

Carex × *takhtadjanii* (*Carex diluta* × *C. distans*; *Cyperaceae*), a new hybrid for the flora of Ukraine

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Key words: checklist, Starobilsk, Luhansk region, parental species, sedge, vascular plants.

Ključne besede: seznam, Starobilsk, regija Lugansk, starševska vrsta, šaš, cevnice.

Abstract

There are 96 species of the genus *Carex* (Cyperaceae) known in the flora of Ukraine, but so far there are no data about its hybrids for the country yet. However, the first one, *C. × takhtadjanii* [*C. diluta* × *C. distans*], was discovered in Starobilsk town (Luhansk region) during a field investigation in 2021. Detailed information about this floristic finding with the description of morphological characters of this hybrid and its habitat is given. Also a map with known locations of *C. × takhtadjanii* around the world is compiled, as well as the main morphological differences between this hybrid and its parental species are reported.

Izveleček

V flora Ukrajine je dosedaj znanih šestindeset vrst rodu *Carex* (Cyperaceae), vendar ni nobenih znanih podatkov o njihovih križancih. Med terenskimi raziskavami leta 2021 smo v mestu Starobilsk (regija Lugansk) odkrili prvega, *C. × takhtadjanii* [*C. diluta* × *C. distans*]. V članku smo podali natančne informacije o tej najdbi z opisom morfoloških znakov tega križanca in opisom rastišča. Naredili smo zemljevid znanih nahajlišč *C. × takhtadjanii* v svetu in prikazali glavne morfološke razlike med križancem in obema starševskima vrstama.

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Introduction

The vascular plants in Ukraine have been explored rather well; there is a nomenclatural checklist of its flora available (Mosyakin & Fedoronchuk, 1999). Nonetheless, information about new species and hybrids within the country appears from time to time. Some of them have an alien origin, which have recently appeared in the country (Olshanskyi & Orlov, 2013; Orlov & Iakushenko, 2013; Novák & Zukal, 2018; Orlov et al., 2019), other ones are native, but previously undetected or overlooked (Peregrym & Kuzemko, 2010; Bezsmertna, 2011; Bezsmertna et al., 2012; Peregrym et al., 2013; Ryff, 2013; Moysiienko et al., 2021). The genus *Carex* L. (Cyperaceae) is no exception in this context, because several new sedges have been found in Ukraine during the last decades (Gynda & Danylyk, 1994; Danylyk, 1995; Danylyk & Panchenko, 2001). According to the latest published data, the genus *Carex* is represented in the Ukrainian flora by 96 species (Danylyk & Olshanskyi, 2021), out of 235 known ones within Europe (Koopman, 2022). However, there has never been given any information about the presence and distribution of hybrids of this genus for the flora of Ukraine, though Koopman (2022) mentioned 295 *Carex* hybrids for Europe. Moreover, *Carex* hybrids are known from all neighbouring countries of Ukraine, except Moldova, namely: Poland (Ceynowa-Gieldon, 1993; Więclaw, 2014; Więclaw & Wilhelm, 2014; Kobierski et al., 2018; Koopman et al., 2019), Slovakia (Dostál, 1989; Dostál & Červenka, 1992; Bernátová, 2008; Jiménez-Mejías et al., 2014; Więclaw, 2014; Koopman, van Beusekom, et al., 2021), Hungary (Koopman, 2022), Romania (Więclaw, 2014; Koopman, 2022), Russia (Egorova, 1999; Jiménez-Mejías et al., 2014; Elven et al., 2017; Koopman, Więclaw, et al., 2021; Koopman, 2022) and Belarus (Dubovik et al., 2012, 2017). Therefore, it is easy to assume that such discoveries of *Carex* hybrids are only a matter of time for the territory of Ukraine.

Thus, the main aim of this paper is to describe the first finding of *Carex* × *takhtadjanii* Jac. Koopman & Więclaw [*C. diluta* M. Bieb. × *C. distans* L.], discovered in Starobilsk town (Luhansk region) during a field investigation in 2021. Also, we are going to discuss the current range of this hybrid, as well as its morphological difference from parent species. So far, there are no hybrids known from *C. diluta*, apart from the mentioned one, but of *C. distans* there are known another ten hybrids, with: *C. demissa* Hornem. [*C. × gogelana* Podb.], *C. extensa* Gooden. [*C. × tornabenei* Chiov.], *C. flava* L. [*C. × luteola* (Rchb.) Sendtn.], *C. hirta* L., *C. hostiana* DC. [*C. × muelleriana* F.W.Schultz], *C. epidocarpa* Tausch [*C. × binderi* Podb.], *C. mairei* Coss. & Germ. [*C. × costei* Rouy.], *C. oederi* Retz., *C. riparia* Curtiss [*C. × loretii* Rouy.], *C. tomentosa* L. (Koopman 2022).

Material and methods

The first author of this communication found a sedge with morphological characters close to *Carex distans* on a small plot of wet meadows (Lat: 49.280051°, Lon: 38.927307°) in the River Aidar valley within Starobilsk town (Luhansk region, Ukraine) on June 13, 2021. However, their untypical, yellow-green utricles as well as their shape raised doubts for its definitive identification. According to the second author these plants might be the hybrid of *C. diluta* × *C. distans*, known so far from Russia and Armenia, which has recently got its own name, *C. × takhtadjanii* (Koopman et al., 2021). The final checking of all morphological features and its identification by comparing the material with hybrid material collected in Armenia reveals that it concerns indeed the hybrid *C. × takhtadjanii*. Duplicates of *C. × takhtadjanii* are kept in ERE (Herbarium of the Institute of Botany of the National Academy of Sciences of Armenia).

The collected material of *C. × takhtadjanii* is kept at the second author's private herbarium. Duplicates are in LNU (Herbarium of the Luhansk Taras Shevchenko National University).

The nomenclature of the genus *Carex* is according to Koopman (2022), the names of other species according to The Euro+Med PlantBase (<https://www.emplantbase.org>).

The map of currently known locations of *C. × takhtadjanii* (Figure 1) was produced by available tools at the website "Simplemapp" (<https://www.simplemapp.net>).

Results and discussion

The very first information about possible hybridisation between *Carex distans* and *C. diluta* was reported by Egorova (1976). After the characteristics of *C. distans* and its subspecies (*C. distans* subsp. *distans* and *C. distans* subsp. *aspratilis* (V.I.Krecz.) T.V.Egorova), she wrote: "Often forms sterile hybrids with *C. diluta*". The second mention of *C. diluta* × *distans* is in Volume 9 of the "Flora of Turkey and the East Aegean islands" (Nilsson, 1985). There are data about eight known locations of the hybrid, specified as follows: "In E. Anatolia, within the area of *C. diluta*, introgression to *C. distans* seems to occur. Morphological intermediates are met with and the limits between the two species are diffuse". The presumed presence of this hybrid within the boundaries of Siberia was discussed by Malyshv (1990), who wrote without any accurate specification of its localities: "*C. diluta* is very close to *C. distans* subsp. *aspratilis* (V. Krecz.) Egor., it hardly differs from it in Southern Siberia, forming intermediate forms. It is possible that in this case convergence is manifested based on introgressive hybridisation". Later, Koopman (2011)

mentioned this hybrid for Russia and Asia, thus for the first time presented its distribution, with a remark that it seems that these plants are often overlooked. Soon after, the hybrid *C. diluta* × *C. distans* was found new for Armenia, and its morphological characters (sterile utricles; its colour was strikingly yellowish-green, whereas *C. diluta* is more bluish-green and *C. distans* brownish-green) were mentioned for the first time (Koopman et al., 2016). One year later, another location of this hybrid was discovered in Armenia (Koopman et al., 2017). Finally, because the hybrid *C. diluta* × *C. distans* did not have a binomial name yet, the name *C. × takhtadjanii* Jac. Koopman & Więclaw has been provided for it with all relevant information (morphological description, the selected type, flowering time, habitat, its global distribution, distribution in Armenia and etymology) as a result of the revision of the genus *Carex* in Armenia (Koopman et al., 2021).

Thus, after our finding of *C. × takhtadjanii* in Luhansk region (Ukraine), this hybrid is known for certain within four countries in Europe and Asia (Turkey, Armenia, Ukraine and Russia), though data have not been published about its accurate locations in the Russian Federation yet. All present known locations of *C. × takhtadjanii* are shown in Figure 1. Nevertheless, we guess that the

range of *C. × takhtadjanii* is wider, and it, most likely, occurs in the whole area where both natural ranges of *C. distans* and *C. diluta* are overlapping, whereas *C. distans* has

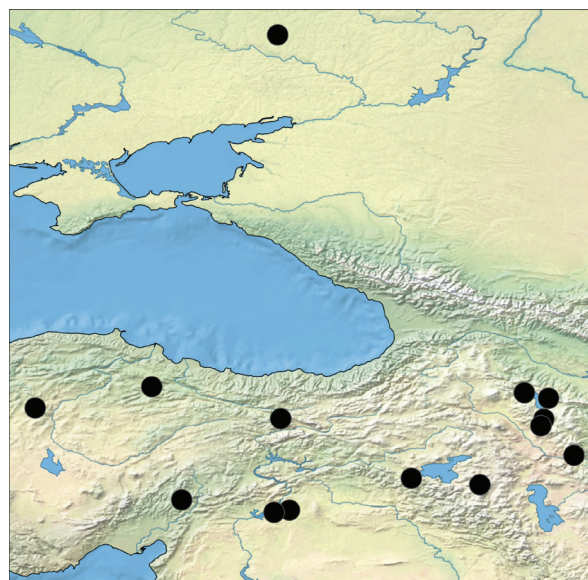


Figure 1: Currently known locations of *C. × takhtadjanii* («●»).
 Slika 1: Trenutno znane lokacije *C. × takhtadjanii* («●»).

Table 1: Morphological characters of *C. × takhtadjanii*, compared with those of *C. distans* and *C. diluta* (according to Nilsson, 1985; Egorova, 1999; Koopman et al., 2021); in bold are the diagnostic characters.

Tabela 1: Morfološki znaki *C. × takhtadjanii*, v primerjavi z *C. distans* in *C. diluta* (v skladu z Nilsson, 1985; Egorova, 1999; Koopman et al., 2021); s krepkim tiskom so izpostavljeni značilni znaki.

Morphological character	<i>C. diluta</i>	<i>C. × takhtadjanii</i>	<i>C. distans</i>
Colour of leaves	glaucous	yellowish-green	dull or greyish-green
Lowest leaf sheaths	greyish-brown	brown	mid to dark brown
Male spike	solitary, 1-2 (3) cm, often with a few female flowers at base	solitary, 2.5–3 cm	usually solitary, 1.5-5.5 cm
Male glumes	pale brown	light brown with wide scarious margin	(light) brown or pale ferruginous
Female spikes	3–4 (5), (0.5) 0.8–2.5 (3) cm × (4) 5–8 mm, ovoid to shortly cylindrical, from erect to slightly drooping, lower with peduncles to 3.5 cm	3–5 (7), 2.5–3 cm × 3–4 mm, erect, shortly stalked, the lowest spike with 3–4 cm long peduncle	2–3 (4), oblong-cylindrical, brown, (0.8) 1.2–2.8 (3.2) cm × 2–2.5 mm, erect, all usually distant, lower pedunculate to 4 cm
Lowest bract	as long as or somewhat longer (no more than 1.5 times) than the inflorescence	longer than the lowest spike, shorter than the inflorescence	longer than the lowest spike but shorter than the inflorescence
Female glumes	2–3 × 1–1.2 mm, ovoid to shortly cylindrical, light or pale brown	2–2.5 × 1.5–2 mm, shorter than the utricles, light brown with broad lighter midrib , ending in short mucronate and serrulate apex	2.5–3.5 × 1.5–2 mm, ovate, obtuse to acute, usually mucronate, pale mid-green to red-brown, with greenish mid-vein
Utricles	full, pale yellowish- to greyish-green, 2.9–4 mm, rather gradually tapering into emarginate or shallowly bifid, often smooth beak	empty , i.e. completely sterile; dull greyish-green with purple spots , veined, 1.8–2.8 mm , with short beak, beak teeth minutely serrulate inside	full, pale greenish-brown or sometimes yellowish-brown or dark reddish-brown, often purplish spotted, broadly aloid, (2.2) 3.5–4.6 mm, ascending, rather dull, distinctly veined, abruptly tapering into an often scabrid, shortly to deeply bifid beak to 1 mm



Figure 2: *Carex × takhtadjanii* in Starobilsk, Luhansk region (Ukraine).
Slika 2: T *Carex × takhtadjanii* v mestu Starobilsk, regija Lugansk (Ukrajina).

a much wider range than *C. diluta*, so, the distribution range of *C. diluta* is the limiting factor.

We pay attention only to the most important characters for distinguishing *C. × takhtadjanii* from its parental species *C. distans* and *C. diluta* (Table 1). Figure 2 shows material of *C. × takhtadjanii* from the new locality in Ukraine.

The common characteristics of the plot on wet saline meadows in Starobilsk town where this hybrid grows has already been published (Peregrym et al., 2021), however without the specification of the plant community with *C. × takhtadjanii*. According to Dziuba (2019), it belongs to the association of *Bolboschoenetum maritimi* Egger 1933, *Scirpion maritimi* Dahl et Hadač 1941, *Bolboschoenetalia maritimi* Hejný in Holub et al. 1967, *Bolboschoenetea maritimi* Vicherek et Tx. in Tx. et Hülbusch 1971. The cover of this community is about 100%, *Bolboschoenus maritimus* (L.) Palla is the dominant species with 90–95% of its projective cover. Here was also noted *Eleocharis uniglumis* (Link) Schult. (3%), *Epilobium hirsutum* L. (3%), *Humulus lupulus* L. (1%), *Carex × takhtadjanii* (1%), *C. diluta* (+), *Geranium collinum* Stephan ex Willd. (+), *Inula helenium* L. (+), *Plantago cornutii* Gouan (+), *Potentilla anserina* L. (+), *Ranunculus repens* L. (+), and *Anacamptis palustris* (Jacq.) R. M. Bateman, Pridgeon & M. W. Chase (+). The structure of this community is similar to those in Armenia where *Carex × takhtadjanii*

was noted along small streams and rivulets, often together with (one of) the parents (Koopman et al., 2017; Koopman et al., 2021). Unfortunately, no detailed information about the hybrid's habitat in other regions could be found.

Conclusions

The hybrid *Carex × takhtadjanii* has been found for the first time in the flora of Ukraine. Moreover, it is the first confirmed discovery of a *Carex* hybrid within Ukraine. It is confirmed that *C. × takhtadjanii* is known for the territories of Turkey, Armenia, Ukraine and Russia now, though its natural range is, most likely, wider, and it presumably occurs in all areas where the natural ranges of *C. distans* and *C. diluta* are overlapping. It seems that the hybrid is easily generated, where both parental species co-occur(red).

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