

CHROMOSOME NUMBERS IN *HIERACIUM* (ASTERACEAE) FROM CENTRAL AND SOUTHEASTERN EUROPE III

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Chromosome numbers for 13 species of *Hieracium* L. s.str. from Bulgaria, Macedonia, Poland and Romania are given and their metaphase plates are illustrated. Chromosome numbers are published for the first time for *H. djimilense* s.lat. $2n=3x=27$, *H. fiekii* R. Uechtr. $2n=3x=27$, *H. glabrescens* (F. W. Schultz) Murr $2n=3x=27$, *H. juranomorphum* Zahn $2n=3x=27$, *H. sparsiflorum* subsp. *sparsiceps* Zahn $2n=3x=27$ and *H. sparsum* subsp. *naegelianiforme* Behr & Zahn $2n=3x=27$.

Keywords: Asteraceae, chromosome number, Europe, *Hieracium*, karyotype

INTRODUCTION

The paper is the third of a series concerning the karyological investigation of *Hieracium* L. in Central and Southeastern Europe (Musiał and Szelać, 2015; Musiał et al., 2016). Here we present the chromosome numbers for 13 species of *Hieracium* from 20 localities in Bulgaria, Macedonia, Poland and Romania, including an undescribed species of the *H. djimilense* aggregate from Bulgaria which is the subject of ongoing studies.

This study is a continuation of karyological investigations of *Hieracium* L. consistently conducted in the last decade at the Department of Plant Cytology and Embryology of the Jagiellonian University (Szelać et al., 2007; Ilnicki et al., 2010; Ilnicki and Szelać, 2011; Szelać and Ilnicki, 2011).

MATERIAL AND METHODS

The seeds for cytological investigations were collected by ZS from plants in nature or in an experimental garden, and germinated on moistened filter paper in Petri dishes. The karyological

analysis was performed as given by Marciniuk et al. (2012) with some modifications applied in the later studies (Wolanin and Musiał, 2017).

RESULTS AND DISCUSSION

Hieracium bifidum s.lat.; $2n=3x=27$ (Fig. 1a)

1. Poland, Wyżyna Krakowsko-Częstochowska upland, Biakło hill, 320 m a.s.l., calcareous rocks with *Festuca pallens* (plants with glabrous leaves) (Fig. 1a).
2. Poland, Wyżyna Krakowsko-Częstochowska upland, Biakło hill, 330 m a.s.l., calcareous rocks with *Festuca pallens* (plants with hairy leaves).
3. Poland, Wyżyna Krakowsko-Częstochowska upland, Zielona Góra hill, 340 m a.s.l., calcareous rocks with *Allium montanum*.
4. Poland, Wyżyna Krakowsko-Częstochowska upland, Góra Zamkowa hill, 330 m a.s.l., calcareous rocks with *Galium cracoviense*.

Hieracium bifidum s.lat.; $2n=4x=36$ (Fig. 1b)
Poland, Wyżyna Krakowsko-Częstochowska upland, Duże Towarne hill, 310 m a.s.l., calcareous rocks with *Galium cracoviense*.

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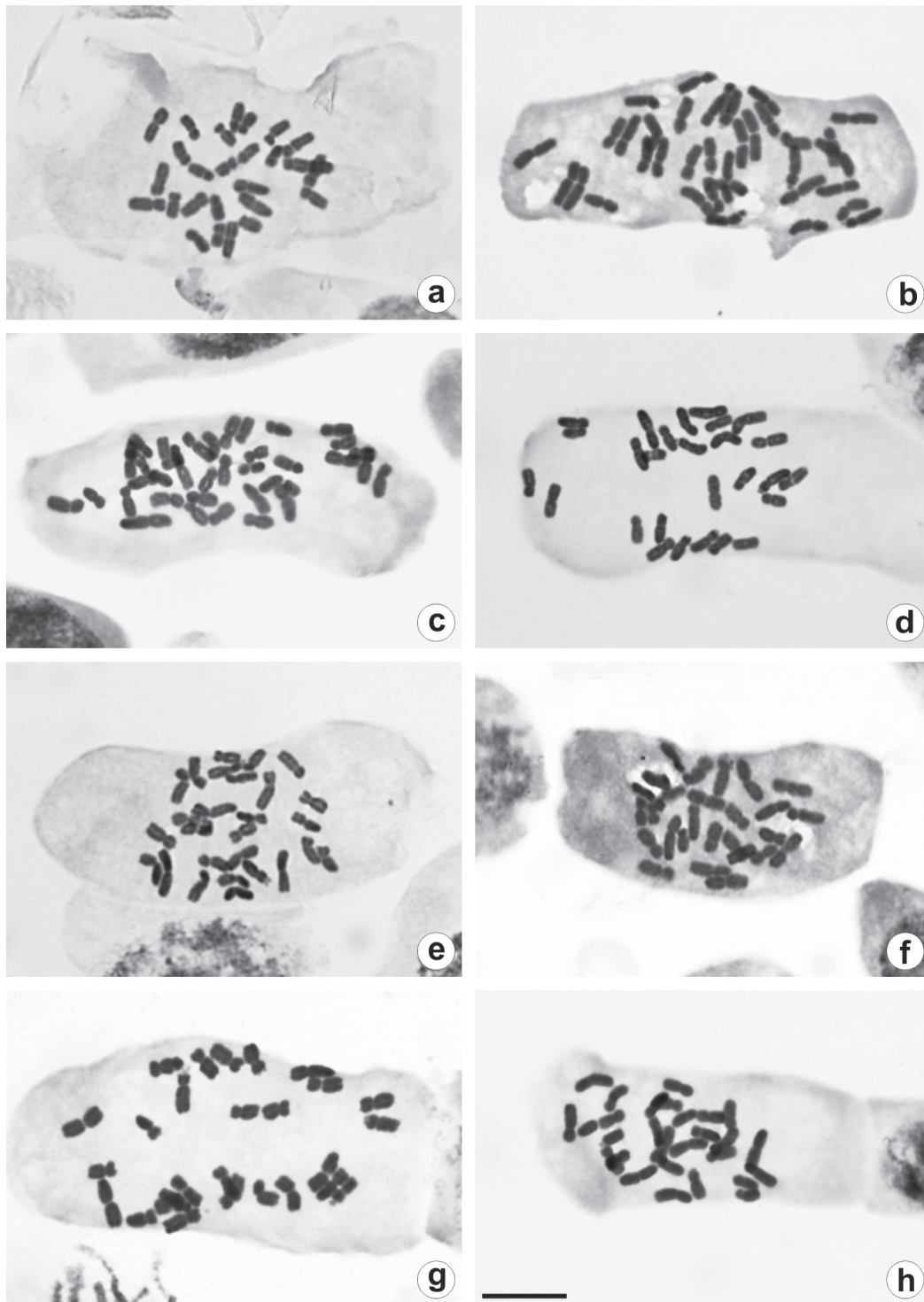


Fig. 1. Metaphase plates of: (a) *Hieracium bifidum* s.lat. $2n = 27$, (b) *H. bifidum* s.lat. $2n = 36$, (c) *H. chlorocephalum* $2n = 36$, (d) *H. djimilense* s.lat. $2n = 27$, (e) *H. fiekii* $2n = 27$, (f) *H. glabrescens* $2n = 27$, (g) *H. glaucinum* $2n = 27$, (h) *H. juranomorphum* $2n = 27$. Scale bar in h = 10 μm and corresponds to all figures.

Our chromosome counts well match those previously published for *H. bifidum* s.lat. (e.g., Goldblatt and Johnson, 1979; Schuhwerk and Lippert, 1999; Mráz and Szlag, 2004; Ilnicki and Szlag, 2011).

Hieracium chlorocephalum R. Uechtr.; $2n=4x=36$ (Fig. 1c)

Poland, Western Sudetes, Karkonosze Mts., Mały Śnieżny Kocioł glacial cirque (*locus classicus* of the species), 1350 m a.s.l., basalt rock crevices.

Our data confirm the chromosome number published by Chrtek (1996).

Hieracium djimilense s.lat.; $2n=3x=27$ (Fig. 1d)

Bulgaria, Pirin Mts., between Banderishka poljana and Banderica hut, 1750 m a.s.l., rocky slope along a road in a *Picea abies* forest.

This is the first chromosome number for this collective species of the morphological formula *H. prenanthoides* – *H. sparsum*. The analyzed plants represent a previously undescribed species, morphologically similar to *H. djimilense* subsp. *nigradorsum* (Urum. & Zahn) Zahn (Szlag and Vladimirov, in prep.).

Hieracium fiekkii R. Uechtr.; $2n=3x=27$ (Fig. 1e)

Poland, Western Sudetes, Karkonosze Mts., Kocioł Łomniczki glacial cirque (*locus classicus* of the species), 1210 m a.s.l., grassy places in *Pinus mugo* communities, on granite.

This is the first chromosome number for this species endemic to the Western Sudetes, which belongs to the *Hieracium prenanthoides* aggregate.

Hieracium glabrescens (F. W. Schultz) Murr; $2n=3x=27$ (Fig. 1f)

Romania, Apuseni Mts., Cheile Ordâncușei gorge, 800 m a.s.l., calcareous rocks along the road at the bottom of the gorge.

It is the only known extant occurrence of the species in the entire Carpathians (Szlag, 2016a).

This is the first chromosome number for this species.

Hieracium glaucinum Jord. $2n=3x=27$ (Fig. 1g)

1. Poland, Western Sudetes, Karkonosze Mts., Mt. Chojnik 610 m a.s.l., granite rocks on *Fagus sylvatica* forest margin with *Hieracium schmidtii*.

2. Poland, Western Sudetes, Karkonosze Mts., Biały Jar glacial cirque, 1170 m a.s.l., on eroded porphyry rocks with *Hieracium schmidtii* (Fig. 1g).

This is the first chromosome number for the species from Poland which confirms the previously published counts from Spain (Castro et al., 2007).

Hieracium juranomorphum Zahn; $2n=3x=27$ (Fig. 1h)

Bulgaria, Vitosha Mts. (*locus classicus* of the species), Mecha poliana, 1750 m a.s.l., *Picea abies* forest margin, on granite.

This is the first chromosome number report for this species endemic to Bulgaria.

Hieracium morisianum Rchb fil.; $2n=3x=27$ (Fig. 2a)

Romania, Southern Carpathians, Mehedinți Mts., La Scărița west of the Poiana Țăsnei glade, 850 m. a.s.l., calcareous scree.

This chromosome number confirms the number counted in plants from the Western Carpathians (Chrtek et al., 2004) and Bavarian Alps (Schuhwerk, 2010).

Hieracium schmidtii Tausch; $2n=3x=27$ (Fig. 2b)

1. Poland, Western Sudetes, Karkonosze Mts., Biały Jar glacial cirque, 1170 m a.s.l., on eroded porphyry rocks.

2. Poland, Western Sudetes, Karkonosze Mts., Mt. Chojnik 610 m a.s.l., granite rocks on *Fagus sylvatica* forest margin (Fig. 2b).

Our chromosome number well matches those for plants from the Czech part of the mountains (Chrtek, 1996).

Hieracium sparsiflorum subsp. *sparsiceps* Zahn; $2n=3x=27$ (Fig. 2c)

Bulgaria, Rhodope Mts., Pamparovo, 41°38'09"N/24°42'03"E, grassy slope along the road to Smoljan, 1660 m a.s.l.

This is the first chromosome number for this taxon known from several localities in southern Bulgaria.

Hieracium sparsum subsp. *naegelianiforme* Behr & Zahn; $2n=3x=27$ (Fig. 2d)

1. Macedonia, Korab Mts., along the road from Stirovica valley to Dlaboka Reka valley, 1790 m a.s.l. (*locus classicus* of the subspecies), rocky slope on *Fagus sylvatica* forest margin.

2. Macedonia, Baba Mts., Mt. Kozji Kamen, 2100 m a.s.l., subalpine grassland on schist (new locality of the subspecies) (Fig. 2d).

This is the first chromosome number for this taxon known from a few localities in Macedonia.

Hieracium wimmeri R. Uechtr.; $2n=3x=27$ (Fig. 2e)

Poland, Western Sudetes, Karkonosze Mts., Mały Śnieżny Kocioł glacial cirque, 1280 m a.s.l., basalt rock crevices.

This is the first chromosome number for the species from Poland, which confirms the previously published counts from Czechia (Chrtek, 1994).

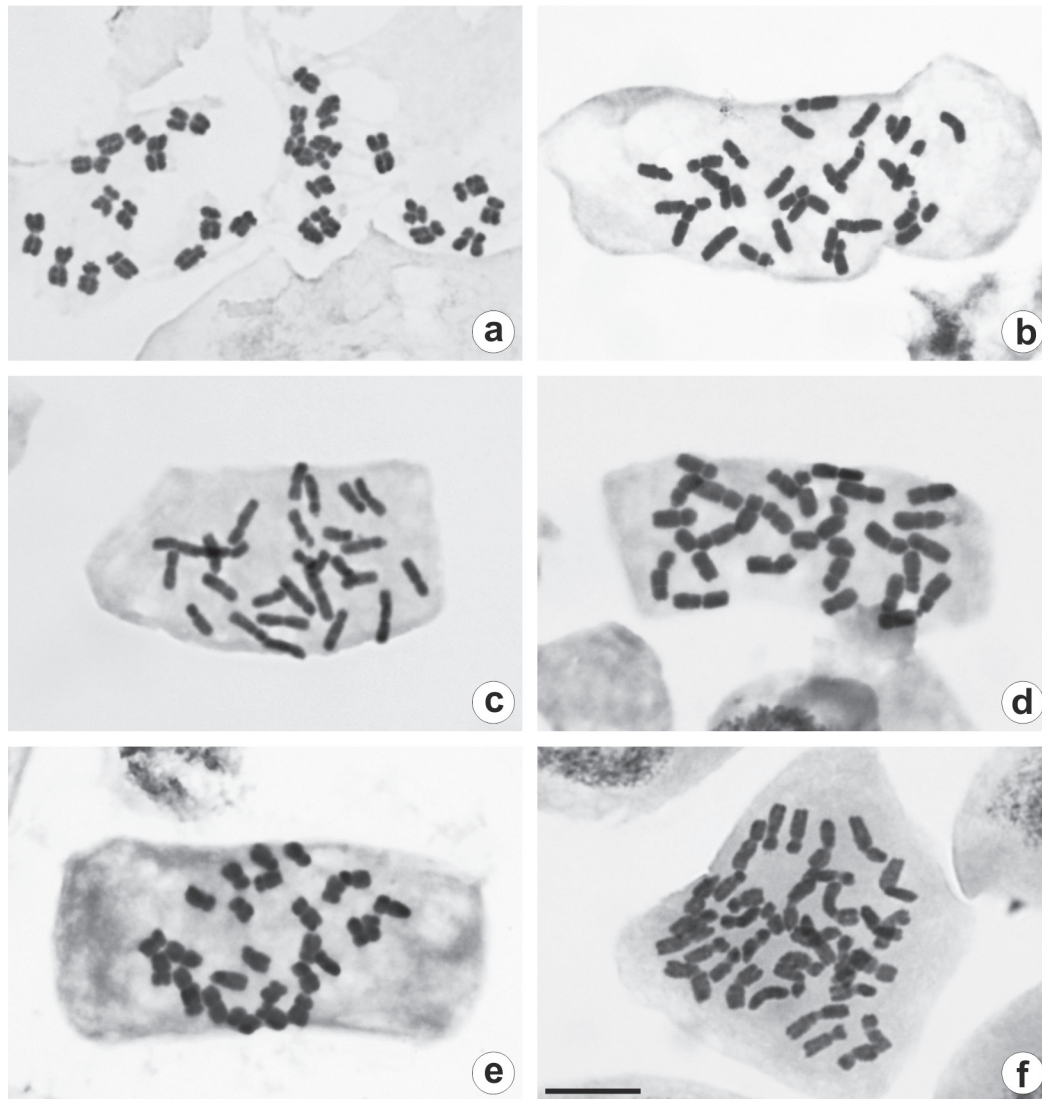


Fig. 2. Metaphase plates of: (a) *Hieracium morisianum* $2n=3x=27$, (b) *H. schmidtii* $2n = 27$, (c) *H. sparsiflorum* subsp. *sparsiceps* $2n = 27$, (d) *H. sparsum* subsp. *naegelianiforme* $2n = 27$, (e) *H. wimmeri* $2n = 27$, (f) *H. zanogae* $2n = 36$. Scale bar in f = $10 \mu\text{m}$ and corresponds to all figures.

Hieracium zanogae Pax; $2n = 4x = 36$ (Fig. 2f)

Romania, Southern Carpathians, Parâng Mts., western slope of Mt. Coricia, 150 m south of the Mănăstirea Jieț, 1360 m a.s.l., slates along road No. DN7A.

It is the only locality of the species outside the Retezat Mts. (Szeląg, 2017). The same chromosome number was published from the Retezat Mts. (Ilnicki and Szeląg, 2011) for *H. tubulare* Nyár., a species considered conspecific with *H. zanogae* (Szeląg, 2016b).

AUTHORS' CONTRIBUTION

KM and AJ – karyological analysis, preparation of figures and interpretation of results; ZS – idea, sampling and drafting of manuscript. The authors have declared that there is no conflict of interest.

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REFERENCES

- CASTRO M, MATEO G, and ROSSELLÓ JA. 2007. Chromosome numbers in *Hieracium* and *Pilosella* species (Asteraceae) from the Iberian Peninsula and the Balearic Islands. *Botanical Journal of the Linnean Society* 153: 311–320.
- CHRTEK J. 1994. Chromosome numbers in selected *Hieracium* species in the Krkonoše Mts. (the West Sudeten). *Folia Geobotanica et Phytotaxonomica* 29: 91–100.
- CHRTEK J. 1996. Chromosome numbers in selected species of *Hieracium* (Compositae) in the Sudeten Mts. and the Western and Ukrainian Eastern Carpathians. *Fragmenta Floristica et Geobotanica* 41: 783–790.
- CHRTEK J, MRÁZ P and SEVERA M. 2004. Chromosome numbers in selected species of *Hieracium* s.str. (*Hieracium* subgen. *Hieracium*) in the Western Carpathians. *Preslia* 76: 119–139.
- GOLDBLATT P and JOHNSON DE. [eds.] 1979. *Index to plant chromosome numbers*. Missouri Botanical Garden, St. Louis. (<http://mobot.mobot.org/W3T/Search/ipcn.html>)
- ILNICKI T, HASTEROK R, and SZELĄG Z. 2010. Cytogenetic analysis of *Hieracium transylvanicum* (Asteraceae). *Caryologia* 63: 192–196.
- ILNICKI T, and SZELĄG Z. 2011. Chromosome numbers in *Hieracium* and *Pilosella* (Asteraceae) from Central and Southeastern Europe. *Acta Biologica Cracoviensia Series Botanica* 53(1): 102–110.
- MARCINIUK P, MUSIAŁ K, JOACHIMIĄK AJ, MARCINIUK J, OKLEJEWICZ K and WOLANIN M. 2012. *Taraxacum zajacii* (Asteraceae), a new species from Poland. *Annales Botanici Fennici* 49: 387–390.
- MRÁZ P, and SZELĄG Z. 2004. Chromosome numbers and reproductive systems in selected species of the genera *Hieracium* L. and *Pilosella* Hill (Asteraceae) from Romania. *Annales Botanici Fennici* 41: 405–414.
- MUSIAŁ K, and SZELĄG Z. 2015. Chromosome numbers in *Hieracium* (Asteraceae) from Central and Southeastern Europe I. *Acta Biologica Cracoviensia Series Botanica* 57(2): 115–120.
- MUSIAŁ K, JANAS A, and SZELĄG Z. 2016. Chromosome numbers in *Hieracium* (Asteraceae) from Central and Southeastern Europe II. *Acta Biologica Cracoviensia Series Botanica* 58(1): 119–123.
- SCHUHWERK F. 2010. Chromosomenzahlen von *Hieracium* (Compositae, Cichorieae) – Teil 5. *Berichte der Bayerischen Botanischen Gesellschaft* 80: 141–160.
- SCHUHWERK F, and LIPPERT W. 1999. Chromosomenzahlen von *Hieracium* (Compositae, Lactuceae) Teil 3. *Sendtnera* 6: 197–214.
- SZELĄG Z. 2016a. *Hieracium glabrescens* (Asteraceae) rediscovered in the Carpathians. *Polish Botanical Journal* 61: 263–265.
- SZELĄG Z. 2016b. Identity and neotypification of *Hieracium zanogae* (Asteraceae), endemic to the Southern Carpathians. *Phytotaxa* 257(2): 198–199.
- SZELĄG Z. 2017. A new species and a new range extension in *Hieracium* sect. *Cernua* (Asteraceae) from Romania. *Phytotaxa* 309(2): 173–178.
- SZELĄG Z, and ILNICKI T. 2011. Diploid chromosome numbers in *Hieracium* and *Pilosella* (Asteraceae) from Macedonia and Montenegro. *Acta Biologica Cracoviensia Series Botanica* 53(2): 124–126.
- SZELĄG Z, ILNICKI T, NIKETIĆ M, and TOMOVIĆ G. 2007. Diploid chromosome numbers in five *Hieracium* species from Serbia and Montenegro. *Acta Biologica Cracoviensia Series Botanica* 49(1): 119–121.
- WOLANIN MM, and MUSIAŁ K. 2017. Chromosome numbers in 11 species of *Taraxacum* section *Erythrosperma* DT. from Poland. *Acta Biologica Cracoviensia Series Botanica* 59(2): 77–82.