



Botanica Pacifica plant chromosome data 3

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ABSTRACT

The chromosome numbers (CNs, $2n$) and ploidy level (nx) according to the inferred basic chromosome number (x) are presented for 27 vascular plant species from 16 genera and 11 families: Amaryllidaceae: *Allium*; Asteraceae: *Galinsoga*; Caryophyllaceae: *Dianthus*; Geraniaceae: *Erodium*; Iridaceae: *Crocus*; Liliaceae: *Fritillaria*, *Lilium*, and *Tulipa*; Malvaceae: *Malva*; Onagraceae: *Oenothera*; Plantaginaceae: *Chaenorhinum* and *Digitalis*; Poaceae: *Lolium*, *Panicum*, and *Setaria*; Violaceae: *Viola*. The studied specimens originated from Europe (Bulgaria), Caucasus (Russia), West Asia (Turkey), Central Asia (Tajikistan), Siberia (Altai Republic, Novosibirsk Region, Republic of Buryatia, and Republic of Khakassia), and Russian Far East (Amur Region and Kamchatka Territory). The CN was for the first time established in *Lolium* × *hybridum* ($2n = 28$). For the other species, previously known CNs have been confirmed.

Key words: diploid, triploid, polyploid, chromosomal races, geophytes, invasive plants

РЕЗЮМЕ

Кривенко Д.А. (ред.), Айтач З., Бобоев М.Т., Чечен О., Чернягина О.А., Эрст А.С., Леонова Т.В., Митренина Е.Ю., Панкова Т.В., Веклич Т.Н., Ван В., Зыкова Е.Ю. *Botanica Pacifica*: числа хромосом растений 3. Представлены числа хромосом ($2n$) и уровень плоидности (nx), в соответствии с предполагаемым базовым числом хромосом (x), для 27 видов сосудистых растений из 17 родов и 11 семейств Amaryllidaceae: *Allium*; Asteraceae: *Galinsoga*; Caryophyllaceae: *Dianthus*; Geraniaceae: *Erodium*; Iridaceae: *Crocus*; Liliaceae: *Fritillaria*, *Lilium* и *Tulipa*; Malvaceae: *Malva*; Onagraceae: *Oenothera*; Plantaginaceae: *Chaenorhinum* и *Digitalis*; Poaceae: *Lolium*, *Panicum* и *Setaria*; Violaceae: *Viola*. Исследованные образцы – происхождением из Европы (Болгария), Кавказа (Россия), Западной Азии (Турция), Центральной Азии (Таджикистан), Сибири (Республика Алтай, Новосибирская область, Республика Бурятия, Республика Хакасия) и Дальнего Востока России (Амурская область и Камчатский край). Впервые число хромосом определено у *Lolium* × *hybridum* ($2n = 28$). Для других видов были подтверждены ранее известные числа хромосом.

Ключевые слова: диплоид, триплоид, полиплоид, хромосомные расы, геофиты, инвазивные растения

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Geophytes from Bulgaria, Russia, Tajikistan and Turkey

Elizaveta Yu. Mitrenina, Tatiana V. Leonova, Mariyo T. Boboev, Ömer Çeçen, Zeki Aytac, Tatiana N. Veklich, Wei Wang, Andrey S. Erst & Denis A. Krivenko

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AMARYLLIDACEAE

Allium barszewskii Lipsky; $2n = 4x = 32$, $x = 8$. Tajikistan, Khatlon Region, Norak District, Pamir-Alay, Sanglok range, between Nurek tunnel and Rozien village, roadside, 1411 m a.s.l., 38°18'06.85"N 69°15'00.35"E, 25.05.2022, A.S. Erst & M.T. Boboev 70806 (IRK00033515). – The species is distributed from north-eastern Iran, through Central Asia to the western Himalayas. Diploids ($2x$) are also known, including from Tajikistan (Agapova et al. 1990, Rice et al. 2015). Variable ploidy.

Allium microdictyon Prokh.; $2n = 2x = 16$, $x = 8$. Russia, Republic of Khakassia, Tashtypsky District, 13–15 km SE of Tashtyp village, Sugesh ski tourist complex, pine forest, 589 m a.s.l., 52°43'18.4"N 89°56'15.9"E, 09.07.2023, T.V. Leonova HAK2023-1 (NS); Russia, Republic of Khakassia, left bank of the Matur

river, 15 km W of Matur village, 586 m a.s.l., 52°39'13.1"N 89°16'31.3"E, 09.07.2023, T.V. Leonova HAK2023-2 (NS); Russia, Republic of Khakassia, Ordzhonikidzevsky District, Priiskovoe village, mixed forest, 857 m a.s.l., 54°39'03.9"N 88°41'55.9"E, 11.07.2023, T.V. Leonova HAK2023-4 (NS); Russia, Republic of Khakassia, Ordzhonikidzevsky District, Deer pass state nature zakaznik, 1402 m a.s.l., 54°23'34.6"N 88°25'18.6"E, 22.07.2023, T.V. Leonova HAK2023-5 (NS). – Predominantly Siberian species. The CN is constant (Rice et al. 2015).

Allium saxatile M. Bieb. (= *A. globosum* M. Bieb., *A. globosum* M. Bieb. ex DC., *A. ochroleucum* Rchb., *A. ruprechtii* Boiss.); $2n = 2x = 16$, $x = 8$. Russia, Krasnodar Territory, urban district Novorossiysk city, Shirokaya Balka village, A.I. Maystrenko boarding house, Black Sea coast, on a dry slope facing the sea, 44°39'11.7"N 37°42'35.50"E, 15.06.2022, T.I. Morozova 68187 (IRK00020218). – The species is distributed in Eastern Europe and the Caucasus, and is found isolated in Altai. Most sources indicate this CN and very rarely a tetraploid (4x) (Rice et al. 2015). Variable ploidy.

IRIDACEAE

Crocus chrysanthus (Herb.) Herb., $2n = 2x = 8$, $x = 4$. Turkey, Karaman Province, between Taşkent and Başıyayla cities, 10 km NNW of Başıyayla city, high mountain steppe, 36°47'20"N 32°37'54"E, 24.04.2021, A.S. Erst, T.V. Erst, O. Çeçen & Z. Ayaç TU2021-5 (NS). – The species is distributed in Balkans and Turkey. The CNs are very variable, with $2n = 8, 9, 10, 12$, and 20 known (Rice et al. 2015). It is probable that the chromosomal races can represent independent species. A special karyosystematic research is necessary.

LILIACEAE

Fritillaria bucharica Regel (≡ *Rhinopetalum bucharicum* (Regel) Losinsk.); $2n = 2x = 24$, $x = 12$. Tajikistan, Khatlon Region, Shamsiddin Shohin District, Pamir-Alay, Western Pamir, Darvoz range, 5 km NE of Sangunel village, stony steppe, 2177 m a.s.l., 37°59'41.9"N 70°15'19.8"E, 06.05.2022, A.S. Erst & M.T. Boboev TJ2022-17 (NS); Tajikistan, Khatlon Region, Norak District, Pamir-Alay, Sanglok range, between Nurek tunnel and Roziyen village, roadside, 1411 m a.s.l., 38°18'06.85"N 69°15'00.35"E, 25.05.2022, A.S. Erst & M.T. Boboev 68180 (IRK00019243). – Central Asian and NE Afghan species. The CN is constant (Rice et al. 2015).

Fritillaria camschatcensis (L.) Ker Gawl.; $2n = 2x = 24$, $x = 12$. Russia, Kamchatka Territory, Petropavlovsk-Kamchatsky city, Avacha Bay of the Pacific Ocean, Sovetskaya Str., under the curtain of *Crataegus chlorosarca*, 53°01'19.15"N 158°38'51.32"E, 18.06.2023, O.A. Chernyagina 74417 (IRK00041397); ib., 74418 (IRK00041398). $2n = 3x = 36$, $x = 12$. Russia, Kamchatka Territory, Petropavlovsk-Kamchatsky city, Pacific coast, Khalaktyrsky beach, coastal of crowberry tundra (with *Empetrum nigrum*), 052°59'57.85"N 158°51'32.60"E 23.06.2023, O.A. Chernyagina 74419 (IRK00041399); ib., 74420 (IRK00041400). – Northern Pacific species. The diploid (2x) CN was determined in the Russian Far East, including Kamchatka Peninsula, as well as in Japan and the western North America (Probatova et al. 2007, Rice et al. 2015). However, a triploid (3x) is reported from Japan (Nishikawa 2008). Variable ploidy.

Fritillaria dagana Turcz.; $2n = 2x = 24$, $x = 12$. Russia, Republic of Buryatia, Tunkinsky District, Eastern Sayan, 3 km N of Mondy village, forb meadow, 51°42'02.65"N 101°00'27.92"E, 22.06.2023 E.S. Kharin & O.A. Chernysheva 73739 (IRK). – South Siberian and North Mongolian species. The CN is constant (Rice et al. 2015).

Fritillaria eduardii A. Regel ex Regel (≡ *Petilium eduardii* (Regel) Vved.); $2n = 2x = 24$, $x = 12$. Tajikistan, Khatlon Region, Shamsiddin Shohin District, Pamir-Alay, Western Pamir, Darvoz range, bassin of Obiniob river, vicinity of Kalay-Khuhna old village, shrubs, 2304 m a.s.l., 38°00'32.7"N 70°15'35.2"E, 06.05.2022, A.S. Erst & M.T. Boboev, TJ2022-16 (NS). – Central Asian species. The CN is constant (Rice et al. 2015).

Fritillaria maximowiczii Freyn; $2n = 2x = 24$, $x = 12$. Russia, Amur Region, Zeysky District, Zeya Nature Reserve, oak-birch forest, 347 m a.s.l., 53°51'22.9"N 127°21'30.4"E, 01.06.2023, T.N. Veklich (NS). – The species is distributed in Eastern Siberia, the Russian Far East, and Northern and Central China. The CN is constant (Rice et al. 2015).

Fritillaria pinardii Boiss. (= *F. armena* Boiss., *F. zagrica* Stapf); $2n = 2x = 24$, $x = 12$. Turkey, Karaman Province, between Taşkent and Başıyayla cities, 10 km NNW of Başıyayla city, high mountain steppe, 36°47'20"N 32°37'54"E, 24.04.2021, A.S. Erst, T.V. Erst, O. Çeçen & Z. Ayaç TU2021-5 (NS). – The species is distributed in Iran, Lebanon, Syria, Transcaucasia, and Turkey. The CN is constant (Rice et al. 2015).

Fritillaria sewerzowii Regel (≡ *Korolkowia sewerzowii* (Regel) Regel); $2n = 2x = 24$, $x = 12$. Tajikistan, Sughd Region, Ghafurov District, Western Tien Shan, Qurama ridge, above of the Istiqlol (formerly Taboshar) town, 1270 m a.s.l., 40°36'41.04"N 69°46'28.58"E, 22.04.2021, M.T. Boboev & S. Yoqubov s.n. (NS). – Central Asian species. The CN is constant (Rice et al. 2015).

Lilium jankae A. Kern. (≡ *L. bulbiferum* subsp. *jankae* (A. Kern.) Nyman); $2n = 2x = 24$, $x = 12$. Bulgaria, Sofia City Province, Vitosha Mt., Vitosha Nature Park, Bistrishko Branishte nature reserve, meadow, 42°33'48.6"N 23°18'38.2"E, 1586 m a.s.l., 04.07.2022, A.S. Erst & A.N. Tashev BU2021-1 (NS). – Southern European species. The CN is constant (Rice et al. 2015).

Tulipa anisophylla Vved. (= *T. korshinskyi* Vved.); $2n = 2x = 24$, $x = 12$. Tajikistan, Khatlon Region, Shamsiddin Shohin District, Pamir-Alay, Western Pamir, Hazratishoh range, 5 km ESE of Devdor village, stony slopes, 2721 m a.s.l., 37°46'40.8"N 70°02'38.4"E, 07.05.2022, A.S. Erst, M.T. Boboev & K.M. Boboev TJ2022-19 (NS). – The species is rare in Southern Tajikistan and Uzbekistan. The diploid (2x) CN in this species, including its taxonomic synonym, is stable (Zonneveld 2009).

Tulipa humilis Herb. (= *T. aucheriana* Baker, *T. lipskyi* Grossh., *T. violacea* Boiss. et Buhse); $2n = 2x = 24$, $x = 12$. Tajikistan, Sughd Region, Ayni District, Pamir-Alay, Hissaro-Alay, Hisar range, near the southern side of the Anzob tunnel, subalpine meadow, 39°03'55.2"N 68°41'49.6"E, 2671 m a.s.l., 26.05.2022, A.S. Erst & K.A. Bobokolonov TJ2022-4 (NS). – The species is distributed in the north of Western Asia, as well as Central Asia. The CN is constant (Zonneveld 2009, Rice et al. 2015).

Tulipa kaufmanniana Regel; $2n = 2x = 24$, $x = 12$. Tajikistan, Sughd Region, Varzob District, Pamir-Alay, Hissaro-Alay, Hisar range, upstream of the Anzob river, subalpine meadow, 3314 m a.s.l., 39°04'37.5"N 68°52'27.5"E, 18.06.2022, A.S. Erst & K.A. Bobokolonov TJ2022-22 (NS). – Central Asian species. The CN is constant (Zonneveld 2009, Rice et al. 2015).

Invasive plant species from Novosibirsk Region and Altai Republic (Western Siberia)

Tatyana V. Pankova & Elena Yu. Zykova

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Vouchers in the NS.

ASTERACEAE

Galinsoga parviflora Cav.; $2n = 2x = 16$, $x = 8$. Novosibirsk Region, Novosibirsk City, Geroyev Truda St., wasteland, 54°51'37.7"N 83°04'45.345"E, 125 m a.s.l., 23.09.2018, T.V. An'kova Z.649. – Annual plant, with a primary habitat in the mountains of Mexico, actively settling in regions

with temperate and subtropical climates (Vinogradova et al. 2010). In Siberia, the species was discovered since the end of 20th century. The CN were counted from different regions (Rice et al. 2015). The CN $2n = 32$ from Tyva Republic (Krasnikov et al. 2007) refers to another species, which became clear after studying its herbarium specimen. This CN most likely belongs to *G. ciliata* (Raf.) S.F. Blake and its hybrids (Gopinathan & Babu 1982). The CN is constant. First CN count from Novosibirsk Region accession.

Galinsoga quadriradiata Ruiz et Pav.; $2n = 4x = 32, x = 8$. Novosibirsk Region, Novosibirsk city, Serebrennikovskaya Str., in the yards, 28.09.2021, E.Yu. Zykova Z943b-3021. – The native range of this annual species is from Mexico to South Tropical America, from here it has spread widely throughout the globe. In the regions of Siberia, it has been discovered since the end of the 20th century. The same CN was earlier determined from the different regions, but $2n = 16$, probably, belongs to the previous species (Rice et al. 2015). The CN is constant. First CN count from Novosibirsk Region accession.

CARYOPHYLLACEAE

Dianthus barbatus L.; $2n = 2x = 30, x = 15$. Republic of Altai, Maiminsky Raion, Alferovo village, wasteland, 10.08.2021, E.Yu. Zykova Z946-1321; Novosibirsk Region, Novosibirsk city, “Niva” garden society, roadside, 02.09.2021, E.Yu. Zykova Z979-2221. – The range consists of European and East Asian parts, in the culture the species is represented by European subspecies, it is noted as running wild in most regions of Southern Siberia. The same and the one CN was studied in different regions (Rice et al. 2015). The CN is constant. First CN count from Siberia accession.

GERANIACEAE

Erodium cicutarium (L.) L'Hér.; $2n = 4x = 40, x = 10$. Novosibirsk Region, Koltsovo Science town, edge of wheat field, 54°54'49.5"N 83°10'26.5"E, 17.08.2021, T.V. Pankova & E.Yu. Zykova Z970-1721. – Eurasian species, as an alien – cosmopolitan. It is common in the regions of Southern Siberia. The same CN is known from mostly regions, rarely $2n = 18, 20, 42, 36, 38, 54, 56, 48, 60, 80$ from different populations were noted (Rice et al. 2015). Variable ploidy. First CN count from Novosibirsk Region accession.

MALVACEAE

Malva moschata L.; $2n = 6x = 42, x = 7$. Novosibirsk Region, Novosibirsk city, Sovetsky district, “Topol” garden society, roadside, 55°52'04.7"N 83°02'16.35"E, 101 m a.s.l., 27.07.2021, T.V. Pankova Z948. – The native range covers the western part of Europe and Asia Minor. Very rare in Siberia, first discovered in 2000 (Ebel et al. 2009). The same and the one CN of species was given in the literature (Rice et al. 2015). The CN is constant. First CN count from Russian accession.

ONAGRACEAE

Oenothera biennis L.; $2n = 2x = 14, x = 7$. Novosibirsk Region, Novosibirsk city, Akademgorodok, “Niva” garden society, roadside, 02.09.2021, E.Yu. Zykova Z955-2221. – North American species, settled in Eurasia, noted in most regions of Siberia. The same and the one CN for different regions was reported (Rice et al. 2015). The CN is constant. First CN count from Novosibirsk Region accession.

PLANTAGINACEAE

Chaenorhinum minus (L.) Lange (incl. *Ch. viscidum* (Moench) Simonk.); $2n = 2x = 14, x = 7$. Republic of Altai, Gorno-Altaysk city, between the bus-stops “Ploshchad” and “Ruch'i”, the embankment of the Maima River, on pebble, 04.08.2021, E.Yu. Zykova Z936-1121. – Its area covers Central Europe, European part of Russia and the Caucasus. The same CN was counted in most regions (Rice et al. 2015), except $2n = 12$ from Stavropol Krai (Magulaev 1984) and $2n = 28$ from Greece (Baden 1983). Further studies are needed. First CN count from Novosibirsk Region accession.

Digitalis grandiflora Mill.; $2n = 8x = 56, x = 7$. Novosibirsk Region, Novosibirsk city, mixed forest across the road from the old exhibition areas of the Central Siberian Botanical Garden, 02.10.2019, E.Yu. Zykova Z802-231. – European-West Asian meadow-forest species. It is rare in Siberia. This species has mostly $2n = 56$, but also $2n = 48$ (Agapova et al. 1993, Rice et al. 2015). The species has variable cytotypes. First CN count from Russian accession.

POACEAE

Lolium × hybridum Hausskn. (= *L. perenne* L. × *L. multiflorum* Lam.); $2n = 4x = 28, x = 7$. Novosibirsk Region, Novosibirsk district, Lozhok village, wasteland, 22.09.2020, E.Yu. Zykova Z951-1720. – It was found on the territory of European Russia (Tzvelev 1974, Mayorov et al. 2012) and was noted in Tomsk in places of joint growth *L. perenne* and *L. multiflorum* (Ebel et al. 2015). Most data on CNs of parents taxa give $2n = 14$ (Rice et al. 2015). First CN for this hybrid taxon.

Panicum miliaceum L. (incl. *P. miliaceum* subsp. *ruderales* (Kitag.) Tzvel.), $2n = 4x = 36, x = 9$. Novosibirsk Region, Novosibirsk city, Akademgorodok, Nikolaev St., wasteland, 54°85'83.75"N 83°11'31.26"E, 07.09.2018, E.Yu. Zykova Z670-3618. – Asian species, as alien – cosmopolitan. Mostly the same CNs were counted on European and Asian populations, rarely $2n = 18, 54, 72$ (Rice et al. 2015). Variable ploidy ($2x, 4x, 6x$, and $8x$). First CN count from Novosibirsk Region accession.

Setaria pumila (Poir.) Roem. et Schult.; $2n = 4x = 36, x = 9$. Novosibirsk Region, Novosibirsk city, Zaeltsovsky neighborhood, “Flora and Fauna” residential community, the bank of the Ob' River, 55°05'09.8"N 82°48'14.8"E, 12.09.2021, T.V. Pankova Z972-2721. – The species has Eurasian-American range. This CN confirms earlier counts from Europe and Western Siberia (Rice et al. 2015), also from the Russian Far East, sometimes diploids ($2n = 2x = 18$), rarely – hexaploids ($2n = 6x = 54$) and octoploids ($2n = 8x = 72$) were reported from different regions (Rice et al. 2015). Variable ploidy. First CN count from Novosibirsk Region accession.

VIOLACEAE

Viola arvensis Murray; $2n = 2x = 34, x = 17$. Novosibirsk Region, Novosibirsk city, Geroev Truda Str., wasteland, 29.08.2019, E.Yu. Zykova Z805-1019. – European species, settled in the Holarctic. The same and the one CN were counted for different regions (Rice et al. 2015). The CN is constant.

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