# A new species record of *Tragopogon (Asteraceae)* for the Bulgarian flora

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- **Abstract.** *Tragopogon coelesyriacus (Asteraceae)* is reported for the first time for the Bulgarian flora. It has been recorded in several closely situated localities in the Eastern Rhodopi Mountains, all on the territory of Ivaylovgrad Municipality. The species is easily recognized by the other non-yellow flowering *Tragopogon* species in the Bulgarian flora by its very short ligules and long-beaked, buff-coloured to nearly whitish achenes. Brief morphological description of the taxon and a key for determination of the non-yellow flowering species in Bulgaria are provided. Chromosome number of 2n = 2x = 12 is reported. The genome size of the species is in the range 1C = 2.21 2.24 pg. Data about the distribution, habitats and populations of the species in the Bulgarian flora is provided. The text is amply illustrated.
- Key words: Bulgaria, chromosome number, genome size, new record, Tragopogon coelesyriacus.
- **Citation:** Vladimirov, V. & Stoyanov, S. 2022. A new species record of *Tragopogon (Asteraceae)* for the Bulgarian flora. -- Phytologia Balcanica, 28(3): 341-346 -- ISSN 1310-7771 (print), 1314-0027 (online).

### Introduction

So far, the genus *Tragopogon* L. (*Asteraceae*) has been represented by 10 species in the Bulgarian flora: *T. balcanicus* Velen., *T. dubius* Scop., *T. floccosus* Waldst. & Kit., *T. orientalis* L., *T. porrifolius* L. (*T. p.* subsp. *eriospermus* (Ten.) Greuter), *T. pratensis* L., *T. pterodes* Petrović, *T. samaritanii* Boiss., *T. stribrnyi* Hayek, and *T. tommasinii* Sch. Bip. (Greuter 2006+; Vladimirov & Tsoneva 2006; Assyov & Petrova 2012; Stoyanov & al. 2021). Field studies in the Eastern Rhodopi Mts revealed another taxon is present – *T. coelesyriacus* Boiss. The latter is distinctive with its pinkish-lilac (rarely to dirty yellowish) ligules, much shorter than the involucral bracts, and the very long-beaked achenes.

The aim of the present article is to report *T. coele-syriacus* for the first time for the Bulgarian flora and to provide some data about the Bulgarian population of the species.

#### Material and methods

Field studies were carried out in 2018–2022 in the floristic region of Rhodopi Mts (*Eastern*). Herbarium material was gathered for detailed morphological examination and stored in the Herbarium (SOM) of the Institute of Biodiversity and Ecosystem Research in Sofia. Additionally, ripe seeds were collected for obtaining live plants for studying the chromosome number and genome size of the species. Morphological characters were noted from the collected specimens and compared with data from relevant literature (e.g., Matthews 1975; Richardson 1976). Taxonomy and nomenclature of *Tragopogon* taxa mainly follows Greuter (2006+), with the exception of *T. pratensis* and *T. orientalis* which are treated as separate species (cf. WFO 2022).

To obtain the chromosome number, seeds were germinated on a Petri-dish. Root-tips were collected and pre-treated with 0.01% colchicine solution for *ca*. 90 min, then fixed in acetic alcohol (1:3) for at least

2 h at room temperature, hydrolysed in 1n HCl for 10 min at 60°C, stained in Gomori's haematoxylin (Melander & Wingstrand 1953) for 30 min at 60°C, and finally squashed in 45% acetic acid.

Genome size was estimated by a flow cytometer CyFLow SL Green (PARTEC, Germany) equipped with a green (532 nm) solid-state laser. Plant material (leaves) was obtained from young plants cultivated in pots from seeds collected from the field. The material was treated with CyStain PI Absolute P extraction and staining kit (SYSMEX), following the protocol provided with the kit. A piece of a fresh leaf of Tragopogon was co-chopped with a sharp razor-blade in 500 µl extraction buffer together with a piece of a fresh leaf of Pisum sativum 'Kleine Rheinländerin' (1C = 4.38 pg, Greilhuber & al. 2007) as an internal standard. The next steps were filtering of the extract and staining in a buffer containing RNAse and PI for one to two hours at room temperature in the dark. The sample was then measured at a rate of *ca*. 15–20







Fig. 2. *Tragopogon coelesyriacus*: flower head with yellowish ligulate florets (photo S. Stoyanov).

particles per second, with 5000 particles measured per run. Measurements were repeated 3–5 times for each sample.

## **Results and discussion**

*Tragopogon coelesyriacus* Boiss., Diagn. Pl. Orient. 11 (1849) 47 (Fig. 1)

Synonyms: *T. longirostris* Bischoff ex Sch. Bip., Hist. Nat. Iles Canaries 3(2; 2) (1850) 469, *T. porrifolius* subsp. *longirostris* (Sch. Bip.) Greuter in Willdenowia 33(2) (2003) 237.

Biennial. Stems arachnoid-hairy at base, glabrous above, 30–60(70) cm, unbranched or little branched near the base. Leaves slightly broadened near the base, narrowly linear above. Peduncles swollen, with a ring of simple eglandular hairs just below the capitula (Fig. 2). Involucral bracts 5–8, lanceolate, attenuate, 3–4 cm in flower, enlarging to 6–7 cm in fruit. Ligules pale lilac to pinkish-lilac, rarely dirty yellowish (Fig. 2), all more or less of the same length, more than twice shorter than involucrum. Achenes buff-coloured to nearly whitish, *ca.* 30–45 mm, with  $\pm$ 10 longitudinal rows of separate scales, with a slender beak about 1.5 times longer than body, white-clavate at apex. Pappus 25–30 mm, pale greyish-brown, annulus arachnoid-hairy. Flowering IV–V, fruiting V–VI.

*Tragopogon coelesyriacus* is distinguished from the other non-yellow flowering *Tragopogon* species in the Bulgarian flora by its very short, pinkish-lilac ligules and the long-beaked and very pale, buff-coloured achenes (Figs. 3, 4).

# Key to non-yellow flowering *Tragopogon* species in the Bulgarian flora:

- Body, at least of the outer achenes, with five rows of scales (longer than 1 mm) forming distinct wings; flowers pink or white-pinkish, ligules about 1.5 times longer than involucral bracts......*T. pterodes*
- 1\*. Body of all achenes unwinged (only with distinct scales less than 1 mm); flowers brownish, lilac, purple to violet, rarely whitish or dirty-yellowish, ligules equalling or shorter than involucral bracts .....2
- 2. Ligules violet-brownish, rarely whitish, ± equalling involucrum; achenes with a thick beak, ± equalling body of achene.....**T.** balcanicus
- 3. Leaves lanceolate, broadened in the lower part and broadly linear above, often with undulate margin; ligules slightly shorter than involucrum; receptacle non-tuberculate; beak of achene not or scarcely clavate at apex...*T. porrifolius* subsp. *eriospermus*



Fig. 3. Flower heads of non-yellow flowering *Tragopogon* species in the Bulgarian flora: A. *T. pterodes*, B. *T. balcanicus*, C. *T. porrifolius* subsp. *eriospermus*, D. *T. coelesyriacus*.



Fig. 4. Achenes of non-yellow flowering *Tragopogon* species in the Bulgarian flora: A. *T. pterodes*, B. *T. balcanicus*, C. *T. porrifolius* subsp. *eriospermus*, D. *T. coelesyriacus*.

**Habitats.** In Bulgaria, *Tragopogon coelesyriacus* grows on roadsides, eroded rocky slopes and sparsely vegetated dry grassland, at *ca.* 50–400 m a.s.l. In all known Bulgarian localities of the species, it forms small subpopulations usually comprising a few dozens

of plants, rarely to a few hundreds of individuals. The species exhibits pioneer behaviour inhabiting disturbed ground – eroded and roadside slopes. It has not been observed in densely vegetated grassland communities which suggests it is not a very competitive species.

Distribution in Bulgaria. Rhodopi Mts (Eastern): by the road from Ivaylovgrad town to Svirachi village, rocky roadside slope, ca. 225 m, 41.489692°N, 26.111122°E, 05.05.2018, coll. V. Vladimirov; loc. ibid., ca. 220 m, 41.48954°N, 26.11171°E, 15.05.2021, V. Vladimirov & S. Stoyanov obs.; loc. ibid., 225 m, 41.48995°N, 26.11028°E, 16.05.2021, coll. S. Stoyanov; by the road from Svirachi to Mandritsa villages, Ivaylovgrad Municipality, roadside slopes and grassland, 90-100 m, 41.44038°N, 26.13294°E, 15.05.2021, V. Vladimirov & S. Stoyanov obs.; by the road between Mandritsa and Dolno Lukovo villages, Ivaylovgrad Municipality, roadside and adjacent grassland, 100-110 m, 41.39072°N, 26.09629°E, 15.05.2021, V. Vladimirov & S. Stoyanov obs.; SW of Odrintsi village along the road to Mandritsa village, Ivaylovgrad Municipality, open grassy communities, 80 m, 41.42931°N, 26.12758°E, 16.05.2021, coll. S. Stoyanov; W of Byalgradets village, Ivaylovgrad Municipality, along the road towards Kazak village, open grassy communities, 240 m, 41.42122°N, 25.90417°E, 16.05.2021, coll. S. Stoyanov; between Byalgradets and Kazak villages, Ivaylovgrad Municipality, along the road, open grassy communities, 370 m, 41.41487°N, 25.88821°E, 16.05.2021, S. Stoyanov obs.; Likana locality between Svirachi and Odrintsi villages, Ivaylovgrad Municipality, roadside grassland vegetation, 180-190 m, 41.45069°N, 26.13567°E, 13.05.2022, coll. V. Vladimirov.

The species was observed some years ago independently by both authors in Mt Strandzha floristic region. However, neither herbarium specimens were collected nor recent observations were made. Therefore, the occurrence of the species in this floristic region needs confirmation.



**Fig. 5.** Metaphase plate of *Tragopogon coelesyriacus*, 2n = 12.

*General distribution.* SE Balkan Peninsula, Cyprus, Crete, SW Asia (Sinai Peninsula, Asia Minor, N Arabian Peninsula, to Afghanistan and Kazakhstan to the east) (Hassler 2022). In the Balkan Peninsula, the species has been so far recorded in Greece and Turkey-in-Europe (Greuter 2006+).

**Chromosome number and genome size.** The chromosome number was counted in roots obtained from three germinated achenes collected on 15.05.2021 from the locality between Ivaylovgrad town and Svirachi village. The individuals had the same chromosome number of 2n = 2x = 12 (Fig. 5). This count is congruent with previous reports from elsewhere (Ownbey & McCollum 1954 – from Israel, sub *T. longirostris*; Wilson 1983 – from Jordan, Lebanon and Turkey, sub *T. coelesyriacus*; Öztürk & al. 2009 & Gültepe & al. 2015 – from Turkish accessions, sub *T. porrifolius* subsp. *longirostris*).

The genome size varies in the range 1C = 2.21-2.24 pg (Table 1). This data is congruent with an earlier report for the species from the Lebanese flora (1C = 2.18 pg, Bou Dagher-Kharrat & al. 2013).

Table 1. Genome size in Tragopogon coelesyriacus plants from Bulgarian accessions.

Accession	1 <sup>st</sup> run [pg]	2 <sup>nd</sup> run [pg]	3 <sup>rd</sup> run [pg]	4 <sup>th</sup> run [pg]	5 <sup>th</sup> run [pg]	Mean [pg]	CV [%]
Rhodopi Mts ( <i>Eastern</i> ): W of Byalgradets village along the road towards Kazak village, 16.05.2021, SS	2.214	2.216	2.208			2.21	0.19
Rhodopi Mts ( <i>Eastern</i> ): W of Byalgradets village along the road towards Kazak village, 16.05.2021, SS	2.222	2.222	2.209			2.22	0.35
Rhodopi Mts ( <i>Eastern</i> ): W of Byalgradets village along the road towards Kazak village, 16.05.2021, SS	2.235	2.237	2.249			2.24	0.33
Rhodopi Mts ( <i>Eastern</i> ): roadside by the road from Ivay- lovgrad town to Svirachi village, 15.05.2021, VV & SS	2.226	2.230	2.218	2.237	2.195	2.22	0.73

Acknowledgements. This work was partly supported by the Bulgarian National Science Fund under the project 'Flora of the Republic of Bulgaria, vol. 12: Biological diversity in Asteraceae subfam. Carduoideae and Cichorioideae', Contract DN01/7 of 16.12.2016. Technical assistance of Mrs. Zoya Mitrinska for preparation of the slides for chromosome counting is gratefully acknowledged.

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