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Chromosome numbers in some alien plant species of Novosibirsk Region (Novosibirsk city): post I

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Keywords: diploid, invasive species, mixoploid, Novosibirsk Region, polyploid, vascular plants.

Summary. Chromosome numbers (2*n*) for 14 alien species (Apiaceae, Asteraceae, Brassicaceae, Commelinaceae, Fabaceae, Onagraceae, Poaceae) from the Novosibirsk city (Akademgorodok) are represented. For the first time the chromosome number is counted for *Silphiodaucus hispidus* (M. Bieb.) Spalik, Wojew., Banasiak, Piwczyński et Reduron (2*n* = 22) in Russia; for *Cardamine flexuosa* With. (2*n* = 32), *Commelina communis* L. (2*n* ≈ 48), *Astragalus falcatus* Lam. (2*n* = 16), *Lathyrus sylvestris* L. (2*n* = 14), *Oenothera rubricaulis* Klebahn, (2*n* = 14) in Siberia; for *Raphanus raphanistrum* L. (2*n* = 18) in West Siberia; for *Centaurea jacea* L. (2*n* = 44), *Erigeron canadensis* L. (2*n* = 18), *Sonchus asper* (L.) Hill. (2*n* = 18), *Sisymbrium officinale* (L.) Scop. (2*n* = 14), *Lolium multiflorum* Lam. (2*n* = 14) in Novosibirsk Region. All species are provided with the brief information on their general spreading and distribution in Novosibirsk Region, as well as literature data on chromosome numbers.

Числа хромосом некоторых чужеродных видов растений Новосибирской области (г. Новосибирск): сообщение 1

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Ключевые слова: диплоид, инвазивные виды, миксоплоид, Новосибирская область, полиплоид, сосудистые растения.

Аннотация. Приводятся числа хромосом (2*n*) для 14 чужеродных видов семейств Apiaceae, Asteraceae, Brassicaceae, Commelinaceae, Fabaceae, Onagraceae, Poaceae из Академгородка (г. Новосибирск, Советский район). Впервые для России определено число хромосом *Silphiodaucus hispidus* (M. Bieb.) Spalik, Wojew., Banasiak, Piwczyński et Reduron (2*n* = 22); впервые для Сибири – *Cardamine flexuosa* With. (2*n* = 32), *Commelina communis* L. (2*n* ≈ 48), *Astragalus falcatus* Lam. (2*n* = 16), *Lathyrus sylvestris* L. (2*n* = 14), *Oenothera rubricaulis* Klebahn, (2*n* = 14); впервые для Западной Сибири – *Raphanus raphanistrum* L. (2*n* = 18); впервые для Новосибирской области – *Centaurea jacea* L. (2*n* = 44), *Erigeron canadensis* L. (2*n* = 18), *Sonchus asper* (L.) Hill. (2*n* = 18), *Sisymbrium officinale* (L.) Scop. (2*n* = 14), *Lolium multiflorum* Lam. (2*n* = 14). Для всех исследованных видов приводятся краткие сведения по общему распространению и расселению в Новосибирской области, литературные данные по числам хромосом.

Studying the polyploidy phenomenon, which existence supposed to contribute the species viability by some authors (Breslavets, 1963; Stebbins, 1985; Probatova, 2003; Soltis et al., 2010), we start investigating the chromosome numbers of alien flora species in Novosibirsk Region. The first communication represents data on 14 species (Apiaceae, Asteraceae, Brassicaceae,

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Commelinaceae, Fabaceae, Onagraceae, Poaceae), seven of them are active either at the whole territory of the Novosibirsk Region, or in only single habitats newly discovered recently.

We collected the seeds and herbarium material *in situ* from Akademgorodok (Novosibirsk city, Sovetsky district). The chromosome numbers were determined according to the standard approach: the karyological analysis was made on root meristem squash preparations from seedlings. Seeds were germinated in Petri dishes on wet sterile sand at 27 °C and light regime providing of 16 hours of daylight and eight hours of darkness. The germs were treated in 0.2 % colchicine for two hours and then fixed in a mixture of ethanol acetic acid (3 : 1). The chromosomes were stained with acetohaematoxylin according to Smirnov (1968). Slides were examined under Axioscop-40 microscope. We conducted the chromosome analyses on 5–10 slides under 100× magnification. Vouchres are stored in the Herbarium of the Central Siberian Botanical Garden of Siberian Branch of the Russian Academy Sciences (NS, Novosibirsk).

APIACEAE

Silphiodaucus hispidus (M. Bieb.) Spalik, Wojew., Banasiak, Piwczyński et Reduron (*Laserpitium hispidum* M. Bieb.), **2*n* = 22**

"Novosibirsk Region, Novosibirsk city, the Central Siberian Botanical Garden, old overgrown sites, 54°50′N, 83°06′E. 9 X 2017. E. Zykova, T. Shemetova", 7517-Z411 (fig. 1A).

Distribution: Caucasus, Asia Minor, southern regions of East Europe, from it is spread to central parts of European Russia. In Siberia it's known only in Novosibirsk Region, here it was first discovered in 2013 (Zykova et al., 2014a). In the revealed habitats it's active, expands the area of populations. The same number is indicated for the Ukraine and Turkey (Rice et al., 2015). We give the first data on chromosome number for Russia.

Diploid (2*x*), *x* = 11.

ASTERACEAE

Centaurea jacea L., **2*n* = 44**

"Novosibirsk Region, Novosibirsk city, Nikolaev street, Technopark, along roads, 54°50′N, 83°06′E. 1 VIII 2017. E. Zykova", 3917-Z483 (fig. 1B).

Distribution: European-Mediterranean species with Holarctic secondary distribution. The first finding in Novosibirsk Region was recorded in 1970s (Zykova, 2016); by now, the species has spread widely throughout the region (Zykova, 2019). It is included in the Black Book of Siberia (Zykova, 2016) and in the list of invasive and potentially invasive species (Ebel et al., 2014). The same chromosome number was reported first for Siberia on specimens of the Republic of Altai (Zykova et al., 2018). Only tetraploid strain is known for Russia (Tonyan, 1968; Probatova et al., 2008). We give the first data on chromosome number for Novosibirsk Region.

Tetraploid (4*x*), *x* = 11. Variable ploidy.

Cota tinctoria (L.) J. Gay (*Anthemis tinctoria* L.), **2*n* = 18**

"Novosibirsk Region, Novosibirsk city, «Shlyuz» micro-district, wasteland along a narrow-gauge road, 54°50′N, 83°06′E. 2 VIII 2017. E. Zykova, T. Shemetova", 4417-Z454.

Distribution: European species was settled to Eurasia; marked in most parts of Novosibirsk Region (Zykova, 2019). The same number was determined first for Siberia at the Central Siberian Botanical Garden surroundings by T. Rostovtseva (1983). Diploid and tetraploid strain were identified first for the Republic of Altai (An'kova, Zykova, 2017).

Diploid (2*x*), *x* = 9. Variable ploidy.

Erigeron canadensis **L.** (*Conyza canadensis* (L.) Cronq.) **2*n* = 18**

"Novosibirsk Region, Novosibirsk city, Tereshkova street, houses' yards, outside lawns and flower beds, 54°50′N, 83°06′E. 30 VII 2017. E. Zykova", 3817-Z375 (fig. 1C).

Distribution: North American native species, as invasive one is cosmopolite. It is known in the Novosibirsk Region since 1932 (Antipova, 2016), now is common in the region (Zykova, 2019). It is included in the Black Book of Siberian flora (Antipova, 2016) and in the list of invasive and potentially invasive species (Ebel et al., 2014). The same chromosome number was reported for Siberia on specimens from Republic of Buryatia, Irkutsk Region (Chepinoga, 2014), Kurgan Region (Krasnikov, Korolyuk, 1995) and Republic of Altai (Lomonosova et al., 2018). Tetra- and hexaploid chromosomal strains of this species are observed in Portugal, India and Canada (Rice et al., 2015). We give the first data on chromosome number for Novosibirsk Region.

Diploid (2*x*), *x* = 9. Variable ploidy.

Sonchus asper (L.) Hill., **2*n* = 18**

"Novosibirsk Region, Novosibirsk city, the Central Siberian Botanical Garden, weeds in greenhouses, 54°50′N, 83°06′E. 25 V 2017. E. Zykova, T. Shemetova", 0317-Z406 (fig. 1D).

Distribution: Eurasian species. In Novosibirsk Region it is known only from Novosibirsk city (Zykova et al., 2014b; Zykova, 2019). It was determined for the first time for West Siberia on Republic of Altai: $2n = 18$ and $2n = 32$ (An'kova, Zykova, 2017). Diploid and tetraploid strains are noted for East Siberia (Rice et al., 2015). We give the first data on chromosome number for Novosibirsk Region.

Diploid ($2x$), $x = 9$. Variable ploidy.

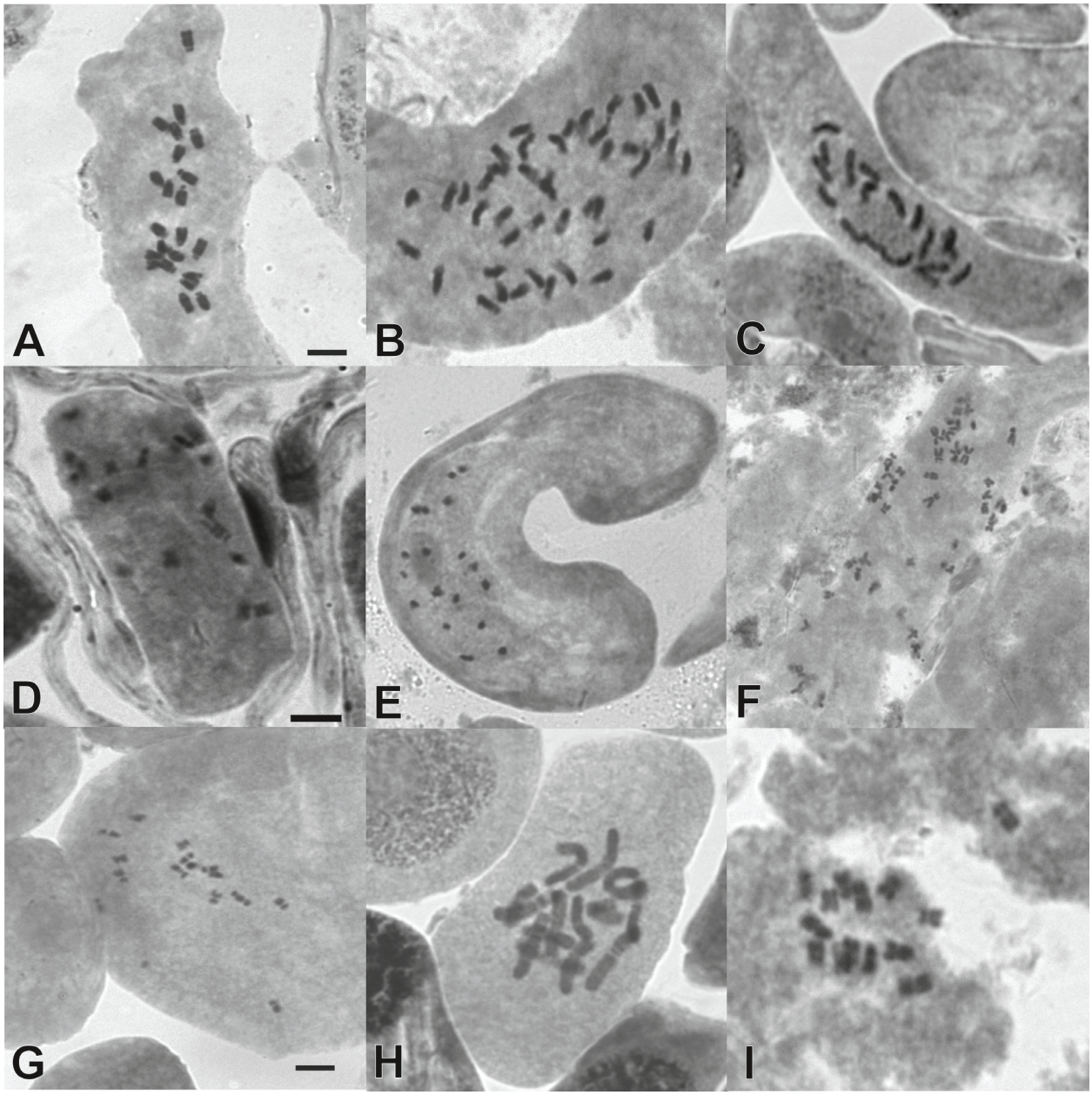

Fig. 1. Mitotic metaphases: A – *Silphiodaucus hispidus*, $2n = 22$; B – *Centaurea jacea*, $2n = 44$; C – *Erigeron canadensis*, $2n = 18$; D – *Sonchus asper*, $2n = 18$; E – *Raphanus raphanistrum*, $2n = 18$; F – *Commelina communis*, $2n \approx 48$; G – *Astragalus falcatus*, $2n = 16$; H – *Lathyrus sylvestris*, $2n = 14$, I – *Oenothera rubricaulis*, $2n = 14$. Scale = 5 μm.

BRASSICACEAE

Cardamine flexuosa With., **$2n = 32$**

"Novosibirsk Region, Novosibirsk city, the Central Siberian Botanical Garden, weeds in greenhouses, 54°50′N, 83°06′E. 25 V 2017. E. Zykova, T. Shemetova", 0317-Z315.

Distribution: European-Mediterranean species. In Siberia it is known only in Novosibirsk Region; it was discovered in Novosibirsk city in 2010 (Shaulo, Zykova, 2013). We give the first data on chromosome number for Siberia.

Diploid ($2x$), $x = 16$.

Raphanus raphanistrum L., **2*n* = 18**

"Novosibirsk Region, Novosibirsk city, the Upper Zone, suburban areas along roads, 54°50′N, 83°06′E. 2 VIII 2017. E. Zykova, T. Shemetova", 4017-Z371 (fig. 1E).

Distribution: Eurasian weed. It's common in all areas of Novosibirsk Region (Zykova, 2019). The same chromosome number is given for East Siberia (Probatova et al., 2012). We give the first data on chromosome number for West Siberia.

Diploid (2*x*), *x* = 9.

Sisymbrium officinale (L.) Scop., **2*n* = 14**

"Novosibirsk Region, Novosibirsk city, «Shlyuz» micro-district, wasteland along a narrow-gauge road, 54°50′N, 83°06′E. 2 VIII 2017. E. Zykova, T. Shemetova", 4417-Z317.

Distribution: European-Mediterranean-Asia minor species, settled in the world temperate zone. In the Novosibirsk Region is quite rare (Efremov, 2016; Zykova, 2019). It is included in the Black Book of Siberian flora (Efremov, 2016) and in the list of invasive and potentially invasive species of Siberia (Ebel et al., 2014).

The same chromosome number was determined for the first time for Russia on the Republic of Altai (Zykova et al., 2018). We give the first data on chromosome number for Novosibirsk Region.

Diploid (2*x*), *x* = 7.

COMMELINACEAE

Commelina communis L. **2*n* ≈ 48**, the number is unstable

"Novosibirsk Region, Novosibirsk city, vicinity of the Central Beach, railway embankments, 54°50′N, 83°06′E. 2 VIII 2017. E. Zykova, T. Shemetova", 4217-Z628 (fig. 1F).

Distribution: Far Eastern species with the secondary Holarctic range; rare in Siberia. In Novosibirsk Region it was discovered in 2017 in Novosibirsk city (Zykova, Shemetova, 2018).

For the first time in Russia, the number of chromosomes 2*n* ≈ 48 was determined in Primorye Territory (Probatova, Sokolovskaya, 1986). The chromosome number varies within one individual. We give the first data on chromosome number for Siberia.

Mixoploid.

FABACEAE

Astragalus cicer L., **2*n* = 64**

"Novosibirsk Region, Novosibirsk city, the Upper Zone, suburban areas along roads, 54°50′N, 83°06′E. 2 VIII 2017. E. Zykova, T. Shemetova", 4017-Z322.

Distribution: European species; quite rare in Siberia. The first location in Novosibirsk city was fixed in 1998 (Shaulo et al., 2010). It enters the list of invasive and potentially invasive species in Siberia (Ebel et al., 2014). It is noted the same chromosome number as before in the Central Siberian Botanical Garden vicinity (An'kova et al., 2013).

Polyploid (8*x*), *x* = 8. Variable ploidy.

Astragalus falcatus Lam., **2*n* = 16**

"Novosibirsk Region, Novosibirsk city, the Central Siberian Botanical Garden, old overgrown areas, 54°50′N, 83°06′E. 9 X 2017. E. Zykova, T. Shemetova", 7517-Z625 (fig. 1G).

Distribution: The natural range covers Europe, the Caucasus, Asia Minor. It was withdrawal of culture noted in Novosibirsk Region in 2017 (Zykova, Shemetova, 2018).

In Russia, the same number is specified for the North Caucasus (Stavropol Territory) (Magulaev, 1980). We give the first data on chromosome number for Siberia.

Diploid (2*x*), *x* = 8.

Lathyrus sylvestris L., **2*n* = 14**

"Novosibirsk Region, Novosibirsk city, the Central Siberian Botanical Garden, abandoned expositions, 54°50′N, 83°06′E. 15 X 2017. E. Zykova", 7617-Z389 (fig. 1H).

Distribution: The natural range covers Europe, the Caucasus, the Mediterranean and Asia Minor. It is rare in Siberia, in Novosibirsk Region since 2000; it was found in Iskitim, Novosibirsk districts and Novosibirsk city (Shaulo, Zykova, 2013; Zykova et al., 2014a).

In Russia, the same chromosome number is known only in Ossetia (Efimov, 2005). We give the first data on chromosome number for Siberia.

Diploid (2*x*), *x* = 8.

ONAGRACEAE

Oenothera rubricaulis Klebahn (*O. biennis* auct. non L.), **2*n* = 14**

"Novosibirsk Region, Novosibirsk city, «Shlyuz» micro-district, wasteland along a narrow-gauge road, 54°50′N, 83°06′E. 2 VIII 2017. E. Zykova, T. Shemetova", 4417-Z455 (fig. 1I).

Distribution: North American species. It is recently in Siberia compared with other genus species. In Novosibirsk Region it was found in 2012

in Novosibirsk city (Ebel et al., 2015). It's marked in the list of invasive and potentially invasive species in Siberia (Ebel et al., 2014).

The same chromosome number is known for the Far East and North Caucasus (Rice et al., 2015). We give the first data on chromosome number for Siberia.

Diploid (2*x*), *x* = 7.

POACEAE

Lolium multiflorum Lam., **2*n* = 14**

"Novosibirsk Region, Novosibirsk city, Tereshkova street, in houses' yards, outside lawns and flower beds, 54°50′N, 83°06′E. 30 VII 2017. E. Zykova", 3817-Z492.

Distribution: Eurasian species. It is known in Novosibirsk Region since 1990 (Nikiforova, 1990), found in Novosibirsk city, where the species is currently rather active.

In Siberia 2*n* = 14 is defined for Irkutsk Region (Chepinoga et al., 2012) and the Republic of Altai (Lomonosova et al., 2018). We give the first data on chromosome number for Novosibirsk Region.

Diploid (2*x*), *x* = 7. Variable ploidy.

Conclusion

Five of seven active species have variable ploidy: *Cota tinctoria*, *Centaurea jacea, Erigeron canadensis, Lolium multiflorum*, two species showed a ploidic increase: octoploid in *Astragalus cicer* and tetraploid in *Centaurea jacea*. Others are stable diploids: *Silphiodaucus hispidus, Cardamine flexuosa, Raphanus raphanistrum, Sisymbrium officinale, Astragalus falcatus, Lathyrus sylvestris, Oenothera rubricaulis.*

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