



Nitraria komarovii Iljin & Lava ex Bobrov (Nitrariaceae), a new record for the flora of Kazakhstan

Maria Anatolyevna Tomoshevich, Evgeny Viktorovich Banaev, Taigana Ayasovna Ak-Lama

Laboratory of Dendrology, Central Siberian Botanical Garden SB RAS, 101 Zolotodolinskaya Str., Novosibirsk, 630090, Russia.

Corresponding author: Maria A. Tomoshevich, arysa9@mail.ru

Abstract

Nitraria komarovii Iljin & Lava ex Bobrov is newly reported for the flora of Kazakhstan. The two new records extend the range of this species eastward from its previously known range in Azerbaijan and Turkmenistan. A full description of *N. komarovii* is given for the first time, along with illustrations, notes on its taxonomy, and a distribution map. *Nitraria komarovii* is most similar to *N. schoberi* L., but differs in its habit, narrower and longer, linear-spatulate, greenish-yellow leaves, which gradually narrow to the base, more subtle inflorescences, size of the stone, petal, stamen, and pistil, and color of the fruit.

Keywords

Floristic records, geographic range extension, Lake Balkhash.

Academic editor: Anzar Khuroo | Received 2 April 2019 | Accepted 21 September 2019 | Published 11 October 2019

Citation: Tomoshevich MA, Banaev EV, Ak-Lama TA (2019) *Nitraria komarovii* Iljin & Lava ex Bobrov (Nitrariaceae), a new record for the flora of Kazakhstan. Check List 15 (5): 891–897. <https://doi.org/10.15560/15.5.897>

Introduction

The genus *Nitraria* L. (Nitrariaceae) comprises of about 10 species and is distributed mainly in the steppe and desert regions of Central Asia, Southeast Europe, North Africa, and Australia (Bobrov 1965; Banaev et al. 2015, 2017). The genus is considered to be a relic of the Paleogene desert-steppe flora and has its center of diversity in Central Asia (Bobrov 1946; Zhang et al. 2015).

Nitraria schoberi L. and *N. sibirica* Pall., the two most widespread species present high variability of their morphological characters. However, they can be distinguished by their habit, branching, and shape and size of leaves, fruits, seeds, and vegetative organ pubescence (Bobrov 1965; Grubov 1982; Pan et al. 1999, 2003; Yingxin and Zhou 2008; Temirbayeva and Zhang 2015). Some researchers (Peshkova 1996; Koropachinsky 2016) have remarked on the difficulty in identifying these species

in herbarium specimens from West Siberia, as well as the need for studies of *Nitraria* species in natural populations. As noted by Komarov (1908), the variability of *N. schoberi* L. is very large, and it is difficult to identify diagnostic characters for the species. Some individuals are striking for either their extreme fluffiness, the size of their leaves, or the form of their inflorescences. *Nitraria schoberi* has the widest range of any *Nitraria* species; its geographic range extends from Romania to Dzungaria in northwest China. *Nitraria schoberi* lives in intra-zonal communities on soils of various mechanical and chemical compositions and forms local populations with different morphotypes. Petrov (1972) considered *Nitraria komarovii* Iljin & Lava ex Bobrov as a narrow-leaved form of *N. schoberi*.

Nitraria komarovii was first mentioned in by Iljin (1944), who had samples from the vicinity of Krasnovodsk (now Turkmenbashi), Turkmenistan. However,

Iljin did not provide a legitimate diagnosis of *N. komarovii*. Bobrov (1946) later described this species. In comparing *N. komarovii* and *N. schoberi*, Bobrov indicated that *N. komarovii* had longer, linearly spatulate leaves, which narrow gradually to the base, and more subtle inflorescence.

Until now, only two species, namely *N. schoberi* and *N. sibirica* Pall., have been authentically recognized in Kazakhstan (Pavlov 1963; Abdulina 1998; Baitenov 1999).

Methods

Three species of *Nitraria* were found in one habitat during the expeditions to the eastern shore of Lake Balkhash in the Republic of Kazakhstan in June–August in the years between 2012 and 2017.

Plant specimens (i.e., leaves, twigs, etc.) from 10–30 specimens of each species were collected, placed in paper bags, labeled, and transported to the laboratory in Novosibirsk for taxonomic determination. The taxonomic identification used the revisionary work in scientific papers and floras of Kazakhstan and surrounding regions (Trautvetter 1871; Bobrov 1965; Baitenov 2001; Pan et al. 1999; Yingxin and Zhou 2008).

Morphological observations of leaves, flowers, fruits, and seeds were carried out under a Zeiss Stereo Discovery V12 stereomicroscope. Photographs were taken with an Axio Cam high-resolution digital camera and Axio-Vision v. 4.8 software. Detailed observations and morphological measurements of vegetative and reproductive

parts were repeated 30. Basic statistics were calculated in the SIAMS Photolab program with the additional “SIAMS MesoPlant” module. A detailed comparison between the *Nitraria komarovii* and other morphologically most similar species is shown in Table 1.

All samples gathered during the expeditions are kept in the NSK collection at the Central Siberian Botanical Garden of the Siberian Branch of the Russian Academy of Sciences (Novosibirsk, Russia) and are available in digital herbarium (CSBG SB RAS) (<http://herb.csbg.nsc.ru:8081>). The three *Nitraria* species were identified as *N. schoberi*, *N. sibirica*, and *N. komarovii*. *Nitraria komarovii* was newly found in the study area and Kazakhstan for the first time.

Results

Nitraria komarovii Iljin & Lava ex Bobrov

New records. Kazakhstan • Almaty region, Sarkand district, shore of Lake Balkhash, sandy desert, 46°40'N, 079°18'E, 02-VI-2012, E.V. Banaev & M.A. Tomoshevich collectors (NSK3000924) • Almaty region, Sarkand district, shore of Lake Balkhash, sandy desert, 46°36.71'N, 079°14.20'E, 26-VII-2013, E.V. Banaev & M.A. Tomoshevich collectors (NSK3000926) (Figs 1–3).

Identification. Shrubs 0.5–1 m tall, densely branched from the base, with slightly arcuate shoots, which project upwards in the center of the bush; with few prickles. Branches bare with ash-gray, cracked bark; annual shoots yellowish, shiny, and pubescent, with single, adherent



Figure 1. Distribution map of *Nitraria komarovii*. ■ = locus classicus, ● = localities known from herbaria and literature; ◆ = new locality in Kazakhstan, 1 = specimen NSK3000924, 2 = specimen NSK3000926).



Figure 2. Specimens of *Nitraria komarovii* collected in Kazakhstan. In bloom 02-VI-2012 (NSK3000924).

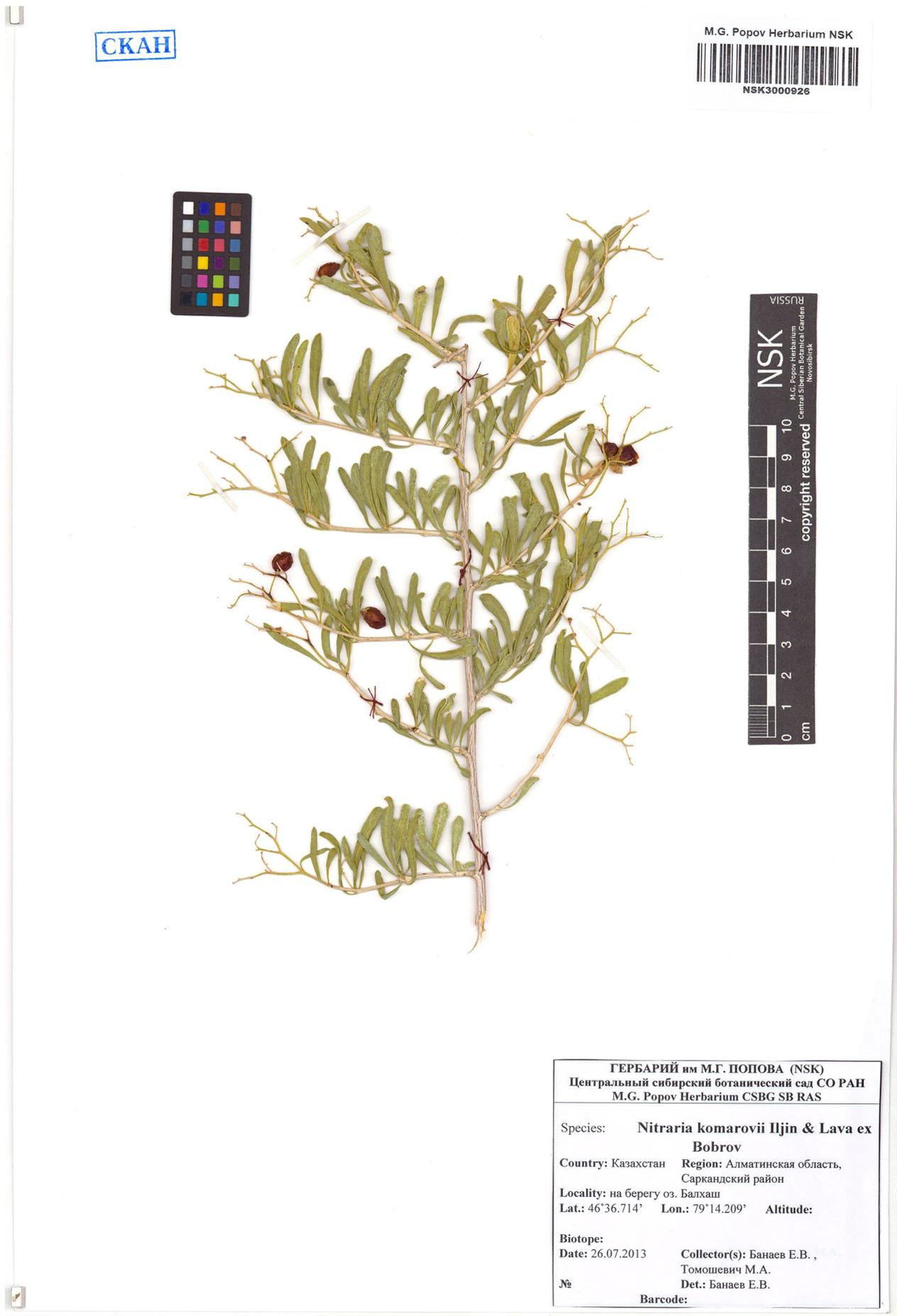


Figure 3. Specimens of *Nitraria komarovii* collected in Kazakhstan. In fruiting 26-VII-2013 (NSK3000926).

hairs. Leaves (12) 25–28 (30) × (2) 2–3.5 (4) mm, narrow, linear-spatulate, gradually tapering to the base, sharp or obtuse at the apex, smooth-edged, greenish-yellow, and slightly fleshy. Young leaves slightly pubescent on both sides. Inflorescences in dense cymes, with peduncle 5.5–15 cm; flowers 17–20. Flowers bisexual, usually 5-merous, in loose racemes at ends of branches. Inflorescence peduncles and axes slightly pubescent. Persistent calyx up to 2.5 mm, fleshy, and slightly fluffy. Petals yellowish-white, oblong-oval, 2–4 × 1–3 mm, concave with edges turned inward, and claws short. Fruit a juicy drupe; yellow, orange, from pale to bright red (darkening when dried, sometimes to burgundy) with colorless or pale pink juice; oval, 8–10 mm long, 7–9 mm in diameter; finely pubescent; edible and salty-sweet. Ripe berry juice stains white paper pale pinkish. Stone pale, greyish-yellow, oblong-conical with elongated tip, 8–11 mm long, 4–6 mm in diameter, and base rounded. Fl. May, fr. July.

Distribution and habitat. Previously, this species was known in the Caucasus, at Absheron, near Balakhanov, Azerbaijan, and in Central Asia, at Cheleken, in the area adjacent to Krasnovodsk Gulf, Karakum, western Turkmenistan (Lava 1948; Bobrov 1949; Akhani 2002). Maritime, saline clayey and sandy-clayey deserts.

Discussion

The new records of *Nitraria komarovii* from the shore of Lake Balkhash in Kazakhstan, are the first for that country and the most eastward. The present study provides for the first time a complete description of this species. *Nitraria komarovii* is most similar to *N. schoberi* but

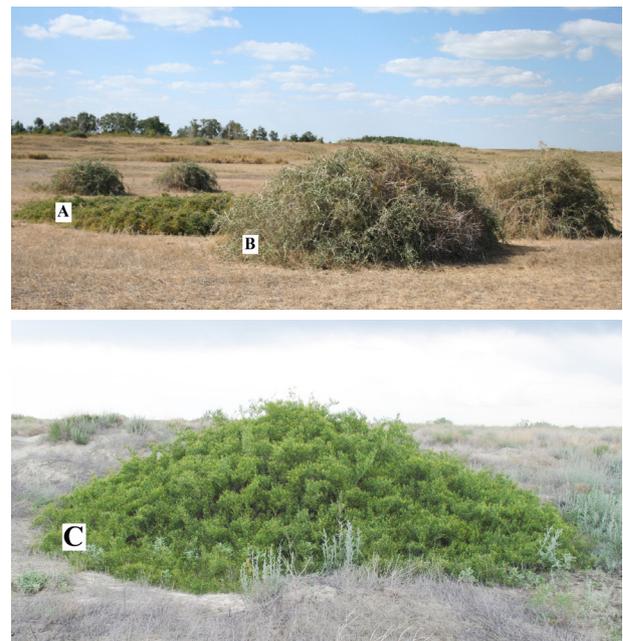


Figure 4. Habit of bush of three species of *Nitraria* in Kazakhstan. **A.** *N. sibirica*. **B.** *N. schoberi*. **C.** *N. komarovii*.

differs in its habit (Fig. 4), narrower and longer, linear-spatulate, greenish-yellow leaves, which gradually narrow to the base and more subtle inflorescences (Fig. 5), and in the size of stone (Fig. 6), petal, stamen, and pistil (Table 1). The fruit is yellow, orange, from pale to bright red in *N. komarovii* but dark-red to black in *N. schoberi* (Fig. 7).

Additional extensive fieldwork in Kazakhstan, as well as careful examination of existing materials in herbaria, will be required to gain a full understanding of the distribution of *N. komarovii* in Kazakhstan.

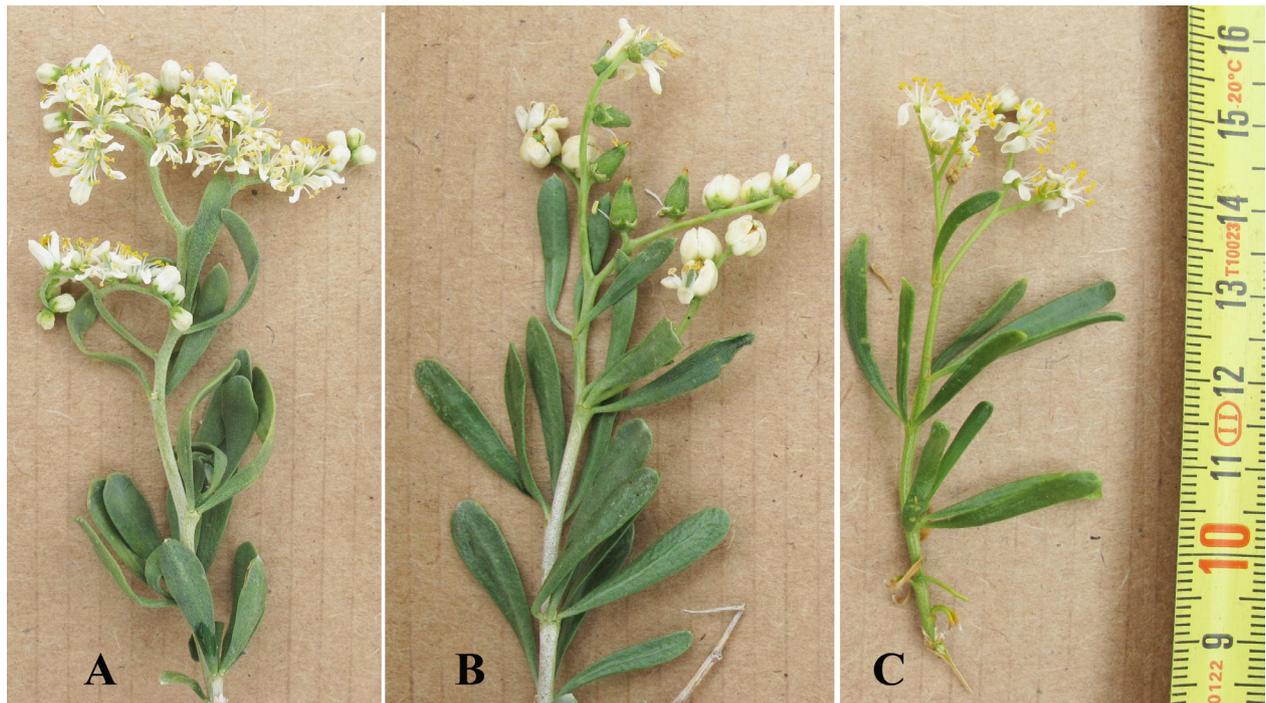


Figure 5. Leaves and flowers of three species of *Nitraria* in Kazakhstan. **A.** *N. sibirica*. **B.** *N. schoberi*. **C.** *N. komarovii*.

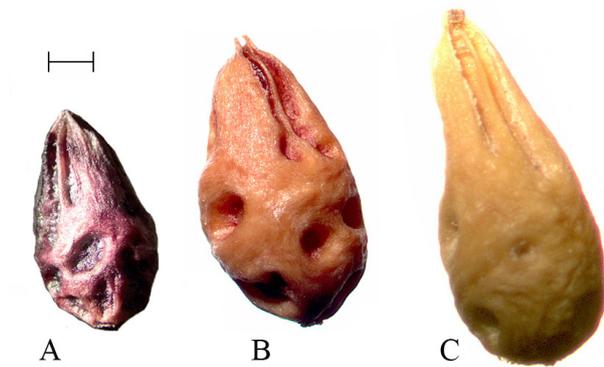


Figure 6. Stone of three species of *Nitraria* in Kazakhstan **A.** *N. sibirica*. **B.** *N. schoberi*. **C.** *N. komarovii*. Scale bar = 1 mm.

Authors' Contributions

MAT and EVB jointly collected specimens and wrote the manuscript; EVB prepared figures and identified the specimens; TAA conducted morphometric studies.

References

- Abdulina SA (1998) Checklist of vascular plants of Kazakhstan. Academy of Sciences of the Kazakhstan, Almaty, 187 pp.
- Akhani H (2002) Notes on the flora of Iran: *Asparagus* (Asparagaceae) and *Nitraria* (Zygophyllaceae). Edinburgh Journal of Botany 59 (2): 295–302. <https://doi.org/10.1017/S0960428602000112>
- Baitenov MC (2001) Flora of Kazakhstan Genus complex of flora. Vol. 2. Gylym Press, Almaty, 280 pp.

Table 1. A comparison of the main characters distinguishing *Nitraria sibirica*, *N. schoberi*, and *N. komarovii*.

Characters	<i>N. sibirica</i>	<i>N. schoberi</i>	<i>N. komarovii</i>	
Height of bush (m)	0.5–1	0.7–1.5	0.5–1	
Habit	Spreading-branching, dense	Spreading-branching	Branching, graceful	
Leaf	Length (mm)	8–16	20–26	
	Width (mm)	2.0–4.0	3.0–6.0	
	Colour	Glaucous-green	Dark green, shiny	Pale green
	Shape	Oblanceolate	Oblong-spathulate	Narrow, linear-spathulate
Flowers	White (buds pale-violet)	Yellowish-white	Yellowish-white	
Flower spacing (mm)	0.2–0.3	0.4–0.8	0.3–0.7	
Petal	Shape	Acuminate-elliptical; claws narrow	Ovate or rhombic; claws short	Ovate; claws short
	Length (mm)	2.6–3.9	3.0–4.9	1.7–3.9
	Width (mm)	1.0–2.8	2.0–3.6	1.1–2.9
Stamen filament length (mm)	0.72–2.96	0.88–3.03	0.97–2.19	
Pistil	Length (mm)	1.35–3.19	2.02–4.50	2.01–3.59
	Width (mm)	0.97–1.41	1.38–2.23	1.09–1.82
Fruit	Color	Black	Dark-red to black	Yellow, orange, or pale to bright red
	Length (mm)	4–6	7–10	8–12
	Width (mm)	4–7	6–11	7–11
	Shape	Globate or oval	Oval	Oval
	Sap	Dark blue	Pale reddish	Pale pink
Weight of 100 fruits (g)	170–230	270–390	380–430	
Stone	Length (mm)	4–6	8–10	9–11
	Width (mm)	2.4–3.4	4.7–6.5	4.7–6.0
	Shape	Ovate, pointed	Ovate, obtuse	Oblong-conical, pointed at apex

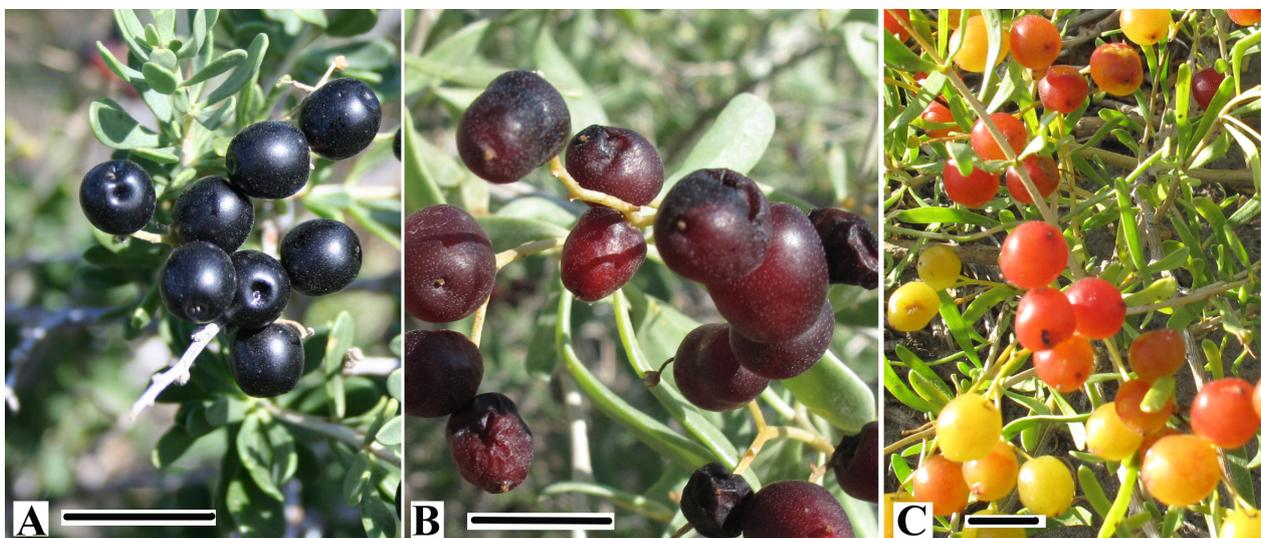


Figure 7. Fruits of three species of *Nitraria* in Kazakhstan **A.** *N. sibirica*. **B.** *N. schoberi*. **C.** *N. komarovii*. Scale bars = 10 mm.

- Banaev EV, Voronkova MS, Vysochina GI, Tomoshevich MA (2015) Population structure and differentiation of the Siberian representatives of the genus *Nitraria* L. (Nitrariaceae) based on the composition and content of phenolic compounds in leaves. *Contemporary Problems of Ecology* 8 (6): 735–742. <https://doi.org/10.1134/S1995425515060025>
- Banaev EV, Tomoshevich MA, Yamtyrov MB (2017) On variation of metric and qualitative characters of *Nitraria* L. species in the context of ecological-climatic conditions of habitats in Siberia. *Contemporary Problems of Ecology* 10 (6): 664–673. <https://doi.org/10.1134/S1995425517060038>
- Bobrov EG (1946) Ob aziatskikh vidah roda *Nitraria* L. [Asian species of the genus *Nitraria* L.] *Sovetskaya Botanika* 14 (1): 19–30 [in Russian].
- Bobrov EG (1949) Nitrarioideae. In: Shishkin BK (Ed.) *Flora SSSR*. Tom 14, Geraniales, Sapindales, Rhamnales. Izdatel'stvo Akademii Nauk SSSR, Moscow/Leningrad, 196–198 [in Russian].
- Bobrov EG (1965) O proiskhozhdenii flory pustyn' starogo sveta v svyazi s obzorom roda *Nitraria* L. [Origin of desert flora of the Old World related to review of the genus *Nitraria* L.]. *Botanicheskij Zhurnal* 50 (8): 1053–1067 [in Russian].
- Grubov VI (1982) *Opredelitel' sosudistykh rastenij Mongolii* [Guide for identification of vascular plants of Mongolia]. Nauka Publishing House, Leningrad, 433 pp [in Russian].
- Iljin MM (1944) Nitrariya i proiskhozhdenie flory pustyn' [*Nitraria* and the origin of the desert flora]. *Priroda* 5/6: 116–118 [in Russian].
- Komarov VL (1908) Vvedenie k floram Kitaya i Mongolii [Introduction to the floras of China and Mongolia]. *Trudy Sankt-Peterburskogo Botanicheskogo sada* 19: 1–179 [in Russian].
- Koropachinsky IY (2016) *Arboriflora Siberia*. Academic Publishing House Geo, Novosibirsk, 578 pp.
- Lava YI (1948) Rod *Nitraria* L. v Turkmenistane [Genus *Nitraria* L. in Turkmenistan]. *Izvestiya Turkmenskogo Filiala Akademii Nauk SSSR* 1: 54–57 [in Russian].
- Pan XY, Shen GM, Chen PA (1999) Preliminary research on taxonomy and systematics genus *Nitraria*. *Acta Botanica Yunnanica* 21 (3): 287–295.
- Pan XY, Wei XP, Yu QS, Chen JK, Wang GX (2003) Polyploidy: classification, evolution and applied perspective of the genus *Nitraria*. *Chinese Bulletin of Botany* 20 (5): 632–638.
- Pavlov NV (1963) *Nitraria*. In: Pavlov NV (Ed.) Flora Kazakhstan 6. Publishing House of the Academy of Sciences of the Kazakh SSR, Alma-Ata, 52–53.**
- Peshkova GA (1996) Family Nitrariaceae. In: Pimenov MG, Vlasova NV, Zhev VV (Eds) **Flora Sibiri**. Tom 10 [Flora of Siberia]. Nauka Publishing House, Novosibirsk, 34–35 [in Russian].
- Petrov MP (1972) K sistematike i geografii selitryanok (*Nitraria* L.) Azii [Systematics and geography of *Nitraria* L. species in Asia]. In: Vasilchenko IT (Ed) **Istoriya flory i rastitel'nosti Evrazii** [The history of flora and vegetation of Eurasia]. Nauka Publishing House, Leningrad, 156–181 [in Russian].
- Temirbayeva K, Zhang ML (2015) Molecular phylogenetic and biogeographical analysis of *Nitraria* based on nuclear and chloroplast DNA sequences. *Plant Systematics and Evolution* 301 (7): 1897–1906. <https://doi.org/10.1007/s00606-015-1202-5>
- Trautvetter RE (1871) *Observationes in plantas a Dre. G. Radde anno 1870 in Turcomania et Transcaucasia lectas, nec non in alias quasdam*. *Acta Horti Petropolitani* 1 (1): 13–34.
- Yingxin L, Zhou L (2008) Nitrariaceae. In: Zhengyi W, Raven PH (Eds) *Flora of China* 11. Science Press, Beijing, 41–42.
- Zhang ML, Temirbayeva K, Sanderson SC, Chen X (2015) Young dispersal of xerophil *Nitraria* lineages in intercontinental disjunctions of the Old World. *Scientific Reports* 5: 13840. <https://doi.org/10.1038/srep13840>