other site this species did not belong to the dominant taxa, it had a cover rate "+". Therefore, those communities did not correspond to the original association description given by SLAVNIĆ (1948). Similarly, the description is not reliable for vegetation with dominance of *Ch. chenopodioides*, which we recorded on secondary habitats (field depressions, slurry pits) around villages Iža and Bajč in 2009.

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