

Current occurrence of rare weed *Camelina rumelica* (ČELAK.) VELEN. in Slovakia

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Eliáš P. jun., Dítě D., Hajnalová M. & Eliašová M. (2014): Current occurrence of rare weed *Camelina rumelica* (ČELAK.) VELEN. in Slovakia. – Thaiszia – J. Bot. 24 (2): 101-109. – ISSN 1210-0420.

Abstract: Recent occurrence of *Camelina rumelica* was investigated during 2003 – 2012. Only three localities were confirmed in Slovakia now (Kamenica nad Hronom, Bajtava, Vŕšok Nature Reserve). The species was not recently confirmed in natural and semi-natural pioneer xerothermic habitats, we have found it only in grassland vegetation from alliances *Arrhenatherion elatioris* and *Festucion valesiaceae*, occasionally also in field edges as a member of communities of *Caucalidion lappulae*. According to IUCN categories and criteria, we suppose to classify *C. rumelica* as critically endangered species of Slovak flora [CR A2ac; B2a(i)b(iii,iv,v)c(iv)].

Keywords: *Camelina*, occurrence, Slovakia, weeds

Introduction

Genus *Camelina* includes about 10 annual or biennial species distributed in Central Europe, Mediterranean region and Central Asia (MIREK 1981; AKEROYD 1993; ELIÁŠ 2001). Most of members of this genus are weeds, only *Camelina sativa* is cultivated as oil plant (HUTCHEON et al. 2010). In the central Europe, five species have been occurred – *Camelina alyssum*, *C. laxa*, *C. microcarpa*, *C.*

rumelica and *C. sativa* (SMEJKAL 1971, 1992; BARINA & KIRÁLY 2009; ELIÁŠ jun. 2002, 2003).

C. rumelica is mostly regarded as weed or ruderal species throughout distribution range (MIREK 1981), but it has been sporadically used as vegetable, oil source and gene pool (YILDIRIM et al. 2001; FLYMAN & AFOLAYAN 2006; HUTCHEON et al. 2010; SÉGUIN-SWARTZ et al. 2013). According to MIREK (1981), AKEROYD (1993) and MARHOLD (2011), *Camelina rumelica* is native to the Middle and East Europe (Fig. 1, Austria, Hungary, Slovakia, Ukraine, Russia), Balkan Peninsula (Albania, Bulgaria, former Yugoslavia, Greece, Romania), Turkey, Cyprus, Iran, Iraq, Lebanon, Syria, the Caucasus (Armenia, Azerbaijan), Iran, Afghanistan, Central Asia (Tajikistan, Turkmenistan, Uzbekistan, Pakistan), and N Africa (Egypt). The species is considered naturalized or alien in many other European countries (Belarus, the Czech Republic, England, France, Italy, Poland, and Spain) and also in Mexico and USA (SMEJKAL 1992; MCGREGOR 1984; VILLASEÑOR & ESPINOSA-GARCIA 2004). In Slovakia, *C. rumelica* has been found only rarely in lowland areas and in western part of the Poiplie region (ELIÁŠ jun. 2002). It is included in Slovak Red list of rare and threatened plant species in category critically endangered (FERÁKOVÁ et al. 2001).

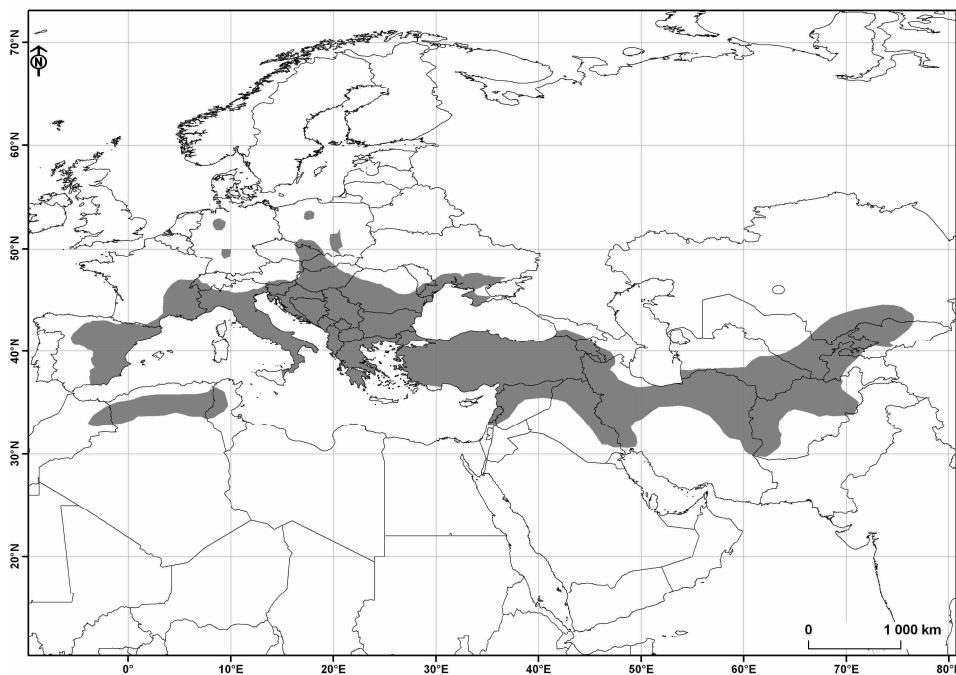


Fig. 1. Distribution range of *Camelina rumelica* Velen. (orig. D. Senko).

From the taxonomical point of view, *C. rumelica* is usually divided to two subspecies: nominate subsp. *rumelica* distributed throughout the species range and subsp. *transcaspica* regarded as endemics of Iran (SMEJKAL 1992; ELIÁŠ jun. 2002). Comparing to nominate subspecies, it is distinguished by stem densely covered by branched hairs and different number of chromosomes $n=13$ (GHAFFARI & TAJIK 2007). Different number of chromosomes supports distinction of this taxon to species level, but further research is needed.

The paper is aimed to bring information about recent occurrence and actual population trends of rare weed *Camelina rumelica* in Slovakia.

Material and Methods

According to MIREK (1981) and ELIÁŠ jun. (2002), *Camelina rumelica* (Fig. 2) is an winter annual plant with unbranched or distally branched stem up to 0.20–0.8(–1) m in height. Stem is densely to moderately hirsute-hispidulous basally, trichomes are simple, to 3.5–4 mm long, mixed with fewer, branched ones. Basal leaves are mostly persistent after anthesis, blade oblong, cauline leaves with blade lanceolate to oblong, base sagittate or minutely auriculate, apex acute, surfaces pubescent, trichomes primarily simple. Sepals 3–4(–4.5) mm long; petals yellowish, creamy white after anthesis, 6–9 mm long. Silicula pyriform to obovoid, 5.5–8 × 3.5–5 mm, apex acute; valves each obscurely veined, margin narrowly winged; style 1.5–2.5 mm long, fruit pedicels thickened, 7–18 mm long. Seeds yellowish brown, 1.4–1.6 mm long.

The study was carried out during the years 2003 – 2012. Herbarium abbreviations are according VOZÁROVÁ & SUTORÝ (2001). Results of this study are presented on the point map. The map was designed by program ArcGis, version 9.2. The grid on the map follows one that was described by NIKLFELD (1971). A list of localities was compiled according to directives of the Flóra Slovenska VI/1 (cf. GOLIAŠOVÁ & ŠÍPOŠOVÁ 2008).

The Phytogeographical divisions of FUTÁK (1980) are also used. Nomenclature of flowering plants follows MARHOLD & HINDÁK (1998). Names of syntaxa are according to JAROLÍMEK ET AL. (2008). Categories of threat were determined according to the methodology of IUCN (2001).

Results

Only three localities of *Camelina rumelica* were confirmed in Slovakia at present: Kamenica nad Hronom, Bajtava, and Vřšok Nature Reserve (Fig. 3). The first one represents the largest population of the species in Slovakia; it reached about 0.07 ha including loess slope in north edge of the Kamenica nad Hronom village and field edge upper this slope in NW part of Čierny vrch Hill. The species has occurred in stands of communities of the *Arrhenatherion elatioris* and *Caucalidion lappulae* alliances. The population size has been depending on cultivated crop in individual year, the largest number of individuals (some hundreds) was found when *Brassica napus* was cultivated here.

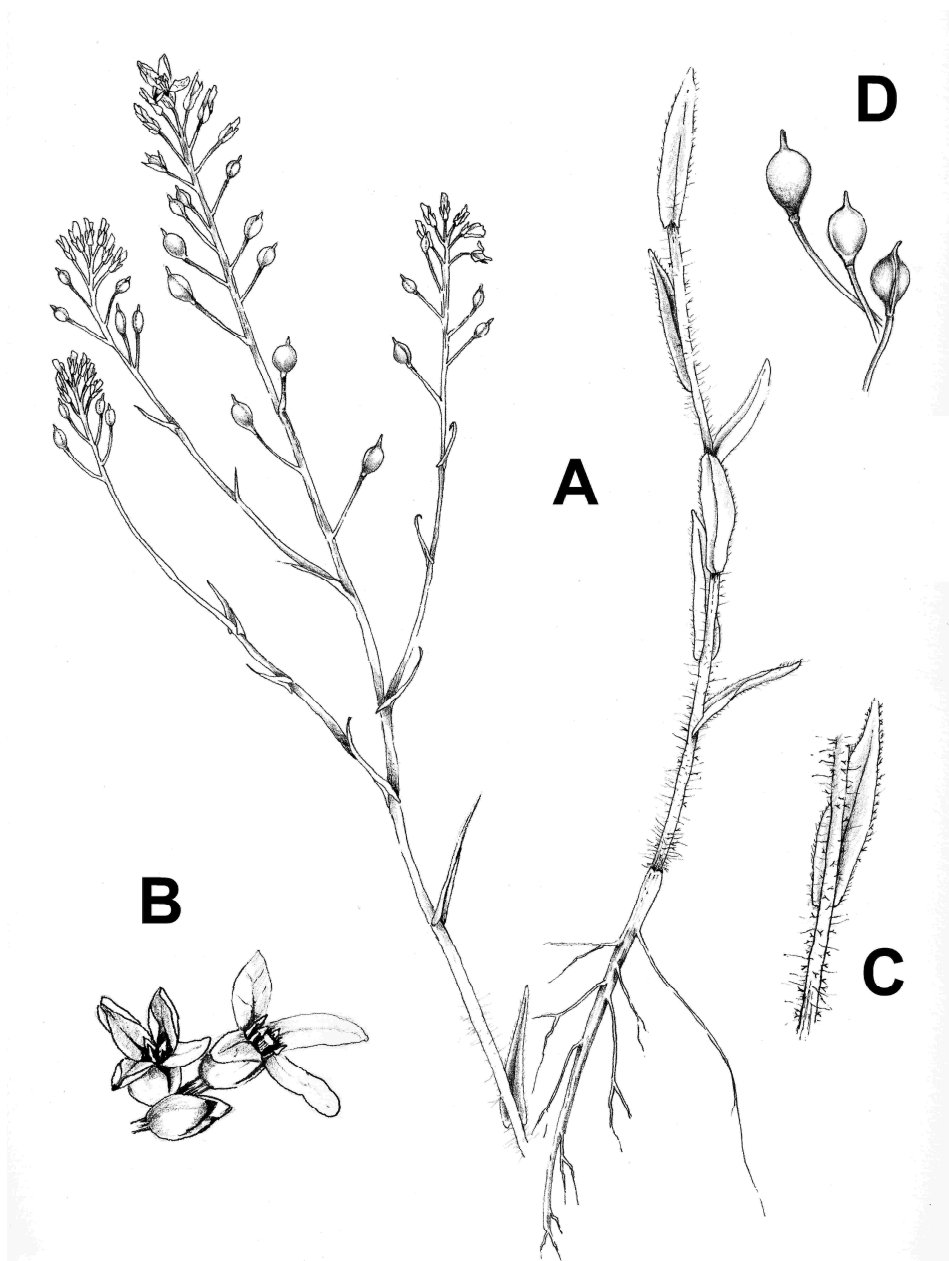


Fig. 2. *Camelina rumelica* subsp. *rumelica*: A – habit of the plant, B – detail of flowers, C – lower part of the stem with characteristic 3–4 mm long hairs, D – fruits (orig. R. Grošaftová).

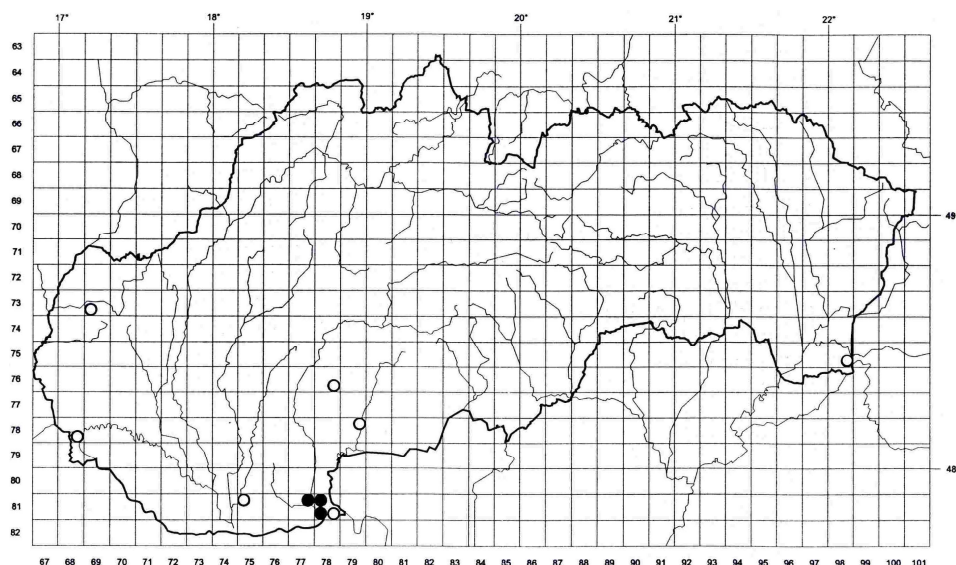


Fig. 3. Historical (○) and recent (●) occurrence of *Camelina rumelica* subsp. *rumelica* in Slovakia (modified according to Eliáš jun. 2002).

The second locality is located ca 3.5 km northeast of the above-mentioned only in the cadastre of Bajtava village on the steep slopes above the road to the village of Salka (foothill of the Ploská hora Hill). The stands of *C. rumelica* tend to be well developed in bare plots in vegetation of *Festucion valesiaceae* covering an area approximately 0.05 ha.

The last one site was confirmed near the village of Mužla on southern slopes of the Modrý vrch Hill in the Vřšok Nature Reserve. Small population of *C. rumelica* including approximately 20 individuals was found here in bare tracks of unpaved road crossing the reserve in 2003 in *Festucion valesiaceae* stands. It later disappeared due to secondary succession (we confirmed it here not in 2008), but occurrence of the species was rediscovered in 2013. The population size was low again, the number of individuals was lower than 25.

As showed our data, *C. rumelica* is very rare in Slovakia now. According to IUCN categories and criteria, we suppose to classify *C. rumelica* as critically endangered species of Slovak flora [CR A2ac; B2a(i)b(iii,iv,v)c(iv)].

List of recent localities of *C. rumelica*:

1. **Burda Hills:** Kamenica nad Hronom NW, loess slope upper the road to Bajtava (Eliáš jun. 2003, 2004, 2012 NI). = Kamenica nad Hronom N, Čierny vrch hill, field edge (Eliáš jun et Sádovský 2003 NI; Eliáš jun. et Dítě 2012 NI).
2. **Ipeľsko-rimavská brázda region:** Bajtava, near the road to Salka near Ploská hora hill (Eliáš jun. 2003 NI; Eliáš jun. et Dítě 2012 NI).

6. **Podunajská nížina lowland:** Nána, Belianske kopce Hills, Vršok Nature Reserve, unpaved road, around 20 individuals (Eliáš jun. 2003 NI; Eliáš jun. et Dítě 2013 NI).

Discussion

Camelina rumelica subsp. *rumelica* is considered as border element of Slovak flora on the northern edge of its distribution range (SMEJKAL & ČEŘOVSKÝ 1999; ELIÁŠ jun. 2002), although its origin was sometime discussed (HALADA 1997; GOJDIČOVÁ et al. 2002). Now, the species is considered as native in Slovakia, while other representatives of the genus are regarded archaeophytes or neophytes (MEDVECKÁ et al. 2012). The fact is that *C. rumelica* was not reliably documented in archaeobotanical research in Slovakia up to now. The seeds of *C. rumelica* are when studied under normal stereoscopic microscope with up to 40 magnification, practically undistinguishable from seeds of *Camelina microcarpa* (M. Hajnalová 2013 ined.). The first records of *Camelina* species identified to date as *C. microcarpa* and/or *C. sativa* are in Slovakia documented from the late Iron Age contexts (450 BP – 100 AD) (Fehér 2007; Hajnalová 2012). We assume that the species has penetrated our territory from the south through the valley of the Danube River as many other thermophilic plant species (e.g. *Bombicylaena erecta*, *Convolvulus cantabrica*, *Herniaria incana*, *Stipa crassiculmis*) after the last Ice Age when the climate conditions were more favourable for xerothermic vegetation (KRIPPEL 1986). Recently, the species was not confirmed along Slovak border area in Hungary (CSIKY 2004; NAGY 2007; BARINA & PIFKÓ 2007); there is only old data from the beginning of 20th century from Dorogh settlement (JÁVORKA 1906 sec. BARINA 2006).

According to published data (SMEJKAL 1971; SMEJKAL & ČEŘOVSKÝ 1999; ELIÁŠ jun. 2002), distribution centre of *C. rumelica* is in the wider surrounding of Štúrovo (Belianske kopce hills, Kamenica nad Hronom, Štúrovo town). However, two of those locations were not confirmed currently ("Skaly" upper Kamenica nad Hronom; Štúrovo town). The occurrence of *C. rumelica* was confirmed in northwestern edge of the Kamenica nad Hronom village (road edge and field edge) in the Vršok Nature Reserve and new locality was found near the Bajtava village. We also found new historical location in this area during revision of unsorted herbarium material of Z. SVOBODOVÁ, she sampled it in the surrounding of the Chľaba settlement in seventies (SVOBODOVÁ 1974 NI). The species was not confirmed here later, but it can still survive in this area due to existence of typical habitats (field edges, rocky slopes). From this area, the species is occasionally spread to the north (Borský Mikuláš, Hurbanovo, Plášťovce, Jabloňovce). However, it has been also occasionally introduced by import of agricultural products (Danube harbour in Bratislava, Čierna nad Tisou train station) (SMEJKAL 1971; ELIÁŠ jun. 2002).

From the syntaxonomical point of view, *C. rumelica* is a member of both ruderal and xerothermic vegetation, but exact data are missing in general. Soó (1980) mentioned it in alliance of *Eragrostion cilianensi-minoris* Tüxen ex Oberdorfer 1954, however, he stated that *C. rumelica* is found also in

communities typical to *C. microcarpa* from classes *Secalienetea*, *Chenopodio-Scleranthetea* and *Festuco-Brometea*. ČARNÍ & MATEVSKI (2005) pointed the species as a member of stands of the *Sisymbrium officinalis* alliance. The alliance include ruderal, therophytic communities in the southern part of the Balkan peninsula that develop early in the spring in abandoned fields and fields temporarily not cultivated, respectively. Similarly in the Black Sea region (SE Ukraine), DUBYNA & TIMOSHENKO (2005) mentioned the species from stands of the class *Festuco-Brometea* and later also from ruderalised sand vegetation of class *Festucetalia vaginatae* (DUBYNA et al. 2009). As we found during field research in Slovakia, *C. rumelica* has occupied grassland vegetation from alliances *Arrhenatherion elatioris* and *Festucion valesiaceae*, occasionally also in field edges as a member of communities of *Caucalidion lappulae*. SMEJKAL (1971) also mentioned the species in open xerothermic vegetation of *Alyso-Sedion albi*, but we found the species not there. According to above mentioned data, it is clear that *Camelina rumelica* has no well-defined coenological relationship to particular plant unit and therefore they can be expected in other ruderal or pioneer communities of dry grassland in the future.

Acknowledgements

We are grateful to Renata Grošaťová (Plzeň) for drawings, Marek SÁDOVSKÝ (Úľany nad Žitavou) assistance in the field and DUŠAN SENKO (Bratislava) for map of *C. rumelica* distribution range. The study was supported by grant VEGA No. 1/0814/09.

References

- AKERROYD J. (1993): *Camelina* L. In: TUTIN T.G. et al. (eds.), *Flora Europaea*, 2nd edition. Cambridge, UK, Cambridge University Press.
- BARINA Z. (2006): A Gerecse hegység flórája. – Magyar Természettudományi Múzeum, Duna & Ipoly Nemzeti Park Igazgatóság, Budapest, 612 pp.
- BARINA Z. & PIFKÓ D. (2007): Botanikai kutatások a Visegrádi-hegységben. – *Kitaibelia* 7(1): 9–25.
- BARINA Z. & KIRÁLY G. (2009): *Camelina* L. – In: KIRÁLY G. (ed.), Új magyar fűvészkönyv. Magyarország hajtásos növényei. Határozókulcsok. Aggteleki Nemzeti Park Igazgatóság, Jósvalő, p. 185.
- DUBYNA D.V. & TYMOSHENKO P. A. (2005): Intrazonal communities' synanthropic flora of the Northern Black Sea Region. – *Chornomorsk. Bot. J.* 1(2): 33–46.
- DUBYNA D. V., DVORETSKY T. V. & TIMOSHENKO P. A. (2009): Ecological and floristic features of *Festucetea vaginatae* communities in Ukraine and perspectives of its conservation. – *Chornomorsk. Bot. J.* 5(3): 491–501.
- CSIKY J. A. (2004): Karancs, a Medves-vidék és a Cerová vrchovina (Nógrád-Gömöri bazaltvidék) flóra- és vegetációtérképezése. Pécs, 451 pp.
- ELIÁŠ P. JUN. (2002): *Camelina* Crantz. In: GOLIAŠOVÁ K. & ŠIPOŠOVÁ H. (eds.), *Flóra Slovenska* V/4, Veda Bratislava, p. 566–588.
- ELIÁŠ P. JUN. (2003): *Camelina microcarpa* L. in Slovakia. *Acta Fytotechnica et Zootechnica* 6(3): 57–61.

- FEHÉR A. (2007): Historical reconstruction of expansion of non-native plants in the Nitra River Basin (SW Slovakia). – *Kanitzia* 15: 47–62.
- FERÁKOVÁ V., MAGLOCKÝ Š. & MARHOLD K. (2001): Červený zoznam papraďorastov a semenných rastlín. – *Ochr. Prír.*, Banská Bystrica, 20 (Supl.): 44–76.
- FLYMAN M. V. & AFOLAYAN A.J. (2006): The suitability of wild vegetables for alleviating human dietary deficiencies. – *South African Journal of Botany* 72, 492–497.
- GHAFFARI S.M. & TAJIK F. (2007): Chromosome counts of some angiosperm species from Iran (III). – *Rostaniha* 8(2): 74–83.
- GOJDIČOVÁ E., CVACHOVÁ, A. & KARASOVÁ E. (2002): Zoznam nepôvodných, invázných a expanzívnych cievnatých rastlín Slovenska 2. – *Ochrana prírody*, Banská Bystrica, 21: 59 – 79.
- GOLIAŠOVÁ K. & ŠÍPOŠOVÁ H. (eds.) (2008): *Flóra Slovenska VI/1*. – Veda, Bratislava, 420 pp.
- HAJNALOVÁ M. (2012): Archeobotanika doby bronzovej na Slovensku. Štúdie ku klíme, prírodnému prostrediu, poľnohospodárstvu a paleoekonomii. – FF UKF, Nitra, p. 228.
- HALADA Ľ. (1997): Archeofyty flóry Slovenska - predbežný zoznam. – *Bull. Slov. Bot. Spoločn.* 19: 129–136.
- HUTCHEON C., DITT R. F., BEILSTEIN M., COMAI L., SCHROEDER J., GOLDSTEIN E., SHEWMAKER C.K., NGUYEN T., DE ROCHER J. & KISER J. (2010): Polyploid genome of *Camelina sativa* revealed by isolation of fatty acid synthesis genes. – *BMC Plant Biol.* 10: 233–233.
- IUCN (2001): Red List categories and criteria: version 3.1. – IUCN Species Survival Commission, Gland.
- KRIPPEL E. (1986): Postglaciálny vývoj vegetácie Slovenska. Veda, Bratislava, p. 307.
- MARHOLD K. (2011): *Brassicaceae*. – In: Euro+Med Plantbase - the information resource for Euro-Mediterranean plant diversity. URL: <http://ww2.bgbm.org/EuroPlusMed/> (accessed 18 February 2013).
- MARHOLD K. & HINDÁK F. (eds.) (1998): Checklist of nonvascular and vascular plants of Slovakia. – Veda, Bratislava, 687 pp.
- MCGREGOR R. L. (1984): *Camelina rumelica*, another weedy mustard established in North America. – *Phytologia* 55(4): 227–228.
- Medvecká J., Kliment J., Májeková J., Halada Ľ., Zališková M., Gojdičová E., Feráková V. & Jarolímek I. (2012): Inventory of the alien flora of Slovakia. – *Preslia* 84 (2): 257–309.
- MIREK Z. (1981): Genus *Camelina* in Poland - Taxonomy, Distribution and Habitats. – *Fragmenta Floristica et Geobotanica* 27:445–503.
- NAGY J. (2004): Börzsöny hegység edényes flórája. – *Duna-Ipoly Nemzeti Park Igazgatóság*, Budapest, 378 pp.
- NIKL FELD H. (1971): Bericht über die Kartierung der Flora Mitteleuropas. – *Taxon* 20: 545–571.
- SÉGUIN-SWARTZ G., NETTLETON J. A., SAUDER C., WARWICK S. I., GUGEL R. K. (2013): Hybridization between *Camelina sativa* (L.) Crantz (false flax) and North American *Camelina* species. – *Plant Breeding* 132: 390–396.
- SMEJKAL M. (1971): Revision of the Czechoslovakian Species of the Genus *Camelina*, Cruciferae. – *Preslia* 43: 318–37.
- SMEJKAL, M. (1992): *Camelina* Crantz. – In: HEJNÝ S. & SLAVÍK B. (eds.), *Květena České republiky* 3. Academia, Praha, p. 159–166.
- SMEJKAL M. & ČEŘOVSKÝ J. (1999): *Camelina rumelica* Velen. – In: ČEŘOVSKÝ J. et al. (eds.), *Červená kniha ohrozených a vzácných druhov rastlín a živočíchov SR a ČR*. 5. Vyššie rastliny. Príroda, Bratislava, p. 68.

- Soó R. (1980): A magyar Flóra és vegetáció rendszertaninövényföldrajzi kézikönyve. Synopsis systematico-geobotanica florum vegetationisque Hungariae. VI. – Akadémiai Kiadó, Budapest, p. 655.
- VILLASEÑOR J.L. & ESPINOSA-GARCIA F.J. (2004): The alien flowering plants of Mexico. – Diversity Distrib. 10:113–123.
- VOZÁROVÁ M. & SUTORÝ K. (eds.) (2001): Index herbariorum Reipublicae bohemicae et Reipublicae slovacae. – Bull. Slov. Bot. Spoločn., Bratislava, Suppl. 7, 95 pp.
- YILDIRIM E., DURSUN A. & TURAN M. (2001): Determination of the nutrition contents of the wild plants used as vegetables in Upper Coruh Valley. – Turk. J. Bot. 25: 367–71.

Received: April 16th 2014
Revised: October 15th 2014
Accepted: October 15th 2014