

## *Erysimum bulgaricum* (Brassicaceae), a newly distinguished species for the Balkan Peninsula

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### Abstract

*Erysimum bulgaricum* proposed here as a species new to science is based on the combination *Erysimum goniocaulon* BOISS. var. *bulgaricum* VELEN. It is a diploid, biannual plant, whose area of distribution ranges from Thracia north-eastwards along the West Black Sea coast to North Dobroudza.

**Key words:** *Brassicaceae*, *Erysimum bulgaricum*; new species, Flora of Balkan Peninsula.

### Introduction

J. VELENOVSKY in his *Flora Bulgarica, Supplementum I* (1898) listed 5 species of the genus *Erysimum*. Among them was the Anatolian *Erysimum goniocaulon* BOISS. VELENOVSKY separated the Bulgarian specimens from the typical species by describing var. *bulgaricum*. It was only in the fourth edition of *Flora of Bulgaria* (Stojanov, Stefanov & Kitanov 1966) that *Erysimum goniocaulon* var. *bulgaricum* was dismissed in the synonymy of *E. cuspidatum* or misdetermined as *E. crepidifolium*. The recent critical taxonomic studies on *Erysimum* in the Bulgarian flora revealed that *E. bulgaricum* deserves species status.

### Material and Methods

This study is based on herbarium material deposited in BP, BRNU, GJO, GOET, GZU, H, LE, LI, M, MHA, PR, PRC, SO, SOA, SOM, W and WU and authors' collections along the West Black Sea coast, in North-Eastern Bulgaria and the North Dobroudza plain.

The chromosome number counted by both authors was studied on mitotic metaphase plates obtained from flower buds, collected in the field (see also ANČEV & POLATSCHEK, 1998). The karyologically studied populations are marked by an asterisk (\*) in the list of examined specimens, vouchers have been deposited in SOM and W.

The hair types and their relative abundance are indicated in the description in the following way: HT 2: 2-fid hairs predominant (more than 50%); HT 2: 2-fid hairs common (10 to 50 %); HT (2): 2-fid hairs uncommon (up to 10 %); HT ((2)): 2-fid hairs rare, scattered on the apex and lower surface of the leaves, or completely absent; HT 3: 3- fid hairs predominant, etc.

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## Results and discussion

### *Erysimum bulgaricum* (VELEN.) ANČEV & POLATSCHEK, comb. et stat. nov.

- ≡ *Erysimum goniocaulon* var. *bulgaricum* VELEN., Fl. Bulg. Suppl. I (1898) 20; Holotypus: In declivibus m. Rhodope, leg. V. Stribrny 1894, det. J. Velenovsky [PRC!]. Ind. loc.: In declivibus m. Rhodope ad Stanimaka a. 1894 detexit am. Stribrny (VELENOVSKY 1898: 20).
- = *Erysimum crepidifolium* auct. non REICHENB.: STOJ. & STEF., Fl. Balg. 1, 1: 524 (1924); HAYEK, Prodr. Fl. Penins. Balc. 1: 384 (1925), p.p.; ASSENOV, Fl. Nar. Rep. Balg. 4: 358 (1970).

VELENOVSKY (1898) described *Erysimum* specimens morphologically well differentiated from the known Bulgarian *Erysimums* as *E. goniocaulon* BOISS. var. *bulgaricum* VELEN. The material had been collected by V. Stribrny from the Rhodopes in the vicinity of Assenovgrad. The plants are biennial, gray-green, with well developed 60 - 120 mm long narrowly fusiform main root. Stem almost cylindrical, simple or with few branches, 310 - 730 (- 1220) mm tall, pubescent [HT 2+(3)+((4))], with long petiolate runcinate acute toothed basal leaves, forming a distinct rosette which is dry at flowering time, covered by bifid and stellate hairs. Cauline leaves linear lanceolate, pubescent, 10 - 82 × 1 - 2 (- 4) mm, acute, entire or sometime on the margin with 3 (- 4) set up short hyaline teeth. Hairs branched, 2 - 3-fid on the stem and the leaf midrib, (2 -) 3 - 4 (- 5)-fid on the basal and cauline leaves. The synflorescence is racemose with 0 - 3 (- 6) short branches, elongating during fruit development. Pedicels 3 - 5 (- 6) mm, pubescent. The flowers are almost without scent. Sepals pubescent on outer surface, 5 - 6 (- 7) × 1.5 - 1.7 (- 2) mm. Petals pale yellow, 8-15 × 1.5 - 2.5 (- 3) mm, cuneate; the blade 4 - 5 × (1.5 -) 2 - 2.5 (- 3) mm. Stamens glabrous, anthers 2.5 - 3 mm long. Lateral and median nectaries developed. Siliqua 38 - 68 mm long, 1.1 - 1.3 mm thick, 4-angled in cross-section, grey-greenish; edges glabrescent. HT 2+3+(4). Angle between the axis of the raceme and the pedicel 45° - 50°; siliqua divergent at 20° - 30°. Style 1-3 mm. HT (2)+3+4+(5)+((6)). Stigma clavate. Pollen grains tricolpate: P = 17.5 - 19 μm, E = 15.5 - 17.5 μm. Flowers (V) VI (VII). 2n = 2x = 14; x = 7 (fig. 1).

### Distribution and ecological characteristics

*Erysimum bulgaricum* is found in the south-eastern and eastern parts of the Balkan Peninsula. Its area of distribution ranges from West to East Thracia on the territory of Greece and Europaean Turkey, north-eastward to the Derventsky vazvishenia, and the Upper Thracian plain in Bulgaria. Along the West Black Sea coast it reaches Dobrudza with many localities in steppe habitats in Bulgaria and Romania (fig. 2).

*E. bulgaricum* occurs in dry grassy and gravelly open habitats, in pastures and on roadsides, sometime along the seashore on steep slopes, usually on limestone or marly substrate, from 80 up to 350 m a.s.l. In Bulgaria it is wide-spread in the South-East and East of the country in localities in the Upper Thracia plain (the surroundings of Popovitza and Haskovo), the Tundzha hilly region (Derventsky vazvishenia at Goljam Dervent), along the Black Sea coast (Balchik, Kavarna, Kaliakra cape), in the East Stara Planina Mt. (Kamciyska planina) and in North-Eastern Bulgaria (Kardam, Nevsha, Bezhanovo).

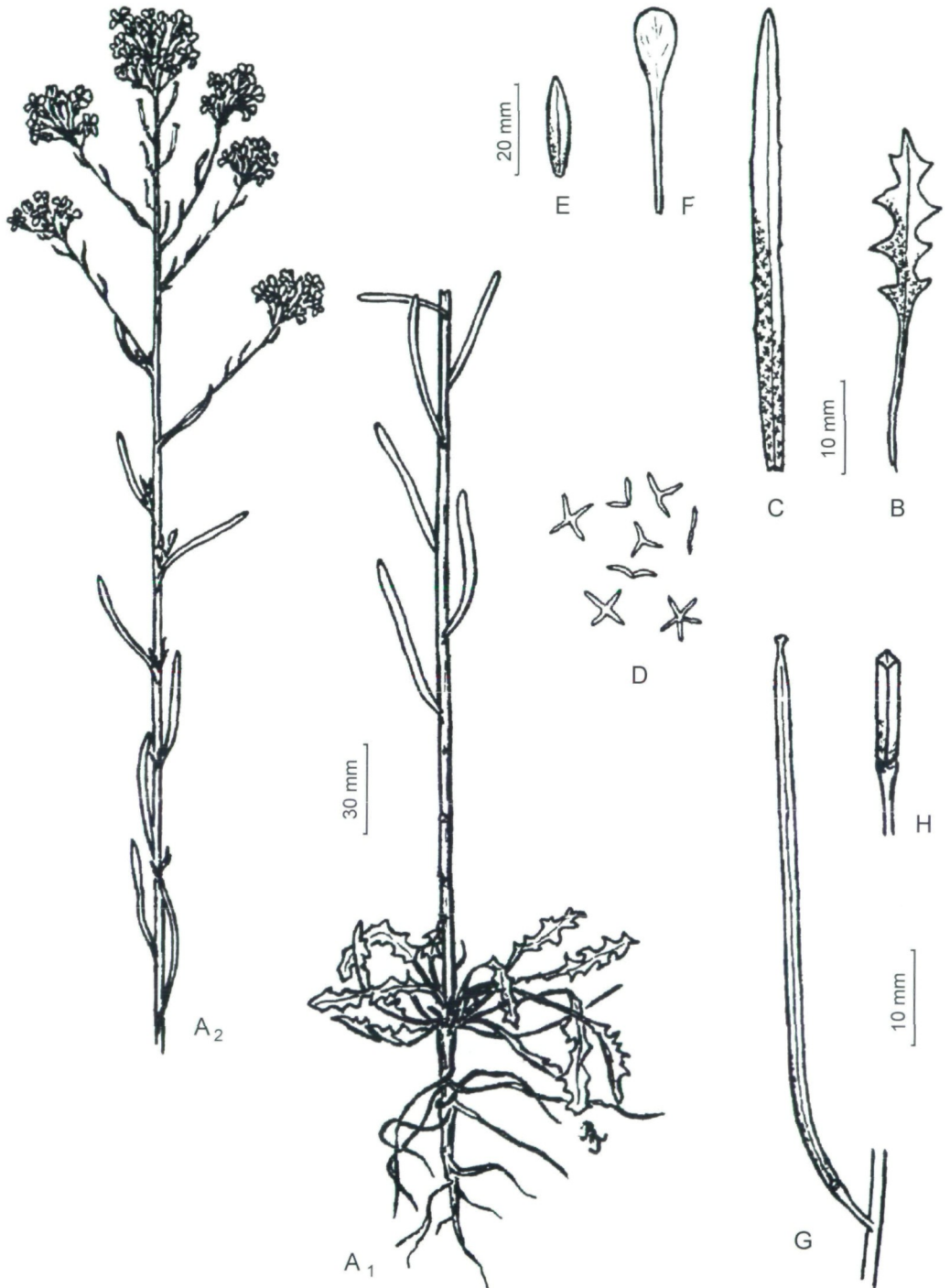


Fig. 1: A<sub>1</sub>, A<sub>2</sub>: Habit; B: Basal leaf; C: Cauline leaf; D: Hairs from cauline leaves; E: Sepal; F: Petal; G: Siliqua; H: A fragment of siliqua with a cross-section.



Fig. 2: Distribution of *Erysimum bulgaricum*.

In North-Eastern Bulgaria in a locality south of village of Bejanovo the species grows in plant communities of *Festuca valesiaca* and *Paeonia tenuifolia* together with *Astragalus haarbachii*, *A. dasyanthus*, *Linum austriacum*, *Onosma thracica*, *Asyneuma anthericoides*, *Achillea collina*, *Hyacinthella leucophaea* et al.

### Taxonomic notes and phytogeographical relations

STOJANOV & STEFANOV in the first edition of *Flora na Bulgaria* (1924: 523) and later in the second edition (1933: 477) listed *E. goniocaulon* var. *bulgaricum*, following Velenovsky's (1891, 1898) data. *E. goniocaulon* was mentioned also in the third edition of the same *Flora* for the Rhodopes, with Malko Tarnovo (instead of *E. diffusum* s.l.) and Elhovsko (STOJANOV & STEFANOV 1948) as additional localities. In the fourth edition of this *Flora* *E. goniocaulon* var. *bulgaricum* was put in the synonymy of *E. cuspidatum* (BIEB.) DC., a decision accepted also by ASSENOV (1970: 363). The reason is at least partly explained by the fact that there was a herbarium specimen of *E. cuspidatum* collected by V. Stribny in Rhodopes, determined by him as *E. goniocaulon* var. *bulgaricum*. Significantly, *E. goniocaulon* var. *bulgaricum* had been early reported by GEORGIEV & KITANOV (1939: 73) instead of *E. cuspidatum* for a specimen collected by Stribny in June 1910 in Eli Dere.

A. HAYEK (1925: 384) included *E. goniocaulon* var. *bulgaricum* in his *Prodromus Florae Peninsulae balcanicae* with a short morphological description. It is interesting that in

Hayek (l.c.) *E. cuspidatum* f. *brevistylus* NEJČEV was put in the synonymy of *E. gonio-caulon* var. *bulgaricum*. However, the revision of the type material of *E. cuspidatum* f. *brevistylus* showed, that it was a correctly determined form of *E. cuspidatum* by NEJČEV (1906: 138). The form was mentioned again from the classical locality (NEJČEV 1908: 26), and later ASSENOV (1970: 363) correctly included f. *brevistylus* in the synonymy of *E. cuspidatum*.

JORDANOV (1939: 90) reported *Erysimum gonio-caulon* var. *bulgaricum* from calcareous habitats in Strandza Mt. (Petrova niva). The revision of the herbarium material showed, however, that it pertains to *E. diffusum* s.l. The herbarium specimen is a single plant with green entire basal leaves covered with bifid hairs and simple racemose fruiting inflorescence with five siliquae with thick pedicels, without valves.

*E. bulgaricum* is morphologically and geographically well differentiated from *E. gonio-caulon*. In fact, *E. bulgaricum* is morphologically close to the E European and W Asiatic *E. leucanthemum* (STEPHAN) B. FEDTSCH., ranging from the steppes of Moldavia and Ukraine to West Siberia, Central Asia and the Caucasus (КОТОВ 1979). *E. bulgaricum* and *E. leucanthemum* are biannual plants with runcinate basal leaves, characterized by a synflorescence which is simple racemose or with few short branches, and by pale yellow flowers with narrow spatulate petals.

*E. bulgaricum* differs from *E. leucanthemum* in the position of the runcinate leaves - basal in *E. bulgaricum*, and basal and cauline in *E. leucanthemum*, the form of the cauline leaves, pedicel form and length of the siliqua (table 1).

Tab. 1: Characters distinguishing *Erysimum bulgaricum* from *E. leucanthemum*

Characters	<i>E. bulgaricum</i>	<i>E. leucanthemum</i>
Basal leaves	runcinate, congested at the stem base	runcinate, basal and on the lower 1/2 of the stem
Cauline leaves	entire or on the margin with (3) 4 set up short hyaline teeth	runcinate, serrate or subentire
Pedicels	3.5 - 5 (- 6) mm long, thin	1.5 - 3 (- 5) mm long, thick
Siliqua	4-angled, 36 - 68 mm long, with 2 - 3 (4)-fid hairs	terete, 20-45 mm long, with 3 - 4 ((5))-fid hairs

### Examined specimens

#### *Erysimum bulgaricum*

**Bulgaria:** Black Sea coast, in collis calcareis Dobrodgae circa urbem Balchik, 16.V.1904 B. Davidov, sub. *Erysimum odoratum* EHRH., rev. B. Achtarov sub. *E. crepidifolium* RCHB. [SOM 33252]; – Northern coastal area of the Black Sea, White Coast E of Balchik, Cap Imeto E of Balchishka Tuzla, 50-70 m, 43°24'41"N/28°15'53"E, 03.06.1998 D. Uzunov, Ch. Gussev & E. Vitek 98-164 \* [SOM, W]; – Northern coastal area of the Black Sea, ca. 12 km WNW Shabla, NE of Vidno, plain E of valley Goren dere, ca. 75 m s.m., 43°34'38"N/28°24'28"E, D. Uzunov, Ch. Gussev & E. Vitek 98-305 \* [SOM, W]; – Open steep marl slopes south of cape Chirakman near Kavarna, 23.V.2000

M. Anchev & A. Polatschek [SOM, W]; – Kaliakra cape, calcareous steppe terrains, pastures, 23.V.2000 A. Polatschek & M. Anchev [SOM, W]; – North-Eastern Bulgaria, in collis siccis Dobrozeae, ad pagum Harman-Kujussu [= Kardam], 12.VII.1900 B. Davidov, sub *Erysimum crepidifolium* RCHB. [SOM 33252]; – In collis siccis Deli-Orman supra stationem Nevša, 18.V.1902 B. Davidov, sub *Erysimum odoratum* EHRH. [SOM 33250]; – Ca. 10 km W of Durankulak. Kalk, flachgründiger Steppenrasen mit *Astragalus onobrychioides*, *Paeonia tenuifolia*, *Filipendula vulgaris*, *Erysimum diffusum*, 24.5.2000 A. Polatschek \* [W]; – Grassy gravelly places along the road Kardam - Shabla, east of village of Bejanovo, 24.V.2000 A. Polatschek & M. Anchev \* [SOM, W]; – Stara Planina Mt., in collis siccis mt. Balkan orient., Kamcijska pl., 11.V.1898 B. Davidov, sub *Erysimum crepidifolium* RCHB. [SOM 33261]; – Thracian plain, Rumelia orientalis, Pr. Haskova, VI.1900 J. Podpera, sub *Erysimum canescens* ROTH. [BRNU, W]; – In aridis collis ad vicum Papazlii [Popovitza] distr. Plovdiv, 13.VII.1909 I. Urumov, sub *Erysimum moesiicum* VELEN. [SOM 33158]; – In nemoribus ad Papazli, VI.1909, V. Stribrny, sub *Erysimum moesiicum* VELEN. [BRNU, W]; – Papazly, VI.1910 V. Stribrny, sub *E. canescens* EHRH. [PR, WU]; – In Papazli, pasbishta, VI.1910 V. Stribrny, sub *Erysimum canescens* ROTH [PR 24724]; – In graminosis ad Nova Mahala, VII.1914 V. Stribrny, sub *Erysimum moesiicum* [SOM 01485]; – Papazli, pasbishta, V-VI [sine anno] Stribrny, sub *Erysimum moesiicum* VELEN. [SOM 01486]; – Nova Mahala, VI.1914 V. Stribrny sub *Erysimum odoratum* EHRH. [*Erysimum pannonicum*] [SOM 01489]; – Pastures and lawns along oak forests south of Popovitza, 26.VI.2001 M. Anchev [SOM]; – Pastures south of Popovitza, 12.V.2002 M. Anchev & A. Polatschek [SOM, W]; – Tundza hilly region, Derventsky vazvishenia, stony terrain, east of Goljam Dervent, Jambol District, 24.IV.1937 D. Jordanov, sub *Erysimum goniocaulon* var. *bulgaricum* VELEN. [SO 29092].

**Greece:** Thrakien, ca 1 - 2 km S. Didimotichon, S von Meric Nehri, ca. 100 - 200 m, substr. silic., 23.5.1979 F. Krendl \* [W]; – Thracia occidentalis, Didimotichon in collibus saxosis, substr. silic., ca. 70 m, 25.IV.1961 K.H. Rechinger [W].

**Roumania:** Dobroudza, Distr. Constanta, Mangalia, pr. Pestera Movable in locis herbosis et petrosis, 43°49'35" N, 28°33'30" E, alt. 15 m, 20. May 1995 G. Negrean, sub *Erysimum diffusum* EHRH. [LI]; – Dobrogea, SW von Basarabi, W von Murfatla, ca. 50 - 100 m, Sandsteppe, Sande, Kalk, 12.05.1976 F. Krendl \* [W]; – Dobroudja, Allah-bair, Südhang auf Kalkschutt, Felssteppe. H. Heltmann 18.5.1978, sub *E. canescens* ROTH [LI].

**Turkey in Europe:** Edirne, Argel 9 km NNE Uzunköprü, 200 m, 27. V.1988 F. Speta [LI]; – Ca. 10 km SE Edirne in Richtung Iskenderköy, 20.6.1981 A. Polatschek \* [W]; – Edirne, Iskenderköy, 10 km ESE Edirne, trockener Steppenrasen, 5.V.–8.VI.1968 K. Bauer, K. Fitz, F. Spitzenberger [W]; – Kirklareli, oberhalb Poyrali, Richtung Demirköy, 31.5.1988 F. Speta [LI].

### *Erysimum cuspidatum*

[Bulgaria], Rhodopes, Eli-Dere, VI.1910 V. Stribrny, sub *Erysimum goniocaulon* var. *bulgaricum* VEL. [SOA 15629].

### *Erysimum cuspidatum* f. *brevistylus* NEJČEV.

Typus: Po kamenisti pripeci visoko v Koru-dere, Chital cham, VII.1903 I. Neičev [SO 29021].

***Erysimum diffusum* s.l.**

[Bulgaria] Strandza Mt., on the rocky marble terrain at Petrova niva, north of village of Stoilovo, Malkotarnovsko, 15.VI.1934 D. Jordanov, sub *Erysimum goniocaulon* [SO 29091].

***Erysimum leucanthemum***

[Russia] Prov. Volgograd, Distr. Pallasovka, N-Ufer des Elton-See nahe Mündung des Chora, Artemisia-Steppe, 8.5.1984 N. Beljanina [MHA]; – Prov. Volgograd, Distr. Olkhovka, bei Kamennyi Brod, Kreide, Steppenhänge, 18.5.1984 N. Beljanina [MHA]; – Fl. Rossica, prope col. Sarepta fere ubique, A. Becker, pl. Wolga infer., ed. R.F. Hohenacker, sub *E. versicolor* [BP, GOET]; – Sarepta, s. dat. Wunderlich, sub *E. versicolor* [GOET, M, W, WU]; – Sarepta, auf Sand- und Lehmboden der Berge, IV.1877 A. Becker, Pl. astrachanicae, sub *E. versicolor* [BP, WU]; – Sarepta, auf Sand- und Lehmboden der Berge und der Steppe, 28.4.1884 A. Becker [BP, BRNU, GJO, LI, WU]; – Gouv. Saratov, ad fl. Choper et Medwaditzam, ubique frequens, s. dat. s. coll., sub *E. versicolor* [PRC]; – Ex campis ad Wolgam inferiorem, haud procul Astrachan, V.1824 s. coll., sub *Ch. versicolor* [LE]; – Gouv. Saratow, Sarepta, Lehmboden, VI.1899 A. Becker, sub *E. versicolor* [BP, GZU]; – Fl. Rossica, merid.-orient. Gouv. Saratow, Sarepta, 1898 A. Becker, sub *E. andrzejovskianum* (rev. A. Polatschek 1984) [W]; – Gouv. Saratow, na kamenistih holmah Bicheva, 24.IV.1920 V.I. Dorofeev [MHA]; – Sarepta, s. dat. Kühlewein, sub *E. versicolor* (rev. A. Polatschek) [W]; – Orenburg, s. dat. A. Bunge, sub *E. versicolor*, sub *E. leucanthemum* (rev. A. Polatschek) [W]; – prope Semipalatinsk et in deserto Soongoro-Kirghisico, 1840 Karelin & Kiriloff, sub *E. versicolor* [W]; – Severo-Kavkaska, Groznenskaja Obl., Grozny, 8 km W Bakhilon, Dünen-Sandhügellandschaft, 12.V.1954 G.N. Nekli [W]; – Gouv. Stavropol, N. Kaukasus, Nikolaevskoje, 11.6.1906, I. Nopokrovski [LE]; – Fl. Caucasicca, Tarskoje Obl., Steppe W Kizlyar, 17.5.1906 Schelkovnikov, Kaznakov & Beljavski, sub *E. versicolor* [W].

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