

Notes on the genus *Erucastrum* (Brassicaceae) in Bosnia and Herzegovina

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Abstract

This paper presents a survey of *Erucastrum* taxa found in Bosnia and Herzegovina and includes an identification key, distribution data and map of localities in Bosnia and Herzegovina based on a revision of herbarium specimens from SARA, literature data and field observations. After 75 years, the occurrence of *E. gallicum* (Willd.) O. E.

Schulz (Brassicaceae) in Bosnia and Herzegovina was confirmed and its distribution is supplemented by new localities. Four populations were found in the central part of Bosnia and Herzegovina, near the town of Vareš. The field survey covered the central reaches of the river Stavnja.

Keywords: Balkans, Bosnia and Herzegovina, *Erucastrum*, taxonomy

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Sažetak

U radu je prikazan pregled taksona roda *Erucastrum* koji su zabilježeni u Bosni i Hercegovini i obuhvaća identifikacijski ključ i kartu distribucije u Bosni i Hercegovini na temelju revizije herbarijskih uzoraka iz herbarijuma SARA, literaturnih podataka kao i terenskih promatranja. Nakon 75 godina potvrđena je prisutnost *E. gallicum* (Willd.) O. E. Schulz

(Brassicaceae) u Bosni i Hercegovini, a distribucija vrste se dopunjuje novim lokalitetima. Četiri populacije su zabilježene u središnjem dijelu Bosne i Hercegovine, u blizini grada Vareša. Terenska istraživanja obuhvataju središnji tok rijeke Stavnje.

Keywords: Balkan, Bosna i Hercegovina, *Erucastrum*, taksonomija

Introduction

The genus *Erucastrum* C. Presl is distinguished by having usually quadrangular siliques; somewhat keeled, prominently one-nerved valves; oblong or oval, uniseriately arranged seeds; nonsaccate sepals and occasionally bracted inflorescences. The genus comprises approximately 20 species primarily distributed in the western Mediterranean region and in most of Africa (Al-Shehbaz 1985), with four representatives distributed in Europe. Of these species only two are distributed in the Balkan Peninsula: *E. gallicum* (Willd.) O. E. Schulz and *E. nasturtiifolium* (Poir.) O. E. Schulz. (Marhold 2011) and in Bosnia and Herzegovina (Bjelčić & Šoljan 2015).

Material and methods

After 75 years, the occurrence of *E. gallicum* (Brassicaceae) in flora of Bosnia and Herzegovina was confirmed and its distribution is supplemented by new localities. During fieldwork in 2015 and 2016, numerous specimens were found in four localities in the vicinity of the small town of Vareš (East Central Bosnia). Digital photographs and GPS coordinates were taken in the field. Identification of the specimens was done according to Rich (1991) and the nomenclature follows Marhold (2011). The specimens were collected and stored in the Herbarium of the National Museum of Bosnia and Herzegovina (SARA, 51834, 51835). All available materials of the genus *Erucastrum* have been studied, including the data gathered from references and from public (SARA) and private herbariums of the authors as well. Herbarium abbreviations are given according to Holmgren et al. (1990). The distribution of the species in Bosnia and Herzegovina is shown on the map using standard UTM grid 10x10 km. Localities gathered from literature and herbariums are indicated in black on the map, while new data are indicated in red (Fig. 1).

Results and discussion

In the flora of Former Yugoslavia only two species of the genus *Erucastrum* are present: *E. gallicum* and *E. nasturtiifolium*. To separate these two species, we offer the adjusted key according to Scoggan (1978) and Gómez-Campo (1993).

- 1a Basal lobes of the upper stem-leaves not clasping; inflorescence bracted in the lower part; flowers yellowish white; sepals erect; siliqua not stalked above the sepal-scars***E. gallicum***
- 1b Basal lobes of the upper stem-leaves downwardly directed and clasping the stem; inflorescence bractless; flowers bright yellow; sepals spreading; siliqua distinctly stalked above the sepal-scars***E. nasturtiifolium***

Erucastrum gallicum (Willd.) O. E. Schulz, in Bot. Jahr. 54 Beibl. 119: 56 (1916).

Synonyms: *Brassica ochroleuca* (Gaudin) Soy.-Will.; *Eruca erucastrum* (L.) P. Gaertn., B. Mey. et Scherb.; *Erucastrum obtusangulum* Hegetschw. & Heer, non (Schicher) Reichenb.; *Erucastrum pollichii* Schimp. et Spenn.; *Hirschfeldia pollichii* (G. W. Schimp. & Spenn.) Fritsch; *Sisymbrium gallicum* Willd.

Species description: *E. gallicum* is an annual or biennial (Fig. 2a). Stems are erect to decumbent, 20-80 cm high, branched below and above, with simple, deflexed hairs below. Leaves often in a dense rosette, up to 25 cm, petiolate, oblong to oblanceolate in outline but deeply cut to pinnately divided with an oblong to lanceolate, obtuse terminal lobe and 3-10 pairs of lateral lobes. Cauline leaves are alternate, not clasping the stem at the base, similar but increasingly smaller in size up the stem, passing gradually into floral bracts. Inflorescence crowded. Flowers arranged in terminal raceme, in at least the lower 1/3 of the

main raceme with leaf-like bracteoles (Fig. 2c). Sepals 4-6 mm long, oblong, erect to inclined. Petals 6-8 mm long, yellowish white, claw about as long as the limb, linear, pale (Fig. 2b). Petals about twice as long as sepals. Pedicels in fruit 5-19 mm long, slender, ascending to patent. Siliqua 20-50 x 1-2 mm, not stipitate; beak 2-4 mm long, without seeds. Seeds elliptic or obovate, orange-brown (Fig. 2d). Chromosome number is $2n=30$ (Rich 1991, Tutin & Akeroyd 1993).

The species is native to southwestern and central Europe, but widely introduced and naturalized in other parts of Europe (Rich 1991), Canada and the United States (Warwick & Wall 1998). *E. gallicum* is rare in the Balkans with insufficient studies in areas: Bosnia and Herzegovina (Maly 1919), Romania (Săvulescu 1955), Albania (Greuter 1986), Serbia (Sarić & Diklić 1986), Croatia (Nikolić 1997),

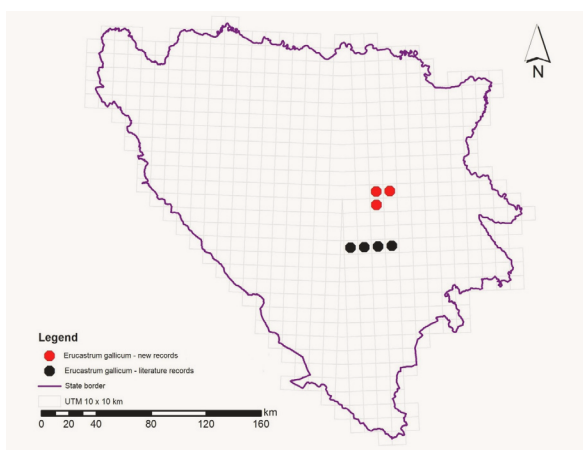


Figure 1. The distribution of *Erucastrum gallicum* in Bosnia and Herzegovina.

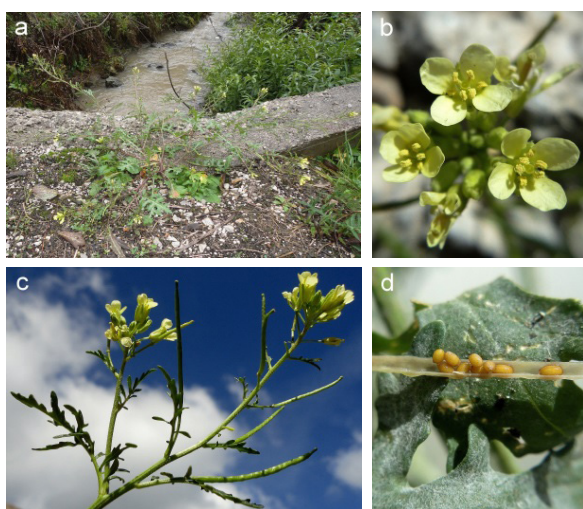


Figure 2. *Erucastrum gallicum* on the right bank of Stavnja river near Vareš: a – habitat; b – flower; c – inflorescence with leaf-like bracteoles; d – seeds (Photos: Š. Šarić 2016).

Slovenia (Martinčić et al. 1999) and Greece (Tan 2002).

During a floristic research in Central Bosnia in the valley of the Stavnja river we could confirm the presence of *E. gallicum* in the area of Bosnia and Herzegovina. The species was found in three localities around the town of Vareš (Fig. 1) in the different types of habitats: in roadsides, on fallow lands, waste grounds, trenches, silts of river and brooks.

Locality 1: Vareš, right bank of Ponikva Brook, about 4 km upstream from the mouth of Ponikva in Stavnja and about 5 km NE of Vareš ($44^{\circ} 10' 16.63''$ N. $18^{\circ} 23' 48.59''$ E; elevation 1035 m. a. s. l.). About 100 specimens were recorded along the road, at a linear distance of about 800 m.

Locality 2: Vareš, right bank of Stavnja river, about 300 m downstream from the mouth of Ponikva in Stavnja and about 2 km N of Vareš ($44^{\circ} 10' 40.63''$ N. $18^{\circ} 20' 13.27''$ E; elevation 925 m a. s. l.). About 10 specimens were recorded.

Locality 3: It is split into two main groups. The northernmost group is located in Vareš, Podjavor, right bank of Stavnja river, about 6 km S of Vareš ($44^{\circ} 07' 05.84''$ N. $18^{\circ} 18' 27.75''$ E; elevation 733 m a. s. l.). Only five specimens were recorded. The second one is located in Pajtov Han, right bank of Stavnja river, about 8 km S of Vareš ($44^{\circ} 05' 43.92''$ N. $18^{\circ} 18' 49.41''$ E; elevation 656 m a. s. l.). About 10 specimens were recorded.

It should be mentioned that there are confusions about the presence of a certain *Erucastrum* species in Bosnia and Herzegovina. Namely, *E. nasturtiifolium* was reported by Maly (1920) under the name *E. obtusangulum* (G. Haller ex Schleich.) Rchb. (synonym *E. pollichii* non Schimp. et Spenn). In the Herbarium of the National Museum of Bosnia and Herzegovina (SARA), eleven specimens of the genus *Erucastrum* were stored. All specimens were collected at four localities in the wider Sarajevo area and marked with four different names: *E. obtusangulum*, *E. nasturtiifolium*, *E. pollichii* and *E. gallicum*. With a detailed overview of the herbarium collection SARA we have found that all stored specimens belong to *E. gallicum*.

Specimina visa: Sarajevsko polje near Ilidža (SARA 14060; coll. Maly 1914 as *Erucastrum obtusangulum* (G. Haller ex Schleich.) Rchb.), Miljacka River valley near Sarajevo (SARA 14058; coll. Maly 1918 as *Erucastrum obtusangulum* Rchb.), Sarajevsko polje (SARA 14059; coll. Maly 1923 as *Erucastrum obtusangulum* (G. Haller ex Schleich.) Rchb.), Sarajevsko polje, Miljacka River valley near Sarajevo (SARA 14057; coll. Maly 1925 as *Erucastrum nasturtiifolium* (Poir.) O. E. Schulz.), Sarajevsko polje, Miljacka River valley near Sarajevo (SARA 14061; coll. Maly 1933 as *Erucastrum nasturtiifolium* (Poir.) O. E. Schulz.), Sarajevo, Osenik near Tarčin (SARA 14063, 14067;

coll. Ritter-Studnička 1936 as *Erucastrum pollichii* G. W. Schimp. & Spann.), Sarajevo, Zovik near Pazarić (SARA 14064, 14065, 14066; coll. Ritter-Studnička 1938), Sarajevo, Zovik near Pazarić, on track ballast along the railway (SARA 14062; coll. Ritter-Studnička 1938 as *Erucastrum nasturtiifolium* (Poir.) O. E. Schulz.).

Erucastrum nasturtiifolium (Poir.) O. E. Schulz, in Bot. Jahr. 54 Beibl. 119: 56 (1916).

Synonyms: *Brassica erucastrum* L.; *Brassica nasturtiifolium* Poir., *Erucastrum obtusangulum* (Schleich.) Rchb. f.; *Sinapis nasturtiifolia* Poir.

Species description: *E. nasturtiifolium* is biennial or perennial plant with a basal rosette and some erect stems that are often branched in terminal racemes. Stems are angular, 20-100 cm high, densely hispid with deflexed hairs, at least below. Basal leaves are lyrate-pinnatisect with 3 pairs of lateral lobes. Cauline leaves are alternate, clasping the stem at the base, similar to basal, but increasingly smaller in size up the stem, with 6-8 pairs of lateral lobes. Inflorescence bractless; flowers bright yellow; sepals spreading; fruit distinctly stalked above the sepal-scars. Sepals 5 mm long, patent. Petals 9 mm long, limb broadly obovate, yellow. Siliqua 25-60 x 1-2 mm, stipitate; beak 3-6 mm long, with 1-2 seeds. Seeds elliptic, light- to reddish-brown. Chromosome number is $2n=16$ (Gómez-Campo 1993, Tutin & Akeroyd 1993).

E. nasturtiifolium has a South-Western European distribution, extended from South-western Europe to Northern France and Southern Germany (Jalas et al. 1996). Elsewhere in Central and Eastern Europe it has an adventitious character. In the Balkans the species was only known in Romania (Săvulescu 1955), Albania (Greuter 1986) and Slovenia (Martinčič et al. 1999).

The literature data on the presence of the genus *Erucastrum* in the flora of Former Yugoslavia are at least confusing. Hayek (1927) and Tutin & Akeroyd (1993) mention only *E. nasturtiifolium* for the Balkans (Bosnia, Croatia). According to Trinajstić (1986) *E. nasturtiifolium* is present in Bosnia and Slovenia, and *E. gallicum* grows only in Slovenia. All confirmed findings indicate that *E. nasturtiifolium* in the territory of Yugoslavia is present only in Slovenia (Martinčič & al. 1999), and *E. gallicum* in Bosnia and Herzegovina (Maly 1919, 1920, 1940), Croatia (Nikolić 1997), Serbia (Sarić & Diklić 1986) and Slovenia (Martinčič et al. 1999).

The occurrence of *E. nasturtiifolium* in the flora of Bosnia and Herzegovina was firstly noted by Hayek (1927: 456), based on the erroneous mistaken naming of Maly (1920). Based on that

quotation, it was noted by Trinajstić (1986: 430) and also by Bjelčić & Šoljan (2015: 71). In the herbarium collection SARA there are no specimens of this species from Bosnia and Herzegovina. We therefore consider its occurrence in Bosnia and Herzegovina as doubtful. The presence of *E. nasturtiifolium* in Bosnia and Herzegovina needs to be confirmed and further field work is necessary.

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