

***Geranium aristatum* (Geraniaceae): a new species for the Bulgarian flora**

Ana Petrova

Institute of Botany, Bulgarian Academy of Sciences, Acad. G. Bonchev St., bl. 23,
1113 Sofia, Bulgaria, e-mail: petrova@bio.bas.bg

Received: October 27, 2005 ▷ Accepted: April 28, 2006

Abstract. *Geranium aristatum* is a Balkan endemic known from Albania, Greece and R Macedonia and found on the territory of Bulgaria after enlarging its area to the East.

Key words: distribution, *Geranium aristatum*, karyology, morphology

Introduction

The genus *Geranium* is represented by 23 species in the Bulgarian flora (Petrova & Kozhuharov 1979). Most of them are widely distributed in the country, but one, *G. macrostylum* Boiss., has very restricted distribution in the country. During field work in the West Frontier Mts (Mt Vlahina) a new Balkan endemic species was found for the Bulgarian flora: *G. aristatum*.



Fig. 1. *G. aristatum* in flowers and fruits.
Photo: Daniella Ivanova.

Material and methods

The morphological description is mainly based on data from *Flora Europaea* (Web & Ferguson 1968), Aedo (1996), as well as on personal data.

The karyotype was studied on mitotic metaphase plates obtained from root-tips of wild-collected plants. Root-tips were pretreated with 0,01 % colchicine for 20–30 min, then fixed in ethanol:glacial acetic acid (1:3) for 24h at room temperature. Hydrolysed was conducted in 1N HCl for 15 min at 60 °C. Then root-tips were transferred in ethyl ether:HCl (1:1) for 8 min at room temperature, washed in distilled water and stained with haematoxylin after Gomori (Melander &

Wingstrand 1953) for 90 min at 60 °C, then squashed in 45 % acetic acid and mounted in Euparal. The photograph was made with high-performance CCD Camera and microscope Olympus-UCMAA3, Japan.

Voucher specimens are deposited in the Herbarium of the Institute of Botany, Bulgarian Academy of Sciences (SOM).

Results and discussion

The species is described from Mt Plaka in S Pindhos, Greece. The lectotype (Greece, Chaliki, Plaka Mt, Thessalia Graeca, *Sintenis* 673, LD) is designated by Aedo (1996). It belongs to subg. *Erodioidea* (Picard) Yeo, sect. *Erodioidea* which includes three species altogether (Aedo & al. 1998), the other two *G. phaeum* L. and *G. reflexum* L. also distributed in Bulgaria (Petrova & Kozuharov 1979). The species is close and very similar to *G. reflexum* by its strongly deflexed petals and differs from it by the long sepal arista, blue-lilac petals with darker veins and opposite cauline leaves.

Geranium aristatum Freyn & Sint., Bull. Herb. Boissier, 5: 587. 1897 (Fig. 1, Plates I & II)

The species is perennial, with stout oblique rhizome. Stems 25–70 cm, erect, branched, almost glabrous at the base, with short glandular and long eglandular hairs, deflexed in the upper part (Plate I, Fig. 4). Basal leaves long petiolate in deciduous rosette; leaf-blade 5–10 cm in diameter (Plate I, Fig. 1), with appressed eglandular and subappressed or erect glandular hairs; margin glandular-serrate; cauline leaves opposite, in the lower part with long in the upper with shorter patent eglandular petiole. Inflorescence axillary, leaf-opposed and terminal, many-flowered. Bracts lanceolate with short glandular and long eglandular hairs; bracteoles linear with long and short eglandular hairs. Pedicels recurved with long eglandular and short glandular hairs (Plate I, Fig. 5), together with peduncles often exceeding the subtending leaves. Sepals 9–10 mm long, 3–4 mm wide, with 4–7 mm long arista (Plate I, Fig. 6), covered with long eglandular and short glandular hairs, and long eglandular hairs on the margin, reflexed at anthesis (Plate II, Fig. 2) and erect in fruit (Plate II, Fig. 3). Petals 11–17 mm long, 5–8 mm wide, oblong elliptical, entire or slightly emarginated, apiculate (Plate I, Fig. 7), blue-lilac, with darker veins, strongly reflexed (Plate II, Fig. 1), significantly different from others in the genus. Mericarps 7–8 mm long, sericeous towards the base, with 2–4 strong transverse ridges below the beak (Plate I, Fig. 8), appressed eglandular hairy and c. 30 mm long beak in fruit. Seeds (Plate I, Fig. 9) 4–4.5 mm long, brown.

Phenology. Flowering June to August, fruiting July to September.

Habitat and ecology. The species inhabits damp, shady places in meadows and woodland clearings, usually on limestone, between 1300–1400 m. The most common accompanying species are grasses and herbs, such as *Dactylis glomerata* L., *Trisetum flavescens* (L.) P. Beauv., *Silene vulgaris* (Moench) Garcke, *Stellaria holostea* L., *Hypericum perforatum* L., *Potentilla argentea* L., *Fragaria vesca* L., *Trifolium repens* L., *Helianthemum nummularium* (L.) Mill., *Armeria rumelica* Boiss., *Clinopodium vulgare* L., *Origanum vulgare* L., *Nepeta nuda* L., *Galium verum* L., *Plantago lanceolata* L., *Carlina acanthifolia* All., etc.

Distribution in Bulgaria. The species has been found in the West Frontier Mts (Mt Vlahina) between Sushitsa (Kadiitsa) village, Blagoevgrad district and the old frontier post, at alt. 1375 m, FM-62, 41° 47' 45.2" N, 22° 59' 41.5" E, 15.07.1981 & 17.07.2004, coll. A. Petrova (SOM 162680, 162676–162679) (Fig. 2).

Most probably the species can be found in Mt Belasitsa, too, owing to its distribution in the Macedonian part of this mountain (Matevski 2005), and the other localities of the West Frontier Mts, along the border with R Macedonia.

Overall distribution: the Balkan Peninsula, the mountains of South Albania, Northwest Greece and R Macedonia (Web & Fergusson 1968; Persson 1986; Aedo 1996; Matevski 2005), as well as in West Bulgaria.

Balkan endemic. The Bulgarian locality is apparently the easternmost boundary of the species area.

Conservation status

The species is very rare for the Bulgarian flora. It is discovered only in one locality in Mt Vlahina. The population is stable, with numerous individuals, and reproduces by seeds and vegetatively.

According to the IUCN criteria (IUCN 2001, 2003a, b), the species is rated in **Critically Endangered (CR)** national IUCN category. Further efforts for monitoring the population are required.

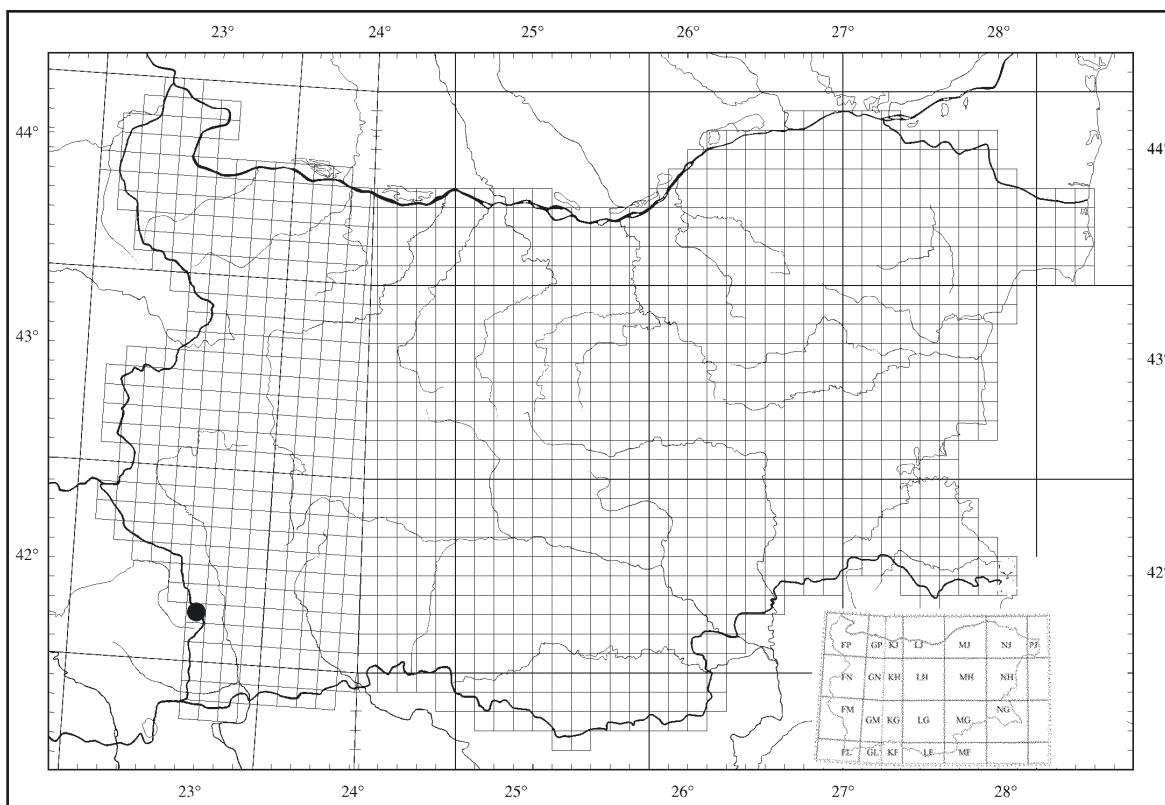


Fig. 2. Distribution map of *G. aristatum* in Bulgaria.

Chromosome number

$$2n = 2x = 26 \text{ (Fig. 3)}$$

The karyotype consists of meta- and submetacentric chromosomes, one pair of the last type being SAT.

The chromosome number counted in the Bulgarian materials doesn't agree with the earlier reported for the species by Gauger (1937). Unfortunately, the origin of the population investigated by that author is

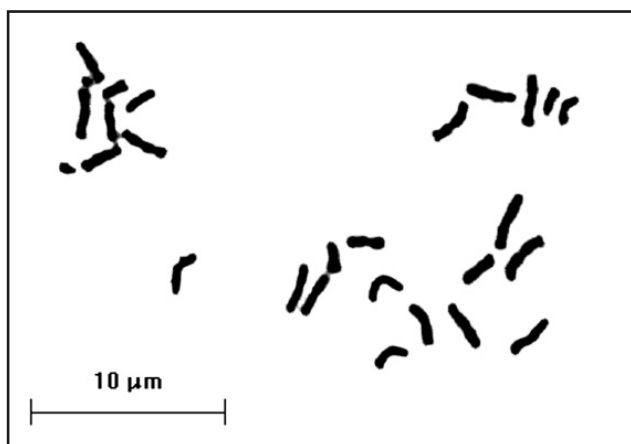
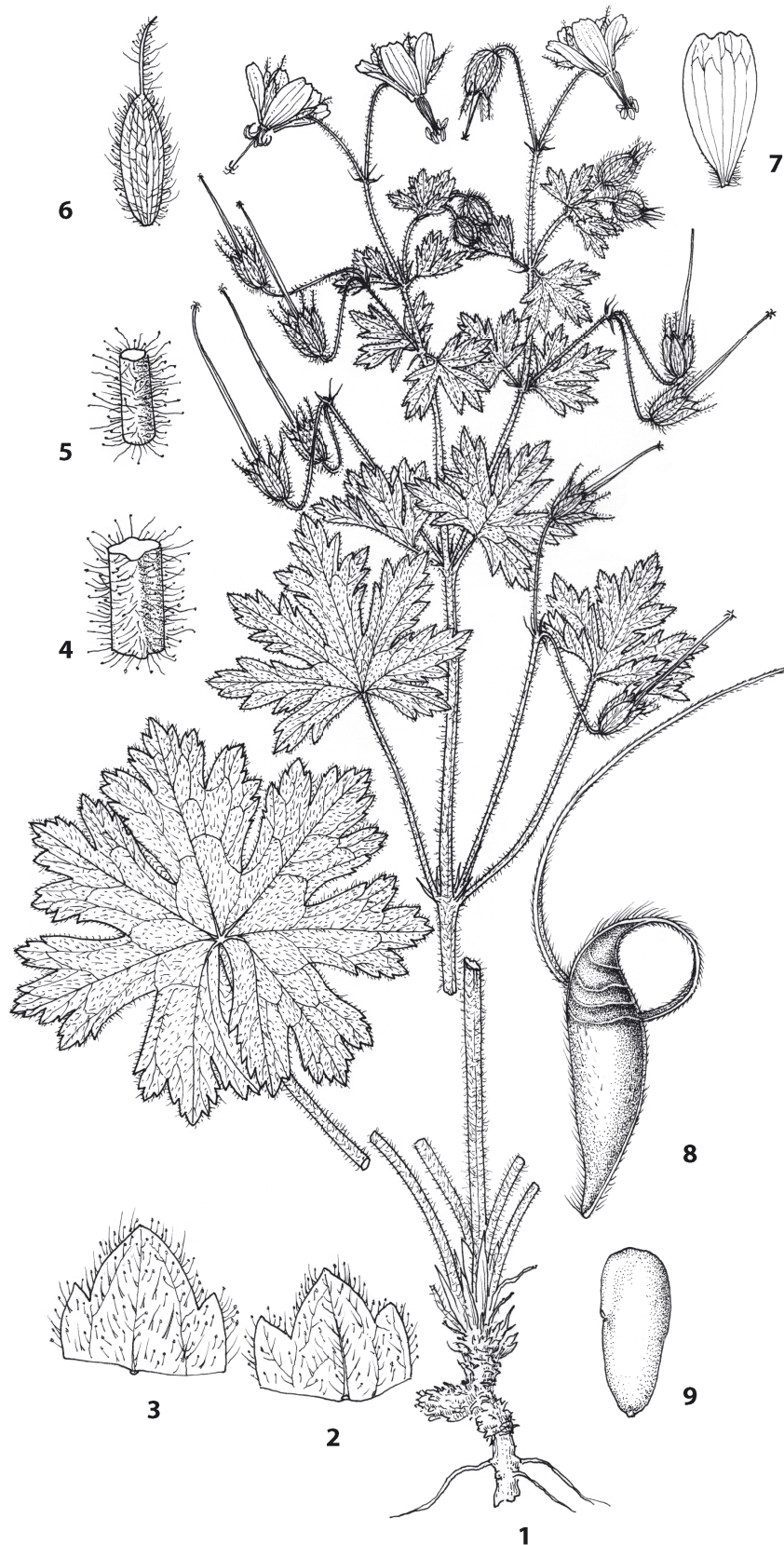


Fig. 3. Microphotograph of metaphase plate of *G. aristatum*, $2n = 26$.

not clear, because Munich is mentioned in the paper (most probably from the botanical garden). Our study comprised eight individuals from the population and the chromosome number was very carefully counted. The chromosome number $2n = 26$ is known only for one species of subg. *Erodioidea* – *G. nanum* (Quezel 1957), but according to Guittonneau (Aedo 1996) it is incorrect. This chromosome number is rare between the perennial species of *Geranium* and is reported for *G. endressii* (Gauger 1937; Delay & Vivant 1978), *G. albiflorum* (see Goldblatt 1988), and *G. nepalense* (see Goldblatt 1981; Malla & al. 1981), as well as $2n = 52$ on the basis of $x = 13$ for *G. agavacense*, *G. cruceroense*, *G. culminicola* and *G. nervosum* (see Fedorov 1969), *G. bucknellii* and *G. carolinianum* (Löve & Löve 1982), etc.

Acknowledgements. The author is grateful to Mrs Zoya Mitrska for the valuable technical assistance, to Mr Dimitur Vlaev for the drawings of the species. The financial support of the Ministry of Environment and Waters of R Bulgaria under the Project no. 3383/416, *Red Lists of Vascular Plants and Fungi*, is also gratefully acknowledged.

Plate I



Figs 1-9. Drawings of *G. aristatum*:

1, habit; 2, indumentum of low laminar surface; 3, indumentum of upper laminar surface; 4, portion of stem (indumentum); 5, portion of pedicel (indumentum); 6, sepal; 7, petal; 8, fruit; 9, seed.

Plate II



Figs 1-3. *G. aristatum*:
1, flower; 2, sepals at anthesis;
3, sepals in fruit.
Photo: Vladimir Vladimirov.

References

- Aedo, C.** 1996. Revision of *Geranium* subgenus *Erodioidea* (*Geraniaceae*). – Syst. Bot. Monogr., **49**: 1-104.
- Aedo, C., Muñoz Garmendia, F. & Pando, F.** 1998. World checklist of *Geranium* L. (*Geraniaceae*). – Anales Jard. Bot. Madrid, **56**(2): 211-252.
- Delay, J. & Vivant, J.** 1978. Sur quelques endémiques pyrénéennes. Cytotaxonomie (Ire partie). – Bull. Soc. Bot. France, **125**: 485-492.
- Fedorov, A.** (ed.). 1969. Chromosome Numbers of Flowering Plants. Nauka, Leningrad.
- Gauger, W.** 1937. Ergebnisse einer zytologischen Untersuchung der Familie *Geraniaceae*. I. – Planta, **26**: 529-531.
- Goldblatt, P.** (ed.). 1981. Index to plant chromosome numbers 1975-1978. – Monogr. Syst. Bot. Missouri Bot. Gard., **5**.
- Goldblatt, P.** (ed.). 1988. Index to plant chromosome numbers 1984-1985. – Monogr. Syst. Bot. Missouri Bot. Gard., **23**.
- IUCN.** 2001. IUCN Red List Categories and Criteria: Version 3.1. IUCN Species Survival Commission. Gland & Cambridge.
- IUCN.** 2003a. Guidelines for Using the IUCN Red List Categories and Criteria. IUCN Species Survival Commission. Gland & Cambridge.
- IUCN.** 2003b. Guidelines for Application of IUCN Red List Criteria at Regional Levels: Version 3.0. IUCN Species Survival Commission. Gland & Cambridge.
- Löve, A. & Löve, D.** 1982. Reports. – In: **Löve, A.** (ed.), IOPB Chromosome Number Reports, 75. – Taxon, **31**(2): 344-360.
- Malla, S.B., Bhattarai, S., Gorkhali, M., Saiju, H. & Kayastha, M.** 1981. Reports. – In: **Löve, A.** (ed.), IOPB Chromosome Number Reports, 70. – Taxon, **30**(1): 75.
- Matevski, V.** 2005. *Geranium* L. – In: **Micevski, K.** (ed.), The Flora of the Republic of Macedonia. Vol. **1**(6), pp. 1485-1509. Maced. Acad. Sci. & Arts, Skopje (in Macedonian).
- Melander, Y. & Wingstrand, K.G.** 1953. Gomori's haematoxylin as a chromosome stain. – Stain Technol., **28**: 217.
- Persson, J.** 1986. *Geranium* L. – In: **Strid, A.** (ed.), Mountain Flora of Greece. Vol. **1**, pp. 538-549. Cambridge Univ. Press, Cambridge.
- Petrova, A. & Kozhuharov, S.** 1979. *Geranium* L. – In: **Jordanov, D.** (ed.), Fl. Reipubl. Popularis Bulgaricae. Vol. **7**, pp. 27-64. In Aedibus Acad. Sci. Bulgaricae, Serdicae (in Bulgarian).
- Quezel, P.** 1957. Peuplement végétal des hautes montagnes de l'Afrique du Nord. P. Lechevalier, Paris.
- Web, D.A. & Ferguson, I.K.** 1968. *Geranium* L. – In: **Tutin, T.G. & al.** (eds), Flora Europaea. Vol. **2**, pp. 193-199. Cambridge Univ. Press, Cambridge.