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# NOTES ON THE TAXONOMY OF *GIRGENSOHNIA* (*CHENOPODIACEAE* / *AMARANTHACEAE*)

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An overview is given of *Girgensohnia* (*Chenopodiaceae*/*Amaranthaceae*). Five species are recognized including one new species, *Girgensohnia bungeana* Sukhor. A key for identifying species is provided together with details of their distribution. Lectotypes for the following names are chosen: *Girgensohnia diptera* Bunge, *Girgensohnia oppositiflora* (Pall.) Fenzl, *Anabasis heteroptera* Jaub. & Spach (= *Girgensohnia heteroptera* (Jaub. & Spach) Bunge), *Girgensohnia imbricata* Bunge and *Girgensohnia pallasii* Bunge (= *Girgensohnia oppositiflora* (Pall.) Fenzl).

*Keywords.* *Chenopodiaceae*/*Amaranthaceae*, *Girgensohnia*, lectotypification, new species, taxonomy, C and SW Asia.

## Introduction

The genus *Girgensohnia*, described by Bunge (1849), is known to comprise four annual species, mainly distributed in C and SW Asia. Almost all the taxa have relatively small ranges (*Girgensohnia diptera* Bunge, *G. imbricata* Bunge, *G. minima* Korovin), connected with the western Irano-Turanian region (based on the system by Takhtajan, 1978). Only *Girgensohnia oppositiflora* (Pall.) Fenzl occupies a large territory, from the semi-deserts of Kazakhstan in the north to Iraq and Pakistan in the south. In some areas this species is rather common (e.g. in the deserts or semi-deserts of Kazakhstan). However, in more southern areas it often grows together with another taxon, differing in its branching (typical 'tumble-weed') and other characters. Further *in-situ* observations together with the analysis of herbarium collections and literature have shown that this is a species new to science, *Girgensohnia bungeana* Sukhor. New features for delimiting the species are suggested and their distribution ranges are more accurately drawn.

## Materials and Methods

Field studies were carried out from 2000 to 2006 in the Republics of Kazakhstan and Uzbekistan as well as in southeastern European Russia. The collections are housed in MW (herbarium acronyms according to *Index Herbariorum*: http://sweetgum.nybg.org/ih/); some duplicates are also in LE. Older collections of the genus

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*Girgensohnia* were studied in B, LE, MHA, MOSP, MW and P, and in the herbarium of the Timiryazev Agricultural Academy in Moscow.

## Principal Characters of *Girgensohnia*

**Girgensohnia** Bunge ex Fenzl in Ledeb., Fl. Ross. 3: 835 (1851). – Type: *Girgensohnia oppositiflora* (Pall.) Fenzl.

Annual plants, usually branched from the base, glabrous or covered with short papilliform trichomes. Stem epidermis 1-layered. Leaves opposite, linear-subulate, with a small apical mucro, stiff. Flowers axillary, solitary, sessile, with 2 bracteoles. Perianth consisting of 5 whitish membranous tepals, persistent, in fruit forming a cone-shaped structure, with two or three of them developing wing-shaped projections; less often the projections absent or at least not recorded (*Girgensohnia minima*). Stamens 5 with short filaments; anthers 0.4–1.0 mm long, usually long-persisting in upper part of the perianth; connective with a short terminal extension, up to 0.2 mm long. Stigma capitate or bilobed, sessile or on a very short (less than 0.2 mm) style. Fruit ovoid; pericarp composed of 3 to 5 cell layers, epidermis papillate in upper part of the fruit; seed coat 2-layered; embryo vertical, with the radicle oriented upward (terminal or subterminal); perisperm inconspicuous. Flowering: June–September; fruiting: September–October (November).

The most important characters for species delimitation are the presence of trichomes and the number of wings on the perianth segments.

The genus belongs to subfamily *Salsoloideae* Ulbr. A subgeneric classification of *Girgensohnia* has never been suggested.

### *Key to species*

1a. Plant glabrous, or only bracteoles and inflorescence axis with sparse papillae; perianth with two horizontal wings only _____ **1. G. diptera**

1b. Plant papillose, at least on the inflorescences; perianth with two horizontal and one vertical wing adpressed to inflorescence axis, less often appendages missing _____ 2

2a. Plant globular in shape ('tumble-weed' habit); tepals in fruit 3.5–4.5 mm long; anthers (0.7–)0.8–1.0 mm long _____ 3

2b. Plant not globular in shape, branched mostly in the basal part; tepals in fruit 3.0–3.5(–4.0) mm long; anthers 0.4–0.6 mm long _____ 4

3a. Plant scarcely papillose, greyish or greyish-green; leaves and bracts straight, or only bracts slightly recurved; lower and middle leaves 8–15 mm long; fruits 2.8–3.2 mm long, wings lanceolate to rhomboid, rarely broadly ovate _____ **2. G. bungeana**

3b. Plant usually densely papillose, yellowish-green; leaves and bracts recurved; lower leaves 4–8 mm long; fruits 2.2–2.6 mm long, wings absent _____ **5. G. minima**

4a. Plant with several stems up to 15(–25) cm tall; lower leaves up to 8–10 mm long; inflorescence compact, with up to 2.5 mm long internodes, sometimes a few lower internodes 4–10 mm long; bracts broadly ovate, up to 2.5 mm long, with minute mucro up to 0.15 mm long; fruits 2.5–2.8 mm long _____ **3. G. imbricata**

4b. Plant branched in both basal and middle part, with pronounced main stem, (10–)15–50 cm tall; lower leaves 10–20(–35) mm long; inflorescence loose, with pronounced internodes, over (2.5–)3.0 mm long; bracts triangular, less often broadly ovate, with a mucro of (0.2–)0.3–1.0 mm long; fruits 2.0–2.5(–2.7) mm long _____ **4. G. oppositiflora**

**1. Girgensohnia diptera** Bunge, Rel. Lehm. 303 (1852); Boiss., Fl. Orient. 4: 968 (1879); Iljin in Shishkin (ed.), Fl. URSS 6: 281 (1936); Nikitina in Vvedensky (ed.), Fl. Kirgiz. SSR 5: 70 (1955); Kinzikayeva in Ovczinnikov (ed.), Fl. Tadzh. SSR 3: 430 (1968); Pratov in Vvedensky (ed.), Consp. Fl. As. Med. 3: 112 (1972); Hedge in Rechinger (ed.), Fl. Iran. 172: 300 (1997); Abdulina, Checklist Vasc. Pl. Kazakhstan 76 (1999). – Type: Leg. in deserto argilloso-salso nec non in collibus apricio circa Samarcandam (collected in steppe clay and saline soils and in the dry hills around Samarkand), x 1841, *C.A. Meyer* s.n. (lecto P!, designated here). **Figs 1, 2.**

Annual, glabrous or only slightly pubescent in the inflorescence; 15–40 cm tall. Lower leaves up to 10 mm long. Bracts 3–5 mm long, slightly longer than bracteoles, ovate, apex with minute mucro. Anthers 0.5–0.7 mm long. Tepals in the fruit about 3 mm long, 2 abaxial tepals with a yellowish or buff wing-like projection (Fig. 1) located 0.8–1.3 mm below the top. Fruits 2.0–2.3 mm long.

*Distribution*. From N Afghanistan through W Tajikistan to S Kazakhstan (Fig. 2).

*Habitat*. Clayey, often saline, deserts and semi-deserts, up to 2000 m altitude.

*Specimens examined*. KAZAKHSTAN. **S:** Chimkent distr., near Timur railroad station, 8 ix 1910, *N. Androsov* 92 (LE); Yany-Kurgan distr., ancient valley of Syr-Darya river, near Ak-kut station, Solonchak, 6 ix 1935, *A.V. Prozorovsky* s.n. (LE); Shaul'der distr., left bank of Syr-Darya river, Sazan-tyube, among *Anabasis* on saline soil, 26 ix 1948, *Tropova* s.n. (LE); Bair-kum village, sandy place, 28 ix 1952, *M. Nemtzov* s.n. (herb. Timiryazev-Acad.); near Turkestan, clayey desert, 13 x 1956, *A. Skvortsov* s.n. (MHA).

KYRGYZSTAN. **W:** near Osh, 1934, *Ivanov* s.n. (LE).

UZBEKISTAN. **E:** near Samarkand, 9 vi [18]69, *O. Fedczenko* s.n. (LE); [prov. Kokand], near Margilan on dry solonchak, 15 x 1878, *Korolkow* s.n. (MW); Namangan prov., within 4 km from Chust, 11 vi 1912, *O. Knorring* s.n. (LE); distr. Namangan, 1912, *S.S. Neustruyev* s.n. (LE); prov. Fergana, 14 x 1913, *O.V. Sokolov* 393 (MHA); Fergana, 1924, *E. Korovin* s.n. (LE); Fergana valley, loessial plains between Namangan and Chust, 9 x 1964, *V.P. Bochantsev* 50 (LE).

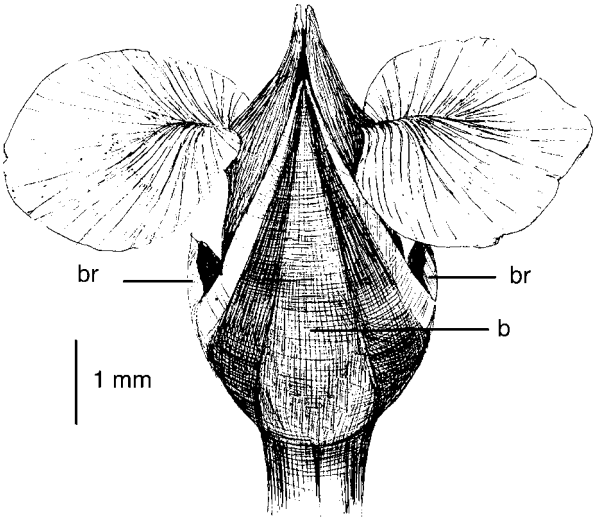


FIG. 1. *Girgensohnia diptera* Bunge. b, bract; br, bracteoles.

TAJIKISTAN. **N:** Northern slope of Turkestan range, N Isfara village, deserts with *Anabasis* and *Artemisia* spp., 26 viii 1937, *K. Afanasyev* 561 (LE); Khudzhand [Leninabad], Mogol-Tau piedmont, 16 viii 1952, *E. Leontyeva* s.n. (LE); Foothills of Turkestan range slope, 15 x 1956, *P.N. Ovchinnikov & G. Kinzikayeva* 413 (LE).

AFGHANISTAN. Northern provinces from Jowzjan to Samangan (see Hedge, 1997).

**2. Girgensohnia bungeana** Sukhor., **sp. nov. Figs 3–5.**

Planta annua, breviter et sparse papillata, caule primario expresso, tota longitudine ramoso, 30–50 cm alto. Axes primarii perfecti, paene horizontaliter reclinati. Omnia folia recta aut apice tantum recurva; folia inferiora et media ad 1.5 cm

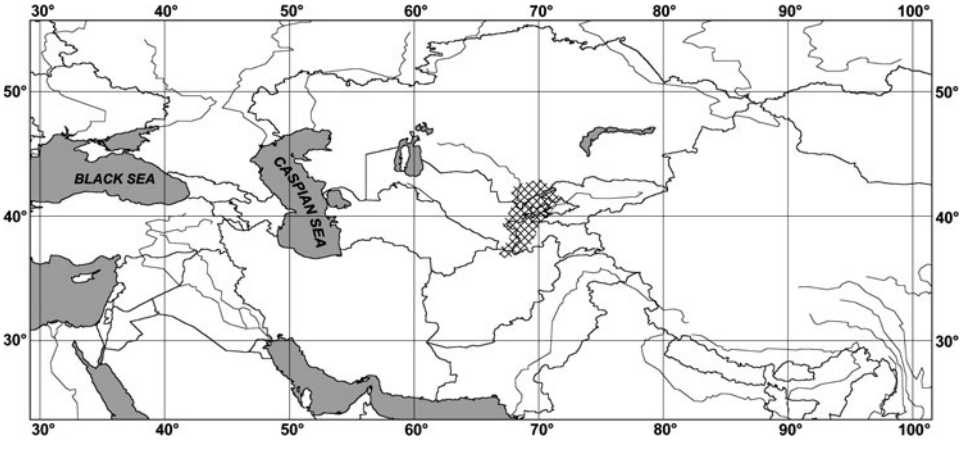


FIG. 2. Distribution of *Girgensohnia diptera* Bunge.

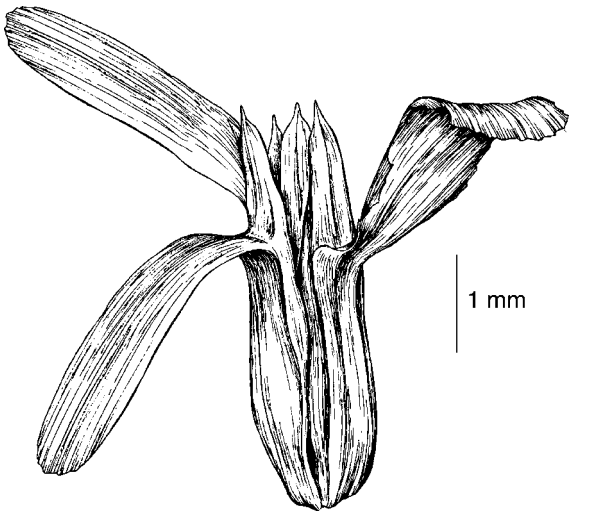


FIG. 3. Tepals of *Girgensohnia bungeana* Sukhor. in fruit.

longa. Bracteae ovales aut triangulares, 4.0–8.0 mm longae, vertice contractae, cuspide 0.5–1.0 mm longa, bracteolis paullo longiores, rarius iis aequales. Perianthii phylla in latere abaxiali superne saltem papillulata, tempore florendi 3.2–3.7 mm longa, fructificatione 3.5–4.5 mm longa; tria exteriora fructificatione excrescentias aliformes (Fig. 3), oblongas aut anguste rhomboideas (raro tamen late ovales), albas aut flavidas aut rubellas ad 7 mm longas evolvunt. Locus, quo ala abit, a summo perianthii phyllo 1.7–2.2 mm distat. Antherae (0.7–)0.8–1.0 mm longae. Fructus 2.8–3.2 mm longi (Fig. 4). – Typus: Uzbekistania, prov. Maracandana (Samarkand), sub radicibus elevationis Karakczita, prope pag. Pajaryk, deserto argilloso (Uzbekistan, prov. Samarkand, Foothills of Karakchita by village Payaryk, clayey deserts), 17 x 2006, *A. Sukhorukov* U-250 (holo MW; iso E). Original text on the label is in Russian.

?*G. gypsophiloides* Bunge, Rel. Lehm. 303 (1852), in adn. – ?*G. oppositiflora* (Pall.) Fenzl var. *glauca* Bunge, Anabas. Rev. 32 (1862). – Type: specimens not found.

Annual plants, scarcely papillose, with pronounced main stem 30–50 cm high and elongated, often horizontal declined branches. Leaves straight, sometimes slightly recurved at apex. Lower and middle leaves up to 1.5 cm long. Bracts ovate or triangular, 4.0–8.0 mm long, with apical mucro 0.5–1.0 mm long. Tepals in upper part shortly papillose, in the flowering stage 3.2–3.7 mm, in fruit 3.5–4.5 mm long. Three outer tepals forming lanceolate or rhomboid (rarely broadly ovate), white-yellowish or reddish wings up to 7 mm long, located 1.7–2.2 mm below tepal apex. Anthers (0.7–)0.8–1.0 mm long. Fruits 2.8–3.2 mm long.

*Taxonomic remarks.* Bunge (1852) suggested a new species *Girgensohnia gypsophiloides* but was not sure that it could be distinguished from *G. heteroptera* (= *G. oppositiflora*).

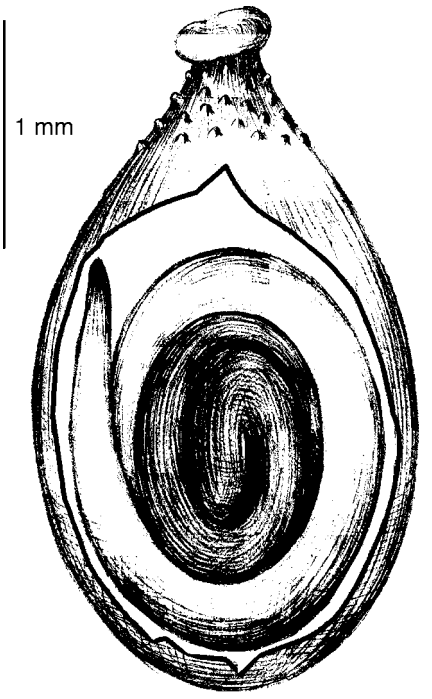


FIG. 4. Fruit of *Girgensohnia bungeana* Sukhor. in section; seed with embryo.

Later (Bunge, 1862) he reduced *Girgensohnia gypsophiloides* to the variety *G. oppositiflora* var. *glauca*, suggesting characters which are typical for *G. bungeana*: 'eximie glauca, radice multicaulis *caulibus elongatis dichotome ramosis*, foliis subfloralibus abbreviatis, *floribus omnibus remotis*, *antheris majusculis*. G. gypsophiloides m'. Unfortunately the search for Bunge's specimen in P and LE has not been successful. Instead, *Girgensohnia bungeana* is described as new although Bunge's plants may also belong here.

*Relationships.* *Girgensohnia bungeana* is similar to *Girgensohnia minima* in the length of the anthers and tepals, but it is scarcely papillose, greyish or greyish-green; the leaves and bracts are straight and three tepals always have wings.

*Distribution.* Desert plains and lower mountain belts in desert parts of C Asia, C and E Iran (Fig. 5).

*Habitat*. Sandy, stony, clayey, sometimes ruderal places.

*Etymology*. This new species is described in honour of Alexander Bunge, a prominent specialist in the *Chenopodiaceae* (which is now referred to the *Amaranthaceae*) and other plant families growing in the arid regions of Eurasia.

The differences between *Girgensohnia bungeana* and *G. oppositiflora* are summarized in Table 1.

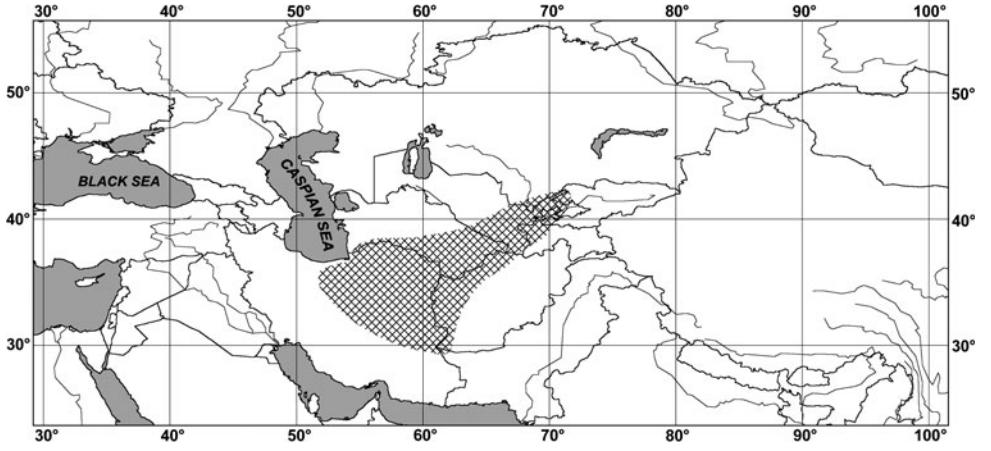


FIG. 5. Distribution of *Girgensohnia bungeana* Sukhor.

*Specimens examined.* KAZAKHSTAN. **S:** distr. Kopalsk, Alexandrovsky ridge, Uch-bulak, 4 ix 1909, *A. Mikhelson* 2731 (LE, MHA). These specimens possess broadly ovate tepal wings.

KYRGYZSTAN. **W:** Kara-Kirghizia, Ak-bash stow, Kuch-art-su river valley, 9 ix 1925, *P.S. Massagetov* s.n. (LE).

UZBEKISTAN. **E:** [without locality], grass steppe, ix–x 1909, *N.A. Dimo* s.n. (LE); Tashkent distr., Tay-tyube, roadside, 6 ix 1912, ex herb. *von Minkwitz* 43 (LE); prov. Fergana, 26 ix 1913, *O.V. Sokolov* s.n. (LE); Samarkand, city surroundings, on hills, 16 vi 2001, *A. Sukhorukov* s.n. (MW); **S:** Amu-darya-Gebiet, zwischen Scherabad und Ghusar, 2000′, 9 ix 1881, *A. Regel* s.n. (LE); prov. Bukhara, Kermin, 9 ix 1901, *N. Androsov* s.n. (LE, herb. Timiryazev-Acad.); prov. Samarkand, deserts, 22 viii 1915, *M.D. Spiridonov* R16 (LE); Boisun-tau low-hill terrains, stony deposits between Ghuzar and Derbent, 5 ix 1956, *P. Polyakov* 883 (LE); **SE:** Surhan-darya prov., ENE within 6–7 km from Kadrun village, 9 ix 1934, *V. Golbina* s.n. (MOSP); Kashkadarya river basin, between Sarycha & Kara-kaynak, 14 ix 1938, *S.N. Kudryashev & G.P. Sumnevich* 1668 (LE); prov. Surhandarya, stony low-hill terrains between Sherabad & Zarabag, terra rossa (red clays), 8 x 1970, *V.P. Bochantsev* 17 (LE). This specimen possesses widely oval wings.

TABLE 1. The features of *Girgensohnia bungeana* and *G. oppositiflora*

| Character | *G. bungeana* | *G. oppositiflora* |
|---|---|---|
| Shape of plant body | Globular (tumble-weed), by dense branching in middle and upper parts | Diffuse, with most branches in the lower part |
| Anther length (mm) | 0.7–1.0 | 0.4–0.6 |
| Length of perianth segments in fruit (mm) | 3.5–4.5 | 3.3–4.0 |
| Wing, location below tepal apex (mm) | 1.7–2.2 | 1.0–1.5 |
| Wing shape | Lanceolate to rhomboid, rarely broadly ovate | Broadly ovate or rhombic |
| Fruit length (mm) | 2.8–3.2 | 2.0–2.7 |

TAJIKISTAN. **N:** Khodzhent, clayey desert, 16 ix [18]97, *S. Korshinsky* s.n. (LE); Zeravshan river, stony slope of a valley between Rarz and Varziminar, 10 ix 1953, *P. Gordienko & L. Chilikina* 553 (MW); Kuhitang ridge, a way down to Bazar-Tepe, 22 viii 1928, *E. Bobrov* 1432 (LE); **C:** Zeravshan ridge, near Fendarya river estuary, 9 ix 1956, *G.K. Kinzikayeva* 279 (LE).

TURKMENISTAN. **S:** Ashabad, 18 ix 1897, *D. Litvinov* s.n. (LE); Aschabad, in collibus ad Mekrowa, 23 ix 1900, *J. Bornmülle*r 2202 (B, LE).

IRAN. **N:** Kewir, Sebsewar, 27 vi 1942, *Sherbenovsky* s.n. (LE); **SE:** Persia austro-orient., prov. Kerman: Kerman, in incultis, 1900 m.s.m., 22 viii 1892, *J. Bornmüller* 4174 (P).

**3. Girgensohnia imbricata** Bunge, Anabas. Rev. 32 (1862); Boiss., Fl. Orient. 4: 968 (1879); Hedge in Rechinger (ed.), Fl. Iran. 172: 301 (1997); Assadi in Assadi et al., Fl. Iran. 419 (2001). – Type: [Iran, Khorasan prov.] In salsis montibus inter Afris et Afselabad et prope Birdshand (saline mountains between Afris and Afzelabad and by Birdjand), 4–5 ix 1858, *herb. Al. de Bunge* (lecto P!, designated here). **Fig. 6.**

Annual, with scattered papillae, basally branched, with several stems to 15(–20–25) cm. Lower leaves up to 0.8(–1.0) cm long. Internodes in lower parts of shoots distinct, much shorter in upper parts, up to 2.5 mm long. Bracts broadly ovate, 1.8–2.5 mm long, each with a minute mucro up to 0.15 mm, equal to or longer than bracteoles. Anthers 0.4–0.5 mm long. Tepals with inconspicuous papillae, 3.0–3.5 mm long; three lower tepals forming rounded or broadly ovate wing-like projections (Fig. 6), wings entire or toothed, located 0.7–1.3 mm below the apex of the tepal. Fruits 2.5–2.8 mm long.

*Distribution*. Endemic to Iran.

*Habitats*. Stony and clayey places.

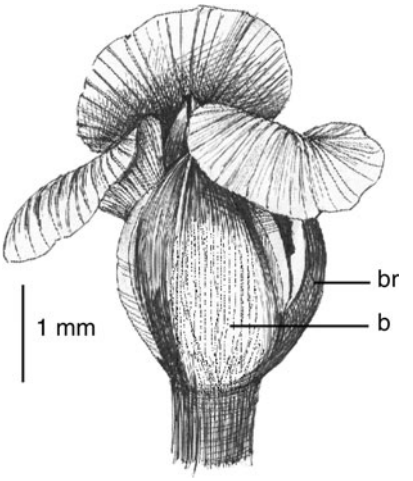


FIG. 6. Tepals of *Girgensohnia imbricata* Bunge in fruit. b, bract; br, bracteoles (only one is seen).

*Specimens examined*. IRAN. **N:** Teheran, Steppe bei Tscharta-chan, 29 ix 1909, *T. Brüns* 211 (B, LE); **E:** Khorasan prov.: Birjan-Mud (way to Seistan), branches of Gagran-Kuh, 30 ix 1925, *E. Czerniakowska* 290 (LE).

Unidentified location: Iter Persico-turcicum, 1892–93, *J. Bornmüller* 4177 (B).

**4. Girgensohnia oppositiflora** (Pall.) Fenzl in Ledeb., Fl. Ross. 3: 835 (1851); Boiss., Fl. Orient. 4: 967 (1879); Iljin in Shishkin (ed.), Fl. URSS 6: 277 (1936); Nikitina in Vvedensky (ed.), Fl. Kirgiz. SSR 5: 70 (1955); Takhtajan (ed.), Fl. Armen. 2: 375 (1956); Zohary, Fl. Palaest. 1: 176 (1966); Grubov, Pl. As. Centr. 2: 101 (1966); Kinzikayeva in Ovczinnikov (ed.), Fl. Tadzh. SSR 3: 428 (1968); Pratov in Vvedensky (ed.), Consp. Fl. As. Med. 112 (1972); Nikitin & Geldikhanov, Opr. Rast. Turkmen. 189 (1988); Hedge in Rechinger (ed.), Fl. Iran. 172: 297 (1997); Abdulina, Checklist Vasc. Pl. Kazakhstan 76 (1999); Hedge in Ali et al. (eds), Fl. Pakistan 204: 185 (2001); Assadi in Assadi, Khatamsaz & Maassoumi, Flora of Iran: 416 (2001); Zhu et al., in Wu & Raven (eds), Fl. China 5: 39 (2003). – *Salsola oppositiflora* Pall., Reise Russ. Reich. 2: 735 (1773). – *Chenopodium oppositifolium* [sic!] L.f., Suppl. 172 (1781). – *Polycnemum oppositifolium* [sic!] Willd., Sp. Pl. 1: 193 (1797). – *Anabasis oppositiflora* (Pall.) M.Bieb., Mem. Soc. Nat. Mosc. 1: 148 (1806). – *Halogeton oppositiflorus* (Pall.) C.A.Mey. in Ledeb., Fl. Alt. 1: 378 (1829), in adn. – *Halogeton oppositiflorus* (Pall.) Moq., Chenop. Monogr. Enum. 161 (1840), *nom. superfl.* – *Noaea oppositiflora* (Pall.) Moq. in DC., Prodr. 13(2): 209 (1849). – Type: [W Kazakhstan, Atyrau prov.] Ad Jaicum [Ural] lecta (collected by the river Ural), *Pallas* s.n. (lecto LE!, designated here by Sukhorukov & Hedge). **Figs 7, 8.**

*Anabasis heteroptera* Jaub. & Spach, Ill. Pl. Orient. 2: 45 (1844–46). – *Girgensohnia heteroptera* (Jaub. & Spach) Bunge, Rel. Lehm. 303 (1852). – Type: tab. 133 in Jaubert & Spach, l.c. (1844–46). 'In Persia, inter urbes Teheran et Ispahan' (Iran, between Teheran and Isphahan), 'leg. Olivier et Bruguiere' (lecto P, designated here by Sukhorukov & Hedge).

*Girgensohnia pallasii* Bunge, Rel. Lehm. 303 (1852). – Type: Songoria et Deserto Songor[ico] (Dshungarya deserts), *Bunge* s.n. (lecto P!, designated here).

Annual, (10–15)20–40(–50) cm, branched mainly in its basal part, with a prominent main stem and arched ascending or spreading branches. Lower leaves up to 1.5 cm, less often up to 3.0–3.5 cm. Tepals 2.8–3.5 mm in flower, 3.3–4.0 mm in fruit. Wings broadly ovate or rhombic, the margin entire, toothed or erose (Fig. 7); in fruit whitish to brownish, located 1.0–1.5 mm below the apex of the tepals. Anthers 0.4–0.6 mm long. Fruits 2.0–2.5(–2.7) mm long.

$2n = 18$ (Zakharyeva, 1968), the analysed specimen not cited.

*Taxonomic remarks*. Two specimens of *Girgensohnia pallasii* annotated by A. Bunge are preserved in P. One of them has two parts with different labels ('Deserto Songorico' et 'Iter Persicum' 1858–59, Al. de Bunge); however, since in the protologue A. Bunge specified the collection place as 'Kirghisensteppe' ('Songoria'), it appears logical to choose the Songorian part for lectotypification.

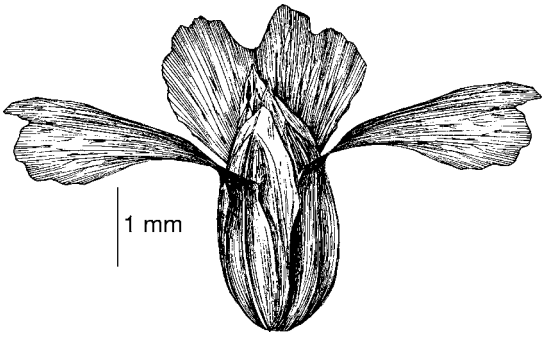


FIG. 7. Tepals of *Girgensohnia oppositiflora* (Pall.) Fenzl in fruit.

*Distribution*. Quite common all over Middle Asia and in the Middle East (Fig. 8).

*Habitat*. Sand massifs, clayey deserts, as a ruderal plant from the plains up to medium mountain belts at 2000(–2500) m altitude.

*Specimens examined.* KAZAKHSTAN. **W:** (European part): Guryev [Atyrau] distr., between Baksay and Narynka, a ditch near a well, 4 vii 1927, *M.M. Iljin & Yu.S. Grigoriev* s.n. (LE); Saraychik village, alkali soils, 13 vii 1927, *Z. Korovnik & T. Poyarkova* s.n. (LE); Guryev [Atyrau], clayey hills near the town, 2 ix 1927, *S.A. Nikitin* s.n. (LE); Novobogatinsk, solonchak, 16 ix 1927, *Z. Korovnik & T. Poyarkova* s.n. (LE); deserts with *Artemisia* & *Salsola* spp. near Bish-Choho, 9 ix 1939, *T. Yakubov* s.n. (LE); (Asian part): Guryev [Atyrau] distr., Inder, ruderal place, 3 vi 1927, *M.M. Iljin & Yu.S. Grigoriev* 107 (LE); Ural-Emba distr., Shilaya Kosa, Minghit stow, 3 viii 1936, *S. Nikitin & M. Deulina* s.n. (LE); Aktyubinsk prov., Ust-Urt, 3 km E Aktykty, 15 ix 1948, *Vostokova* s.n. (MW); left bank of Emba river, Borlak, across from Besbay village, along the terrace above the flood-plain with *Salsola* spp., 15 ix

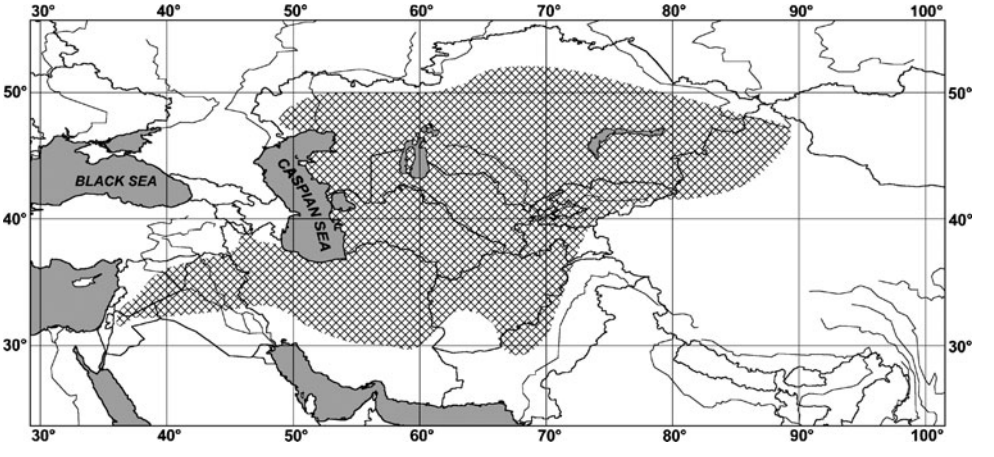


FIG. 8. Distribution of *Girgensohnia oppositiflora* (Pall.) Fenzl.

1955, *V. Grubov & N. Lyubarsky* 316 (LE); Mangistau prov., distr. Beyneu, 10 km north of Beyneu village, solonchak plain, 3 vi 2003, *A. Sukhorukov* s.n. (MW); **E:** Zaisan, Kaldshir valley, Chiganchiy, deserts, 6 vii 1908, *B.A. Keller* s.n. (LE); Lepsy distr., clayey bank slope of Aksu river near Aksuysky village, 22 viii 1928, *N. Pavlov* 1035 (MW); Taldy-Kurgan distr., Lepsy river valley, solonchak in 10 km east of Kara-Chagan, 5 ix 1928, *V.I. Smirnov* 1310 (MW); Taldy-Kurgan distr., stony spots on Ush-Tobe mountain slopes near Taldy-Kurgan, 29 ix 1928, *N. Pavlov* 1301 (MW); Zaisan, Kurchum distr., solonchak near Kara-Nura, 5 viii 1930, *N. Goncharov & A. Borisova* 1555 (LE); Semipalatinsk prov., 5 km SW Aktogai, semi-fixed sands, 25 ix 2000, *M.N. Lomonosova & A. Sukhorukov* s.n. (MW, LE); **N:** Akmola prov., Atbasar distr., steppe depression, 5 viii 1909, *V. Petrovsk*y 52 (LE); Atbasar distr., Kara-Dshar, steppe on the river terrace, 11 vii 1914, *V.F. Semyonov* s.n. (LE); **C:** Aktyubinsk prov., Chelkar distr., sandy steppe near Kara-Chokat station, 25 viii 1907, *N.V. Androsov* s.n. (LE); W Kara-Chokat station, wormwood association, 15 ix 1927, *M.D. Spiridonov* 1712 (LE); Karsakpay distr., in clayey steppe near Shihan village, 28 viii 1929, *S. Lipshitz* 817 (MW); Irghiz distr., Ak-chi village, along the road from Irghiz to Akchi, 7 ix 1929, *V. Kutyeva* s.n. (MW); **SW:** Adayevsk distr., Western Ust-Urt, Mangyshlak, 30 ix 1926, *F.N. Rusanov* 90 (LE); Adayevsk distr., Eastern Ust-Urt, Sankibay, 4 x 1926, *Roshevitz & Heinrikhson* 268 (LE); **S:** Tschu, *A. Schrenk* 2789 (LE); Songoria, Sary-ssu, 20 vii 1842, *A. Schrenk* s.n. (LE); Desertum Aralense, regione fl. Ssyr-Darya, 12 viii 1857, *E. Borszczow* 847 (LE); Syr-Darya distr., Muyun-Kum, Kos-kuduk, the wash (old river-bed) of Chu river, idle fields, 18 ix 1929, *S.A. Nikitin* 458 (LE); near Saksaulskaya railroad station, clayey desert, 9 ix 1956, *A. Skvortsov* s.n. (MHA); near Turkestan city, clayey semi-desert, 13 x 1956, *A. Skvortsov* (MHA); Aral sea, Barsa-Kelmes island, x 1957, *V.A. Roshek* 6 (LE); Karatau ridge, Iskikan settlement, loessial foothills, 4 ix 1961, *V. Bochantsev* s.n. (LE); Dshambul prov., Kuyuk passage, along a stream, 29 viii 1985, *V.D. Bochkin* s.n. (MHA); **SE:** Verny distr., Sary-Bulak stow, 23 viii 1910, *A. Mikhelson* 2780 (LE); Verny distr., between the towns of Saguty & Alasa, deserted plain, 18 vi 1915, *V. Titov* s.n. (LE); Pishpek distr., wormwood steppe, 18 viii 1916, *Zvyagintsev* 1659 (LE); Dsharkent distr., surroundings of Dsharkent town, vii 1928, *N.L. Desyatkin* s.n. (LE); right bank of Ili river, 70 km lower Bakanas village, 23 ix 1944, *L. Gvozdeva* s.n. (LE).

China. **E:** Sultangarten bei Kuldsha, vii 1877, *A. Regel* s.n. (LE); Untere Borotala bei Utsch-tube, 4000′, 20, 27 viii 1878, *A. Regel* 3503 (LE); Iter turkestanicum, fl. Urtaksary, 5000′, ix 1880, *A. Regel* s.n. (LE); Dshungarya, surroundings of Urumchi, stony slope, 6 ix 1929, *M.G. Popov* 439 (LE); Sinkiang, Dshungarya, Altai, Shara-sume, 200 m, 6 ix 1956, *Tzin* 2743, 2708 (LE); Sinkiang, Dshungarya, Altai, 50 km to the south of Koshtologoy, 500 m, in semideserts, 22 ix 1956, *Tzin* 3357 (LE); Sinkiang, Urunchu river, in 35 km to SE of Sulyugou stow, the northern outskirts of Dzosotyn sands, *Haloxylon* deserts on the sands, 11 vii 1959, *A.A. Yunatov & Yuan I-fen* 1647 (LE); Sinkiang, Dshungaria, Urumchi, 33 km to the east of Shiho town, deserts with *Artemisia* & *Salsola* spp., 30 viii 1959, *M.P. Petrov* s.n. (LE).

Kyrgyzstan. **W:** Osh, hills over Ak-buroy river, 2 vii 1930, *S. Yuzepczuk* s.n. (LE); **NE:** Prshevalsk distr., 22 x 1910, *A. Mikhelson* 552 (LE); Prshevalsk distr., between Zanarynskoye & Suhotinovka, deserts with *Salsola* spp., 25 viii 1912, *V. Saposhnikov & B. Shishkin* s.n. (LE); **N:** Frunze [Bishkek] prov., Chuya valley, to the north of Frunze [Bishkek] city, 18 ix 1957, *Nikitin & Vyhodtsev* s.n. (LE); **S:** distr. Dshalalabad, loessial slopes of foothills, 26 vi 1945, *An.A. Theodorov & E.M. Iljina* 43 (LE); Foothills of Talassky Alatau northern slope, desert near Klyuchevka village, 1000 m, 16 viii 1966, *I.A. Gubanov* 33 (MW).

Uzbekistan. **W:** delta of Amudarya, 18 ix 1928, *N.I. Kuznetsov* s.n. (LE); Karakalpakian Kyzyl-Kum, Bukan-tau, 19 ix 1932, *N. Afanasyev* 541 (LE); **SE:** in a desert south of Murgak station, 13 ix 1926, *M.G. Popov* 144 (LE); distr. Surhandarya, NW from Uzun-kuduk, rock faces, 5 vii 1934, *V. Golbina* s.n. (MOSP).

TAJIKISTAN. **N:** Zeravshan ridge, left bank of Kshtut river, near the estuary on a weedy plot with *Poa* and *Kochia* spp., 1850 m, 18 viii 1967, *T. Strishova* 1386 (MHA); Pamiro-Alai, the estuary part of Iskander-darya river, vii 1972, *I. Shukin* s.n. (MW); **CE:** Bartang village, 13 viii 1913, *N.N. Tuturin* 180 (LE); **C:** Kafirnichak river, Aruktau, 7 vi 1969, *G.P. Nepli* 203 (MW); **E:** Inter Schugnan and Darwaz, 6000′, ix 1882, *A. Regel* s.n. (LE); Shugnan, 24 viii 1932, *L.B. Lanina* 752 (LE); Yazgulem river, deserts, 9 vi 1971, *M. Darvaziev* s.n. (LE).

TURKMENISTAN. **W:** Zakaspiy distr., 1897, *D.I. Litvinov* (LE); **C:** Kara-kum, 13 v 1953, *L.E. Rodin et al.* 255 (LE); **E:** deserted hills along the right bank of Amu-darya river near Charshanga village, 12 vi 1970, *G.M. Proskuryakova* s.n. (MHA); **N:** Tashauz, 6 ix 1935, *Shingaryova* 29 (LE); **NW:** Tashauz prov., Ust-Urt, 30 v 1953, *L.E. Rodin et al.* 430 (LE); **S:** Transcaspia, in deserto argilloso prope As'chabad, 30 x 1897, *D. Litvinov* s.n. (MHA, MW); Regio transcaspico, Aschabad, in incultis, 2 x 1900, *P. Sintenis* (B); Kopet-Dag, Karakala, clayey slopes, 12 x 1930, *M.M. Iljin* 875 (LE); Kopetdag, Vannovskoye, between stones on a slope, 7 vii 1942, *V. Alyokhin* s.n. (MW).

AZERBAIJAN. **SW:** Ordubad, 28 ix [18]93, *W.H. Lipsky* s.n. (LE); prope Ordubad, regione semideserta in locis arenosis, 19 ix 1934, *A. Takhtadjan* s.n. (LE); surroundings of Dshulfa town, deserts with *Achillea* spp. in the valley of Araks river, 19 x 1936, *M.M. Iljin & E.M. Iljina* s.n. (LE); surroundings of Nahichevan city, piedmont desert with *Artemisia* spp., 21 x 1936, *M.M. Iljin & E.M. Iljina* s.n. (LE); Nahichevan Rep., near Haich village, road to Nahichevan, 11 viii 1946, *A. Takhtadjan* s.n. (LE).

ARMENIA. **S:** Indicated for the town of Megri (Takhtajan, 1956).

IRAN. **N:** Inter Kum and Hawuz, 1868, *C. Haussknecht* s.n. (LE); Zentral-Elburs, Tal des Hableh-Rud, Kiesebene, 1150 m, 3–4 ix 1948, *Manoutcheri & Aellen* s.n. (LE); **NW:** inter urbes Teheran et Ispahan, leg. *Olivier et Bruguiere*, P? (see protologue of *Anabasis heteroptera*); **S:** Farsistan: Niris, ad lacum salsum, 1600 m.s.m., 5 x 1892, *J. Bornmüller* s.n. (LE); **SE:** Kerman prov., in incultis ad Kerman, 1900 m, 22 viii 1892, *J. Bornmüller* 4173 (B).

AFGHANISTAN. **C:** Bamian prov., Shar-e-Gholgola, in den Ruinen nahe bei Bamian, 2500 m, 22 ix 1963, *H.F. Neubauer* 4463 (B); Bamian prov., Bamian, sterile Hänge bei den Buddah-Statuen, 2400 m, 2 ix 1965, *D. Podlech* 12597 (LE); **E:** Kabul, 5 ix 1924, *D. Bukinich* s.n. (LE); Kabul-Aliabad, 1810 m, 1 x 1963, *D. Podlech* 3379 (B); **N:** Chanabad, 1882, *Th. Pichler* s.n. (LE); prov. Balkh, 8 km oestlich von Balkh, an der Strasse nach Mazar-i-Sharif, 360 m, 7 x 1970, *D. Podlech* 19786 (LE).

PAKISTAN. **W:** Baluchistan, East-Camp, Quetta, dry stony roadside, common, 9 ix 1942, *J. Sinclair* 2463 (P).

SYRIA. **S:** on the border with Jordan, Dshebel-Tenif, 17 viii 1959, *L.E. Rodin* 2499 (LE).

IRAQ. Near Baghdad, x 1964, *V. Bochantsev* s.n. (LE).

JORDAN. Indicated for SW (Zohary, 1966); he also indicated that the plants are densely pubescent.

The species was also reported from near Astrakhan in southeastern European Russia by Ball (1964, 1993), obviously based on Stankov & Taliyev (1949), but I was unable to confirm its occurrence in Russia. The locality which comes closest to Russia (12 km to the east of Astrakhan region border) is Bish-Choho in W Kazakhstan.

**5. Girgensohnia minima** Korovin, Not. Syst. Herb. Horti Petropol. 5(11–12): 176 (1924); Iljin in Shishkin (ed.), Fl. URSS 6: 278 (1936); Nikitin & Geldikhanov, Opr. Rast. Turkmen. 189 (1988); Hedge in Rechinger (ed.), Fl. Iran. 172: 299 (1997). – Type: [Uzbekistan] desertum Aralo-caspicum, Kara-kum prope Ungus,

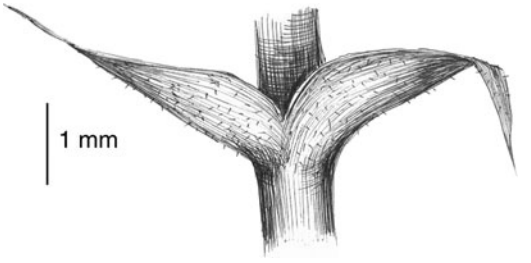


FIG. 9. Leaves of *Girgensohnia minima* Korovin.

in salso-argillosis (sandy desert Kara-kum between Aral and Caspi by Unguz), 8 vi 1916, *Eug. Korovin* s.n. (holo TASH; iso LE!). **Fig. 9.**

Annual, up to 40 cm tall, yellowish or yellowish-green, branched from the base. Leaves and bracts significantly recurved (Fig. 9), lower leaves up to 0.8 cm long. Tepals 3.0–3.5 mm long when flowering, 3.5–4.0 mm in fruit. Anthers 0.7–1.0 mm long. Fruits 2.2–2.6 mm long.

*Distribution.* Turkmenistan, Uzbekistan, NW Afghanistan (prov. Faryab: Maimana, vi 1964, *Neubauer* 4236 (B)).

*Habitat*. Sandy massifs and saline clayey deserts.

When describing the new species, Korovin (1924) apparently compared the features of that species not, as indicated, with those of *Girgensohnia oppositiflora*, but with specimens which in fact belong to *G. bungeana* described as a new species in this paper ('antherae 1 mm longae').

*Girgensohnia minima* requires further field observations, especially when in fruit. Almost all of the few available specimens (including types) were collected in June to July. Iljin (1936) pointed out that no wings develop on the tepals in fruit. I am aware of only three collections of *Girgensohnia minima* which were collected with well-developed fruits: (i) Turkmenistan, Bala-Ishem, sandy depression, 9 ix 1935, *Shingaryova* 51 (LE); (ii) N Turkmenistan, Kysyl-Arvat – Tashauz, border of a runnel, ix 1935, *L.E. Rodin* 152 (LE); (iii) Uzbekistan, N Kara-kum, the piedmont of Garimchay upland, sandy soil, 27 ix 1974, *U. Pratov* s.n. (LE). In no specimens were the tepals found to have even primordia or rudiments of wing-like projections.

One of the investigated specimens had short anthers (like in *Girgensohnia oppositiflora*): Afghanistan, prov. Badakhshan, Kokcha river valley, 90 km below Faizabad, hill slope, 8 vii 1974, *I.A. Gubanov et al.* s.n. (MW).

## EXCLUDED SPECIES

*Girgensohnia fruticulosa* Bunge, Anabas. Rev. 30 (1862). = **Cyathobasis fruticulosa** (Bunge) Aellen, Candollea 12: 160 (1949).

The main distinguishing features of this genus are: perennial type of growth, long style, papillae-free fruits (Aellen, 1949), anthers unappendaged, bracteoles surpassing the perianth segments (Kühn, 1993). The *Girgensohnia* representatives are annual, their anthers have short appendages, the bracteoles are shorter than the perianth, and the fruits are papillose.

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