

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

ALEKSANDRA GRABOWSKA-JOACHIMIAK¹  AND ZBIGNIEW SZELAG^{2*} 

¹Department of Plant Breeding, Physiology and Seed Science, University of Agriculture in Kraków,
Łobzowska 24, 31-140 Kraków, Poland

²University of the National Education Commission, Institute of Biology and Earth Sciences,
Podchorążych 2, 30-084 Kraków, Poland

Received May 7, 2026; revision accepted June 15, 2025

Chromosome numbers of 14 *Hieracium* s.str. species from Czechia, Poland, Romania and Slovakia are presented and their metaphase plates are illustrated. Chromosome numbers are published for the first time for *H. caesnense* Szelag $2n = 4x + 1 = 37$, *H. hugoi* Szelag $2n = 4x = 36$, *H. liptoviense* subsp. *amaurotheca* Schack & Zahn $2n = 3x = 27$, *H. moravicum* Oborny $2n = 4x = 36$, *H. oycoviense* Szelag $2n = 5x = 45$, *H. villosum* subsp. *undulifolium* Nägeli & Peter $2n = 3x = 27$, as well as three undescribed species of the *H. laevigatum* agg. $2n = 3x = 27$, *H. ramosum* agg. $2n = 4x = 36$ and *H. rohacsense* agg. $2n = 4x = 36$.

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

INTRODUCTION

This paper continues a series of publications dedicated to karyological research on the genus *Hieracium* L. in Central and Southeastern Europe. Hitherto the chromosome numbers of 136 species from nearly 170 populations have been determined (Grabowska-Joachimiak and Szelag, 2025; Musiał and Szelag, 2015, 2019, 2023; Musiał et al., 2016, 2017, 2018, 2020, 2024).

We report the chromosome numbers of 14 *Hieracium* s.str. species from Czechia, Poland, Romania and Slovakia. These data may contribute to a better understanding of the phylogenetic relationships within this highly taxonomically intricate genus.

MATERIAL AND METHODS

The seeds used for karyological analyzes were collected either from plants growing in the wild or from plants cultivated by the second author in an experi-

mental garden. Voucher specimens of the analyzed taxa are deposited in the author's herbarium.

Plants obtained from the seeds were grown in a vegetation room (temp. 19 °C, photoperiod 12/12 h) of the Department of Plant Breeding, Physiology and Seed Science, University of Agriculture in Kraków. Young roots were collected, incubated in saturated aqueous solution of α -bromonaphthalene for 24 h at 4 °C, then fixed in a mixture of glacial acetic acid and absolute ethanol (1:3, v/v). Subsequently, they were treated with 1 M HCl at 60 °C for 10 min. For slide preparation, root tips were cut off and squashed in a drop of 45% acetic acid. The squashes were frozen, air-dried and stained with 0.1% aqueous solution of toluidine blue. Then, the slides were thoroughly air-dried and mounted in Entellan New®. For chromosome counting 10-15 well-spread metaphases were selected and photographed using a Nikon Eclipse E800 microscope equipped with a Nikon DS-2MBWc camera and the NIS Elements software.

RESULTS AND DISCUSSION

Hieracium caesium s.lat. $2n = 4x = 36$ (Fig. 1a)

1. Poland, Western Carpathians, Babia Góra Massif, lower part of the Szeroki Żleb couloir, 1410 m a.s.l., sandstone rock with *Saxifraga paniculata*.
2. Poland, Western Carpathians, Babia Góra Massif, NE slope of the Kościółek Zachodni ridge, on steep rocks with the *Saxifraga-Festucetum versicoloris* community, 1560 m a.s.l. (plants with deep brownish-purple spotted leaves).

Our results well match those previously published for *H. caesium* s.lat. from Austria, Germany, Poland and Sweden (Schuhwerk and Lippert, 1999; Chrtek et al., 2007; Musiał and Szelać, 2023; Musiał et al., 2024).

Hieracium caesnense Szelać $2n = 4x + 1 = 37$ (Fig. 1b)

Romania, Mehedinți Mountains, Țăsna Gorge, south-facing calcareous scree ca. 80 m north of the waterfall in the upper part of the canyon, 660 m a.s.l. A recently described species of *H. sect. Villosa*, endemic to the Mehedinți Mts. in Romania (Szelać, 2026a).

Each of the five analyzed individuals showed an aneuploid chromosome number ($2n = 37$). Such aneuploidy was reported by Stace et al. (1995) in two plants of *H. macrocarpum* (*H. sect. Alpina*) from a British population, in which they co-occurred with typical tetraploids. The chromosome number $2n = 37$ has also been noted in *Hieracium gothicoides* (*H. sect. Tridentata*) (Thomas et al., 2011). According to the authors, the aneuploid count was due to chromosome breakage. This possibility cannot be completely ruled out in the case of *H. caesnense* but it requires further detailed verification.

The exceptional occurrence of extra chromosomes can be expected in natural *Hieracium* populations as a result of complex hybridization processes and meiotic abnormalities, but reports on this subject are very scarce and should therefore be treated with great caution.

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

Slovakia, Western Carpathians, Veľká Fatra Mts., W slope of Mt. Krížna, rocky-grassy places along a tourist trail, 1400–1430 m a.s.l.

The same number of chromosomes was found in plants from the Karkonosze Mts. (Chrtek, 1996; Musiał et al., 2017).

This is the first locality of *H. chlorocephalum* outside the Sudetes. Comparison of plants grown in the garden from both the Karkonosze Mts. and Veľká Fatra Mts. did not reveal any morphological differences between them.

Hieracium hugoi Szelać $2n = 4x = 36$ (Fig. 1d)

Poland, Western Carpathians, Mt. Babia Góra Massif, NE slope of the Kościółek Zachodni ridge, tall-herb vegetation on sandstone slope above the Kamienna Dolinka valley, 1550–1570 m a.s.l.

A recently described species of the *H. epimedium* agg., endemic to Babia Góra Massif, grows on the Polish side of the massif (Szelać, 2026b).

Hieracium laevigatum agg. $2n = 3x = 27$ (Fig. 1e)

Poland, southern Baltic coast, Rozewie cape, outcrops of gray clay on an eroded cliff, 5 m a.s.l. Plants with deeply serrate leaves and peduncles with glandular hairs.

The analyzed plants represent a new species and will be the subject of further studies. In their general habit, they are similar to *H. pseudofioniae* Wiinstedt from Bornholm Island and *H. subramosum* Lönnroth from Sweden.

Hieracium levicaule s.lat. $2n = 3x = 27$ (Fig. 1f)

Poland, Western Carpathians, Babia Góra Massif, Mt. Sokolica, grassy places in *Pinus mugo* thickets along a tourist path, 1360 m a.s.l.

The same chromosome number was also found in plants from Great Britain (Morton, 1974) and Poland (Musiał and Szelać, 2015, 2019).

Hieracium liptoviense subsp. *amaurotheca* Schack & Zahn $2n = 3x = 27$ (Fig. 1g)

Poland, Sudetes, Karkonosze Mts., Czarny Kocioł glacial cirque, 1120 m a.s.l., loose *Picea abies* forest on granite.

This is the first chromosome number for this taxon endemic to the Karkonosze Mts.

Hieracium moravicum Oborny $2n = 4x = 36$ (Fig. 1h)

Czechia, Sudetes, Hrubý Jeseník Mts., Vřesová studánka, subalpine grassland on silicate rocks, 1320 m a.s.l.

This is the first chromosome number for this species belonging to the *H. epimedium* agg. (Kocián and Chrtek, 2017).

Hieracium moravobarbatum Szelać $2n = 4x = 36$ (Fig. 2a)

Poland, Kraków-Częstochowa Upland, north-facing, calcareous slope along the road from the village of Skala to the Prądnik valley, among open *Pinus sylvestris* thickets, at 370 m a.s.l.

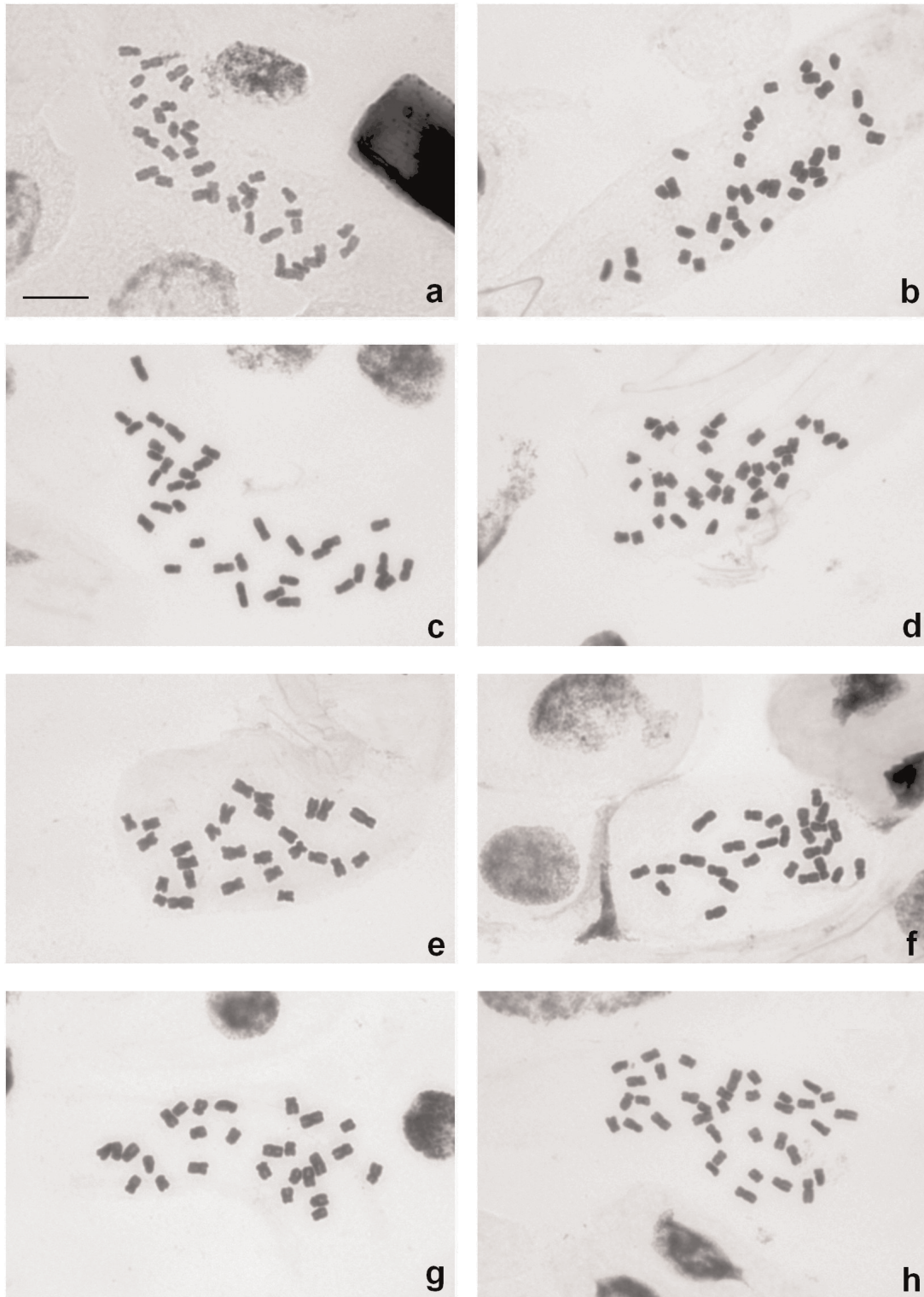


Fig. 1. Metaphase plates of: (a) *Hieracium caesium* s.lat. $2n=4x=36$, (b) *H. caesnense* $2n=4x+1=37$, (c) *H. chlorocephalum* $2n=4x=36$, (d) *H. hugoi* $2n=4x=36$, (e) *H. laevigatum* agg. $2n=3x=27$, (f) *H. levicaule* s.lat. $2n=3x=27$, (g) *H. liptoviense* subsp. *amaurotheca* $2n=3x=27$, (h) *H. moravicum* $2n=4x=36$. Scale bar = 10 μm

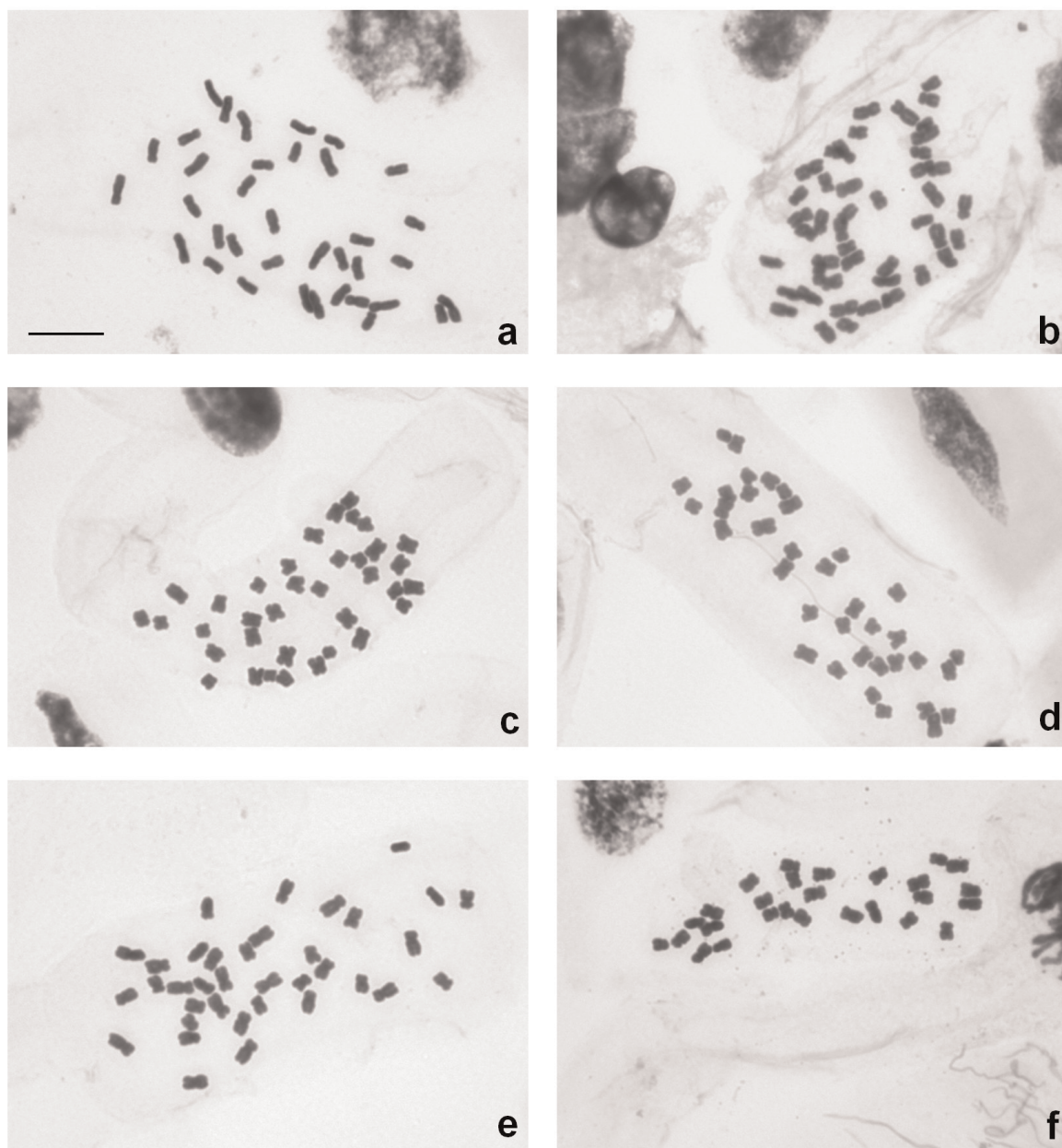


Fig. 2. Metaphase plates of: (a) *Hieracium moravobarbatus* $2n=4x=36$, (b) *H. oycoviense* $2n=5x=45$, (c) *H. racemosum* agg. $2n=4x=36$, (d) *H. rohacsense* agg. $2n=4x=36$, (e) *H. stygium* $2n=4x=36$, (f) *H. villosum* subsp. *undulifolium* $2n=3x=27$. Scale bar = 10 μ m

The species belongs to the *H. racemosum* agg.; its locality in Ojców National Park is the northernmost site of the whole *H. racemosum* agg. in Europe. Our data confirm the chromosome number published by Musiał et al. 2018 (as *H. barbatum*).

Hieracium oycoviense Szelag $2n = 5x = 45$ (Fig. 2b)

Kraków-Częstochowa Upland, north-facing, calcareous slope along the road from the village

of Skała to the Prądnik valley, among open *Pinus sylvestris* thickets, at 360 m a.s.l.

A recently described species combining morphological features of Scandinavian *H. oistophyllum* and an indefinite taxon of the sub-Mediterranean *H. racemosum* aggregate (Szelag, 2026c).

It is worth noting here that in the genus *Hieracium* s.str., pentaploid taxa are extremely rare (Chrtek, 1996; Grabowska-Joachimciak and

Szelag, 2025; Mráz, 2001; Musiał and Szelag, 2023; Pulkina and Tupitsyna, 2000; Sell and Murrell, 2006; Tennant and Rich, 2008).

Hieracium ramosum agg. $2n = 4x = 36$ (Fig. 2c)

Poland, southern Baltic coast, Rozewie cape, outcrops of gray clay on an eroded cliff, 5 m a.s.l. Plants with denticulate leaves and peduncles without glandular hairs.

The analyzed plants are morphologically similar to *H. orbolense* Dahlst. from Scandinavia. Their taxonomic position requires further studies.

Hieracium rohacsense agg. $2n = 4x = 36$ (Fig. 2d)

Poland, Sudetes, Karkonosze Mts., NW of the Wielki Staw glacial lake, on the margins of *Pinus mugo* thickets along a tourist path from the Polana glade to main ridge of the mountains, 1280 m a.s.l. (plants with brownish-purple spotted leaves).

The analyzed plants represent a new species of the *H. rohacsense* agg. and will be the subject of further studies.

Hieracium stygium R. Uechtr. $2n = 4x = 36$ (Fig. 2e)

Poland, Western Carpathians, Babia Góra Massif, E slope of Mt. Cyl, grassy places in *Pinus mugo* thickets, 1450 m a.s.l.

Our data confirm the previously published chromosome number for this species from the Eastern Sudetes and Western Carpathians (Chrtek, 1996; Ilnicki and Szelag, 2011; Mráz, 2001).

Hieracium villosum subsp. *undulifolium* Nägeli & Peter $2n = 3x = 27$ (Fig. 2f)

Czechia, Sudetes, Hrubý Jeseník Mts., Velká Kotlina glacial cirque, Mildeho skalka, silicate rock crevices 1285 m a.s.l.

This is the first chromosome number for this taxon, which in the Hrubý Jeseník Mts. occurs only in the Velká Kotlina glacial cirque (Kocián and Chrtek, 2017).

AUTHORS' CONTRIBUTION

AG-J – karyological analysis, preparation of figures, interpretation of results, writing – review and editing; ZS – sampling and drafting of manuscript. The authors have declared that there is no conflict of interest.

ACKNOWLEDGEMENTS

This work was supported by the scientific subsidy of the Polish Ministry of Science and Higher Education (SUB/D017) for the University of Agriculture in Kraków. Z. Szelag would like to thank Dr. Jindřich Chrtek (Institute of Botany, Czech Academy of Sciences, Průhonice) for the joint trip to the Hrubý Jeseník Mts.

REFERENCES

- 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., Zahradníček J., Mateo G., Szelag Z. 2007. Chromosome numbers and DNA ploidy levels of selected species of *Hieracium* s.str. (Asteraceae). *Folia Geobotanica* 42: 411–430. <https://link.springer.com/article/10.1007/BF02861703>
- Grabowska-Joachimciak A., Szelag Z. 2025. Chromosome numbers in *Hieracium* (Asteraceae) from Central and Southeastern Europe IX. *Acta Biologica Cracoviensia Series Botanica* 67: 673. <https://doi.org/10.24425/abcsb.2025.154314>
- Ilnicki T., Szelag Z. 2011. Chromosome numbers in *Hieracium* and *Pilosella* (Asteraceae) from Central and Southeastern Europe. *Acta Biologica Cracoviensia Series Botanica* 53(1): 102–110. <https://doi.org/10.2478/v10182-011-0014-3>
- Kocián J., Chrtek J. 2017. Distribution of mountain hawkweeds (*Hieracium* s.str.) in the Hrubý Jeseník Mountains. *Acta Musei Silesiae, Scientiae Naturales* 66: 193–229. <https://reference-global.com/article/10.1515/cszma-2017-0024>
- Morton JK. 1974. Chromosome numbers of British plants. 3. *Watsonia* 10: 169.
- Mráz P. 2001. Chromosome numbers in selected species of *Hieracium* sect. *Alpina* (Asteraceae) from Central and Eastern Europe. *Folia Geobotanica* 36: 321–332. <https://link.springer.com/article/10.1007/BF02803184>
- Musiał K., Grabowska-Joachimciak A., Szelag Z. 2024. Chromosome numbers in *Hieracium* (Asteraceae) from Central and Southeastern Europe VIII. *Acta Biologica Cracoviensia Series Botanica* 66(1): 6611. <https://doi.org/10.24425/abcsb.2024.150382>
- Musiał K., Janas A., Szelag Z. 2016. Chromosome numbers in *Hieracium* (Asteraceae) from Central and Southeastern Europe II. *Acta Biologica Cracoviensia Series Botanica* 58(1): 119–123. <https://doi.org/10.1515/abcsb-2016-0007>
- Musiał K., Janas A., Szelag Z. 2017. Chromosome numbers in *Hieracium* (Asteraceae) from Central and Southeastern Europe III. *Acta Biologica Cracoviensia Series*

- Botanica* 59(2): 83–87. <https://doi.org/10.1515/abcsb-2017-0013>
- Musiał K, Janas A, Szelag Z. 2018. Chromosome numbers in *Hieracium* (Asteraceae) from Central and South-eastern Europe IV. *Acta Biologica Cracoviensia Series Botanica* 60(2): 75–79. <https://doi.org/10.24425/abcsb.2018.118052>
- Musiał K, Szelag Z. 2015. Chromosome numbers in *Hieracium* (Asteraceae) from Central and Southeastern Europe I. *Acta Biologica Cracoviensia Series Botanica* 57(2): 115–120. <https://doi.org/10.1515/abcsb-2015-0020>
- Musiał K, Szelag Z. 2019. Chromosome numbers in *Hieracium* (Asteraceae) from Central and Southeastern Europe V. *Acta Biologica Cracoviensia Series Botanica* 61(2): 63–68. <https://doi.org/10.24425/abcsb.2019.127748>
- Musiał K, Szelag Z. 2023. Chromosome numbers in *Hieracium* (Asteraceae) from Central and Southeastern Europe VII. *Acta Biologica Cracoviensia Series Botanica* 65(1): 23–28. <https://doi.org/10.24425/abcsb.2023.145593>
- Musiał K, Vladimirov V, Szelag Z. 2020. Chromosome numbers in *Hieracium* (Asteraceae) from Central and Southeastern Europe VI. *Acta Biologica Cracoviensia Series Botanica* 62(2): 43–50. <https://doi.org/10.24425/abcsb.2020.131672>
- Pulkina SV, Tupirsyna NN. 2000. Poliploidnye komplekсы в роде *Hieracium* (Asteraceae). *Turczaninowia* 3: 79–81.
- Schuhwerk F, Lippert W. 1999. Chromosomenzahlen von *Hieracium* (Compositae, Lactuceae) Teil 3. *Sendtnera* 6: 197–214.
- Sell P, Murrell G. 2006. *Flora of Great Britain and Ireland. Volume 4. Campanulaceae – Asteraceae*. Cambridge University Press, Cambridge.
- Stace CA, Gornall RJ, Squirrell J, Shi Y. 1995. Chromosome numbers in *Hieracium* L. section *Alpina* (Fries) F.N. Williams. *Watsonia* 20: 367–377.
- Szelag Z. 2026a. *Hieracium caesnense* (Asteraceae), a new species in *H.* sect. *Villosa* from Banat in Romania. *Phytotaxa* 755: 108–112. <https://doi.org/10.11646/phytotaxa.755.1.7>
- Szelag Z. 2026b. Two new species in *Hieracium* sect. *Alpestris* (Asteraceae) from Mt. Babia Góra, Western Carpathians, Poland. *Phytotaxa* 750: 43–50. <https://doi.org/10.11646/phytotaxa.750.1.4>
- Szelag Z. 2026c. *Hieracium oycoviense* (Asteraceae), a new pentaploid species in *H.* sect. *Grovesiana* from Poland. *Phytotaxa* 754: 294–298. <https://doi.org/10.11646/phytotaxa.754.3.4>
- Tennant DJ, Rich TCG. 2008. *British alpine hawkweeds. A monograph of British Hieracium section Alpina*. Botanical Society of the British Isles, London.
- Thomas S, Bailey JP, Rich TCG. 2011. Pollen and chromosome studies in *Hieracium* sect. *Alpestris* (Asteraceae). *Nordic Journal of Botany* 29: 244–248. <https://doi.org/10.1111/j.1756-1051.2010.01024.x>