Polish Botanical Journal 56(2): 195–201, 2011

NEW DATA ON THE VASCULAR FLORA OF THE CENTRAL PAMIR ALAI MOUNTAINS (TAJIKISTAN, CENTRAL ASIA)

MARCIN NOBIS & ARKADIUSZ NOWAK

Abstract. The paper presents distributional data for nine species new to the flora of the central Pamir Alai Mts in Tajikistan: *Acalypha australis* L., *Azolla filiculoides* Lam., *Bidens frondosa* L., *Bromus willdenowii* Knuth, *Eragrostis virescens* J. Presl, *Galinsoga ciliata* (Raf.) S. F. Blake, *Nanorrhinum ramosissimum* (Wall.) Betsche, *Stipa gracilis* Roshev. and *Zygophyllum miniatum* Cham. & Schlecht. Six species should be regarded as alien to the Tajik flora, expansively spreading or invasive in this part of Asia. The other three taxa are native elements of the flora of the Pamir Alai Mts. A list of localities of the species in the Tajik Pamir Alai Mts is given, and their habitat preferences are described. Their distribution is mapped and illustrations of some species are provided.

Key words: vascular plants, new records, distribution, Pamir Alai Mts, Tajikistan

Marcin Nobis, Department of Plant Taxonomy, Phytogeography and Herbarium, Institute of Botany, Jagiellonian University, Kopernika 27, 31-501 Kraków, Poland; m.nobis@uj.edu.pl
Arkadiusz Nowak, Laboratory of Geobotany and Plant Conservation, Department of Biosystematics, Opole University, Oleska 48, 45-022 Opole, Poland; anowak@uni.opole.pl

INTRODUCTION

Tajikistan is located almost entirely within the central part of the Pamir Alai mountain system on the border of the subtropical and temperate zones in Central Asia (36°40′–41°05′E/67°31′–75°14′N) (Fig. 1). This is a typical mountainous area rising 300–7495 m a.s.l. Over 50% of the country is above 3000 m a.s.l. The main mountain systems in Tajikistan are the Pamir, Alai and Tian-Shan, which consist of several smaller mountain ranges. The location and the considerable variation of altitude favors a high floristic diversity. The Central Asian mountains have been designated by Conservation International as one of 34 biodiversity hotspots – the world's most important areas of species diversity (Mittermeier *et al.* 2005). Tajikistan is also one of the species-richest regions of the former Soviet Union. According to a ten-volume study of the flora of the former Soviet Socialist Republic of Tajikistan, completed by a large team (Ovchinnikov 1957, 1963, 1968, 1978; Ovchinnikov & Kochkareva 1975; Ovchinnikov & Kinzikaeva 1981; Chukavina 1984; Kochkareva 1986; Kinzikaeva 1988; Rasulova 1991) and supplemented by work by other researchers (e.g., Zakirov 1961; Ikonnikov 1983; Tzvelev 1976), *ca* 4550 vascular plant species are known from the country. This number is not final, as new species have been described from Tajikistan recently (e.g., Fritsch *et al.* 2002; Khassanov *et al.* 2007; Fritsch & Friesen 2009; Ranjbar *et al.* 2010; Nobis 2011b) and new records to its flora have been published (e.g., Lazkov 2009; Nobis *et al.* 2010, 2011; Nobis 2011a). According to literature data, *ca* 30% of the entire flora of vascular plants known from Tajikistan are generally accepted endemics (endemics s.str. + subendemics) (Rassulova 1991; Nowak & Nobis 2010; Nowak *et al.* 2011).

During our exploration of the Pamir Alai Mts in Tajikistan we found many species that are very rare in the flora of the country. Some have never been reported from Tajikistan. Here we present nine vascular plant species new to the flora of Tajikistan. Six species should be regarded as alien to the Tajik flora, intensively spreading or invasive in this part of Asia. The other three taxa are native elements published for the first time from the central Pamir Alai Mts.

Material and methods

Specimens were collected between 2007 and 2010 at different localities in Tajikistan in several geobotanical regions: the East Pamirian range, West Pamirian range, West Tajikistanian range, South Tajikistanian range, Hissar-Darvazian range, Zeravshanian range and Prisyrdarian range (Goncharov 1937). Herbarium materials of the newly discovered species were revised in LE, TAD, TASH, FRU, W, WU for comparison (specimens from the species' ranges) and to supplement their distribution in Tajikistan when relevant. Some specimens collected in Tajikistan which are new to its flora (e.g., *Stipa gracilis* Roshev.) were found during revision. The distribution of the species examined in Tajikistan is mapped in Figure 1. Specimens of taxa listed below and collected by us are deposited in KRA and OPUN.

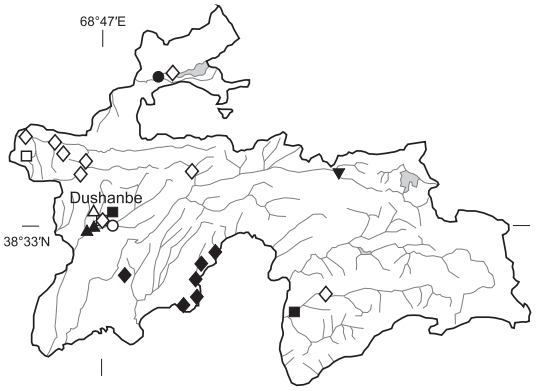

Fig. 1. Distribution map of species new to the flora of Tajikistan. ● – *Azolla filiculoides* Lam., ○ – *Acalypha australis* L., ▲ – *Bidens frondosa* L., Δ – *Bromus willdenowii* Knuth, ■ – *Eragrostis virescens* J. Presl, ◊ – *Galinsoga ciliata* (Raf.) S. F. Blake, ♦ – *Nanorrhinum ramosissimum* (Wall.) Betsche, ▼ – *Stipa gracilis* Roshev., □ – *Zygophyllum miniatum* Cham. & Schlecht.

List of species

Acalypha australis L. (Euphorbiaceae)

Figs 1 & 2

Acalypha australis var. *lanceolata* Hayata, *A. chinensis* Roxburgh, *A. minima* H. Keng, *A. pauciflora* Hornemann, *Urtica gemina* Loureiro

General distribution. To date the species is known from East Asia (Japan, Korea, China, Laos, Philippines, eastern Russia, Vietnam) and is naturalized in the Caucasus (Russia), northern Australia, eastern India and the eastern United Sates (Poyarkova 1974; Delendick 1990; Hauxing & Gilbert 2008; Duman & Terziođlu 2009).

Occurrence in Tajikistan. *Acalypha australis* is an alien species in the flora of Tajikistan; it is a neophyte (kenophyte, epecophyte). It was found in central part of Dushanbe. The species occurs in anthropogenic habitats and is recorded mostly on roadsides, by footpaths and lawns in the city.

Specimens seen. South Tajikistanian range: Dushanbe, Rudaki St., roadside, 13 Sept. 2010, *leg. M. Nobis & A. Nowak*; Dushanbe, Aini St., roadside, 14 Sept. 2010, *leg. M. Nobis & A. Nowak*.

Azolla filiculoides Lam. (Azollaceae)

Figs 1 & 2

General distribution. *Azolla filiculoides* is at present a cosmopolitan species occurring in South Africa, Asia, Australia, Europe, and South, Central and North America (Weber 2005; Hussner 2006).

Occurrence in Tajikistan. *Azolla filiculoides* is an alien (invasive) species in the flora of Tajikistan; it is a neophyte (kenophyte, holoagriophyte). It was found in the left bank tributary of the Syrdaria River, SW of Khujand. The species occurs en masse in this water course and in an anthropogenic habitat, that is, rice paddies by rivers. *A. filiculoides* grows there en masse, overgrowing the water surface and inhibiting the growth and development of native aquatic species occurring in the stream.

Specimens seen. Prisyrdarian range: between Kaznok and Digmai near Khujand, in an unnamed stream (left tributary of the Syrdaria River), N 40°13′49″/E 69°29′10″, 315 m a.s.l., 13 June 2010, *leg. M. Nobis & A. Nowak*.

Fig. 2. General habit of some species new to the flora of Tajikistan. 1 – *Acalypha australis* L., 2 – *Galinsoga ciliata* (Raf.) S. F. Blake, 3 – *Nanorrhinum ramosissimum* (Wall.) Betsche, 4 – *Azolla filiculoides* Lam., 5 – *Eragrostis virescens* J. Presl, 6 – *Zygophyllum miniatum* Cham. & Schlecht.


1
2
3
4
5
6

Bidens frondosa L. (Asteraceae) Fig. 1

Bidens melanocarpus Wiegand

GENERAL DISTRIBUTION. *Bidens frondosa* is a North American species which is spreading in Europe and Asia (Wagenitz 1979; Protopopova 1994; Tutin 1976a).

OCCURRENCE IN TAJIKISTAN. *Bidens frondosa* is an alien (spreading) species in the flora of Tajikistan; it is a neophyte (kenophyte, hemiagriophyte). It was found in Dushanbe and adjacent villages. The species occurs in agglomerations in roadside ditches along roads in the Kafernigan River valley.

SPECIMENS SEEN. South Tajikistanian range: Dushanbe, Esenin St., in roadside ditch, July 2009, *leg. M. Nobis & A. Nowak*; Khaetinar settlement near Gissar, in roadside ditch, 26 June 2010, *leg. M. Nobis & A. Nowak*.

Bromus willdenowii Kunth (Poaceae) Fig. 1

Festuca unioloides Willd., *Bromus unioloides* (Willd.) Rasp., *Bromus catharticus* Vahl.

GENERAL DISTRIBUTION. Europe, southern and southwestern Russia (Smith 1980).

OCCURRENCE IN TAJIKISTAN. *Bromus willdenowii* is an alien species in the flora of Tajikistan; it is a neophyte (kenophyte, epecophyte). Specimens of the species occur singly or in agglomerations on roadsides in Dushanbe.

SPECIMENS SEEN. South Tajikistan: Dushanbe, as a weed in a botanical garden and roadsides, 24 May 2007, *leg. M. Nobis & A. Nowak*; Dushanbe, Nazarshev St., roadside, 9 July 2009, *leg. M. Nobis*.

Eragrostis virescens J. Presl (Poaceae) Figs 1 & 2

Eragrostis mexicana (Hornem.) Link subsp. *virescens* (J. Presl) S. D. Koch & Sánchez Vega

GENERAL DISTRIBUTION. South and North America (Peterson 2003), introduced in Europe and Asia.

OCCURRENCE IN TAJIKISTAN. *Eragrostis virescens* is an alien, spreading species in the flora of Tajikistan: it is a neophyte (kenophyte, epecophyte). It grows in anthropogenic habitats in bigger towns and cities.

SPECIMENS SEEN. South Tajikistanian range: Dushanbe, Rudaki/Bukhoro St., roadside, between pavement slabs, 24 June 2007, 10 July 2009, *leg. M. Nobis & A. Nowak*; Aini St. between pavement slabs, 16 June 2011, *leg. M. Nobis*; West Pamirian range: Khorog, city center, by road, 12 July 2008, *leg. M. Nobis*.

Galinsoga ciliata (Raf.) S. F. Blake (Asteraceae) Figs 1 & 2

Galinsoga quadriradiata Ruiz. & Pav.

GENERAL DISTRIBUTION. North and South America, Central Asia (Vasilchenko 1959; Tutin 1976).

OCCURRENCE IN TAJIKISTAN. *Galinsoga ciliata* is an alien, established species in the flora of Tajikistan: it is a neophyte (kenophyte, epecophyte). The first known localities of *G. ciliata* documented by herbarium material (in TAD) were recorded near a botanical garden in Dushanbe in the early 1980s. The species was not distinguished in Tajikistan from the commonly occurring *Galinsoga parviflora*. A few more specimens of *G. ciliata* were found while revising collections in TAD, and we recorded the species at many sites in Tajikistan during field studies. It occurs in cities and villages on roadsides, lawns, arable fields (in bulb and root plants, in sown crops) and at ruderal sites.

SPECIMENS SEEN. Prisyrdarian range: Khujand, roadside in the city center, 3 June 2010, *obs. M. Nobis & A. Nowak*; South Tajikistanian range: Dushanbe, botanical garden, 20 Oct. 1985, *leg. Kinzikaeva* (TAD 167644); Dushanbe, Lenin ave., no. 6491a, 28 May 1988, *leg. Kinzikaeva* (TAD 161220); Dushanbe, frequent in many parts of the city (e.g., Rudaki St., Aini St., I. Somoni Ave., Korgar St.), 2007–2010, *leg. M. Nobis & A. Nowak*; Hissar-Darvazian range: Garm, roadside, 27 June 2009, *leg. M. Nobis & A. Nowak*; Zeravshanian range: Zeravshan River valley, Urmetan village, roadside, arable field, 12 June 2009, *leg. M. Nobis & A. Nowak*; Zeravshan river valley, Panjikant town, by road, between pavement slabs, 12 June 2009, *leg. M. Nobis & A. Nowak*; Fan River valley, Zeravshan settlement, by road, 25 June 2010, *leg. M. Nobis & A. Nowak*; Dizhik, *Secale cereale* field, 1900 m a.s.l., 19 June 2010, *leg.*

A. Nowak & M. Nobis; Revad settlement near Urmetan village, in arable field, 1381 m a.s.l., 22 June 2010, *leg. A. Nowak & M. Nobis*; West Pamirian range: Rushan Mts, Charsem settlement, 2600 m a.s.l., no. 1105, 17 Sept. 1983, *leg. Navruzshoev* (TAD 153433).

Nanorrhinum ramosissimum (Wall.) Betsche (Scrophulariaceae) Figs 1 & 2

Linaria ramosissima Wall., *Kickxia ramosissima* (Wall.) Janch., *Elatinoides ramosissima* (Wall.) Wetstt.

GENERAL DISTRIBUTION. The species occurs in Northeast Africa and Southwest and South Asia (e.g., Somalia, Sudan, Iran, Afghanistan, Pakistan, India, Nepal, Bhutan) (Ghebrehiwet 2000; Qureshi & Bhatti 2008).

OCCURRENCE IN TAJIKISTAN. *Nanorrhinum ramosissimum* is a native species in the flora of Tajikistan. It was found on the right rocky slope of the Pyandzh River valley. The species occurs in rock crevices on the S-facing right slope of the Pyandzh River valley. It was previously collected by I. Gubanov and G. N. Nepli from southern Tajikistan but erroneously determined as *Kickxia elatine*. The localities of *Nanorrhinum ramosissimum* in Tajikistan are at the northern range limit of the taxon in Central Asia.

SPECIMENS SEEN. Hissar-Darvazian range: along the right slope of the Pyandzh River valley, S-facing 75–85° slope, from SW of the mouth of the Kufob River at the Pyandzh River to Shagon-Bolo settlement), coordinates of one site N 38°03′19″/E 70°21′54″, in rock crevices near waterfall, 1020 m a.s.l., 3 July 2009, 2 June 2011, *M. Nobis & A. Nowak*; South Tajikistanian range: mountains in the vicinity of Bag village on the Pyandzh River, in lower part of Wazhy-su rivulet, in rock crevices, 2 June 1960, *leg. G. N. Nepli* (LE); Tajikistan, Vakhsh Range foothills, W of Dangara village; road verge; 28 Sept. 1961, *leg. I. Gubanov* (LE) [Note: the map position of the last locality (Fig. 1) is imprecise].

Stipa gracilis Roshev. (Poaceae) Fig. 1

GENERAL DISTRIBUTION. Tian-Shan Mts – Kirgizian, Tallaskii Alatau and Pamir Alai – Alai Mts. Endemic (Roshevitz 1934; Pazij 1968; Tzvelev 1976).

OCCURRENCE IN TAJIKISTAN. *Stipa gracilis* is a native species in the flora of Tajikistan. Specimens of the species deposited in LE in St. Petersburg were collected by N. N. Tzvelev from the northern Pamir, but were determined as *Stipa orientalis*.

SPECIMENS SEEN. East Pamirian range; Upper Badakhschan, rocky places in Seldara River valley, between Belyandkiik and Kaindy River valleys, 2900 m a.s.l., no. 1645, 22 Aug 1958, *leg. N. Tzvelev* (LE).

Zygophyllum miniatum Cham. & Schlecht. (Zygophyllaceae) Figs 1 & 2

Zygophyllum cinnabarinum Freyn.

GENERAL DISTRIBUTION. Endemic plant of Central Asia. Known from the Aralo-Caspian Plain, Kara-Kum desert and Pamir Alai range (Borissova 1949).

OCCURRENCE IN TAJIKISTAN. *Zygophyllum miniatum* is a native species in the flora of Tajikistan. This is one of the easternmost localities of the species within its natural range.

SPECIMENS SEEN. Zeravshanian range: southern slopes of loessic hills in Mogien River valley near Mogien cemetery, S-facing 30° slope, N 39°14′53″/E 67°39′06″, 1580 m a.s.l., 12 June 2010, *leg. A. Nowak & M. Nobis*.

ACKNOWLEDGEMENTS. We are grateful to Professor Hildemar Scholz (Berlin Dahlem) for determining *Eragrostis virescens* and to Professor Nikolai N. Tzvelev (St. Petersburg) for discussions on *Stipa gracilis*. We thank the Curators of FRU, LE, TAD, TASH, W and WU for making collections available for study, and to the anonymous reviewers for helpful remarks on the manuscript. This research was funded in part by the Polish Ministry of Science and Higher Education (grant nos. N N303 306237 and N N304 377838).

REFERENCES

BORISSOVA A. G. 1949. *Zygophyllum* L. In: B. K. SHISHKIN & E. G. BOBROV (eds), *Flora URSS*. **14**: 152–194. Izdatel'stvo Akademii Nauk SSSR, Moskva – Leningrad (in Russian).

CHUKAVINA A. P. (ed.) 1984. Flora Tadzhikskoi SSR. **7**. Zontichnye – Verbenovye. Izdatel'stvo Nauka, Leningrad.

DELENDICK T. J. 1990. *Acalypha australis* L. (Euphorbiaceae): new to the New York State. *Bull. Torrey Bot. Club* **117**(3): 291–293.

DUMAN H. & TERZIOĐLU S. 2009. *Acalypha* (Euphorbiaceae): a new genus record for Turkey. *Phytologia Balcan*. **15**(2): 171–173.

FRITSCH R. M. & FRIESEN N. 2009. *Allium oreotadzhikorum* and *Allium vallivanchense*, two new species of *Allium* subg. *Polyprason* (Alliaceae) from the Central Asian republic Tajikistan. *Feddes Repert*. **120**(3–4): 221–231.

FRITSCH R. M., KHASSANOV F. O. & MATIN F. 2002. New *Allium* taxa from Middle Asia and Iran. *Stapfia* **80**: 381–393.

GHEBREHIWET M. 2000. Taxonomy, phylogeny and biogeography of *Kickxia* and *Nanorrhinum* (Scrophulariaceae). *Nord. J. Bot.* **20**(6): 655–690.

GONCHAROV N. F. 1937. Raiony flory Tadshikistana i ikh rastitelnost. Flora Tadzhykistana. **5**. Izdatel'stvo Akademii Nauk SSSR, Moskwa – Leningrad.

HAUXING Q. & GILBERT M. G. 2008. *Acalypha* L. In: Z. Y. WU ZY, P. H. RAVEN & H. DEYUAN (eds), *Flora of China*. **11**: 251–255. Science Press, Beijing, & Missouri Botanical Garden Press, St Louis.

HUSSNER A. 2006. NOBANIS – Invasive Alien Species Fact Sheet – *Azolla filiculoides*. http://www.nobanis.org.

IKONNIKOV S. S. 1983. Notulae ad floram Pamir & Badachschan. *Novosti Sist. Vyssh. Rast*. **20**: 187–195 (in Russian).

KHASSANOV F. O., SHOMURADOV H. & TOBAEV K. 2007. A new *Allium* L. species from Middle Asia. *Linzer Biol. Beitr.* **39**(2): 799–802.

KINZIKAEVA G. K. (ed.) 1988. Flora Tadzhikskoi SSR. **9**. Marenovye – Slozhnotsvetnye. Izdatelstvo Nauka, Leningrad.

KOCHKAREVA T. F. (ed.) 1986. Flora Tadzhikskoi SSR. **8**. Kermekovye – Podorozhnikovye. Izdatelstvo Nauka, Leningrad (in Russian).

LAZKOV G. 2008. *Gastrolychnis alexeenkoi* Lazkov (Caryophyllaceae) – a new species to the flora of Tajikistan. *Novosti Sist. Vyssh. Rast.* **40**: 68–69 (in Russian with English summary).

MITTERMEIER R. A., GIL P. R., HOFFMAN M., PILGRIM J., BROOKS T., GOETTSCH-MITTERMEIER C., LAMOREUX J. & DA FONSECA G. A. B. 2005. Hotspots revisited: Earth's biologically richest and most threatened terrestrial ecoregions. Conservation International, Washington DC.

NOBIS M. 2011a. Remarks on the taxonomy and nomenclature of the *Stipa tianschanica* complex (Poaceae), on the base of a new record for the flora of Tajikistan (central Asia). *Nord. J. Bot*. **29**: 194–199.

NOBIS M. 2011b. *Stipa* ×*brozhiana* (Poaceae): a new hybrid taxon from the western Pamir Alai Mts (Middle Asia) and taxonomical notes on *Stipa* ×*tzvelevii*. *Nord. J. Bot*. **29**: 458–464.

NOBIS M., KOWALCZYK T. & NOWAK A. 2011. *Eleusine indica* (Poaceae): a new alien species in the flora of Tajikistan. *Polish Bot. J.* **56**(1): 121–123.

NOBIS M., NOWAK A. & ZALEWSKA-GAŁOSZ J. 2010. *Potamogeton pusillus* agg. in Tajikistan (Middle Asia). *Acta Soc. Bot. Poloniae* **79**(3): 235–238.

NOWAK A. & NOBIS M. 2010. Tentative list of endemic vascular plants of Zeravshan Mts in Tajikistan (Middle Asia): distribution, habitat preferences and conservation status of species. *Biodivers. Res. Conservation* **19**: 65–80.

NOWAK A., NOWAK S. & NOBIS M. 2011. Distribution patterns, ecological characteristic and conservation status of endemic plants of Tadzhikistan – A global hotspot of diversity. *Journal for Nature Conservation* **19**: 296–305.

OVCHINNIKOV P. N. (ed.) 1957. Flora Tadzhikskoi SSR. **1**. Paprotnikoobraznye – Zlaki. Izdatelstvo Akademii Nauk SSSR, Moskwa – Leningrad.

OVCHINNIKOV P. N. (ed.) 1963. Flora Tadzhikskoi SSR. **2**. Osokovye – Orkhidnye. Izdatelstvo Akademii Nauk SSSR, Moskwa – Leningrad.

OVCHINNIKOV P. N. (ed.) 1968. Flora Tadzhikskoi SSR. **3**. Opekhovye – Gvozdichnye. Izdatelstvo Nauka, Leningrad.

OVCHINNIKOV P. N. (ed.) 1978. Flora Tadzhikskoi SSR. **5**. Krestotsvetne – Bobovye. Izdatelstvo Nauka, Leningrad.

OVCHINNIKOV P. N. & KINZIKAEVA G. K. (ed.) 1981. Flora Tadzhikskoi SSR. **6**. Bobovye (rod Astragal) – Tsinomorievye. Izdatelstvo Nauka, Leningrad.

OVCHINNIKOV P. N. & KOCHKAREVA T. F. (ed.) 1975. Flora Tadzhikskoi SSR. **4**. Rogolistnikovye – Rozotsvetnye. Izdatelstvo Nauka, Leningrad.

PAZIJ V. K. 1968. *Stipa*. In: S. S. KOVALEVSKAYA. (ed.), *Conspectus florae Asiae Mediae*. **1**: 64–82. Academia Scientarum UzSSR, Izdatel'stvo Fan, Tashkent (in Russian).

PETERSON P. M. 2003. *Eragrostis* Wolf. In: M. E. BARKWORTH, K. M. CAPELS, S. LONG, M. B. & PIEP (eds), *Flora of North America North of Mexico*. **25**: 65–105. New York Oxford, Oxford Uniwersity Press.

POYARKOVA A. I. 1974. *Acalypha* L. In: V. L. KOMAROV (ed.), *Flora of the USSR*. **14**: 228–229. Israel Program for Scientific Translation, Jerusalem.

PROTOPOPOVA V. V. 1994. *Bidens* L. In: N. N. TZVELEV (ed), *Flora partis europeae URSS*. **7**: 195. Nauka, St. Petersburg (in Russian).

QURESHI R. & BHATTI G. R. 2008. Taxonomy of Scrophulariaceae from Nara desert, Pakistan. *Pakistan J. Bot.* **40**(3): 973–978.

RANJBAR M., KARAMIAN R. & VITEK E. 2010. *Onobrychis dushanbensis* sp. nova endemic to Tajikistan. *Nord. J. Bot.* **28**: 182–185.

RASULOVA M. R. (ed.) 1991. Flora Tadzhikskoi SSR. **10**. Slozhnotsvetnye. Izdatel'stvo Nauka, Leningrad.

ROSHEVITZ R. Y. 1934. *Stipa* L. In: V. L. KOMAROV (ed.), *Flora SSSR*. **2**: 79–112, 740–741. Izdatel'stvo Akademii Nauk SSSR, Leningrad.

SHISHKIN B. K. 1936. *Gypsophila* L. In: V. L. KOMAROV & B. K. SHISHKIN (eds), *Flora URSS*. **6**: 731–777. Izdatel'stvo Akademii Nauk SSSR. Moskva – Leningrad.

SMITH P. M. 1980. *Bromus* L. In: T. G. TUTIN, V. H. HEYWOOD, N. A. BURGES, D. M. MOORE, D. H. VALENTINE, S. M. WALTERS & D. A. WEBB (eds), *Flora Europaea*. **5**: 182–189. Cambridge University Press.

TUTIN T. G. 1976a. *Bidens* L.. In: T. G. TUTIN, V. H. HEYWOOD, N. A. BURGES, D. M. MOORE, D. H. VALENTINE, S. M. WALTERS & D. A. WEBB (eds), *Flora Europaea*. **4**: 139–140. Cambridge University Press, Cambridge.

TUTIN T. G. 2004. *Galinsoga* Ruiz & Pavón. In: T. G. TUTIN, V. H. HEYWOOD, N. A. BURGES, D. M. MOORE, D. H. VALENTINE, S. M. WALTERS & D. A. WEBB (eds), *Flora Europaea.* **4**: 143–144. Cambridge University Press, Cambridge.

TZVELEV N. N. 1976. Zlaki SSSR. Izdatel'stvo Nauka, Leningrad.

VASILCHENKO I. T. 1959. *Galinsoga* Ruiz et Pav. In: B. K. SHISHKIN (ed.), *Flora URSS*. **25**: 563–567. Izdatel'stvo Akademii Nauk SSSR, Moskva – Leningrad.

WAGENITZ G. 1979. Illustrierte Flora von Mitteleuropa. Pteridophyta, Spermatophyta. **6**(3). Compositae I: Allgemeiner Teil, *Eupatorium – Achillea*. Verlag Paul Parey, Berlin – Hamburg.

WEBER E. 2005. Invasive plant species in the World. Cabi Publishing, Wallingford.

ZAKIROV K. Z. 1961. Flora i rastitelnost basseina reki Zeravshan. 2, konspekt flory. Izdatel'stvo Akademii Nauk Uzbekskoy SSR, Tashkent.

Received 28 June 2011