Hieracium petraeum (Asteraceae): a new casual record in the Bulgarian flora

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Abstract: The genus *Hieracium* is notorious for its taxonomic complexity due to its specific reproductive system involving normal sexual reproduction, hybridization, polyploidy, and apomixis. It is one of the largest genera worldwide and in the Bulgarian flora. So far, no alien *Hieracium* species has been reported for Bulgaria. However, fieldwork in the Rila Mts resulted in the discovery of a taxon of the *Hieracium amplexicaule* collective species (*Asteraceae*), alien for the Bulgarian flora. Due to their ornamental appearance, plants from this group have been cultivated for more than 70 years in the yard of Sitnyakovo, the former King's hunting lodge, and escaped specimens have recently been recorded in the nearby natural habitats. Most probably, they belong to *H. petraeum* (syn. *H. amplexicaule* subsp. *berardianum*). A concise morphological description of the Bulgarian material is provided and the alien status of the population is discussed. The genome size and ploidy level, 2n = 4x = 36, have been estimated by flow cytometry. The text is illustrated with colour photographs from the locality in the Rila Mts.

Key words: alien species, Compositae, genome size, Hieracium amplexicaule s.lat., new plant record, ploidy level

Introduction

The genus *Hieracium* is notorious for its taxonomic complexity due to its specific reproductive system involving normal sexual reproduction, hybridization, polyploidy, and apomixis. It is one of the largest genera worldwide, as well as in the Bulgarian flora. So far, no alien *Hieracium* species has been reported for Bulgaria. However, fieldwork in the Rila Mts, in the area of Sitnyakovo, the former King's hunting lodge, resulted in the discovery of an alien for the Bulgarian flora species of this genus.

The aim of the article is to report for the first time the occurrence of a taxon from the *Hieracium amplexicaule* s.lat. (*Asteraceae*) as an alien species in the Bulgarian flora and to discuss its status.

Material and methods

A single live plant was collected in 2012 from the locality in the Rila Mts near Sitnyakovo, the former King's hunting lodge, and was cultivated further in the experimental garden of the Institute of Biodiversity and Ecosystem Research in Sofia. Morphological characters were noted down for the specimens recorded in the escaped locality of the species in the Rila Mts and from the live specimen in the experimental garden, and compared with the morphological descriptions in literature (Zahn 1921; Sell & West 1976).

Genome size and ploidy level were estimated by flow cytometer CyFlow SL Green (PARTEC, Germany) equipped with a green (532 nm) solid-state laser. The plant material was treated by CyStain PI

Absolute P extraction and staining kit (PARTEC), following the protocol provided in the kit. The main steps were: a piece of a fresh leaf (about 0.5 cm²) of the Hieracium sample was co-chopped with a sharp razorblade together with $ca. 0.5 \text{ cm}^2$ of a fresh leaf of Pisum sativum 'Kleine Rheinländerin' (1C = 1Cx = 4.42 pg, Greilhuber & Ebert 1994) as internal standard in the extraction buffer; the extract was purified; the RNA was digested using RNAse; and DNA was stained with PI for one to two hours at room temperature in the dark. The samples were then measured at a rate of 10-20 nuclei per second, with 5000 nuclei for each measurement; three replicates were done for measurements with CV to 3 %, and five replicates for those with CV =3-5%. The terminology for the C-value follows Greilhuber & al. (2005).

Results and discussion

Morphological description of the plants from Bulgaria: Stems erect, 15–45 cm, branched above, with dense viscid yellowish or brownish glandular hairs and moderate stellate hairs mostly in the upper half.

Basal leaves numerous, in a pseudo-rosette, 3-15(20) \times 1–5 cm, oblong-spathulate to oblong-lanceolate, usually obtuse and mucronate, dentate, attenuate into a winged petiole; cauline leaves 3-8, $2-12 \times 1-5$ cm, elliptic, ovate to ovate-lanceolate, cordate to subcordate and auriculate-amlplexicaul at base, occasionally the lowermost shortly petiolate; all leaves green, with dense yellowish to brownish glandular hairs, occasionally with sparse eglandular hairs along the margin, on the mid-vein beneath and along the petiole. Synflorescence with 2-12(15) capitula. Acladium 1-5 cm; branches and peduncles with dense glandular and stellate hairs. Involucre $12-18 \times 9-16$ mm; involucral bracts in a few rows, $10-14 \times 1-2$ mm, linear-lanceolate, the outermost erecto-patent (Fig. 1), all with moderate to dense stellate and dense glandular hairs. Stigmas yellow. Achenes reddish-brown. Flowering VII-IX, fruiting VIII-X.

The plants in the Rila Mts (Fig. 2) undeniably belong to *H. amplexicaule* s.lat. Although very similar to *H. amlexicaule* s.str., they clearly differ from the latter species by the reddish-brown seeds (Fig. 3), which are blackish in *H. amplexicaule* s.str. Most likely, the plants in the Bulgarian locality belong to *H. petraeum*



Fig. 1. Hieracium petraeum: synflorescence (photo V. Vladimirov).



Fig. 2. Hieracium petraeum: the entire plant (photo V. Vladimirov).

Bluff & Fingerh. [syn. *H. amplexicaule* subsp. *berardianum* (Arv.-Touv.) Zahn].

The taxa of *Hieracium amplexicaule* s.lat. are easily distinguished from all native species of *Hieracium* s.str. in the Bulgarian flora by the presence of dense and conspicuous glandular hairs on the leaves.

Distribution in Bulgaria: Rila Mts, along a dirt road and at a *Picea abies* forest margin near to Sitnyakovo, the former King's hunting lodge, *ca.* 1750 m a.s.l., 42.24398°N, 23.61436°E, 20.07.2000 & 21.07.2004, *V. Vladimirov* obs.; 05.08.2012, coll. *V. Vladimirov*; 16.09.2018, *V. Vladimirov* obs. (photos).

The taxon has been cultivated for a long time (at least since the first half of 20th century) at the hunting lodge as an ornamental species on a small stone wall. The plants flower and set seeds each year, and when cut and cleaned after the first flowering and fruiting period in July-August, they manage to re-grow and flower for a second time in September.

General distribution: Both *Hieracium amplexicaule* s.lat. and *H. petraeum* are native to Central and Southwest Europe and Northwest Africa. On the Balkan



Fig. 3. Hieracium petraeum: seeds (photo V. Vladimirov).

Peninsula, *H. petraeum* has been recorded as native to Albania, Bosnia and Herzegovina, Croatia, Slovenia, and as 'doubtfully present' in Greece (Greuter 2006+). However, the records for Albania are doubtful (cf. Barina & al. 2018: 58, status 'occurrence not proven'). Within their native range, the taxa within this collective species are typical for the mountain rocks and are mainly calcicolous (Sell & West 1976). Some of the segregate species are grown as ornamentals and often escape from cultivation and naturalize on old walls (Sell & West 1976).

Genome size and ploidy level: Genome size of 1C = 7.26 pg and 1Cx = 3.63 pg has been estimated in the single live specimen collected in the Rila Mts. These values are very close to those published by Chrtek & al. (2009) for *H. amplexicaule* s.lat. from Italy (1C = 7.33 pg, 1Cx = 3.67 pg). This genome size corresponds to a tetraploid chromosome number of 2n = 4x = 36, which confirms some earlier counts within the collective species *H. amplexicaule* (e.g. Gentcheff & Gustafsson 1940, Chrtek & al. 2007, 2009). So far, a triploid chromosome number, 2n = 3x = 27 has been reported for *H. petraeum* from Austria (sub *H. amplexicaule* subsp. *berardianum*) (Schuhwerk & Lippert 1999), as well as for *H. amplexicaule* s.str. (e.g. Chrtek & al. 2007, 2009 and references therein).

Origin of the Bulgarian population: Due to its ornamental appearance, the species has been cultivated for more than 70 years on a stone wall (Fig. 4) at Sitnyakovo, the former King's hunting lodge in the Rila Mts, from where it occasionally escapes to the adjacent territories (Fig. 5). The most likely means of escape is either by seeds from the wall or from cut stems with ripe seeds thrown in the nearby forest after cleaning the wall, or by both. Only a few (e.g. three in 2018) to over a dozen of specimens have been observed across the years along the forest road. The plants flower and set seeds.

A wider establishment of *H. amplexicaule* in the region is prevented by the very dense native vegetation and by the lack of open spaces along the road for germination of the seeds and survival of the seedlings. The flora along the road and on the edge of the forest margin is represented mostly by tall herbaceous species or shrubs: *Alchemilla* spp., *Campanula patula*, *Chenopodium bonus-henricus*, *Dactylis glomerata*, *Heracleum verticillatum*, *Plantago major*, *Ranunculus*



Fig. 4. *Hieracium petraeum* cultivated on a stone wall in the yard of Sitnyakovo, the former King's hunting lodge in the Rila Mts, Bulgaria (photo V. Vladimirov).

repens, Rubus idaeus, Rumex alpinus, Telekia speciosa, Trifolium pratense, T. repens, and Urtica dioica. However, if seeds of the alien species happen to be dispersed by the wind to rocks, the chances of establishment will be much higher.

Taking into account the concepts and definitions provided by Richardson & al. (2000), the species should be considered presently a casual taxon in the Bulgarian flora, since a well-established population has not been observed yet and the appearance and establishment of individuals in the wild depends on the seed-set from the cultivated plants.

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Fig. 5. *Hieracium petraeum*: an escape in the wild in the Rila Mts, Bulgaria (photo V. Vladimirov).

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