

OCCURRENCE OF *DIPSACUS STRIGOSUS* (CAPRIFOLIACEAE) IN HUNGARY

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Wirth, T. & Csiky, J. (2019): Occurrence of *Dipsacus strigosus* (Caprifoliaceae) in Hungary. – *Studia bot. hung.* **50**(2): 357–364.

Abstract: During the systematic flora survey of the city a large stand of *Dipsacus strigosus* was found in Pécs. Morphological characteristics, some phytocoenological features, the most likely way of introduction, and the expansion dynamics are discussed and a new key to the *Dipsacus* taxa of Hungary is presented in the study.

Key words: adventive species, ruderal vegetation, stream bank, urban flora

INTRODUCTION

Since the flora of urban areas is usually more rich in species than the flora in their environment (ARAÚJO 2003, KÜHN *et al.* 2004), and in most cases human activities are mainly responsible for long distance dispersal, large amount of neophytes appear the first time and are going through naturalisation in urban habitats (e.g. BÁTORI *et al.* 2012, WOLF & KIRÁLY 2014). The family Dipsacaceae is represented by 6 genera in the Hungarian flora (KIRÁLY 2009). One of them, *Dipsacus* L. is an old world genus with species distributed mainly in Eurasia and Northern Africa. Only three of them (*D. fullonum* L., *D. laciniatus*, and *D. pilosus* L.) are native to Hungary (KIRÁLY 2009, SIMON 2000, Soó 1966). The indigenous members of the genus occur mostly in naturally disturbed or anthropogenic habitats. *D. strigosus* Willd. ex Roem. et Schult. is native to Ukraine, southern Russia, and western Asia (AHRENS 2008, HANSEN 1976, DOMINA 2017) and introduced/more or less naturalised elsewhere in Europe (AHRENS 2007, 2008, DANIHELKA *et al.* 2012, DOMINA 2017, HANSEN 1976, LESLIE 1976, 1980, MELZER & BARTA 2002, PAGITZ 2008, POELT 1976, ROMAHN 2010, VERLOOVE 2018). During the systematic flora survey of the administrative area of Pécs (Hungary) a large population of *D. strigosus* was found along the bank of a stream (that takes its source from Lake Balokány, close to the city centre) in 2013. Including the newly established *D. strigosus* the authors provide a new key to the recent Hungarian *Dipsacus* taxa (KIRÁLY 2009). Furthermore, the possible

way of occurrence and some phytosociological features of the newly established *Dipsacus* species are also given in this paper.

MATERIAL AND METHODS

The field study was conducted in the summer of 2013. The specimens were identified using the key of VERLOOVE (2018). To characterise the habitat of *D. strigosus*, coexisting species were listed in five 4 m² plots according to the Braun-Blanquet methodology (LÁJER *et al.* 2007). Compilation of the analytical table and calculation of species frequencies were managed in the JUICE program (TICHÝ 2002). To identify the characteristic species of the syntaxonomic classes the authors used the 'EuroVegChecklist Expert System' tool embedded within the software of JUICE (MUCINA *et al.* 2016). Latitude and longitude coordinates and elevations of the sites were determined with GPS in WGS 84 projection. The identification and nomenclature of the accompanying species are based on and follow KIRÁLY (2009). Herbarium specimens were also collected and vouchers were placed in the Herbarium of the University of Pécs (JPU). Quadrant number is given according to the Hungarian Flora Mapping Programme (BARTHA *et al.* 2015).

RESULTS AND DISCUSSION

Dipsacus strigosus is a tall (up to 200 cm), biennial herb. The stems are erect, sparsely prickly and hispid. Basal leaves are in a rosette, ovate, narrowed to a long petiole. The cauline leaves are shortly petiolate, not connate at base, ovate-elliptical, with a basal pair of unequal, elliptical leaflets, sometimes simple. Capitula is 20–40 mm in diameter, globose. Involucral bracts are narrowly triangular, sparsely white hispid, with apical spine. The receptacular scales are 15–20 mm long, long attenuate, ciliate, but glabrous at apex. Corolla is pale yellow, anthers yellow or greenish-yellow. Achenes are 4–4.5 mm long, greyish-brown, with black streaks (AHRENS 2007, POELT 1970, VERLOOVE 2018) (Fig. 1).

Besides the 13 native and two casual neophyte species of the subfamily, this is the first adventive representative considered to be established of Dipsacoideae in the Hungarian flora (BALOGH *et al.* 2004, KIRÁLY 2009). The relatively large stand of *D. strigosus* was found in Pécs, along the southern bank of the stream rise from Lake Balokány, in the [9975/1] Hungarian Flora Mapping Unit (Fig. 2) (BARTHA *et al.* 2015). The number of individuals was unstable over the last few years: the initial number of individuals has declined from tens of thousands to a few thousand specimens (this could be attributed to the dredging of the streambed and the placement of dredge on the plants, and with the irregular mowing of the stream bank), however the species spread a few hundreds of metres (at a



Fig. 1. Flowering head (A) and habit (B) of *Dipsacus strigosus* (photos by T. Wirth).

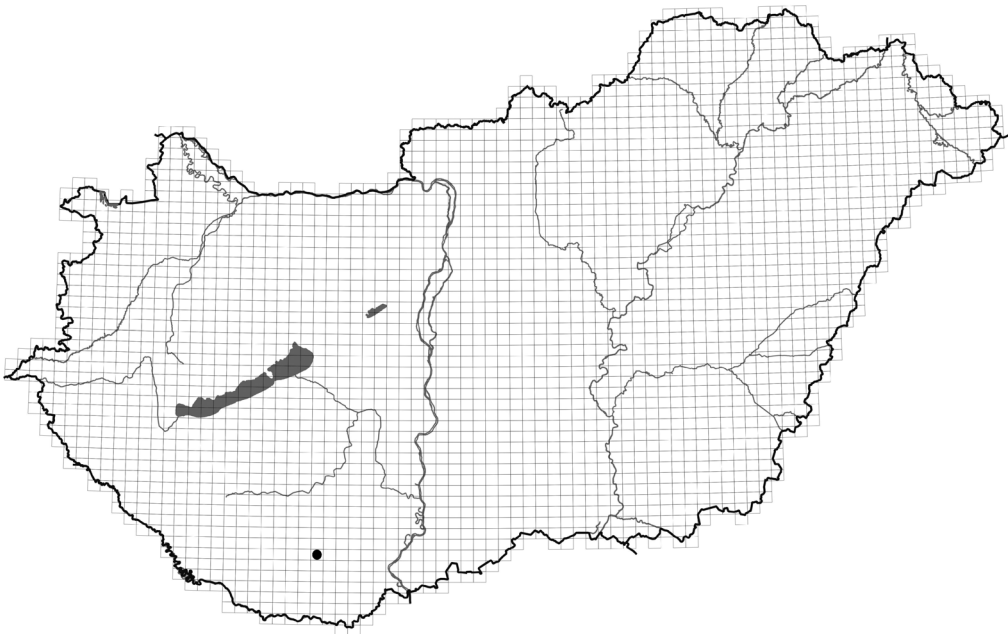


Fig. 2. Distribution of *Dipsacus strigosus* Willd. ex Roem. et Schult. in Hungary.

speed of 52 metres/year) along the creek downstream over the year of detection. This expansion could be explained by hydrochory (spread by floods) and by epizoochory, due to the high density of big game species (e.g. wild boars, European roe deers) occurring in this part of the city.

The species originally grows in thickets of shady places (BOBROV 1976) and it has been indicated from mesic/wet woodlands and from tall-herb vegetation on raw alluvia of colline-submontane streams (alliance: *Petasion officinalis* Sillinger 1933) out of its native range (MEDVECKÁ *et al.* 2012, POELT 1970, VERLOOVE 2011). In Hungary, *D. strigosus* occurs in a narrow band of ruderal tall-herb vegetation between the recultivated tailings reservoir (planted with willow and poplar species) of the Pécs thermal power plant and the stream rise from Lake Balokány. This habitat is dominated by a mixture of some common, nitrophilous and weedy plants characteristic for roadsides and alluvial forest fringes (for further details see Table 1).

Table 1. Synthetic table of the stand of *D. strigosus* in Pécs, along the southern bank of the stream from Lake Balokány. Abbreviations: Fr-frequency (relevés made by T. Wirth and J. Csiky on the 17th of July, 2013).

Relevé number	1	2	3	4	5	Fr
Plot size (m ²)	4	4	4	4	4	
Latitude (°)	46.07157	46.07251	46.07253	46.07293	46.07307	
Longitude (°)	18.24409	18.24508	18.24516	18.24553	18.24555	
Elevation (m)	127	127	127	127	127	
E1 layer (%)	100	100	100	100	100	
E0 layer (%)	10	+	5	5	+	
<i>Ballota nigra</i>	+	1	r	r	1	5
<i>Dipsacus strigosus</i>	2	3	3	4	3	5
<i>Rubus caesius</i>	3	5	1	1	4	5
<i>Agrostis stolonifera</i>	1	+		+	r	4
<i>Elymus repens</i>	2	1	2	2		4
<i>Medicago lupulina</i>	1	+		1	+	4
<i>Melilotus albus</i>	+		+	1	1	4
<i>Urtica dioica</i>	2	r	+		+	4
<i>Calystegia sepium</i>	1	r		r		3
<i>Phalaris arundinacea</i>		+		1	+	3
<i>Ambrosia artemisiifolia</i>				+	+	2
<i>Arctium lappa</i>	2			2		2
<i>Artemisia vulgaris</i>	r		r			2
<i>Bromus sterilis</i>		+			r	2

Table 1 (continued)

Relevé number	1	2	3	4	5	Fr
<i>Chelidonium majus</i>				r	r	2
<i>Erigeron annuus</i>	+			r		2
<i>Geum urbanum</i>	+	+				2
<i>Humulus lupulus</i>	+		+			2
<i>Melilotus officinalis</i>				+	+	2
<i>Picris hieracioides</i>			r	r		2
<i>Plantago major</i>		r			r	2
<i>Sambucus ebulus</i>		2	2			2
<i>Tanacetum vulgare</i>	1				1	2
<i>Torilis arvensis</i>		1	+			2
<i>Torilis japonica</i>				r	r	2
<i>Trifolium pratense</i>				+	1	2
<i>Trifolium repens</i>	r			+		2
<i>Tripleurospermum perforatum</i>	r			r		2
<i>Calamagrostis epigeios</i>	+					1
<i>Carduus acanthoides</i>					+	1
<i>Carex spicata</i>	r					1
<i>Cirsium arvense</i>				r		1
<i>Conyza canadensis</i>	r					1
<i>Cornus sanguinea</i>	r					1
<i>Cucubalus baccifer</i>				r		1
<i>Dactylis glomerata</i>	r					1
<i>Dipsacus laciniatus</i>	1					1
<i>Eupatorium cannabinum</i>				1		1
<i>Juglans regia</i>	r					1
<i>Lactuca serriola</i>					r	1
<i>Linaria vulgaris</i>	r					1
<i>Papaver rhoeas</i>					r	1
<i>Parthenocissus inserta</i>			r			1
<i>Poa pratensis</i>	+					1
<i>Potentilla indica</i>	r					1
<i>Prunus cerasifera</i>		r				1
<i>Silene alba</i>			+			1
<i>Sonchus oleraceus</i>					r	1
<i>Taraxacum officinale</i>		r				1
<i>Verbascum blattaria</i>			r			1
<i>Vicia grandiflora</i>					r	1

According to the descriptions of BORHIDI *et al.* (2012) and MUCINA *et al.* (2016) this vegetation type presumably belongs to the syntaxonomic class Artemisietea vulgaris Lohm. *et al.* in Tüxen 1950, which contains associations of nitrophilous weed vegetation of roadsides. Despite the fact that the local vegetation is similar to the preferred habitat of *D. strigosus* (BOBROV 1976, MEDVECKÁ *et al.* 2012), the relatively high stream bank (deep stream-bed) and mowing may be responsible for conditions similar to roadside habitats.

The authors firmly suggest the insertion of *D. strigosus* in the Hungarian *Dipsacus* key (KIRÁLY 2009) as follows:

- 1a Cauline leaves shortly petiolate, not connate at base. Inflorescence globose 2
- 1b Cauline leaves sessile, connate at base. Inflorescence ovoid-cylindrical 3
- 2a Capitula 15–20 mm in diameter. Corolla white, anthers dark purplish to blackish. Receptacular scales hardly longer than corolla, 8–12 mm long, abruptly narrowed and ciliate towards at apex. Achenes 4–5 mm long, conspicuously ribbed, brown *D. pilosus* L.
- 2b Capitula 25–40 mm in diameter. Corolla pale yellow, anthers yellow or greenish-yellow. Receptacular scales distinctly longer than corolla, 15–20 mm long, long attenuate and glabrous at apex. Achenes 4–4.5 mm long, ribs inconspicuous, greyish-brown, with black stripes
..... *D. strigosus* Willd. ex Roem. et Schult.
- 3a Cauline leaves deeply lobed or pinnatisect, prickly and hispid. Involucral bracts widest at the base, \pm spreading, hardly longer than the inflorescence. Corolla whitish or pale pink *D. laciniatus* L.
- 3b Cauline leaves entire, usually with entire margin, glabrous or sparsely hispid. Involucral bracts linear, ascending, usually longer than the inflorescence. Corolla bluish purple *D. fullonum* L.

There is no previous information on the occurrence of *D. strigosus* in Hungary. In Pécs the plants grows next to an industrial site and a former railway dock, therefore the possible ways of introduction could have been the followings: i) transport by trains, ii) previous landscaping and earthworks, iii) cultivation of non-native aquatic and wetland species in Lake Balokány.

Since the species can be easily confused with the indigenous *D. pilosus*, plants with globose inflorescence appearing in unusual habitats (urban habitats, wastelands, etc.) should be taken with caution in Hungary in the future (see comments of VERLOOVE 2011). The invasiveness of *D. strigosus* is controversial (AHRENS 2008, PYŠEK *et al.* 2012, VERLOOVE 2018) – at the moment it seems to be a rather weedy/invasive species. The cultivation and usage as an ornamental is

not typical, but due to its increasing expansion in Central and Western Europe, future monitoring may be important in Hungary.

Acknowledgements – The project was supported by the European Union, and co-financed by the European Social Fund: Comprehensive Development for Implementing Smart Specialization Strategies at the University of Pécs (EFOP-3.6.1.-16-2016-00004).

Összefoglaló: A szerzők Pécs flórájának szisztematikus felmérése során, 2013-ban egy hazánkból eddig nem ismert mácsonyafaj több tízezer egyedet számláló állományára bukkantak a város Balokány nevű részén, a pécsi hőerőmű korábban rekultivált zagytározója és a Balokány-tóból kiinduló patak közötti sávban. A *Dipsacus strigosus* Ukrajnából, Dél-Oroszországból és Nyugat-Ázsiából származó, Nyugat- és Közép-Európában már hosszabb ideje terjedő, illetve meghonosodott adventív faj. A faj hazai megtelepedésével kapcsolatban nincsenek pontos információink, de a termőhely helyzete alapján a behurcolás történetét a vasúti közlekedés és az ezzel kapcsolatos karbantartási munkálatok, esetleg a korábbi földmunkák által, vagy a Balokány-tóba meghonosított vízi- és mocsári növények telepítése során. A *D. strigosus* könnyen összetéveszthető a Magyarországon őshonos és hasonló termőhelyi körülmények között előforduló *D. pilosus* L.-el, ezért a szerzők indokoltak tartották a hazai *Dipsacus* határozó kulcs kiegészítését. A faj eredeti elterjedési területén árnyas cserjésekben fordul elő, meghonosodott állományait pedig nedves erdőkből, illetve dombvidéki patakparti magaskórósokból jelezték. A magyarországi állomány hasonló körülmények között, de inkább az útszéli gyomnövényzethez közelebb álló élőhelyen fordult elő. Bár a termőhely zavarása miatt a növényegyedek száma a megtalálás évétől kezdve erősen fluktuált, a faj mégis több száz métert terjedt folyásirányban a patak mentén. Gyors expanziója miatt a *D. strigosus* monitorozása erősen ajánlott.

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(submitted: 18.06.2019, accepted: 20.09.2019)