

First records of four alien species for the flora of Tajikistan (Middle Asia)

Первые находки четырех чужеродных видов для флоры Таджикистана (Средняя Азия)

D. A. Krivenko

Siberian Institute of Plant Physiology and Biochemistry,
Siberian Branch of the Russian Academy of Sciences
Department of Biodiversity and Biological Resources,
IRK Herbarium
Lermontova Str., 132, Irkutsk, 664033, Russia
krivenko.irk@gmail.com
ORCID: <https://orcid.org/0000-0003-2658-1723>

Д. А. Кривенко

Сибирский институт физиологии и биохимии растений
Сибирского отделения РАН
Отдел «Биоразнообразие и биологические ресурсы»,
Гербарий ИРК
ул. Лермонтова, 132, Иркутск, 664033, Россия
krivenko.irk@gmail.com
ORCID: <https://orcid.org/0000-0003-2658-1723>

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Abstract. First records of four alien plant species for the flora of Tajikistan are presented: *Amaranthus powellii* S. Watson (*Amaranthaceae*), *Erythranthe guttata* (DC.) G. L. Nesom (*Phrymaceae*), *Medicago lessingii* Fisch. et C. A. Mey. ex Kar. (*Fabaceae*), and *Solidago gigantea* Aiton (*Asteraceae*). Of these, *Erythranthe guttata* and *Solidago gigantea* present novelties to the flora of the whole Middle Asia. For each species, its distribution and habitat, as well as taxonomic notes, are presented. In addition, chromosome numbers (CHNs, $2n$) from the new localities are given for the first three species.

Keywords: *Amaranthus powellii*, *Erythranthe guttata*, *Medicago lessingii*, *Solidago gigantea*, Powell's amaranth, seep monkey-flower, Lessing's medick, giant goldenrod, Tajikistan, floristic novelties, chorology, taxonomy.

Аннотация. Представлены первые находки четырех чужеродных видов растений для флоры Таджикистана: *Amaranthus powellii* S. Watson (*Amaranthaceae*), *Erythranthe guttata* (DC.) G. L. Nesom (*Phrymaceae*), *Medicago lessingii* Fisch. et C. A. Mey. ex Kar. (*Fabaceae*) и *Solidago gigantea* Aiton (*Asteraceae*). Из их числа, *Erythranthe guttata* и *Solidago gigantea* являются новыми видами для флоры Средней Азии в целом. Для каждого вида приведены его распространение, местообитание и таксономический комментарий. Кроме того, для первых трех видов приведены числа хромосом ($2n$) из новых местонахождений.

Ключевые слова: *Amaranthus powellii*, *Erythranthe guttata*, *Medicago lessingii*, *Solidago gigantea*, амарант Пауэлла, губастик крапчатый, люцерна Лессинга, золотарник гигантский, Таджикистан, флористические находки, хорология, таксономия.

The study of the vegetation cover within the modern borders of Tajikistan has been conducted since the mid-19th century, predominantly by botanists of the Russian Empire and later the Soviet Union, who participated in numerous geographical and botanical explorations in the region. Long-term study of the flora and vegetation of Tajikistan became possible after the establishment of the Tajik Base of the Academy of Sciences of the USSR in 1932, which was later reorganized into the Tajik Branch of the Academy of Sciences of the USSR in 1941, and subsequently into the Academy of Sciences of the Tajik SSR in 1951 (Zaprzjagaeva, 1980). A major result of these efforts was the publication of the comprehensive compendium “Flora of Tajik SSR” (Ovczinnikov, 1957–1991). It contains a numbered list of 4 445 species of wild, cultivated, and introduced plants (123 families and 986 genera).

In 2006, Polish botanists under the general leadership of Marcin Nobis and Arkadiusz Nowak began studying

the flora and vegetation of this mountainous country (Nowak et al., 2020, 2025). Thanks to their active floristic research, at least 33 alien plant species and subspecies were identified for the first time in the flora of Tajikistan: *Acalypha australis* L., *Azolla filiculoides* Lam., *Bidens frondosa* L., *Bromus catharticus* Vahl (= *B. willdenowii* Kunth), *Eragrostis virescens* J. Presl, *Galinsoga quadriradiata* Ruiz et Pav. (= *G. ciliata* (Raf.) S. F. Blake) (Nobis, Nowak, 2011a), *Amaranthus deflexus* L., *Euphorbia maculata* L., *Rubus praecox* Bertol. (Nobis, Nowak, 2011b), *Eleusine indica* (L.) Gaertn. (Nobis et al., 2011), *Lepidium didymum* L. (= *Coronopus didymus* (L.) Sm.) (Nobis et al., 2014a), *Panicum capillare* L., *Tribulus pentandrus* Forssk. var. *pentandrus* (= *T. longipetalus* Viv.) (Nobis et al., 2014b), *Amorpha fruticosa* L., *Carduus acanthoides* L. (Nobis et al., 2015a), *Eragrostis amurensis* Prob., *Ludwigia peploides* (Kunth) P. H. Raven subsp. *stipulacea* (Ohwi) P. H. Raven, *Solidago canadensis* L. (Nobis et al.,

2015b), *Crambe orientalis* L. (Nobis et al., 2016), *Erigeron annuus* (L.) Desf. (incl. *E. lilacinus* (Sennikov et Kurtto) Sennikov) (Nobis et al., 2017; Sennikov, Lazkov, 2021), *Erigeron bonariensis* L. (Nobis et al., 2018), *Chenopodium ficifolium* Sm., *Echinochloa colona* (L.) Link, *Onobrychis viciifolia* Scop., *Viola tricolor* L. (Nowak et al., 2020), *Arrhenatherum elatius* (L.) P. Beauv. ex J. Presl et C. Presl, *Dittrichia graveolens* (L.) Greuter, *Geranium pyrenaicum* Burm. f. (Nobis et al., 2023), *Lemna* × *japonica* Landolt, *Nymphaea odorata* Aiton, *Ranunculus rionii* Lagger (Volkova et al., 2024), *Paspalum dilatatum* Poir., *Reynoutria japonica* Houtt. (Nobis et al., 2025). In addition, 7 new alien species were discovered by Russian and Tajik botanists: *Rorippa austriaca* (Crantz) Besser, *R. sylvestris* (L.) Besser (Dorofeev, 1984; Sennikov et al., 2025), *Cardamine hirsuta* L., *Senecio vulgaris* L., *Sisymbrium officinale* (L.) Scop. (Ebel et al., 2020), *Hirschfeldia incana* (L.) Lagr.-Foss. (Ebel et al., 2022), *Neslia paniculata* (L.) Desv. (German, 2024).

This publication adds four new species to the list of alien plants. As a result, at the moment there are 44 alien plant taxa (of 17 families and 39 genera) not listed in the “Flora of Tajik SSR” (Ovczinnikov, 1957–1991).

Materials and methods

Herbarium specimens were collected during expeditions to Tajikistan during 2023–2024. Voucher specimens are stored in the IRK Herbarium, and the *Solidago gigantea* Aiton voucher is also in the NSK Herbarium. The information on taxonomic status and general distribution of the species new to Tajikistan was obtained from “Plants of the World Online” (POWO, 2025). For the study of chromosome numbers (CHNs), I used the meristem of germinal roots of seedlings. The method was described in detail previously (Efimov et al., 2016). The obtained data were compared with the “Index to Plant chromosome numbers” (IPCN, 1979–) and the “Chromosome Counts Database” (CCDB, 2025). In this article, Middle Asia refers to the territories of the five Middle (= Central) Asian republics of the former USSR: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan.

Results and discussion

Amaranthus powellii S. Watson (Powell’s amaranth)

New record. Tajikistan, Sughd Region, Shahrison District, Pamir-Alay, Hissaro-Alay, northern macroslope of the Turkestan Ridge, Shahrison jamoat, vicinity of Firdawsi (Buragen) village, weed-ruderal plant communities, 1852 m a. s. l., 39°41’39.01” N, 68°43’34.53” E, 8 VIII 2023, D. A. Krivenko, E. S. Kharin, № 76873 (IRK00025791 — see [Appendix](#): Fig. A.1).

CHN: $2n = 34$ (Fig.: A). Special karyosystematic studies have shown that *A. powellii* has $2n = 34$, while related species *A. bouchonii* Thell. and *A. hybridus* L. have $2n = 32$ (Greizerstein et al., 1997), which we also confirmed for *A. hybridus* from Beijing, China and *A. powellii* from the Irkutsk Region of Russia (Krivenko et al., 2025).

Distribution and habitat. The natural range of the species includes the south-west states of the United States and the most of Mexico. As a naturalized alien species, it is widespread across much of the rest of temperate America, and was also introduced to various parts of Europe, Africa, Asia, and Australia. Within Middle Asia, it has so far been found only in three localities in Kazakhstan (Ebel et al., 2024). Both in its natural and secondary distribution ranges, *A. powellii* inhabits roadsides, fields and disturbed habitats (Mosyakin, Robertson, 2003; Iamónico, 2015).

Taxonomic notes. The species belongs to the *A. hybridus* complex. It differs from closely related *A. bouchonii* by bracts-to-petals length ratio of 2.3–3.7 (vs 1.2–2.3) and dehiscent (vs indehiscent) fruits, as well as CHN. From other species on this complex it is distinguished by zygomorphic flowers — petals are clearly unequal (Iamónico, 2015).

Erythranthe guttata (DC.) G. L. Nesom ≡ *Mimulus guttatus* DC. (seep monkeyflower)

New records. 1) Tajikistan, Badakhshan Mountainous Autonomous Region, Pamir-Alay, Western Pamir, Rushan Ridge, Khorog town, left bank of the Shakh-dara River, left tributary of the Gunt River (Pyanj River basin), forb plant community along the edge of the *aryk* (irrigation ditch), 2118 m a. s. l., 37°28’52.71” N, 71°35’18.58” E, 15 VIII 2023, D. A. Krivenko, E. S. Kharin, № 77067 (IRK00041432 — see [Appendix](#): Fig. A.2); 2) *ibidem*, 2115 m a. s. l., 37°28’44.18” N, 71°35’26.16” E, 5 VIII 2024, D. A. Krivenko, № 79533 (IRK00048249 — see [Appendix](#): Fig. A.3); *ibidem*, 5 VIII 2024, *idem*, № 79534 (IRK00048250 — see [Appendix](#): Fig. A.4).

CHN: $2n = 28$ (Fig.: B). The CHN is probably stable.

Distribution and habitat. This riparian and wetland species is native to western North America, and is currently found in many European countries, Australia and Ecuador due to deliberate and accidental introductions. It is invasive in some European countries (Vallejo-Marín, 2012; Van den Neucker, Scheers, 2022). In Tajikistan, *E. guttata* grows along an irrigation ditch, directly in the water or along its edges. According to my observations in 2024, compared to 2023, the species has spread along the irrigation ditch by approximately 350 m. According my observations, several alien species in Tajikistan are linked to irrigation.

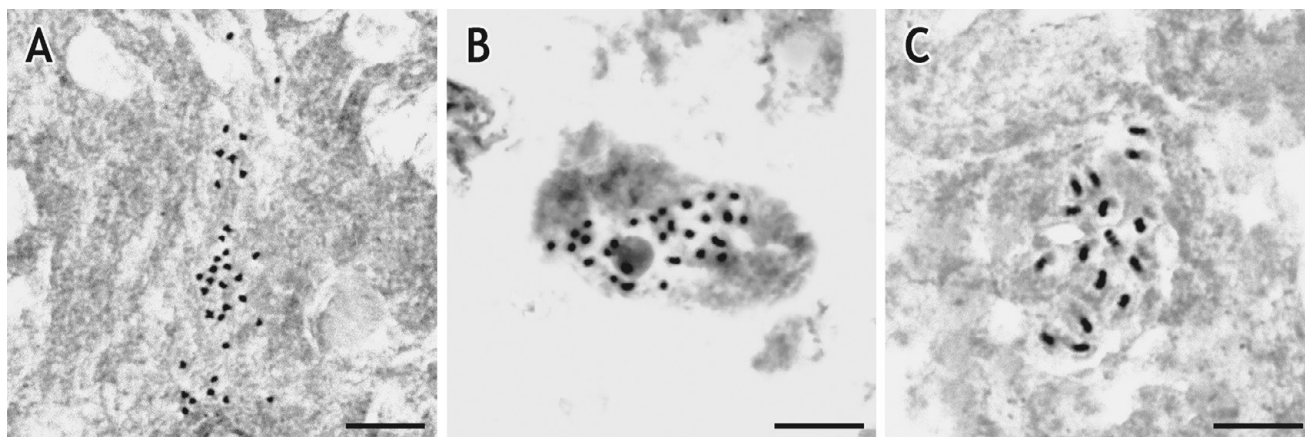


Fig. Mitotic metaphase.

A — *Amaranthus powellii*, IRK00025791 ($2n = 34$); B — *Erythranthe guttata*, IRK00041432 ($2n = 28$); C — *Medicago lessingii*, IRK00027046 ($2n = 16$). Scale bars: 10 μm .

Taxonomic notes. The diploid ($2x$) *E. guttata* differs from the closely related tetraploid ($4x$) *E. lutea* (L.) G. L. Nesom and their triploid ($3x$) hybrid *E. × robertsii* (Silverside) G. L. Nesom (incl. autohexaploid ($6x$) *E. × peregrina* (Vall.-Marín) G. L. Nesom) by the absence of reddish spots or blotches on the corolla and a more or less closed corolla throat (Vallejo-Marín, 2012; Vallejo-Marín, Lye, 2013).

Medicago lessingii Fisch. et C. A. Mey. ex Kar. (Lessing's medick)

New record. Tajikistan, Sughd Region, Shahrison District, Pamir-Alay, Hissaro-Alay, northern macroslope of the Turkestan Ridge, Shahrison jamoat, vicinity of Firdawsi (Buragen) village, weed-ruderal plant communities, 1852 m a. s. l., $39^{\circ}41'39.01''$ N, $68^{\circ}43'34.53''$ E, 8 VIII 2023, D. A. Krivenko, E. S. Kharin, № 75864 (IRK00027046 — see Appendix: Fig. A.5).

CHN: $2n = 16$ (Fig.: C). Most sources cite a diploid ($2x$) CHN for this species, including its taxonomic synonym *M. caerulea* Less. ex Ledeb. Only once in the Stavropol Territory of Russia, there was a tetraploid CHN ($2n = 4x = 32$) established for “*M. caerulea*” (Magulaev, 1980). It is very likely that another species with more or less similar morphology was studied — the allotetraploid *M. × varia* Martyn.

Distribution and habitat. Distributed in the southern European Russia, the Caucasus, as well as West (Iran and Turkey) and Middle (Kazakhstan, Kyrgyzstan and Uzbekistan) Asia. It was also cited for Western Siberia (POWO, 2025), but according to the recent checklist of Asiatic Russia (Chepinoga et al., 2024) it is absent from this region. My observations of the species in the wild (Caucasus and Middle Asia), as well as the analysis of herbarium specimens from the European

Russia, Caucasus and Middle Asia (IRK), have shown that it occurs in disturbed and semi-disturbed habitats: bush thickets, ruderal places, roadsides, etc.

Taxonomic notes. *Medicago lessingii* is reliably distinguished from the closely related *M. sativa* L. and *M. × varia* by the length of flowers and seeds, as well as the diameter of the legumes. *Medicago lessingii* has flowers 5–6 mm long, seeds 1.6–2.1 mm long and legumes up to 5 mm diam., while *M. sativa* and *M. × varia* have flowers 6–12 mm long, seeds 2.2–2.5 mm long and the legumes 5–9 mm diam. (Lesins, Lesins, 1979). In addition, *M. lessingii* and *M. × varia* have different CHNs.

Solidago gigantea Aiton (giant goldenrod)

New record. Tajikistan, Sughd Region, Shahrison District, Pamir-Alay, Hissaro-Alay, northern macroslope of the Turkestan Ridge, Shahrison jamoat, vicinity of Firdawsi (Buragen) village, weed-ruderal plant groups, 1852 m a. s. l., $39^{\circ}41'39.01''$ N, $68^{\circ}43'34.53''$ E, 8 VIII 2023, D. A. Krivenko, E. S. Kharin, № 77063 (IRK00041431 — see Appendix: Fig. A.6); *ibidem*, 8 VIII 2023, *idem*, № 77064 (IRK00041430 — see Appendix: Fig. A.7); *ibidem*, 8 VIII 2023, *idem*, № 77065 (NSK).

Distribution and habitat. North American species, as an ornamental was introduced into Europe (many countries) and Asia (Korean Peninsula and Japan). Cultivation of *S. gigantea* in home gardens remains the primary route for the penetration of this species to new territories. If naturalized, *S. gigantea* initially colonizes disturbed ruderal areas: riverbanks, road and railway sides (Vinogradova et al., 2010).

Taxonomic notes. *Solidago gigantea* is usually the least hairy species of the *S. canadensis* L. complex. The both species are very similar but consistently differ in the length of the involucre and the pappi.

Solidago canadensis has involucre 1.7–2.5 mm and pappi 1.8–2.2 mm, whereas *S. gigantea* has involucre 2.5–4 mm and pappi 2–2.5 mm (Semple, Cook, 2006).

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Supplementary materials

Appendix. Herbarium specimens of *Amaranthus powellii*, *Erythranthe guttata*, *Medicago lessingii* and *Solidago gigantea* collected in Tajikistan and stored in the IRK Herbarium (Siberian Institute of Plant Physiology and Biochemistry of the Siberian Branch of the Russian Academy of Sciences, Irkutsk). https://www.binran.ru/files/journals/Novitates/2025_56/NSPV_56_13_Krivenko_Appendix.pdf

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