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SOLANACEAE

Capsicum rhomboideum (Dunal) Kuntze, 2*n* = 26; Venezuela, Estado de Táchira, *YSG 20* (CORD, HRT).

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ASTERACEAE

Jacobaea vulgaris (L.) Gaertn. (≡ *Senecio jacobaea* L.), 2*n* = 20; Russia, Zabaikalskii Krai, *P. Lubogoschinsky C714* (IRKU).

BORAGINACEAE

Myosotis palustris (L.) L., 2*n* = 22; Russia, Irkutskaya Oblast', *A. Gnutikov & V. Chepinoga C341* (IRKU).

FABACEAE

Oxytropis myriophylla (Pall.) DC., 2*n* = 16; Russia, Chitinskaya Oblast', *M. Pimenov G-1* (LE).
Vicia cracca L., 2*n* = 14; Russia, Republic of Buryatia, *V. Belyaeva 422* (LE).

POACEAE

Poa botryoides (Trin. ex Griseb.) Kom., 2*n* = 42; Russia, Zabaikalskii Krai, *V. Chepinoga C659* (IRKU).
Setaria pumila (Poir.) Schult., 2*n* = 36; Russia, Irkutskaya Oblast', *I. Enushchenko C833* (IRKU).
Setaria viridis (L.) P.Beauv., 2*n* = 18; Russia, Zabaikalskii Krai, *P. Lubogoschinksy C732* (IRKU).
Stipa krylovii Roshev., 2*n* = 44; Russia, Zabaikalskii Krai, *V. Chepinoga & al.* C815 (IRKU).

RANUNCULACEAE

Caltha palustris L., 2*n* = 32; Russia, Zabaikalskii Krai, *V. Chepinoga C661* [Chepinoga & al. in Taxon 61: 890, E8. 2012; as "*C. membranacea*"].
Ranunculus turczaninovii (Luferov) Vorosch., 2*n* = 32; Russia, Zabaikalskii Krai, *A. Gnutikov & I. Enushchenko C377* (IRKU).
Trollius asiaticus L., 2*n* = 16; Russia, Republic of Buryatia, *V. Belyaeva 75-125* (LE), *V. Belyaeva 75-175* (LE).

SAXIFRAGACEAE

Saxifraga oppositifolia L. (= *S. asiatica* Hayek), 2*n* = ca. 26; Russia, Republic of Buryatia, *V. Siplivinsky 74-106* (LE).

Samara Maria Gonçalves Carneiro,[1] Maria Aparecida Oliveira Alves,[2] Maria Francilene Souza Silva,[1] Cristiano C. do Nascimento,[1] Itayguara Ribeiro da Costa[2] & Ivanilza Moreira de Andrade[1]*

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All materials for the chromosome column should be submitted electronically to: Karol Marhold, karol.marhold@savba.sk (Institute of Botany, Slovak Academy of Sciences, SK-845 23 Bratislava, Slovakia, and Department of Botany, Charles University, CZ 128-01 Prague, Czech Republic). The full version of this contribution is available in the online edition of TAXON appended to this article. The following citation format is recommended: Baltisberger, M. & Voelger, M. 2006. *Sternbergia sicula*. In: Marhold, K. (ed.), IAPT/IOPB chromosome data 1. *Taxon* 55: 444, E2.

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PONTEDERIACEAE

Eichhornia crassipes (Mart.) Solms, 2*n* = 32; Brazil, Piauí, *S.M.G. Carneiro & al. 40.*
Eichhornia diversifolia (Vahl) Urb., 2*n* = 30; Brazil, Piauí, *S.M.G. Carneiro & al. 35.*
Heteranthera rotundifolia (Kunth) Griseb., 2*n* = 14 Brazil, Piauí, *S.M.G. Carneiro & al. 34.*

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SOLANACEAE

Capsicum baccatum var. *praetermissum* (Heiser & P.G.Smith) Hunz., 2*n* = 24; Brasil, Estado de São Paulo, *EFM 05/17* (CORD).

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All materials CHN; collected in India; collector: *HK* = *Harpreet Kaur*; vouchers in PUN.

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ALISMATACEAE

Alisma plantago-aquatica L., *n* = 7+0–1B; *HK 29273.*

CANNACEAE

Canna discolor Lindl., *n* = 9; *HK 29225.*

COMMELINACEAE

Commelina caroliniana Walter (= *C. hasskarlii* C.B.Clarke), *n* = 11; *HK 27141*, *HK 27143. n* = 30; *HK 27142.*
Commelina undulata R.Br. (= *C. kurzii* C.B.Clarke), *n* = 30; *HK 28169.*
Murdannia nudiflora (L.) Brenan, *n* = 12; *HK 25617.*
Murdannia spirata (L.) G.Brückn., *n* = 12; *HK 29268*, *HK 29292.*
Tradescantia pallida (Rose) D.R.Hunt, *n* = 12; *HK 29254.*

CYPERACEAE

Pycreus flavidus (Retz.) T.Koyama (≡ *Cyperus flavidus* Retz.), *n* = 32; HK 28167.

DIOSCOREACEAE

Dioscorea bulbifera L., *n* = 10; *HK 28175.*

JUNCACEAE

Juncus articulatus L. subsp. *articulatus*, *n* = 30; *HK 27134.*
Juncus bufonius L., *n* = 30; *HK 27137.*

LILIACEAE

Polygonatum verticillatum All., *n* = 9; *HK 29300.*

POACEAE

Agrostis pilosula var. *royleana* (Trin.) Bor, *n* = 21+0–1B; *HK 24868.*
Andropogon munroi C.B.Clarke (= *A. tristis* Royle), *n* = 20; *HK 28145*, *HK 28146.*
Arundinella setosa Trin., *n* = 24; *HK 28140.*
Chrysopogon serrulatus Trin., *n* = 20; *HK 24816.*
Cymbopogon clandestinus Stapf, *n* = 10; *HK 27160.*
Digitaria abludens (Roem. & Schult.) Veldkamp (= *D. granularis* (Trin.) Henrard), *n* = 36; *HK 27186.*
Echinochloa crus-pavonis (Kunth) Schult., *n* = 27; *HK 27031.*
Eragrostis poaoides Roem. & Schult. (= *E. minor* Host), *n* = 18; *HK 27162.*
Lolium remotum var. *aristatum* (Döll) Asch., *n* = 7; *HK 24876.*
Microstegium fasciculatum (L.) Henrard (= *M. vagans* (Nees ex Steud.) Hand.-Mazz.), *n* = 20+0–1B; *HK 29202.*
Panicum antidotale Retz., *n* = 16; *HK 29297.*
Paspalum dilatatum Poir., *n* = 10; *HK 27119.*
Phacelurus speciosus C.E.Hubb., *n* = 35; *HK 25623.*
Phalaris minor Retz., *n* = 21; *HK 28133.*
Poa nepalensis (Wall. ex Griseb.) Duthie, *n* = 14+0–1B; *HK 24883.*
Poa setulosa Bor, *n* = 14+0–1B; *HK 24884.*
Pogonatherum crinitum (Thunb.) Kunth, *n* = 7; *HK 27121. n* = 14; *HK 28130.*
Setaria barbata (Lam.) Kunth, *n* = 16; *HK 25049.*
Setaria homonyma Chiov., *n* = 16; *HK 29204.*
Themeda anathera (Nees ex Steud.) Hack., *n* = 30+0–2B; *HK 27005*, *HK 27004.*
Vulpia myuros (L.) C.C.Gmel., *n* = 21+0–1B; *HK 24859.*

PONTEDERIACEAE

Monochoria vaginalis (Burm.f.) C.Presl, *n* = 12; *HK 29229.*

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ALLIACEAE

Allium angulosum L., 2*n* = 32; Russia, Amurskaya Oblast', *AVS 65* (VLA).

ASTERACEAE

Artemisia altaiensis Krasch., 2*n* = 54; Russia, Republic of Altai, *A.I. Shmakov 9920* (ALTB), *AAK 99-127* (LE), *AAK 99-131* (LE), *AAK 99-132* (LE), *AAK 99-133* (LE), *AAK 99-134* (LE), AAG *11-09* (LE), *AAG 11-10* (LE), *AAG 2013-62* (LE).

Artemisia argyrophylla Ledeb., 2*n* = 54; Russia, Republic of Altai, *AAK 99-149* (LE), *AAK 99-150* (LE).

Artemisia caespitosa Ledeb., 2*n* = 18; Russia, Republic of Altai, *AAK 99-160* (LE).

Artemisia depauperata Krasch., 2*n* = 18; Russia, Republic of Altai, *A.I. Shmakov*, *D.A. German & al. 99-50* (ALTB), *A.I. Shmakov*, *D.A. German & al. 99-53* (ALTB), *AAK 99-95* (LE), *AAK 99-96* (LE), *AAK 99-97* (LE), *AAK 99-98* (LE). 2*n* = 27; Russia, Republic of Altai, *S.I. Molokanov & A.P. Shalimov 10-12* (ALTB). 2*n* = 36; Russia, Republic of Altai, *A.I. Shmakov, S.V. Smirnov & al. 10-11* (ALTB), *S.V. Smirnov & R.A. Zubov 10-14* (ALTB), *S.V. Smirnov & R.A. Zubov 10-16* (ALTB), *S.V. Smirnov & R.A. Zubov 10-15* (ALTB).

Artemisia gmelinii Weber ex Stechm., 2*n* = 18; Russia, Republic of Altai, *AAK 99-178* (LE), *AAK 99-179* (LE), *AAK 99-215* (LE). 2*n* = 36; Russia, Republic of Altai, *AAK 99-175* (LE), *AAK 99-177* (LE), *A.I. Shmakov*, *D.A. German & al. 99-38* (ALTB), *A.I. Shmakov*, *D.A. German & al. 99-39* (ALTB), *A.I. Shmakov*, *D.A. German & al. 99-40* (ALTB); Russia, Altaiskii Krai, *AAK 99-180* (LE).

Artemisia gracilescens Krasch. & Iljin, 2*n* = 18; Russia, Altaiskii Krai, *A.Yu. Koroljuk 04-06* (LE).

Artemisia nitrosa Weber ex Stechm., 2*n* = 18; Russia, Altaiskii Krai, *AAK 99-69* (LE), *AAK 99-70* (LE), *AAK 99-71* (LE). 2*n* = 36; Russia, Altaiskii Krai, *AAK 99-68* (LE), *AAK 99-81* (LE), *AAK 99-82* (LE).

Artemisia pauciflora Weber ex Stechm., 2*n* = 18; Russia, Altaiskii Krai, *A.Yu. Koroljuk 04-05* (LE).

Artemisia phaeolepis Krasch., 2*n* = 18; Russia, Republic of Altai, *A.N. Kuprianov 99-36* (ALTB), *A.N. Kuprianov 99-37* (ALTB). 2*n* = 36; Russia, Republic of Altai, *AAK 99-191* (LE), *AAK 99-192* (LE), *AAK 99-193* (LE), *S.V. Smirnov & R.A. Zubov 10-09* (ALTB).

Artemisia rutifolia Steph. ex Spreng., 2*n* = 18; Russia, Republic of Altai, *AAK 99-172* (LE), *AAK 99-173* (LE), *AAK 99-174* (LE).

Artemisia schischkinii Krasch., 2*n* = 18; Russia, Republic of Altai, *AAK 99-72* (LE), *AAK 99-73* (LE).

Artemisia schrenkiana Ledeb., 2*n* = 36; Russia, Altaiskii Krai, *AAK 99-77* (LE), *AAK 99-78* (LE), *AAK 99-80* (LE), *AAK 99-79* (LE).

Artemisia sublessingiana Krasch. ex Poljakov, 2*n* = 18; Russia, Altaiskii Krai, *AAK 99-83* (LE).

Doellingeria scabra (Thunb.) Nees, 2*n* = 18; Russia, Amurskaya Oblast', *AVS 63* (VLA).

Pyrethrum abrotanifolium Bunge ex Ledeb., 2*n* = 18; Russia, Republic of Altai, *A.I. Shmakov & S.V. Smirnov 10-20* (ALTB).

Tanacetum vulgare L., 2*n* = 18; Russia, Altaiskii Krai, *AAG 2013-71* (LE), *AAG 2013-72* (LE).

CYPERACEAE

Carex siderosticta Hance, 2*n* = 24; Russia, Primorskii Krai, *N.S. Probatova & V.P. Seledets 7969* (VLA).

GERANIACEAE

Geranium wilfordii Maxim., 2*n* = 28; Russia, Amurskaya Oblast', *AVS & al. 193* (VLA).

IRIDACEAE

Sisyrinchium septentrionale E.P.Bicknell, 2*n* = 32; Russia, Primorskii Krai, *V.A. Nechaev 10279* (VLA).

LAMIACEAE

Prunella asiatica Nakai, 2*n* = 28; Russia, Amurskaya Oblast', *AVS 227* (VLA).

POACEAE

Deschampsia cespitosa (L.) P.Beauv., 2*n* = 26; Russia, Khabarovskii Krai, *I.V. Enuschenko 9944* (VLA).

ROSACEAE

Potentilla anserina L., 2*n* = 28; Russia, Amurskaya Oblast', *AVS 93* (VLA).

Potentilla chinensis Ser., 2*n* = 14; Russia, Amurskaya Oblast', *AVS 3* (VLA).

Potentilla flagellaris Schltdl., 2*n* = 14; Russia, Amurskaya Oblast', *AVS 96* (VLA).

Potentilla freyniana Bornm., 2*n* = 14; Russia, Amurskaya Oblast', *AVS 97* (VLA).

Potentilla semiglabra Juz., 2*n* = 28; Russia, Amurskaya Oblast', *AVS 17* (VLA). 2*n* = 56; Russia, Amurskaya Oblast', *AVS 94* (VLA).

Spiraea media F.Schmidt, 2*n* = 27; Russia, Amurskaya Oblast', *Polyakova 8933* (VLA).

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CHENOPODIACEAE

Atriplex patens (Litv.) Iljin, 2*n* = 36; China, Xinjiang Uyghur Autonomous Province, *DSh, SS & AE 1c/303*, *DSh, SS & AE 1c/305*, *DSh, SS & AE 1a/312*.

Atriplex tatarica L., 2*n* = 18; China, Xinjiang Uyghur Autonomous Province, *DSh, SS & AE 1c/304*, *DSh, SS & AE 1c/306*, *DSh, SS & AE 1a/314*, *DSh, SS & AE 4/313*.

Bassia prostrata (L.) A.J.Scott (≡ *Kochia prostrata* (L.) Schrad.), 2*n* = 36; China, Xinjiang Uyghur Autonomous Province, *DSh, SS & AE 1b/250*.

Bassia scoparia (L.) A.J.Scott (≡ *Kochia scoparia* (L.) Schrad.), 2*n* = 18; China, Xinjiang Uyghur Autonomous Province, *DSh, SS & AE 1a/262*.

Camphorosma lessingii Litv., 2*n* = 12; China, Xinjiang Uyghur Autonomous Province, *DSh, SS & AE 1a/300*.

Chenopodiastrum hybridum (L.) S.Fuentes & al. (≡ *Chenopodium hybridum* L.), 2*n* = 18; China, Xinjiang Uyghur Autonomous Province, *DSh, SS & AE 2c/311*.

Chenopodium novopokrovskianum (Aellen) Uotila, 2*n* = 36; China, Xinjiang Uyghur Autonomous Province, *DSh, SS & AE 1a/286*, *2c/290*.

Grubovia dasyphylla (Fisch. & C.A.Mey.) Freitag & G.Kadereit (≡ *Bassia dasyphylla* (Fisch. & C.A.Mey.) O.Kuntze), 2*n* = 18; China, Xinjiang Uyghur Autonomous Province, *DSh, SS & AE 1b/252*.

Halogeton glomeratus (Bieb.) C.A.Mey., 2*n* = 18; China, Xinjiang Uyghur Autonomous Province, *DSh, SS & AE 1a/265.*
Kali paulsenii (Litv.) Akhani & Roalson (≡ *Salsola paulsenii* Litv.), 2*n* = 36; China, Xinjiang Uyghur Autonomous Province, *DSh, SS & AE 1b/315.*
Kalidium foliatum (Pall.) Moq., 2*n* = 18; China, Xinjiang Uyghur Autonomous Province, *DSh, SS & AE 1c/296.*
Salicornia perennans Willd., 2*n* = 18; China, Xinjiang Uyghur Autonomous Province, *DSh, SS & AE 1c/255*, *DSh, SS & AE 1a/254.*
Suaeda corniculata (C.A.Mey.) Bunge subsp. *corniculata*, 2*n* = 54; China, Xinjiang Uyghur Autonomous Province, *DSh, SS & AE 1a/245.*
Suaeda heterophylla (Kar. & Kir.) Bunge, 2*n* = 18; China, Xinjiang Uyghur Autonomous Province, *DSh, SS & AE 1c/ 245*, *DSh, SS & AE 1a/244.*
Suaeda linifolia Pall., 2*n* = 18; China, Xinjiang Uyghur Autonomous Province, *DSh, SS & AE 1a/246.*
Suaeda olufsenii Paulsen, 2*n* = 18; China, Xinjiang Uyghur Autonomous Province, *DSH, SS & AE 1a/239.*
Suaeda salsa (L.) Pall., 2*n* = 36; China, Xinjiang Uyghur Autonomous Province, *DSh, SS & AE 1a/238.*
Suaeda stellatiflora G.L.Chu, 2*n* = 18; China, Xinjiang Uyghur Autonomous Province, *DSh, SS & AE 1c/243*, *DSh, SS & AE 1a/242*, *DSh, SS & AE 5/241.*

RANUNCULACEAE

Clematis orientalis L., 2*n* = 16; China, Xinjiang Uyghur Autonomous Province, *DSh, SS & AE 3/108.* 2*n* = 32; China, Xinjiang Uyghur Autonomous Province, *DSh, SS & AE 3/109.*
Halerpestes sarmentosa (Adams) Kom., 2*n* = 32; China, Xinjiang Uyghur Autonomous Province, *DSh, SS & AE 1a/110.*
Ranunculus natans C.A.Mey., 2*n* = 16; China, Xinjiang Uyghur Autonomous Province, *DSh, SS & AE 2b/113.*

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Chromosome numbers counted by E. Michalková and ploidy level estimated by D.R. Letz; collectors: *DRL* = D.R. Letz, *EM* = E. Michalková, *PM* = P. Mereďa jun., *VF* = V. Feráková; vouchers in SAV.

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AMARANTHACEAE

Salsola collina Pall., 2*n* ~ 2*x* ~ 18, FCM. Hungary, *DRL & EM HU4-1*, *DRL & EM HU4-2*, *DRL & EM HU4-3.*
Salsola kali subsp. *ruthenica* (Iljin) Soó, 2*n* = 36, CHN. Slovakia, *EM Stup1*, *EM DNV1*, *DRL Nesv1*. 2*n* ~ 4*x* ~ 36, FCM. Austria, *DRL & EM A1-1*, *DRL & EM A1-2*, *DRL & EM A1-3*, *DRL & EM A1-4*, *DRL & EM A4-1*, *DRL & EM A4-2*, *DRL & EM A4-3*, *DRL & EM A4-4*, *DRL & EM A5-1*, *DRL & EM A5-2*, *DRL & EM A5-3*, *DRL & EM A7-1*, *DRL & EM A7-2*, *DRL & EM A7-3*, *DRL & EM A7-4*; Czech Republic, *DRL & EM CZ2-1*, *DRL & EM CZ2-2*, *DRL & EM CZ2-3*, *DRL & EM CZ2-4*, *DRL & EM CZ2-5*, *DRL & EM CZ4-1*, *DRL & EM CZ4-2*, *DRL & EM CZ4-3*, *DRL & EM CZ4-4*, *DRL & EM CZ4-5*; Hungary, *DRL & EM HU1-1*, *DRL & EM HU1-2*, *DRL & EM HU1-3*, *DRL & EM HU1-4*, *DRL & EM HU2-1*, *DRL & EM HU2-2*, *DRL & EM HU2-3*, *DRL & EM HU2-4*, *DRL & EM HU3-1*, *DRL & EM HU3-2*, *DRL & EM HU3-3*, *DRL & EM HU3-4*; Slovakia, *EM S1*, *EM S2*, *EM Stup1*, *DRL Nesv1-1*, *DRL Nesv1-2*, *DRL Nesv1-3*, *DRL & EM S7-1*, *DRL & EM S7-2*, *DRL & EM S8-1*, *DRL & EM S8-2*, *EM DNV2-1*, *EM DNV2-2*, *DRL SK1*, *PM SK2.*
Salsola soda L., 2*n* ~ 2*x* ~ 18, FCM. Greece, *DRL GR5-1*, *DRL GR5-2*, *DRL GR7-1*, *DRL GR7-2*, *DRL GR7-3*; Hungary, *DRL & EM HU5-1*, *DRL & EM HU5-2.*
Salsola tragus L., 2*n* ~ 4*x* ~ 36, FCM. Bulgaria, *DRL BG1-1*, *DRL BG1-2*, *DRL BG1-3*, *DRL BG1-4*, *DRL BG1-5*, *DRL BG2-1*, *DRL BG2-2*, *DRL BG2-3*, *DRL BG2-4*; Croatia, *EM HR1*, *EM HR2*, *EM HR3*; Greece, *DRL GR1*, *DRL GR2-1*, *DRL GR2-2*, *DRL GR2-3*, *DRL GR3-1*, *DRL GR3-2*, *DRL GR3-3*, *DRL GR3-4*, *DRL GR4*, *DRL GR6-1*, *DRL GR6-2*, *DRL GR6-3*, *DRL GR8-1*, *DRL GR8-2*; Turkey, *VF TUR1*, *VF TUR2*, *VF TUR3*, *VF TUR4*, *VF TUR5.*

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AGAVACEAE

Furcraea foetida (L.) Haw., 2*n* = 60; Brazil, Paraíba, *L.P. Felix s.n.* (EAN 11029).

ALSTROEMERIACEAE

Alstroemeria longistaminea Mart. ex Schult. & Schult.f., 2*n* = 16; Brazil, Paraíba, *L.P. Felix s.n.* (EAN 15466).
Bomarea edulis (Tussac) Herb., 2*n* = 18; Brazil, Pernambuco, *L.P. Felix s.n.* (EAN 11184).

AMARANTHACEAE

Alternanthera paranychioides A.St.-Hil., 2*n* = 64; Brazil, Paraíba, *F.C. Ramalho 502.*
Alternanthera tenella Colla, 2*n* = 28; Brazil, Rio Grande do Norte, *F.C. Ramalho 564.*
Blutaparon vermiculare (L.) Mears, 2*n* = 30; Brazil, Paraíba, *L.P. Felix 15026.*

AMARYLLIDACEAE

Hippeastrum psittacinum Herb., 2*n* = 22; Brazil, Paraíba, *S. Pitrez 587.*

APOCYNACEAE

Mandevilla tenuifolia (J.C.Mikan) Woodson, 2*n* = 20; Brazil, Paraíba, *S. Pitrez 507.*
Rauvolfia ligustrina Willd., 2*n* = 22; Brazil, Paraíba, *S. Pitrez 355.*

ARISTOLOCHIACEAE

Aristolochia birostris Duch., 2*n* = 14; Brazil, Paraíba, *A. Almeida 383.*

ASTERACEAE

Conocliniopsis prasiifolia (DC.) R.M.King & H.Rob., 2*n* = 22; Brazil, Paraíba, *S. Pitrez 297.*

CACTACEAE

Cereus jamacaru DC., 2*n* = 22; Brazil, Paraíba, *L.P. Felix 10203.*
Melocactus bahiensis (Britton & Rose) Luetzelb., 2*n* = 44; Brazil, Rio Grande do Norte, *L.P. Felix 5595.*

Melocactus ernesti Vaupel, 2*n* = 44; Brazil, Paraíba, *A. Almeida 240.*
Pilosocereus pachycladus subsp. *pernambucoensis* (Ritter) Zappi, 2*n* = 44; Brazil, Paraíba, *A.S. Barbosa 2013.*

CLUSIACEAE

Clusia nemorosa G.Mey., 2*n* = 60; Brazil, Pernambuco, *L.P. Felix 12616.*

COMMELINACEAE

Tradescantia ambigua Mart., 2*n* = 24; Brazil, Paraíba, *S. Pitrez 611.*

CONVOLVULACEAE

Evolvulus filipes Mart., 2*n* = 26; Brazil, Paraíba, *L.P. Felix 10202.*
Evolvulus glomeratus Nees & Mart., 2*n* = 26; Brazil, Paraíba, *A. Almeida 405.*
Ipomoea longeramosa Choisy, 2*n* = 30; Brazil, Paraíba, *A. Almeida 396.*
Ipomoea marcellia Meisn., 2*n* = 30; Brazil, Paraíba, *S. Pitrez 250.*
Jacquemontia densiflora (Meisn.) Hallier f., 2*n* = 18; Brazil, Paraíba, *S. Pitrez 409.*
Merremia aegyptia (L.) Urb., 2*n* = 30; Brazil, Paraíba, *F.C. Ramalho 619.*

EUPHORBIACEAE

Euphorbia comosa Vell., 2*n* = 40; Brazil, Paraíba, *S. Pitrez 446.*
Stillingia trapezoidea Ule, 2*n* = 36; Brazil, Paraíba, *S. Pitrez 200.*

GESNERIACEAE

Paliavana tenuiflora Mansf., 2*n* = 28; Brazil, Paraíba, *S. Pitrez 379.*
Sinningia nordestina Chautems, Baracho & Siqueira-Filho, 2*n* = 26; Brazil, Paraíba, *A. Almeida 363.*

PHYLLANTHACEAE

Phyllanthus clausseni Müll.Arg., 2*n* = 26; Brazil, Paraíba, *S. Pitrez 335.*

VITACEAE

Cissus decidua Lombardi, 2*n* = 34; Brazil, Paraíba, *S. Pitrez 566.*

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EUPHORBIACEAE

Acalypha multicaulis Müll.Arg., 2*n* = 38; Brazil, Pernambuco, *L.P. Felix 10942.*
Astraea lobata (L.) Klotzsch, 2*n* = 18; Brazil, Paraíba, *L.P. Felix 11278.*
Croton argenteus L., 2*n* = 30; Brazil, Bahia, *L.P. Felix & N.A. Porto 11227.*
Croton argyrophyllus Kunth, 2*n* = 20; Brazil, Paraíba, *L.P. Felix & N.A. Porto 11194.*
Croton blanchetianus Baill., 2*n* = 20; Brazil, Paraíba, *L.P. Felix 14836.*
Croton glandulosus L., 2*n* = 16; Brazil, Paraíba, *L.P. Felix 14837.*
Croton grandivelus Baill., 2*n* = 38; Brazil, Piauí, *L.P. Felix 11036*, *L.P. Felix 11096*; Brazil, Ceará, *L.P. Felix & M.F.O. Pires 10860.*
Croton heliotropiifolius Kunth, 2*n* = 40; Brazil, Paraíba, *N.A. Porto 06.*
Croton jacobinensis Baill., 2*n* = 20; Brazil, Pernambuco, *L.P. Felix 11107*; Brazil, Ceará, *L.P. Felix & M.F.O. Pires 11860.*
Croton pedicellatus Kunth, 2*n* = 18; Brazil, Piauí, *L.P. Felix 11040*, *L.P. Felix 11046*, *L.P. Felix 10675.*
Croton pulegioides Müll.Arg., 2*n* = 20; Brazil, Paraíba, *L.P. Felix 11121.*
Croton urticifolius Lam., 2*n* = 20; Brazil, Paraíba, *L.P. Felix 11467*, *L.P. Felix 11305*; Brazil, Ceará, *L.P. Felix & M.F.O. Pires 10868.*
Euphorbia sarcodes Boiss., 2*n* = 60; Brazil, Pernambuco, *L.P. Felix 10501.*
Manihot carthaginensis subsp. *glaziovii* (Müll.Arg.) Allem, 2*n* = 36; Brazil, Paraíba, *L.P. Felix 12763*, *L.P. Felix 12764*, *L.P. Felix 12036*; Brazil, Pernambuco, *L.P. Felix 11520*, *L.P. Felix 11528*; Brazil, Rio Grande do Norte, *L.P. Felix 11936*, *L.P. Felix 11924*, *L.P. Felix 12154.*
Manihot dichotoma Ule, 2*n* = 36; Brazil, Rio Grande do Norte, *L.P. Felix 11423.*
Manihot esculenta Crantz 'Manipeba', 2*n* = 36; Brazil, Pernambuco, *L.P. Felix 12037.*
Manihot esculenta Crantz 'Pornunça', 2*n* = 36; Brazil, Paraíba, *L.P. Felix 11510.*
Manihot leptophylla Pax, 2*n* = 36; Brazil, Rio Grande do Norte, *L.P. Felix 11425.*
Manihot tripartita (Spreng.) Müll.Arg. subsp. *Tripartita*, 2*n* = 36; Brazil, Bahia, *L.P. Felix 12035.*

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ALISMATACEAE

Alisma plantago-aquatica L., 2*n* = 14; Kyrgyzstan, *NSP & VPS 5153.*

ASTERACEAE

Phalacroloma septentrionale (Fernald & Wiegand) Tzvelev, 2*n* = 27; Russia, Krasnodarskii Krai, *NSP & VPS 11532.*
Pterocypsela indica (L.) C.Shih, 2*n* = 18; Russia, Primorskii Krai, *NSP & VPS 7563.*

Saussurea pulchella (Fisch.) Fisch., 2*n* = 26; Russia, Amurskaya Oblast', *NSP & VPS 9448.*
Sonchus oleraceus L., 2*n* = 32; Russia, Leningradskaya Oblast', *NSP & VPS 11543.*

CHENOPODIACEAE

Atriplex patens Iljin, 2*n* = 36; Russia, Primorskii Krai, *NSP & VPS 7531.*
Kali komarovii (Iljin) Akhani & Roalson, 2*n* = 36; Russia, Primorskii Krai, *O.A. Chernyagina 12463.*

CONVALLARIACEAE

Clintonia udensis Trautv. & C.A.Mey., 2*n* = 14; Russia, Primorskii Krai, *E.M. Bulakh 12425.*

CRASSULACEAE

Hylotelephium pallescens (Freyn) H.Ohba, 2*n* = 24; Russia, Primorskii Krai, *NSP & VPS 7723.*

EUPHORBIACEAE

Euphorbia lucorum Rupr., 2*n* = ca. 40; Russia, Primorskii Krai, *NSP & VPS 6723.*

IRIDACEAE

Iris mandshurica Maxim., 2*n* = 24; Russia, Primorskii Krai, *V.T. Lapenko 10961.*

LAMIACEAE

Scutellaria strigillosa Hemsl., 2*n* = 16; Russia, Primorskii Krai, *E.B. Volynets 11906.*

PAPAVERACEAE

Chelidonium asiaticus (Hara) Krahulc., 2*n* = 10; Russia, Primorskii Krai, *NSP 5469.*

POACEAE

Agropyron cristatum (L.) P.Beauv., 2*n* = 28; Russia, Republic of Yakutia, *NSP & VPS 3769*, *NSP & VPS 3780*, *NSP 3849.*
Agrostis scabra Willd., 2*n* = 42; Russia, Khabarovskii Krai, *NSP & VPS 4478.*
×*Agrotrygia hajastanica* (Tzvelev) Tzvelev, 2*n* = 42; Russia, Amurskaya Oblast', *T.N. Tolmacheva 10541.*
Alopecurus brachystachyus M.Bieb., 2*n* = >100; Russia, Amurskaya Oblast', *NSP & E.G. Rudyka 4004.*
Anisantha tectorum (L.) Nevski, 2*n* = 14; Russia, Volgogradskaya Oblast', *V.V. Makarov 6348.*
Anisantha tectorum var. *hirsuta* (Regel) Tzvelev, 2*n* = 14; Russia, Republic of Daghestan, *NSP 5559.*
Bromopsis angrenica (Drobow) Holub, 2*n* = 42; Tadzhikistan, *NSP & VPS 3741.*
Calamagrostis brachytricha Steud., 2*n* = 42; Russia, Primorskii Krai, *Yu. Murdakhaev 4500.*
Calamagrostis lapponica (Wahlenb.) Hartm., 2*n* = >100; Russia, Khabarovskii Krai, *NSP & VPS 4479.*
Calamagrostis purpurea Trin., 2*n* = 28; Russia, Kamchatka Peninsula, *NSP & E.G. Rudyka 6057.*
Chloris virgata Sw., 2*n* = 20; Russia, Khabarovskii Krai, *L.A. Antonova 12361.*
Danthonia riabuschinskii (Kom.) Kom., 2*n* = 36; Russia, Kamchatka Peninsula, *V.V. Yakubov 6032*, *V.V. Yakubov 6035.*
Deschampsia paramushirensis Honda, 2*n* = 26; Russia, Primorskii Krai, *I.A. Nesterova 8913.*
Digitaria asiatica Tzvelev, 2*n* = 18; Russia, Khabarovskii Krai, *NSP & VPS 7150.*
Digitaria sanguinalis (L.) Scop., 2*n* = 36; Russia, Krasnodarskii Krai, *NSP & VPS 12345.*
Elymus dahuricus Turcz., 2*n* = 42; Kyrgyzstan, *NSP & VPS 5152.*
Elymus subfibrosus (Tzvelev) Tzvelev, 2*n* = 28; Russia, Republic of Yakutia, *NSP & VPS 3776.*
Elytrigia elongatiformis (Drobow) Nevski, 2*n* = 42; Tadjikistan, *A.P. Sokolovskaya & O.S. Strelkova 90.*
Elytrigia repens (L.) Nevski, 2*n* = 42; Russia, Leningradskaya Oblast', *A.P. Sokolovskaya 9*; Russia, Republic of Yakutia, *NSP & VPS 3761*; Ukraine, *NSP 4381.*
Hierochloë arctica J.Presl, 2*n* = 56; Russia, Komi Republic, *A.P. Sokolovskaya s.n.* (LE).
Hierochloë baltica (G.Weim.) Czerep., 2*n* = 42; Russia, Leningradskaya Oblast', *NSP 4349.*
Hordeum violaceum Boiss. & Hohen., 2*n* = 14; Russia, Republic of Daghestan, *NSP 5411.*
Phleum phleoides H.Karst., 2*n* = 28; Kazakhstan, *V.V. Fedyaeva 3976.*
Poa filiculmis Roshev., 2*n* = 42; Russia, Kamchatskii Krai, *V.V. Yakubov 12444.*
Poa palustris L., 2*n* = 28; Russia, Leningradskaya Oblast', *NSP & VPS 11806.*
Poa sichotensis Prob., 2*n* = ca. 56; Russia, Primorskii Krai, *NSP 5472.*
Poa skvortzovii Prob., 2*n* = 42; Russia, Primorskii Krai, *NSP 5471.*
Setaria faberi R.A.W.Herrm., 2*n* = 36; Russia, Khabarovskii Krai, *NSP & VPS 7189.*
Setaria pachystachys (Franch. & Sav.) Matsum., 2*n* = 18; Russia, Primorskii Krai, *NSP & VPS 7523.*
Setaria pumila (Poir.) Roem. & Schult., 2*n* = 36; Russia, Krasnodarskii Krai, *NSP & VPS 11597.*

POLYGONACEAE

Persicaria lapathifolia (L.) Gray, 2*n* = 22; Russia, Amurskaya Oblast', *NSP & VPS 11123.*
Truellum dissitiflorum (Hemsl.) Tzvelev, 2*n* = 20; Russia, Primorskii Krai, *NSP & VPS 11591.*

RANUNCULACEAE

Adonis amurensis Regel & Radde, 2*n* = 16; Russia, Khabarovskii Krai, *V. Bavrin 6523.*

ROSACEAE

Potentilla fragarioides L., 2*n* = 14; Russia, Amurskaya Oblast', *NSP & VPS 9464*; Russia, Primorskii Krai, *NSP & VPS 12434.*
Potentilla intermedia L., 2*n* = 28; Russia, Amurskaya Oblast', *NSP & VPS 9462.*
Potentilla norvegica L., 2*n* = 56; Russia, Amurskaya Oblast', *NSP & VPS 9490.*
Potentilla paradoxa Nutt. ex Torr. & A.Gray, 2*n* = 28; Russia, Irkutskaya Oblast', *NSP & VPS 10686*; Russia, Amurskaya Oblast', *NSP & VPS 11259*; Russia, Primorskii Krai, *NSP & VPS 9675*, *NSP & VPS 10775.*

RUBIACEAE

Galium dahuricum Turcz., 2*n* = 44; Russia, Amurskaya Oblast', *NSP & VPS 4646*; Russia, Primorskii Krai, *VPS 4956.*

SCROPHULARIACEAE

Veronica biloba L., 2*n* = ca.24; Russia, Primorskii Krai, *NSP & VPS 9075.*

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UMBELLIFERAE/APIACEAE

Aegopodium tadshikorum Schischk., 2*n* = 22; Uzbekistan, 19 Jul 2010, *MP & EK s.n.* (Cc)

Aulacospermum simplex Rupr., 2*n* = 18; Kazakhstan, *MP & EK 3.*

Aulacospermum tianschanicum (Korovin) C.Norman, 2*n* = 18; Kyrgyzstan, *UU & EZ 26.*

Heracleum dissectum Ledeb., 2*n* = 22; Kazakhstan, 28 Aug 2011, *MP & EK s.n.* (Cc).

Lomatocarpa albomarginata (Schrenk ex Fisch. & C.A.Mey.) Pimenov & Lavrova, 2*n* = 22; Kyrgyzstan, 16 Aug 2010, *UU & EZ s.n.* (Cc).

Pleurospermum uralense Hoffm., 2*n* = 18; Russia, Buryatia, 10 Aug 2010, *N. Formozov s.n.* (MW)

Prangos herderi (Regel) Herrnst. & Heyn, 2*n* = 22; Kazakhstan, 2 Sep 2011, *MP & EK s.n.* (Cc).

Pseudotrachydium dichotomum (Korovin) Pimenov & Kljuykov, 2*n* = 18; Uzbekistan, *MP & EK 22.*

Scandix stellata Banks & Sol., 2*n* = 20; Kazakhstan, 2 Sep 2011, *MP & EK s.n.* (Cc).

Schulzia prostrata Pimenov & Kljuykov, 2*n* = 22; Kyrgyzstan, 1 Sep 2011, *G. Lazkov s.n.* (MW).

Seseli abolinii (Korovin) Schischk., 2*n* = 22; Kazakhstan, *MP & EK 4.*

Seseli eriocephalum (Pall. ex Spreng.) Schischk., 2*n* = 20; Kazakhstan, *MP & EK* 5.

Seseli mucronatum (Schrenk ex Fisch. & C.A.Mey.) Pimenov & Sdobnina, 2*n* = 22; Kazakhstan, 30 Aug 2011, *MP & EK s.n.* (Cc).

Seseli schrenkianum (C.A.Mey. ex Schischk.) Pimenov & Sdobnina, 2*n* = 22; Kazakhstan, 30 Aug 2011, *MP & EK s.n.* (Cc).

Trinia multicaulis (Poir.) Schischk., 2*n* = 18; Russia, Volgograd prov., 25 Jun 2010, *S. Majorov s.n.* (MW).

Tschulaktavia saxatilis (Bajtenov) Bajtenov ex Pimenov & Kljuykov, 2*n* = 22; Kazakhstan, *MP & EK 6.*

Zozima korovinii Pimenov, 2*n* = 6; Kyrgyzstan, 18 Aug 2010, *UU & EZ s.n.* (Cc).

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TAXON

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Extended online version of

IAPT/IOPB chromosome data 18

edited by Karol Marhold

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SOLANACEAE

Capsicum rhomboideum (Dunal) Kuntze

2*n* = 26, CHN. Venezuela, Estado de Táchira, Municipio de San Cristóbal, environs of Ciudad de San Cristóbal, La Laja paramo, montane dry forest vegetation, in disturbed areas, on sidewalks and backyards, 07°47′57.22″ N, 72°16′35.93″ W, 1124 m, 9 Aug 2004, *Ysbelia Sánchez García 20* (CORD, HRT). [Figs. 1–2]

Mitotic chromosome preparations and conventional Feulgen staining procedure are described in Aguilera & al. (2011). DAPI (4′,6-diamidino-2-phenylindole) fluorescence banding technique to reveal possible AT-rich heterochromatic regions (Hc) was performed according to Moscone & al. (1996a). Double fluorescent in situ hybridization (FISH) approach to unveil the number and localization of 5S and 45S ribosomal loci (rDNA) was carried out following the protocol of Moscone & al. (1996b) and the *Capsicum*-derived rDNA probes from Grabiele (2010). DAPI-enhanced (DAPI+) blocks that appear during FISH procedure correspond to heterochromatic regions. For karyotype description forty-six FISH metaphase plates were analyzed and five were included for measurements of chromosomes and their cytological markers to set up the idiogram. Satellites were classified according to Battaglia (1955). Karyotype asymmetry was estimated by means of A_1 and A_2 (Romero Zarco, 1986), r>2 and R (Stebbins, 1971), AI (Paszko, 2006) and i (centromeric mean; Levan & al., 1964) indexes. Abbreviations used: *m*, metacentric; *sm*, submetacentric; *st*, subtelocentric; NOR, nucleolar organizer region.

Capsicum rhomboideum is a diploid, based on *x* = 13 wild chili pepper that naturally inhabits in México, Guatemala, Honduras, Colombia, Venezuela, Ecuador and Perú. This taxon grows as a shrub or a small tree with rotate and particularly yellow flowers (Fig. 1A), spherical red sweet fruits (Fig. 1B) and brownish seeds (Moscone & al., 2007).

Capsicum rhomboideum possesses a diploid karyotype formula of 20 *m*+2 *sm*+4 *st* chromosomes. The karyotype is slightly unimodal (A_2 = 0.18; R = 2.06) and symmetrical (A_1 = 0.27; r>2 = 0.15; i = 41.43) and belongs to category 2B of Stebbins and AI = 3.59. The diploid genome of *C. rhomboideum* has 74.82 µm and the chromosomes are small to median in length. The smallest one is 1.85 µm (*st*) and the largest one is 3.79 µm (*m*) long with a mean chromosome length of 2.88 µm (Table 1). The short arms of the chromosomes of pair 9 (*m*) present a terminal macrosatellite (Fig. 2A, B, I).

DAPI fluorescence staining revealed the lack of AT-rich constitutive heterochromatin (Hc) in *C. rhomboideum*, evidenced by the absence of DAPI-enhanced chromosomal regions (DAPI+) in both metaphase and interphase nuclei (Fig. 2B, C).

FISH of the 45S rDNA probe to metaphase chromosomes showed two 45S rDNA loci per diploid genome, located at the short arms of the chromosomes of pair 9. Particularly, the red signals of the ribosomal probe hybridization were observed on the macrosatellites and a small region of the short arms located next to the secondary constriction of the current pair 9. These loci are consistent with the NOR active regions (CMA+ DAPI–NOR-associated Hc) found in this taxon (Fig. 2D, E, G, I; Moscone & al., 2007).

Furthermore, FISH of the 5S rDNA probe showed two 5S rDNA loci per diploid genome. These loci were visualized as green signals located interstitially on the short arms of the chromosomes of pair 3 (Fig. 2D, E, H, I).

DAPI-enhanced regions (DAPI+) became visible during rDNA FISH process and were observed as bright blue signals. These FISH-DAPI+ bands are indicative of constitutive heterochromatin and appeared in all but two chromosome pairs (Fig. 2F, I). Five chromosome pairs (1, 2, 4, 6, 7) display these bands at pericentromeric position of both short and large arms. In addition, a paracentromeric band was located at the short arms of pairs 5 and 8 and the large arm of pair #13. Moreover, three pairs (2, 3, 10) showed an intercalary band at their large arms; two pairs (11, 12) were not banded by this method. Singularly, FISH-DAPI+ intercalary and terminal bands at the short arms of the chromosome pairs 3 and 9 correspond to rDNA-associated Hc, respectively (Fig. 2F).

CMA banding performed previously in this accession showed small CMA-enhanced regions (CMA+) at the chromosome ends of most pairs including the macrosatellites of pair 9 (Moscone & al., 2007). These CMA+ regions did not appear as FISH-DAPI+ in this study. The chromosome ends remained euchromatic, suggesting that terminal CMA+ bands could be related to true telomeric sequences (Vaquero-Sedas & Vega-Palas, 2011). Otherwise, it could be an inefficacy of the FISH-DAPI technique to reveal those petite bands. Combined evidence supports that FISH-DAPI+ bands in fact correspond

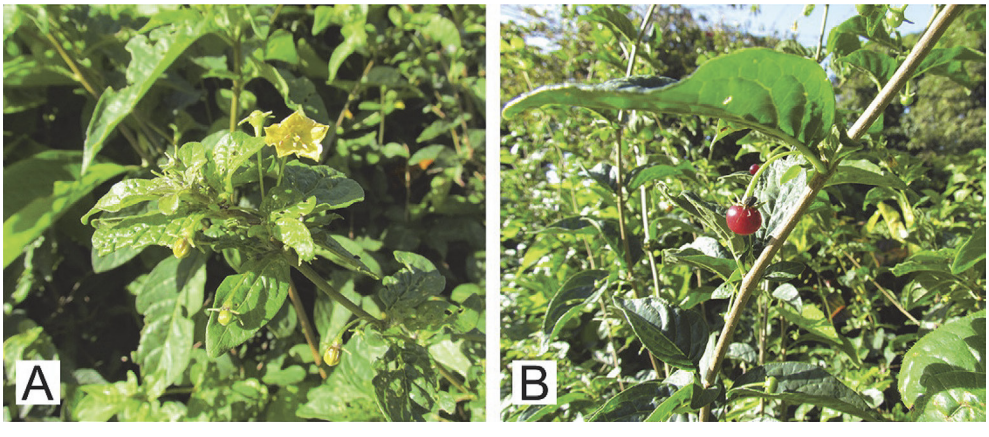

Fig. 1. *Capsicum rhomboideum*. **A,** detail of the yellow flowers and floral buds; **B,** detail of the spherical red sweet fruits.

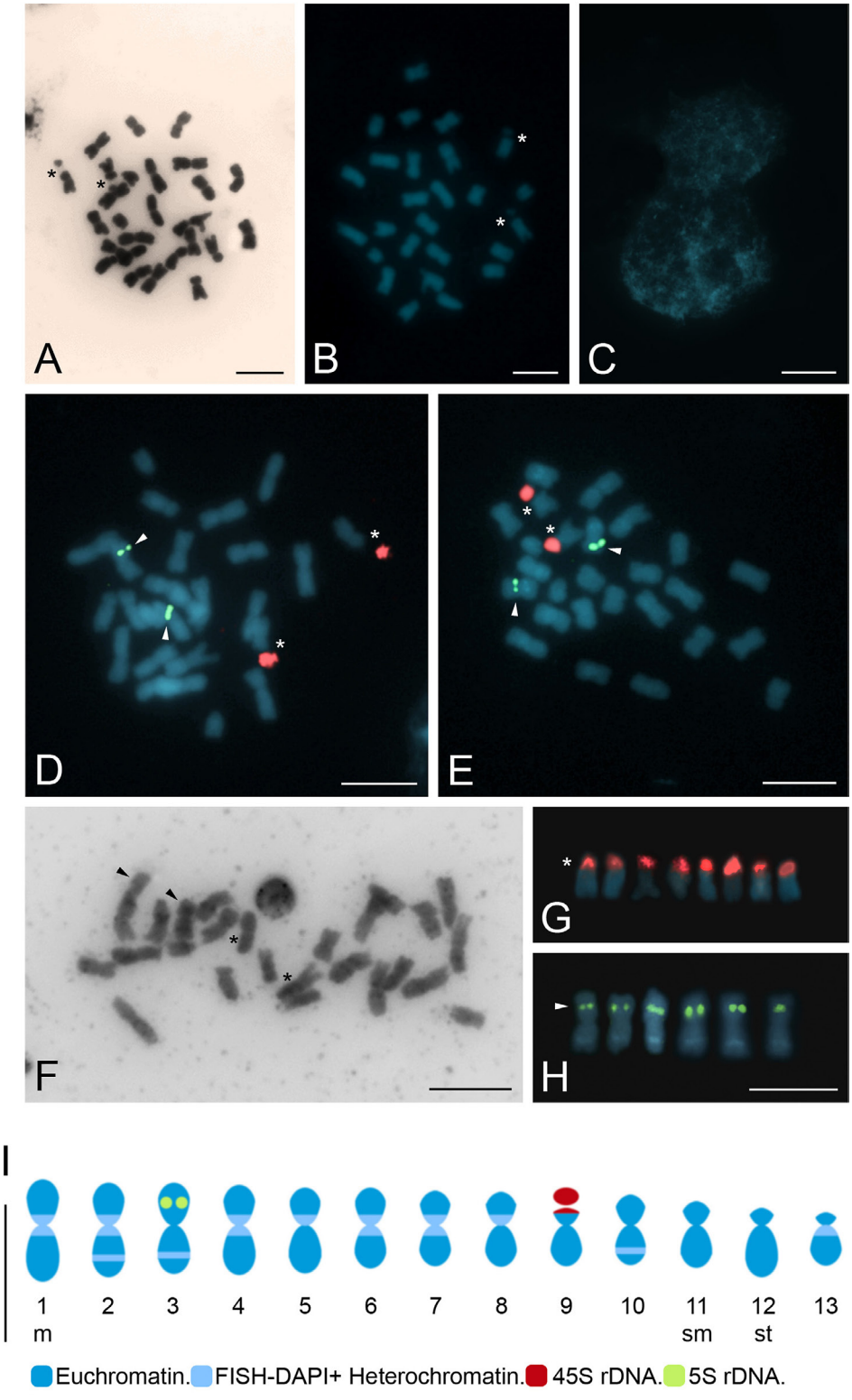

Fig. 2. Cytogenetic characterization of *Capsicum rhomboideum*. **A,** conventional Feulgen-stained metaphase chromosomes; **B, C,** DAPI-stained metaphase chromosomes and interphase nuclei, respectively; note the absence of DAPI-enhanced (DAPI+, bright blue) regions that indicate the lack of AT-rich Hc; **D, E,** FISH of rDNA probes to metaphase chromosomes (5S, green signals; 45S, red signals; DAPI, blue); **F,** DAPI-stained metaphase plate submitted to 5S and 45S rDNA FISH but deprived of rDNA signals and colour-inverted to stand out the blocks (dark grey) that appear during FISH procedure corresponding to heterochromatic regions; **G, H,** selected metaphase chromosomes carrying 45S and 5S rDNA loci, respectively; **I,** idiogram; note that combined cytological markers permit to discriminate to each chromosome. — Asterisks point out chromosomes carrying NORs and arrowheads indicate localization of 5S rDNA loci. Scale bars = 5 µm.

Table 1. Morphometric parameters of the chromosomes of *Capsicum rhomboideum*.

Pair	Short arm	sd	Large arm	sd	Total length	sd	i	RL%	Type
1	1.67	0.15	2.12	0.21	3.79	0.25	44.12	10.14	*m*
2	1.56	0.09	1.92	0.19	3.48	0.23	44.93	9.30	*m*
3	1.56	0.14	1.79	0.15	3.35	0.30	46.57	8.95	*m*
4	1.48	0.18	1.84	0.16	3.32	0.25	44.56	8.88	*m*
5	1.37	0.20	1.78	0.20	3.15	0.28	43.48	8.40	*m*
6	1.36	0.15	1.57	0.20	2.93	0.33	46.34	7.83	*m*
7	1.26	0.18	1.45	0.28	2.71	0.43	46.50	7.23	*m*
8	1.23	0.16	1.47	0.14	2.70	0.26	45.59	7.22	*m*
9	1.24	0.19	1.45	0.20	2.69	0.51	46.10	7.19	*m sat*
10	1.15	0.16	1.38	0.13	2.53	0.26	45.61	6.76	*m*
11	0.87	0.14	1.52	0.17	2.39	0.29	36.52	6.39	*sm*
12	0.62	0.21	1.91	0.14	2.53	0.28	24.51	6.76	*st*
13	0.44	0.10	1.41	0.18	1.85	0.13	23.81	4.93	*st*

Chromosome values in µm; sd, standard deviation; RL%, relative chromosome length.

to a novel class of Hc in *C. rhomboideum*, which is not AT-rich and/or GC-rich (Moscone & al., 2007; present work).

An exhaustive cytogenetic description of *C. rhomboideum* was performed by means of diverse approaches. In combination, these cytological markers permitted to distinguish unequivocally each chromosome pair of this species. Polymorphisms for the cytological markers were not detected.

Our results, coupled to previous studies on the karyotype of *C. rhomboideum* (Moscone & al., 2007) sustain an ancestral state for this species in the phylogeny of *Capsicum*. In addition, molecular studies on the 5S rRNA NTS sequence (Grabiele, 2010) and the particular red nonpungent sweet fruits of *C. rhomboideum* (Bosland & Zewdie, 2001) clearly corroborate its ancestral condition.

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The original data counted by A. Gnutikov were supplemented by several CN from plants found in the Herbarium LE (St.-Petersburg) that remained unpublished. The CNs were marked on herbarium sheets. The counts were made by V. Belyaeva and M. Pimenov, collectors of these specimens.

* New chromosome number (cytotype) for the species.
** First chromosome count from a Siberian accession.

ASTERACEAE

Jacobaea vulgaris (L.) Gaertn. (≡ *Senecio jacobaea* L.)

*2*n* = 20, CHN. Russia, East Siberia, Zabaikalskii Krai, Olovyanninskii Raion, near Byrka village, the Turga River, on the bank, 609 m, 50°44′N 115°57′E, 10 Jul 2008, *P. Lubogoschinsky C714* (IRKU).

BORAGINACEAE

Myosotis palustris (L.) L.

2*n* = 22, CHN. Russia, East Siberia, Irkutskaya Oblast', Cheremkhovskii Raion, vicinity of Golumet' village, oxbow of the Golumet' River, on the bank, 1 Aug 2006, *A. Gnutikov & V. Chepinoga C341* (IRKU).

FABACEAE

Oxytropis myriophylla (Pall.) DC.

2*n* = 16, CHN. Russia, East Siberia, Chitinskaya Oblast', vicinity of Aginskoe settlement, 30 Aug 1958, *M. Pimenov G-1* (LE).

Vicia cracca L.

2*n* = 14, CHN. Russia, East Siberia, Republic of Buryatia, Verkhnaya Angara River basin, valley of Kotera River near to the Delakory locality, floodplain shrub, 26 Aug 1975, *V. Belyaeva 422* (LE).

POACEAE

Poa botryoides (Trin. ex Griseb.) Kom.

2*n* = 42, CHN. Russia, East Siberia, Zabaikalskii Krai, Uletovskii Raion, 2 km SW of Tataurovo village, Sestrinitsa River (left tributary of Ingoda River), on the bank, 707 m, 51°35′N, 112°54′E, 25 Jun 2008, *V. Chepinoga C659* (IRKU).

Setaria pumila (Poir.) Schult.

2*n* = 36, CHN. Russia, East Siberia, Irkutskaya Oblast', Angarskii Raion, Angarsk town, turning off the road to the new bridge over the Kitoi River, garbage dump along the road, 1 Sep 2005, *I. Enushchenko C833* (IRKU).

Setaria viridis (L.) P.Beauv.

2*n* = 18, CHN. Russia, East Siberia, Zabaikalskii Krai, Aginskii Raion, 8 km W of Gunei village, left riverside of Onon River, oxbow Krivoe, on the shore, 50°30′N, 114°25′E, 17 Jul 2008, *P. Lubogoschinksy C732* (IRKU).

Stipa krylovii Roshev.

2*n* = 44, CHN. Russia, East Siberia, Zabaikalskii Krai, Borzinskii Raion, 14 km W of Sherlovaya Gora town, southern part of the Adon-Chelon mountain-steppe massif, on steppe slope, 779 m, 50°31′N, 116°10′E, 1 Aug 2008, *V. Chepinoga*, *S. Rosbakh*, *M. Isaikina & N. Pazdnikova C815* (IRKU).

RANUNCULACEAE

Caltha palustris L.

2*n* = 32, CHN. Russia, East Siberia, Zabaikalskii Krai, Uletovskii Raion, 2 km SW of Tataurovo village, Setrinitsa River (left tributary of Ingoda River), in shallow water, 707 m, 51°35′N, 112°54′E, 25 Jun 2008, *V. Chepinoga C661* [Chepinoga & al. in Taxon 61: 890, E8. 2012 as "*C. membranacea*"].

** *Ranunculus turczaninovii* (Luferov) Vorosch.

2*n* = 32, CHN. Russia, East Siberia, Zabaikalskii Krai, Uletovskii Raion, 4 km N of Ablatuiskii Bor village, bitterly-saline Lake Selitryanoe, wet meadow, 51°13′N 112°14′E, 15 Jun 2007, *A. Gnutikov & I. Enushchenko C377* (IRKU).

Trollius asiaticus L.

2*n* = 16, CHN. Russia, East Siberia, Republic of Buryatia, Baikal Lake, Barguzinskii Natural Reserve, valley of Bolshaya River, head of Malyi spring, stream bank, 7 Jul 1974, *V. Belyaeva 75-125* (LE); Russia, East Siberia, Republic of Buryatia, Baikal Lake, Barguzinskii Natural Reserve, valley of Bolshaya River, head of Malyi spring, swamped lakeside, 17 Jul 1974, *V. Belyaeva 75-175* (LE).

SAXIFRAGACEAE

** *Saxifraga oppositifolia* L. (= *S. asiatica* Hayek)

2*n* = ca. 26, CHN. Russia, East Siberia, Republic of Buryatia, Barguzinskii Natural Reserve, lower course of Levaya Bolshaya River, 2 Jul 1974, *V. Siplivinsky 74-106* (LE).

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* First chromosome count for the species.
§ Species with intra-specific cytotype variation. The chromosome numbers here obtained are different from those reported by other authors (Selvaraj, 1993)

All materials CHN. Vouchers deposited at the Herbarium Delta (abbr. here as HDELTA), Department of Biology, Federal University of Piauí, Campus Parnaíba.

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PONTEDERIACEAE

Eichhornia crassipes (Mart.) Solms

§ 2*n* = 32, CHN. Brazil, Piauí, Ilha Grande, Baixão, 13 Jun 2012, *S.M.G. Carneiro & al. 40* (HDELTA 276). [Fig. 3A]

Eichhornia diversifolia (Vahl) Urb.

2*n* = 30, CHN. Brazil, Piauí, Cajueiro da Praia, Canto Grande, 20 May 2012, *S.M.G. Carneiro & al. 35* (HDELTA 283). [Fig. 3B]

Heteranthera rotundifolia (Kunth) Griseb.

*2*n* = 14, CHN. Brazil, Piauí, Cajueiro da Praia, Canto Grande, 21 Apr 2012, *S.M.G. Carneiro & al. 34* (HDELTA 284). [Fig. 3C]

The family Pontederiaceae consists of nine genera and 33 species, divided into three tribes: Eichhornieae, Heteranthereae and Pontederieae (Cook, 1998; Graham & al., 1998; Simpson & Burton, 2006). It is pantropical in distribution; most species and genera occur in the Neotropical region and a few species occur in northern and southeastern Canada, and in southern and southeastern Argentina.

Other species are found in South Africa, Madagascar, Southeast Asia and Australia (Simpson & Burton, 2006). In Brazil, 19 species occur, in genera *Eichhornia* Kunth, *Heteranthera* Ruiz & Pav., *Hydrothrix* Hook.f. and *Pontederia* L. (Amaral, 2013).

The genera of Pontederiaceae are morphologically similar, which causes problems for the precise determination of species number, and cytogenetic information can be a useful supplement for taxonomic identification. For Brazilian taxa, chromosomal studies are scarce, with only a few species analyzed. According to the IPCN, in this family the chromosome number varies between $2n = 14$ (*Heteranthera oblongifolia* C.Mart. ex Roem. & Schult.) to $2n = 80$ (*Monochoria vaginalis* (Burm.f.) C.Presl). Banerjee (1974), who studied the cytogenetics of several species, has published papers dealing with Pontederiaceae: *Eichhornia crassipes* ($2n = 32$), *Monochoria hastifolia* C.Presl ($2n = 28$), *M. vaginalis* ($2n$ = I 52, II 26, III 80, n = III 80) and *M. vaginalis* var. *plantaginea* (Roxb.) Solms ($2n = 52$). Pedrosa & al. (1999) published chromosome numbers for *Eichhornia crassipes* and *E. paniculata* (Spreng.) Solms, with $2n = 32$ and $2n = 16$, respectively. *Monochoria vaginalis* is the taxon that shows the highest chromosomal variation.

Currently, chromosome numbers have been recorded for four genera and 13 species of the family Pontederiaceae. Recognizing the importance of chromosomal numbers for better delimitation of the species, in the present study focused on the determination of the chromosome numbers of three species of Pontederiaceae that occur in the Delta region of the Rio Parnaiba, in Piauí state, northeastern Brazil.

All cytological investigations have been carried out on root tips from plants collected between 2011 and 2012. The root tips were pretreated with 8-hydroxyquinoline for 24 hours at 8°C and fixed with Farmer solution (3 : 1, ethanol : glacial acetic acid). The slides were prepared following Guerra & Souza (2002) and stained with 2% Giemsa.

The chromosome numbers obtained varied from $2n = 14$ to $2n = 32$ (Fig. 3). In all species, the chromosomes were small in size, ranging from 1.5 to 3 µm, which made it difficult to construct the karyotypes.

Eichhornia crassipes. – It is the commonest species of eutrophic sites. *Eichhornia crassipes* has a chromosome number of $2n = 32$; its chromosome size ranged from 1.5 to 2.2 µm (Fig. 3A), which is comparable to the report by Banerjee (1974), who reported a chromosome size variation of 1.5 to 3 µm for the same species. The chromosome number found in this study agrees with reports of other authors (Banerjee, 1974; Wang & Wang, 1989; Selvaraj, 1993; Pedrosa & al., 1999). Intraspecific chromosome variation was observed for India populations by Selvaraj (1993) who reported $2n = 64$.

Eichhornia diversifolia. – The chromosome number observed was $2n = 30$, with chromosome size ranging from 1.5 to 3.0 µm (Fig. 3B). Eckenwalder & Barrett (1986) also found this number, and so far no intraspecific variation has been observed for this species.

Heteranthera rotundifolia. – This species did not show chromosomal variation and the chromosome number was $2n = 14$ in all cells observed. The length of the chromosomes ranged from 1.7 to 2.1 µm (Fig. 3C). This is the first count for the species, and agrees with that of *H. oblongifolia* (Eckenwalder & Barrett, 1986). In this genus, Eckenwalder & Barrett (1986) found a polyploid record for *H. reniformis* Ruiz & Pav., with $n = 24$ ($2n = 48$).

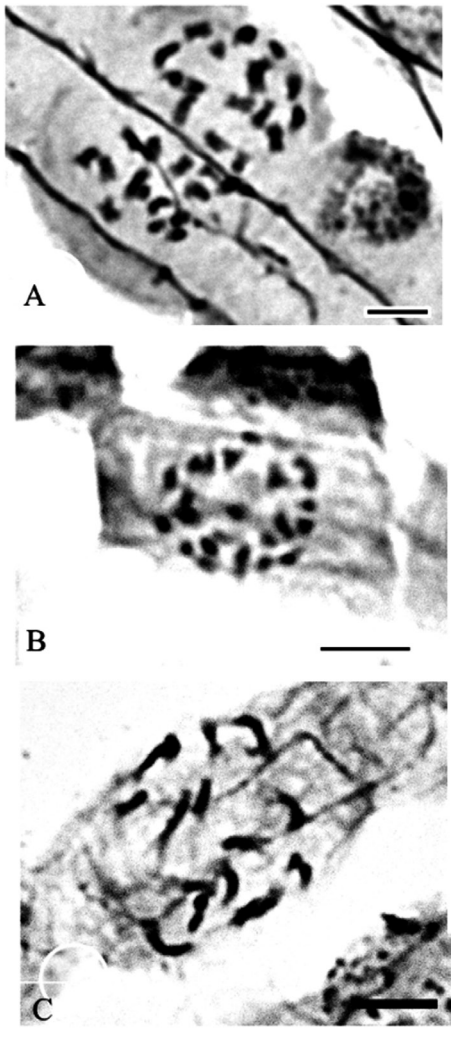

Fig. 3. A, *Eichhornia crassipes*, $2n = 32$; **B,** *Eichhornia diversifolia*, $2n = 30$; **C,** *Heteranthera rotundifolia*, $2n = 14$. — Scale bars = 5 µm.

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This contribution belongs to the series "Cytogenetic characterization of the germplasm of wild chili peppers: *Capsicum baccatum* var. *praetermissum*".

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SOLANACEAE

Capsicum baccatum var. *praetermissum* (Heiser & P.G. Smith) Hunz.

2*n* = 24, CHN. Brasil, Estado de São Paulo, Mogi-das-Cruzes, in open field, 23°31′22″ S, 46°11′16″ W, 7 Mar 2003, *Eliana Forni-Martins 05/17* (CORD). [Fig. 4]

Type, amount and distribution of constitutive heterochromatin (Het) and ribosomal loci (rDNA) were analyzed by means of fluorescence bandings (CMA and C-DAPI) and fluorescent in situ hybridization (FISH) approaches, respectively. CMA (chromomycin A3), specific to GC-rich Het regions, was performed according to Moscone & al. (1996a). C-DAPI, which reveals total Het regions, was carried out following C-banding protocol of Schwarzacher & al. (1980) with the modification introduced by Lambrou & Ehrendorfer (2000) that includes a final staining with 4′,6-diamidino-2-phenylindole (DAPI) instead of Giemsa. Double FISH of 5S and 45S rDNA was achieved according the protocol of Moscone & al. (1996b) and the *Capsicum*-derived rDNA probes from Grabiele (2010).

Somatic chromosome preparations and the procedure for measurements of chromosomes and their landmarks to build the idiogram are described in Moscone & al. (1996a). Thirty metaphase plates were analyzed and five of them were included for measurements. Asymmetry indexes: A_1 and A_2 (Romero Zarco, 1986); r>2 and R (Stebbins, 1971); AI (Paszko, 2006); i (centromeric mean). Abbreviations used: *m*, metacentric; *sm*, submetacentric; *st*, subtelocentric.

Capsicum baccatum var. *praetermissum* is a wild chili pepper native to central and SE Brazil, restricted to the phytogeographic domains of Cerrado, Pantanal and Mata Atlãntica, but also occurs at Paraguay (Moscone & al., 2007; Stehmann & al., 2013). Three other varieties have been described for *C. baccatum*, i.e., *baccatum* L., *pendulum* (Willd.) Eshbaugh and *umbilicatum* Hunz. & Barboza.

This taxon is diploid, based on *x* = 12, it displays median size to large chromosomes, with lengths ranging from 5.25 (s*m*) to 8.17 (*m*) µm, a mean of 6.90 µm and 82.48 µm per haploid genome. The karyotype, 11 *m*+1 *sm*, is markedly unimodal (A_2 = 0.12; R = 1.56) and symmetrical (A_1 = 0.15; r>2 = 0.00; i = 45.67) and belongs to the category 1A of Stebbins and AI = 0.94 of Paszko. Pairs 6 (*m*) and 12 (*sm*), that carry the active nucleolar organizer regions (NORs), display a terminal macrosatellite in their short arms (Fig. 4A).

In addition, CMA fluorescence banding revealed the presence of eighteen CMA-enhanced regions (CMA+) in the whole haploid chromosome complement that actually correspond to GC-rich Het (Fig. 4A, G). These regions are entirely terminals with exception to the intercalary band of pair 10. Particularly, even though the entire terminal regions of large arms of pairs 3 and 5 are CMA+, a superior CMA enhancement is observed at intercalary position if compared. NOR-associated Het of pairs 6 and 12 is GC-rich as usual in plants and embraces the terminal macrosatellites and a small portion of their respective short arms.

C-DAPI fluorescence banding exposed twenty-one DAPI-enhanced regions (DAPI+) corresponding to total Het blocks, eighteen of which mimic the CMA+ banding pattern (Fig. 4B). The three additional bands at intercalary positions of pairs 2 and 10 and at the terminal location of the latter (Fig. 4B, G), correlate with those AT-rich DAPI+ bands found in this accession by means of DAPI staining (Scaldaferro & al., 2013).

Double FISH of rDNA probes to metaphase chromosomes revealed an intercalary 5S locus at the short arm of pair 7. (Fig. 4C, E). Furthermore, fourteen 45S rDNA signals were observed, two of them at the expected active NORs chromosome pairs 6 and 12 (Fig. 4C, E). Additional marks correspond to the typical NOR-inactive Het found in *Capsicum* (Grabiele, 2010; Grabiele & al., unpub.). Co-localization of 45S rDNA signals and total Het blocks that appear during FISH procedure (FISH-DAPI+), which mimic the C-DAPI banding pattern, unveiled the heterochromatic state of these ribosomal regions, more pronounced in the NOR-inactive loci (Fig. 4C–F). The remaining CMA+, C-DAPI+ and FISH-DAPI+ non-ribosomal Het of pairs 1, 3, 5, 7, 8 and 9 (Fig. 4G) indeed correspond to the mixed AT/GC-rich Het observed in this accession by means of triple staining (Scaldaferro & al., 2013). The differential CMA enhancement of the distal portions of large arms of pairs 3 and 5 described above is explained in terms of their distinctive repetitive sequences nature (Fig. 4G).

The combined cytogenetic approach presented here allowed the attainment of a detailed cytological map of *Capsicum baccatum* var. *praetermissum* in that each chromosome can be further classified by means of diverse landmarks (Fig. 4G). Polymorphisms for these cytological markers were not observed. Neither peri/paracentromeric Het was detected. Different Het fractions comprise 15% (12.40 µm) of the haploid genome and Euchromatin/Het ratio is 5.65 : 1.

Cytogenetic divergence is found between the variety *praetermissum* here depicted and the remaining three varieties of *C. baccatum*, mainly at the type and amount of Het, the genome size and the number of active-NORs in addition to distinct floral features (Moscone & al., 2007). Contrasting, viable hybrids and similarities at the DNA level support a close relationship among them (Grabiele, 2010). Cytogenetic differences allowed to Moscone & al. (2007) to propose a specific rank for *C. baccatum* var. *praetermissum*, a subject to be further examined.

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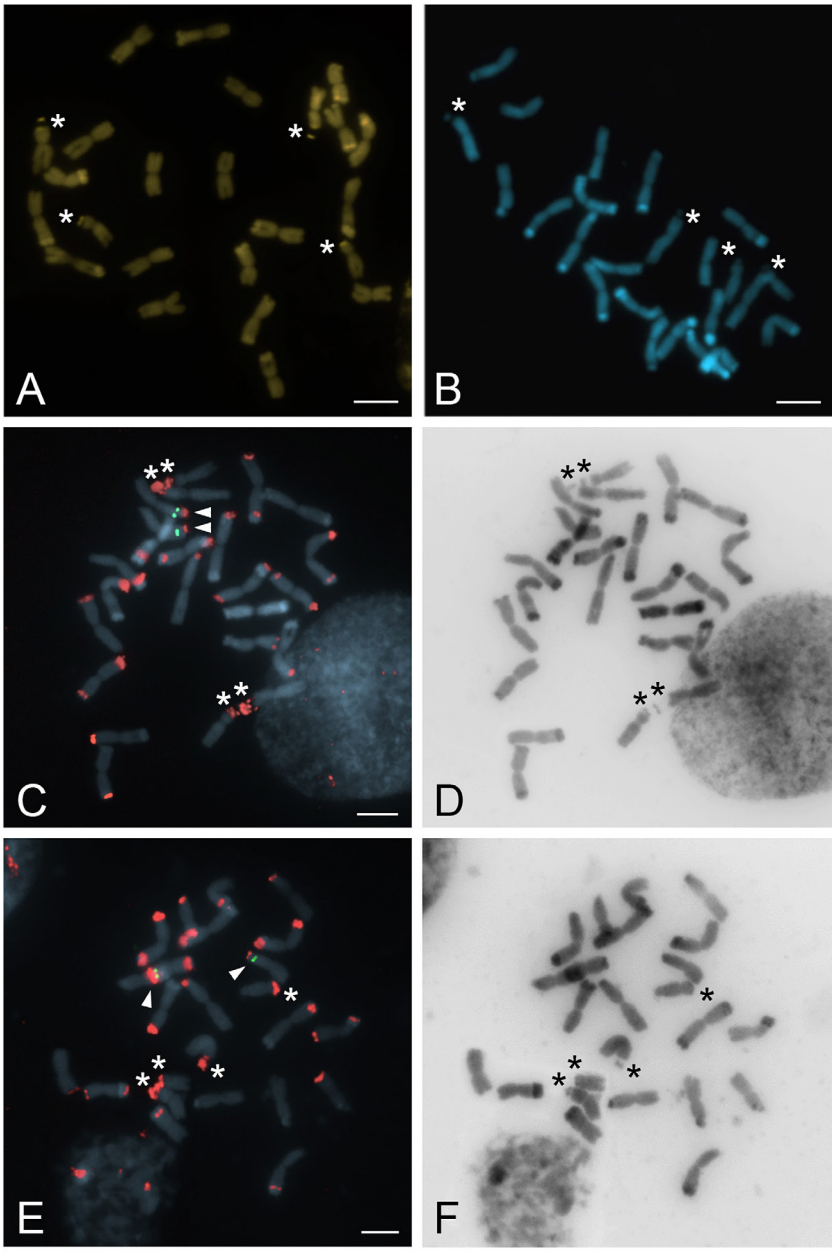
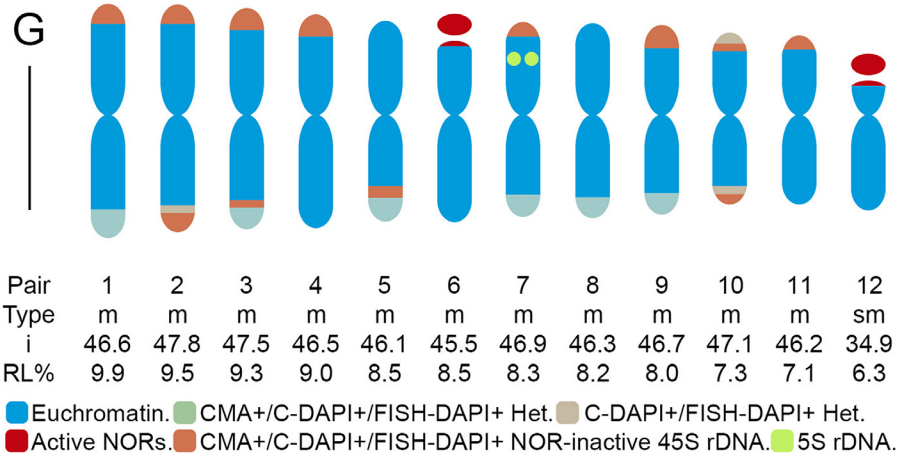


Fig. 4. Cytogenetic characterization of *Capsicum baccatum* var. *praetermissum*. **A,** CMA-stained metaphase chromosomes; CMA-enhanced (CMA+, bright yellow) correspond to GC-rich Het regions; **B,** C-DAPI submitted metaphase chromosomes; DAPI enhanced (DAPI+, bright blue) correspond to total Het regions; **C, E,** FISH of rDNA probes to metaphase chromosomes (5S, green signals; 45S, red signals; DAPI, blue); **D, F,** same metaphase plates as in C and E, respectively, deprived of rDNA signals and colour-inverted to stand out the blocks (dark grey) that appear during FISH procedure (FISH-DAPI+ bands) corresponding to total Het regions that mimic the C-DAPI banding pattern; note the co-localization of 45S signals and Het regions; **G,** idiogram. — Asterisks point out chromosomes carrying NORs and arrowheads indicate localization of 5S rDNA loci. Scale bars = 5 µm.



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* First chromosome count for the species.
** New chromosome number (cytotype) for the species.
▼ First chromosome count from an Indian accession.

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ALISMATACEAE

** *Alisma plantago-aquatica* L.

n = 7+0–1B, CHN. India, Himachal Pradesh, Kangra, Palampur, 32°07′N, 76°32′E, 1563 m, near water spring, 24 Mar 2011, *Harpreet Kaur HK 29273* (PUN 56545). [Fig. 5A]

This is the first record of the presence of B chromosomes for the species. During meiosis, the species exhibits the presence of one B chromosome along with equal distribution of 7 : 7 chromosomes at anaphase I (Fig. 5A).

CANNACEAE

▼ *Canna discolor* Lindl.

n = 9, CHN. India, Himachal Pradesh, Kangra, Multhan, 32°01′N, 76°50′E, 2400 m, open moist places, 8 Aug 2011, *Harpreet Kaur HK 29225* (PUN 56402). [Fig. 5B]

The current chromosomal report is the first record of the chromosome number for this species from India and is found to be in agreement with the previous single report of 2*n* = 18 by Offerijns (1936) from outside of India.

COMMELINACEAE

** *Commelina caroliniana* Walter (= *C. hasskarlii* C.B.Clarke)

n = 11, CHN. India, Himachal Pradesh, Kangra, Chhota Bhangal, 32°02′N, 76°50′E, 2000 m, shady moist places along the roadsides, 1 Sep 2010, *Harpreet Kaur HK 27141* (PUN 55354); India, Himachal Pradesh, Kangra, Suliali, 32°12′N, 76°03′E, 500 m, waste places, 17 Jul 2010, *Harpreet Kaur HK 27143* (PUN 55356). [Fig. 5C]

The haploid chromosome number has been counted at diakinesis in pollen mother cells (Fig. 5C) and it represents a new chromosome number for this species. Earlier, it was reported to have 2*n* = 30 (Patwary & al., 1987) from Bangladesh, 2*n* = 90 (Kammathy & Rao, 1965; Mehra & Sachdeva, 1976) and 2*n* = 84 (Fotedar & Roy, 1969) from India.

n = 30, CHN. India, Himachal Pradesh, Kangra, Bada Gran, 32°05′N, 76°46′E, 3500 m, moist places, 25 Jun 2010, *Harpreet Kaur HK 27142* (PUN 55355). [Fig. 5D]

The chromosome number of *n* = 30 has been counted at diakinesis in pollen mother cells (Fig. 5D). The present chromosome count is the first record of a tetraploid cytotype for this species.

** *Commelina undulata* R.Br. (= *C. kurzii* C.B.Clarke)

n = 30, CHN. India, Himachal Pradesh, Kangra, Dharamsala, 32°13′N, 76°19′E, 1600 m, along shady moist places, 7 Aug 2011, *Harpreet Kaur HK 28169* (PUN 56398). [Fig. 5E]

The pollen mother cells of the species clearly show the chromosomal count of *n* = 30 at anaphase I which is a new chromosome number for the species at tetraploid level. The species is already known to have 2*n* = 90 and 2*n* = 120 (Kammathy & Rao, 1961) from India.

** *Murdannia nudiflora* (L.) Brenan

n = 12, CHN. India, Himachal Pradesh, Kangra, Ranehar, 32°13′N, 76°10′E, 850 m, shady moist places, 26 Feb 2009, *Harpreet Kaur HK 25617* (PUN 53571). [Fig. 5F]

Study of PMCs clearly shows the presence of 12 bivalents at diakinesis (Fig. 5F), which is an additional chromosome number for the species on a world-wide basis as the species is previously known to have 2*n* = 20 from India (Renugadevi & Sampathkumar, 1986) and from outside of India (Jones & Jopling, 1972).

** *Murdannia spirata* (L.) G.Brückn.

n = 12, CHN. India, Himachal Pradesh, Kangra, Dharamsala, 32°13′N, 76°19′E, 1600 m, shady moist places along roadsides, 16 Mar 2010, *Harpreet Kaur HK 29268* (PUN 56540); India, Himachal Pradesh, Kangra, Rehlu, 32°13′N, 76°12′E, 950 m, moist places, 24 Mar 2011, *Harpreet Kaur HK 29292* (PUN 56564). [Fig. 5G]

The chromosome number of *n* = 12 has been counted at anaphase I in pollen mother cells (Fig. 5G). This tetraploid cytotype represents a new chromosome number for the species. Previously, the species is known to have other cytotypes with 2*n* = 20 (Rao & al., 1970) and 2*n* = 18 (Raghavan & Rao, 1961) from India and 2*n* = 40 (Jones & Jopling, 1972; Renugadevi & Sampathkumar, 1986) from India as well as outside of India.

▼ *Tradescantia pallida* (Rose) D.R.Hunt

n = 12, CHN. India, Himachal Pradesh, Kangra, Tal-mata, 32°14′N, 76°12′E, 1103 m, waste places, 29 Sep 2009, *Harpreet Kaur HK 29254* (PUN 56526). [Fig. 5H]

The present chromosomal count agrees with earlier reports by Sobhan & al. (1991) and García Velazquez (1998) from outside of India. Earlier, the species is also known to have 2*n* = 18 by García Velazquez (1998) from outside of India. The haploid chromosome number has been counted at late anaphase I in pollen mother cells (Fig. 5H).

CYPERACEAE

** *Pycreus flavidus* (Retz.) T.Koyama (≡ *Cyperus flavidus* Retz.)

n = 32, CHN. India, Himachal Pradesh, Kangra, Multhan, 32°01′N, 76°50′E, 2400 m, open fields, 10 Aug 2011, *Harpreet Kaur HK 28167* (PUN 56397). [Fig. 5I]

The pollen mother cells of the species clearly reveal 32 bivalents at diakinesis (Fig. 5I). Previous reports comprise other cytotypes as 2*n* = 16 from the Western Himalayas (Mehra & Sachdeva, 1975) and eastern part of India (Rath & Patnaik, 1972), 2*n* = 20 from different parts of India (Sharma & Sarkar, 1968; Sanyal, 1972) and 2*n* = 72 from Punjab plains (Bir & al., 1988) and Pakistan (Khatoon & Ali, 1993).

DIOSCOREACEAE

** *Dioscorea bulbifera* L.

n = 10, CHN. India, Himachal Pradesh, Kangra, Dharamsala, 32°13′N, 76°19′E, 1600 m, along water channels, 7 Jul 2011, *Harpreet Kaur HK 28175* (PUN 56668). [Fig. 5J]

This is the first record of the diploid cytotype for this species. Earlier, the species is also reported to have 2*n* = 36, 54 (Miège, 1954;

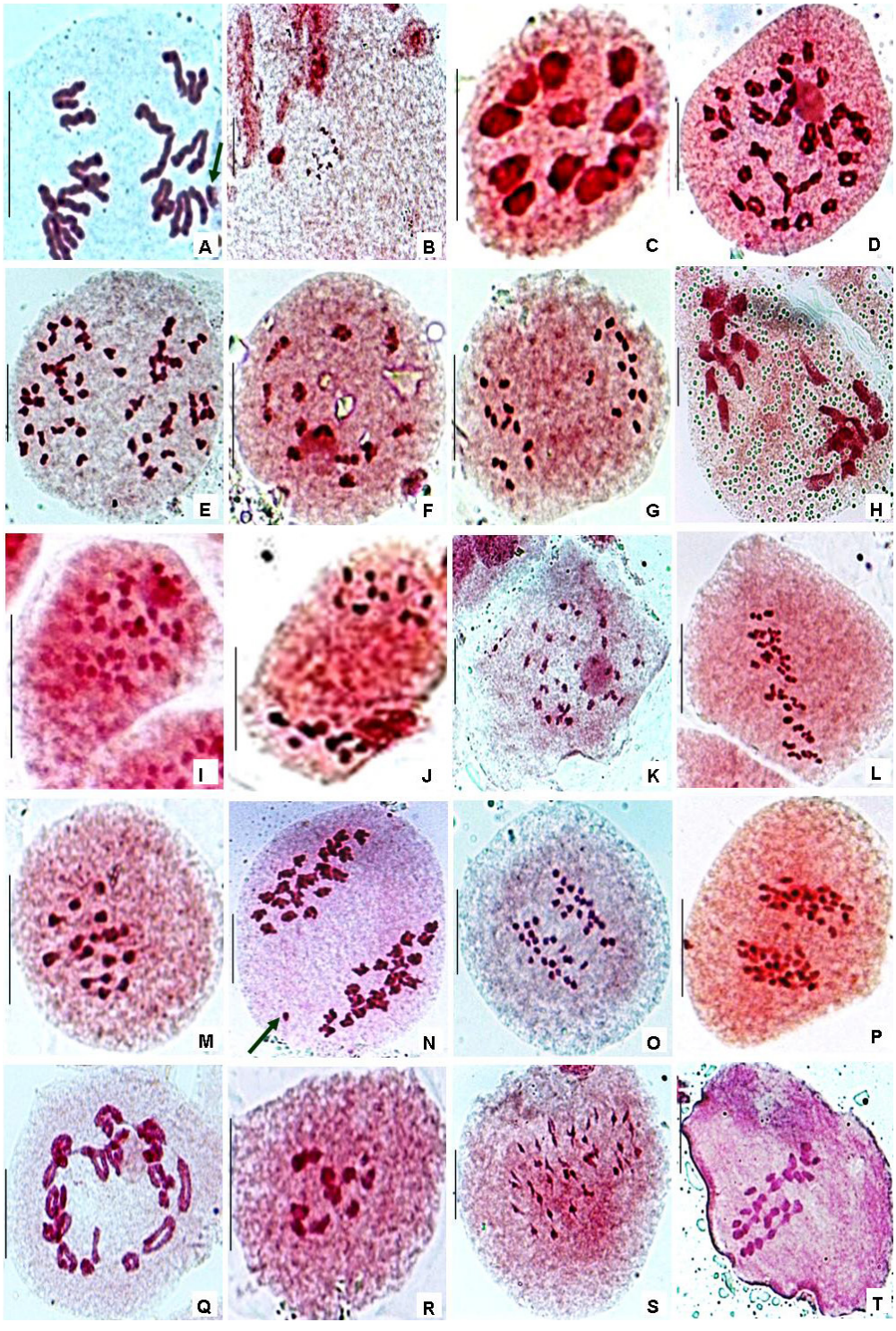

Fig. 5. A, *Alisma plantago-aquatica*, meiotic anaphase I, $n = 7+0–1B$ (PUN 56545) (arrow shows B chromosome); **B,** *Canna discolor*, meiotic metaphase I, $n = 9$ (PUN 56402); **C,** *Commelina caroliniana*, meiotic diakinesis, $n = 11$ (PUN 55356); **D,** *Commelina caroliniana*, meiotic diakinesis, $n = 30$ (PUN 55355); **E,** *Commelina undulata*, meiotic anaphase I, $n = 30$ (PUN 56398); **F,** *Murdannia nudiflora*, meiotic diakinesis, $n = 12$ (PUN 53571); **G,** *Murdannia spirata*, meiotic anaphase I, $n = 12$ (PUN 56564); **H,** *Tradescantia pallida*, meiotic anaphase I, $n = 12$ (PUN 56526); **I,** *Pycreus flavidus*, meiotic diakinesis, $n = 32$ (PUN 56397); **J,** *Dioscorea bulbifera*, meiotic anaphase I, $n = 10$ (PUN 56668); **K,** *Juncus bufonius*, meiotic diakinesis, $n = 30$ (PUN 55350); **L,** *Juncus articulatus* subps. *articulatus*, meiotic metaphase I, $n = 30$ (PUN 55347); **M,** *Polygonatum verticillatum*, meiotic metaphase I, $n = 9$ (PUN 57394); **N,** *Agrostis pilosula*, meiotic anaphase I, $n = 21+0–1B$ (PUN 53549) (arrow shows B chromosome); **O,** *Andropogon munroi*, meiotic anaphase I, $n = 20$ (PUN 56396); **P,** *Arundinella setosa*, meiotic anaphase I, $n = 24$ (PUN 56637); **Q,** *Chrysopogon serrulatus*, meiotic diakinesis, $n = 20$ (PUN 52580); **R,** *Cymbopogon clandestinus*, meiotic metaphase I, $n = 10$ (PUN 55372); **S,** *Digitaria abludens*, meiotic metaphase I, $n = 36$ (PUN 55701); **T,** *Echinochloa crus-pavonis*, meiotic metaphase I, $n = 27$ (PUN 55272). — Scale bars = 10 µm.

Martin & Ortiz, 1963) from outside of India and 2*n* = 40, 60, 80 (Chin & al., 1985), 2*n* = 70 (Sharma, 1970), 2*n* = 98 (Raghavan, 1958), 2*n* = 100 (Martin & Ortiz, 1963; Ramachandran, 1968) both, from India and outside of India. The haploid chromosome number has been counted at anaphase-I in pollen mother cells (Fig. 5J).

JUNCACEAE

▼ *Juncus articulatus* L. subsp. *articulatus*

n = 30, CHN. India, Himachal Pradesh, Kangra, Loharari, 32°04′N, 76°52′E, 2500 m, near water, 28 Jun 2009, *Harpreet Kaur HK 27134* (PUN 55347). [Fig. 5L]

The current chromosome count agrees with the previous report of 2*n* = 60 by Wulff (1937) from Schleswig-Holstein (Germany) and adds a new cytotype from India. Earlier, Mehra & Sachdeva (1976) reported 2*n* = 80 from the western Himalayas. The haploid chromosome number has been counted at metaphase I in pollen mother cells (Fig. 5L).

▼ *Juncus bufonius* L.

n = 30, CHN. India, Himachal Pradesh, Kangra, Bandla, 32°06′N, 76°32′E, 1266 m, near water channels, 29 Mar 2009, *Harpreet Kaur HK 27137* (PUN 55350). [Fig. 5K]

Presently, meiotic studies of the species have been made for the first time from India. PMCs reveal *n* = 30 (Fig. 5K) contrary to the previous reports by Rohweder (1937) and Delay (1947) from outside of India. The species is also known to have a large number of other cytotypes (2*n* = 27–37, 54, 58–78, 80, 81, 100, 106, 108, 110, 115, 120) from different parts of the world.

LILIACEAE

▼ *Polygonatum verticillatum* All.

n = 9, CHN. India, Himachal Pradesh, Kangra, Bhagsunaag, 32°14′N, 76°22′E, 1650 m, moist places, 20 Aug 2011, *Harpreet Kaur HK 29300* (PUN 57394). [Fig. 5M]

This record is in accordance with an earlier report of 2*n* = 18 by Shao & al. (1993) from China and represent a new record for India. Previously, the species is reported to have 2*n* = 24 (Shao & al., 1993), 2*n* = 28 (Baltisberger & al., 2002), 2*n* = 30 (Pandita & Mehra, 1982; Roy & al., 1988), 2*n* = 54 (Yang & al., 1992), 2*n* = 56 (Tamura, 1993), 2*n* = 58 (Yang & al., 1992) and 2*n* = 60 (Pandita & Mehra, 1982) from India as well as from outside of India. The haploid chromosome number has been counted at metaphase I in pollen mother cells (Fig. 5M).

POACEAE

** *Agrostis pilosula* var. *royleana* (Trin.) Bor

n = 21+0–1B, CHN. India, Himachal Pradesh, Kangra, Swad, 32°04′N, 76°48′E, 2800 m, waste places along roadsides, 25 Sep 2009, *Harpreet Kaur HK 24868* (PUN 53549). [Fig. 5N]

This is the first record of B chromosomes for this species, it has been counted at anaphase-I in pollen mother cells.

** *Andropogon munroi* C.B.Clarke (= *A. tristis* Royle)

n = 20, CHN. India, Himachal Pradesh, Kangra, Multhan, 32°01′N, 76°50′E, 2400 m, shady moist places, 6 Aug 2011, *Harpreet Kaur HK 28145* (PUN 56395); India, Himachal Pradesh, Kangra, Bada Gran, 32°05′N, 76°46′E, 3500 m, waste places, 10 Oct 2008, *Harpreet Kaur HK 28146* (PUN 56396). [Fig. 5O]

The haploid chromosome number has been counted at anaphase I in pollen mother cells (Fig. 5O). This octoploid cytotype (*n* = 20) represents a new report for the species. Previously, Mehra & Sharma (1975a) recorded 2*n* = 20 from India.

▼ *Arundinella setosa* Trin.

n = 24, CHN. India, Himachal Pradesh, Kangra, Triund, 32°08′N, 76°58′E, 3000 m, open moist places, 10 Jul 2011, *Harpreet Kaur HK 28140* (PUN 56637). [Fig. 5P]

PMCs depict *n* = 24 at anaphase I (Fig. 5P) which is a new report for India but in conformity with the previous report by Larsen (1963) from Thailand. Earlier, the species is also known to have other cytotypes as 2*n* = 16 (Christopher & Abraham, 1971), 2*n* = 20 (Sindhe, 1980), 2*n* = 32 (Sinha & al., 1990) and 2*n* = 54 (Larsen, 1963).

** *Chrysopogon serrulatus* Trin.

n = 20, CHN. India, Himachal Pradesh, Kangra, Dyot, 32°04′N, 76°56′E, 2800 m, near cultivated fields, 14 Aug 2009, *Harpreet Kaur HK 24816* (PUN 52580). [Fig. 5Q]

This is the first record of a tetraploid cytotype for this species. Previously, the species was reported to have 2*n* = 20 (Ahsan & al., 1994) and 2*n* = 80 (Faruqi & al., 1979) from Pakistan. The haploid chromosome number has been counted at diakinesis in pollen mother cells (Fig. 5Q).

* *Cymbopogon clandestinus* Stapf

n = 10, CHN. India, Himachal Pradesh, Kangra, Suliali, 32°12′N, 76°03′E, 500 m, along open fields, 17 Jul 2010, *Harpreet Kaur HK 27160* (PUN 55372). [Fig. 5R]

The haploid chromosome number has been counted at metaphase I of meiosis in pollen mother cells.

** *Digitaria abludens* (Roem. & Schult.) Veldkamp
(= *D. granularis* (Trin.) Henrard)

n = 36, CHN. India, Himachal Pradesh, Kangra, Plachek, 32°04′N, 76°52′E, 2688 m, along cultivated fields, 29 Sep 2008, *Harpreet Kaur HK 27186* (PUN 55701). [Fig. 5S]

PMCs of the species reveal *n* = 36 at metaphase I (Fig. 5S), which is an additional chromosome number for the species on the world-wide basis. Earlier, the species is reported to have 2*n* = 36 from India (Sharma & Sharma, 1979; Sharma & Kumar, 1980) and Thailand (Larsen, 1963).

▼ *Echinochloa crus-pavonis* (Kunth) Schult.

n = 27, CHN. India, Himachal Pradesh, Kangra, Bhanala, 32°13′N, 76°10′E, 800 m, along roadsides, 23 Aug 2010, *Harpreet Kaur HK 27031* (PUN 55272). [Fig. 5T]

The current chromosome count agrees with the previous report of 2*n* = 54 by Singh & Godward (1960) from East Africa. Previous studies also show the presence of 2*n* = 18 (Olorode, 1975) and 2*n* = 36 (Feng & Zhang, 1993; Hunziker & al., 1998). The haploid chromosome number has been counted at metaphase I in pollen mother cells (Fig. 5T).

** *Eragrostis poaoides* Roem. & Schult. (= *E. minor* Host)

n = 18, CHN. India, Himachal Pradesh, Kangra, Suliali, 32°12′N, 76°03′E, 500 m, along roadsides, 17 Jul 2010, *Harpreet Kaur HK 27162* (PUN 55374). [Fig. 6A]

The meiotic chromosome number *n* = 18 is revealed here, which is a new chromosome number for this species on the world-wide basis. Earlier studies reveal the presence of 2*n* = 30, 40 and 44 cytotypes.

* *Lolium remotum* var. *aristatum* (Döll) Asch.

n = 7, CHN. India, Himachal Pradesh, Kangra, Bada Gran, 32°05′N, 76°46′E, 3500 m, near agricultural fields, 28 Jun 2009, *Harpreet Kaur HK 24876* (PUN 53554). [Fig. 6B]

This variety of the species has been cytologically analysed for the first time and revealed diploid cytotype with *n* = 7 at metaphase I (Fig. 6B).

** *Microstegium fasciculatum* (L.) Henrard (= *M. vagans* (Nees ex Steud.) Hand.-Mazz.)

n = 20+0–1B, CHN. India, Himachal Pradesh, Kangra, Dharamsala, 32°13′N, 76°19′E, 1600 m, shady moist places along the roadsides, 7 Jul 2011, *Harpreet Kaur HK 29202* (PUN 56399). [Fig. 6C]

The present report of $n = 20$ with the occurrence of one B chromosome (Fig. 6C) is a new chromosome number for the species in addition to the first report of a B chromosome for the tetraploid cytotype. Earlier, the species is also known to have $2n = 20$ (Mehra & Sharma, 1977), $2n = 60$ (Mehra, 1982) and $2n = 80$ (Mehra, 1965) from India.

** *Panicum antidotale* Retz.

$n = 16$, CHN. India, Himachal Pradesh, Kangra, Bhanala, 32°13′N, 76°10′E, 800 m, along roadsides, 10 Aug 2009, *Harpreet Kaur HK 29297* (PUN 57390). [Fig. 6D]

PMCs of the species revealed $n = 16$ at metaphase I (Fig. 6D) which is a new chromosome number for the species on a world-wide basis. Earlier studies for the species also showed the numbers $2n = 18$ (Koul & Gohil, 1991; Hamoud & al., 1994), $2n = 28$ (Bir & Sahni, 1985) and $2n = 36$ (Narayan, 1962).

** *Paspalum dilatatum* Poir.

$n = 10$, CHN. India, Himachal Pradesh, Kangra, Ranehar, 32°13′N, 76°10′E, 850 m, near water, 20 Aug 2009, *Harpreet Kaur HK 27119* (PUN 54778). [Fig. 6E]

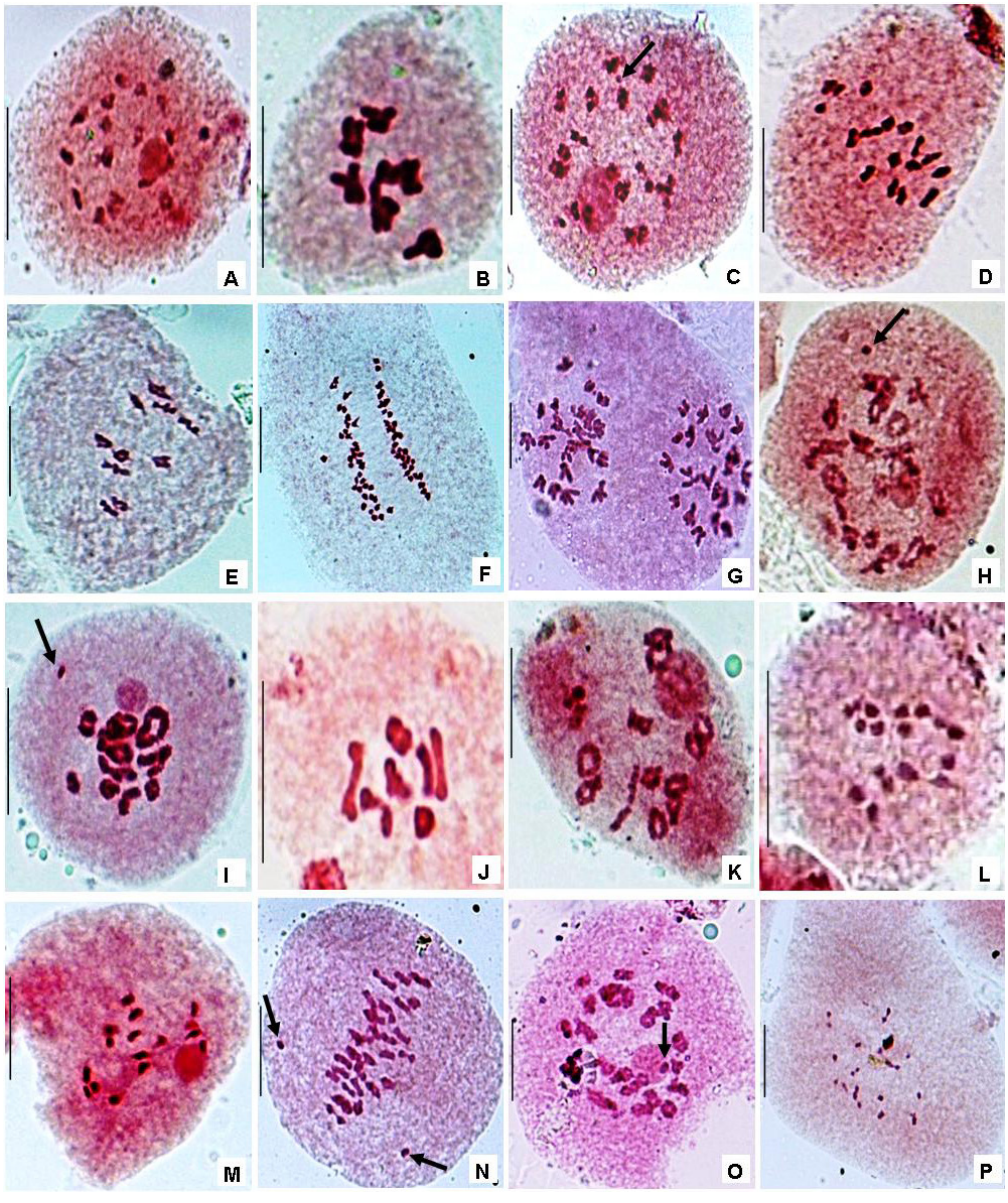

Fig. 6. A, *Eragrostis poaoides*, meiotic diakinesis, $n = 18$ (PUN 55374); **B,** *Lolium remotum* var. *aristatum*, meiotic metaphase I, $n = 7$ (PUN 53554); **C,** *Microstegium fasciculatum*, meiotic diakinesis, $n = 20+0–1B$ (PUN 56399) (arrow shows B chromosome); **D,** *Panicum antidotale*, meiotic metaphase I, $n = 16$ (PUN 57390); **E,** *Paspalum dilatatum*, meiotic metaphase I, $n = 10$ (PUN 54778); **F,** *Phacelurus speciosus*, meiotic anaphase I, $n = 35$ (PUN 53577); **G,** *Phalaris minor*, meiotic metaphase II, $n = 21$ (PUN 56394); **H,** *Poa nepalensis*, meiotic diakinesis, $n = 14+0–1B$ (PUN 52590) (arrow shows B chromosome); **I,** *Poa setulosa*, meiotic diakinesis, $n = 14+0–1B$ (PUN 52591) (arrow shows B chromosome); **J,** *Pogonatherum crinitum*, meiotic metaphase I, $n = 7$ (PUN 55334); **K,** *Pogonatherum crinitum*, meiotic diakinesis, $n = 14$ (PUN 56393); **L,** *Setaria barbata*, meiotic metaphase I, $n = 16$ (PUN 52596); **M,** *Setaria homonyma*, meiotic diakinesis, $n = 16$ (PUN 56400); **N,** *Themeda anathera*, meiotic metaphase I, $n = 30+0–2B$ (PUN 54743) (arrows show B chromosomes); **O,** *Vulpia myuros*, meiotic diakinesis, $n = 21+0–1B$ (PUN 52638) (arrow shows B chromosome). **P,** *Monochoria vaginalis*, meiotic metaphase I, $n = 12$ (PUN 56406). — Scale bars = 10 µm.

The present report of diploid cytotype with $n = 10$ is a new and additional chromosome number for the species. Previously, the species is also known to have many polyploid cytotypes as $2n = 40$ (Pandey & Sinha, 1997; Burson & Hussey, 1998), $2n = 50$ (Mehra & Sharma, 1975b; Spies & Du Plessis, 1987) and $2n = 60$ (Christopher & Abraham, 1976; Ahsan & al., 1994) from India as well as from outside of India, and $2n = 54$ only from India (Mehra & Chaudhary, 1976).

** *Phacelurus speciosus* C.E.Hubb.

$n = 35$, CHN. India, Himachal Pradesh, Kangra, Bada Gran, 32°05′N, 76°46′E, 3500 m, along roadsides, 28 Jun 2009, *Harpreet Kaur HK 25623* (PUN 53577). [Fig. 6F]

The haploid chromosome number has been counted at anaphase I of meiosis in pollen mother cells (Fig. 6F), making a new record of additional cytotype for the species. The species is already known to have $2n = 20$ from India (Sharma & Sharma, 1979) and Pakistan (Ahsan & al., 1994) and $2n = 22$ (Mehra & Sunder, 1969), $2n = 60$ (Mehra & al., 1968) and $2n = 80$ (Mehra, 1965) only from India.

▼ *Phalaris minor* Retz.

$n = 21$, CHN. India, Himachal Pradesh, Kangra, Paragpur, 32°12′N, 76°09′E, 610 m, near cultivated fields, 11 Mar 2010, *Harpreet Kaur HK 28133* (PUN 56394). [Fig. 6G]

The current chromosome count agrees with the previous report of $2n = 42$ by Spies & Voges (1988) from Africa and adds a new chromosome cytotype for India. Earlier, the species is also known to have $2n = 14$ (Spies & al., 1996) from South Africa, $2n = 56$ (Queiros, 1974) from Portugal, and $2n = 28$ from India as well as outside of India (Sinha & al., 1990; Spies & al., 1996). The haploid chromosome number has been counted at metaphase II in pollen mother cells (Fig. 6G).

** *Poa nepalensis* (Wall. ex Griseb.) Duthie

$n = 14 + 0–1B$, CHN. India, Himachal Pradesh, Kangra, Bandla, 32°06′N, 76°32′E, 1266 m, along open fields, 29 Mar 2009, *Harpreet Kaur HK 24883* (PUN 52590). [Fig. 6H]

Earlier records for this species from India represent $2n = 14$ (Mehra & Sunder, 1969) and $2n = 28$ as reported in our previously published data (Kaur & al. 2011). The presence of B chromosomes is reported here for the first time. The haploid chromosome number along with one B chromosome has been clearly seen at diakinesis in pollen mother cells (Fig. 6H).

** *Poa setulosa* Bor

$n = 14+0–1B$, CHN. India, Himachal Pradesh, Kangra, Bhagsunaag, 32°14′N, 76°22′E, 1650 m, near agricultural fields, 14 Aug 2009, *Harpreet Kaur HK 24884* (PUN 52591). [Fig. 6I]

This is the first record of the presence of B chromosomes for the species. During meiosis, the species exhibited 14 bivalents with the presence of one B chromosome at diakinesis in pollen mother cells (Fig. 6I).

** *Pogonatherum crinitum* (Thunb.) Kunth

$n = 7$, CHN. India, Himachal Pradesh, Kangra, Tal-Mata, 32°14′N, 76°12′E, 1103 m, between dry rock crevices, 28 Feb 2009, *Harpreet Kaur HK 27121* (PUN 55334). [Fig. 6J]

Study of PMCs clearly shows the presence of $n = 7$ at metaphase I (Fig. 2J), which is an additional chromosomal record for the species on a world-wide basis as the species is previously known to exhibit $2n = 20$ from India (Kalia, 1978; Mehra, 1982) and from outside of India (Gould & Soderstrom, 1974).

$n = 14$, CHN. India, Himachal Pradesh, Kangra, Chandpur, 32°13′N, 76°18′E, 1676 m, on rocks along roadsides, 13 Mar 2011, *Harpreet Kaur HK 28130* (PUN 56393). [Fig. 6K]

The chromosome number of $n = 14$ has been counted at diakinesis in pollen mother cells (Fig. 6K). This tetraploid cytotype is a new chromosome number for the species.

** *Setaria barbata* (Lam.) Kunth

$n = 16$, CHN. India, Himachal Pradesh, Kangra, Ranehar, 32°13′N, 76°10′E, 850 m, in open fields, 21 Oct 2008, *Harpreet Kaur HK 25049* (PUN 52596). [Fig. 6L]

Pollen mother cells of the species exhibit $n = 16$ at metaphase I (Fig. 6L) and represents a new chromosome number for the species. Previously, other cytotypes were reported, as $2n = 36$ from Nigeria (Olorode, 1975) and India (Kaur & al., 2011); $2n = 54$ from southern India (Christopher & Abraham, 1976) and from outside of India (Dujardin, 1978) as well as $2n = 56$ from the eastern part of India (Sarkar & al., 1976).

** *Setaria homonyma* Chiov.

$n = 16$, CHN. India, Himachal Pradesh, Kangra, Jwala Ji, 32°12′N, 76°08′E, 700 m, waste places and along cultivated fields, 20 Aug 2011, *Harpreet Kaur HK 29204* (PUN 56400). [Fig. 6M]

Meiotic studies of the species revealed $n = 16$ in the pollen mother cells at diakinesis (Fig. 6M), which is a new chromosome number for the species. Previously, the species is already known to have $2n = 18, 20$ from India only (Gupta & Singh, 1977) and $2n = 36$ both from India and outside of India (Tateoka, 1965; Mehra & Sharma, 1975b).

** *Themeda anathera* (Nees ex Steud.) Hack.

$n = 30+0–2B$, CHN. India, Himachal Pradesh, Kangra, Bada Gran, 32°05′N, 76°46′E, 3500 m, on rocks along roadsides, 1 Sep 2010, *Harpreet Kaur HK 27005* (PUN 54744); India, Himachal Pradesh, Kangra, Chhota Bhangal, 32°02′N, 76°50′E, 2000 m, along roadsides, 24 Jun 2010, *Harpreet Kaur HK 27004* (PUN 54743). [Fig. 6N]

The presence of the B chromosomes in this hexaploid cytotype represents the first report of B chromosomes for the species. Earlier studies exhibited other numbers as well, $2n = 20$ (Sharma & Sharma, 1979) and $2n = 22$ (Sisodia, 1971) from India. The haploid chromosome number with two B chromosomes has been counted at metaphase I in pollen mother cells (Fig. 6N).

** *Vulpia myuros* (L.) C.C.Gmel.

$n = 21+0–1B$, CHN. India, Himachal Pradesh, Kangra, Bandla, 32°06′N, 76°32′E, 1266 m, waste places, 29 Mar 2009, *Harpreet Kaur HK 24859* (PUN 52638). [Fig. 6O]

The presence of B a chromosome in this hexaploid cytotype is reported here for the first time on a world-wide basis. Earlier studies show the presence of B chromosomes in the diploid cytotype from Africa as $2n = 14+0–1B$ (Spies & al., 1999) and $2n = 14+2B$ (Spies & Voges, 1988).

PONTEDERIACEAE

▼ *Monochoria vaginalis* (Burm.f.) C.Presl

$n = 12$, CHN. India, Himachal Pradesh, Kangra, Bada Gran, 32°05′N, 76°46′E, 3500 m, near water channels, 9 Aug 2011, *Harpreet Kaur HK 29229* (PUN 56406). [Fig. 6P]

This record is in accordance with an earlier report of $2n = 24$ by Patwary & al. (1989) from Bangladesh and thus, is a new chromosomal number for India. Previously, the species is reported to have $2n = 26$ (Ghosh & Bhattacharya, 1981), $2n = 72, 74$ (Banerjee, 1974) and $2n = 80$ (Chatterjee & al., 1989) from India and $2n = 52$ (Ghosh & Bhattacharya, 1981; Wang & Wang, 1989) both from India and outside of India. The haploid chromosome number has been counted at metaphase I in pollen mother cells (Fig. 6P).

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* New chromosome number (cytotype) for the species

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ALLIACEAE

Allium angulosum L.

2*n* = 32, CHN. Russia, Far East, Amurskaya Oblast', Tambovskii Raion, Muravëvskii nature park, forb meadow, 30 Aug 2005, *A.V. Shatokhina 65* (VLA).

ASTERACEAE

Artemisia altaiensis Krasch.

2*n* = 54, CHN. Russia, West Siberia, Republic of Altai, Kosh-Agachskii Raion, the valley of the Builyukem River, in its middle course, 19 Aug 1997, *A.I. Shmakov 9920* (ALTB); Russia, West Siberia, Republic of Altai, Ulaganskii Raion, right riverside of the Chuya River, stony slope, 25 Sep 1999, *A.A. Korobkov 99-127* (LE); Russia, West Siberia, Republic of Altai, Kosh-Agachskii Raion, right riverside of the Chuya River, 5 km above Chagan-Uzun village, stony slope, outcrop of speckled rocks, 22 Sep 1999, *A.A. Korobkov 99-131* (LE), *A.A. Korobkov 99-132* (LE), *A.A. Korobkov 99-133* (LE), *A.A. Korobkov 99-134* (LE); Russia, West Siberia, Republic of Altai, Ulaganskii Raion, Kuraiskaya steppe, 1655 m, the slope covered by steppe vegetation, 17 Aug 2010, *A.A. Gnutikov 11-09* (LE); Russia, West Siberia, Republic of Altai, Kosh-Agachskii Raion, near Kokorya village, S slope of Bashtu Mt., 17 Aug 2010, *A.A. Gnutikov 11-10* (LE); Russia, West Siberia, Republic of Altai, Kosh-Agachskii Raion, plateau Ukok, mountain range Tabyn-Bogdo-Ola, 2233 m, the riverside of the Severnaya Argamdzha River, 25 Aug 2011, *A.A. Gnutikov 2013-62* (LE).

Artemisia argyrophylla Ledeb.

2*n* = 54, CHN. Russia, West Siberia, Republic of Altai, Ulaganskii Raion, in vicinity of Kurai village, the S rubbly-melkozem slope, the mountain grassy-forb steppe, 23 Sep 1999, *A.A. Korobkov 99-149* (LE), *A.A. Korobkov 99-150* (LE).

Artemisia caespitosa Ledeb.

2*n* = 18, CHN. Russia, West Siberia, Republic of Altai, Kosh-Agachskii Raion, right riverside of the Chagan-Uzun River, above Chagan-Uzun village, shows of speckled rocks, dry bottom of a stream, the thick rubbly-melkozem plots, 22 Sep 1999, *A.A. Korobkov 99-160* (LE).

Artemisia depauperata Krasch.

2*n* = 18, CHN. Russia, West Siberia, Republic of Altai, Kosh-Agachskii Raion, E extremity of the Severo-Chuiskii mountain ridge, 5 km NW of Chagan-Uzun village, 23 Aug 1998, *A.I. Shmakov*, *D.A. German & al. 99-50* (ALTB); Russia, West Siberia, Republic of Altai, Kosh-Agachskii Raion, a canyon of the Chagan-Burgazy River, in its middle course, 1 Aug 1998, *A.I. Shmakov*, *D.A. German & al. 99-53*

(ALTB); Russia, West Siberia, Republic of Altai, Ulaganskii Raion, in vicinity of Kurai village, rubbly edge of a hill, 23 Sep 1999, *A.A. Korobkov 99-95* (LE), *A.A. Korobkov 99-96* (LE), *A.A. Korobkov 99-97* (LE), *A.A. Korobkov 99-98* (LE).

* 2*n* = 27, CHN. Russia, West Siberia, Republic of Altai, Kosh-Agachskii Raion, Yuzhno-Chuiskii mountain ridge, left riverside of the Akkol River near Sofiiskii glacier, mountain tundra, 2356 m, 2 Sep 2008, *S.I. Molokanov & A.P. Shalimov 10-12* (ALTB).

2*n* = 36, CHN. Russia, West Siberia, Republic of Altai, Kosh-Agachskii Raion, Terektinskii mountain ridge, the upper course of the Bol'shoi Il'gumen' River, floodplain, 18 Jul 2008, *A.I. Shmakov, S.V. Smirnov & al. 10-11* (ALTB); Russia, West Siberia, Republic of Altai, Kosh-Agachskii Raion, plateau Ukok, the valley of the Srednaya Argamdzha River in its lower course, on pebbles, 28 Aug 2007, *S.V. Smirnov* & *R.A. Zubov 10-14* (ALTB), *S.V. Smirnov* & *R.A. Zubov 10-16* (ALTB); Russia, West Siberia, Republic of Altai, Kosh-Agachskii Raion, the valley of the Dzhazator River near the mouth of the Tyra River, 25 Aug 2007, *S.V. Smirnov* & *R.A. Zubov 10-15* (ALTB).

Artemisia gmelinii Weber ex Stechm.

2*n* = 18, CHN. Russia, West Siberia, Republic of Altai, Ulaganskii Raion, the highway Aktash–Ust'-Ulagan, the upper course of the Sary-Achik River, the *Pinus* and *Larix* forest belt, open slope of a terrace, 25 Sep 1999, *A.A.*Korobkov 99-178 (LE); Russia, West Siberia, Republic of Altai, Ulaganskii Raion, right riverside of the Chuya River near Chibit settlement, hilly terrace, superficial depression on the slope, grassy-forb meadow with shrubs, 21 Sep 1999, *A.A. Korobkov 99-179* (LE); Russia, West Siberia, Republic of Altai, Ulaganskii Raion, SW foothills of the Kurai mountain ridge, 10 km N of Kurai village, S slope of a hill, small depression, grassy-forb community, 23 Sep 1999, *A.A. Korobkov 99-215* (LE).

2*n* = 36, CHN. Russia, West Siberia, Republic of Altai, Kosh-Agachskii Raion, right riverside of the Chuya River, 5 km above Chagan-Uzun village, outcrop of speckled rocks, S slope of a hill, on rubbly-melkozem ground, 22 Sep 1999, *A.A. Korobkov 99-175* (LE); Russia, West Siberia, Republic of Altai, Ulaganskii Raion, right riverside of the Chuya River near its mouth, rubbly slope of a terrace, 26 Sep 1999, *A.A. Korobkov 99-177* (LE); Russia, West Siberia, Republic of Altai, Kosh-Agachskii Raion, the valley of the Ulandryk River, near its outlet from the mountains, 22 Aug 1998, *A.I. Shmakov*, *D.A. German & al. 99-38* (ALTB), *A.I. Shmakov*, *D.A. German & al. 99-39* (ALTB); Russia, West Siberia, Republic of Altai, Kosh-Agachskii Raion, at Sozontu Pass, 21 Aug 1998, *A.I. Shmakov*, *D.A. German & al. 99-40* (ALTB); Russia, West Siberia, Altaiskii Krai, Zmeinogorskii Raion, the lakeside of the Kolyvanovskoe Lake, rubbly placer, 1 Oct 1999, *A.A. Korobkov 99-180* (LE).

Artemisia gracilescens Krasch. & Iljin

2*n* = 18, CHN. Russia, West Siberia, Altaiskii Krai, Uglovskii Raion, the Bol'shoi Tassor Lake, solonets, 16 Sep 2003, *A.Yu. Koroliuk 04-06* (LE).

Artemisia nitrosa Weber ex Stechm.

2*n* = 18, CHN. Russia, West Siberia, Altaiskii Krai, Loktevskii Raion, the highway Staroaleisk–Gornyak, low terrace of the Solonovka River, near the bridge, 2 Oct 1999, *A.A. Korobkov 99-69* (LE); Russia, West Siberia, Altaiskii Krai, Loktevskii Raion, in vicinity of Noven'koe village, the low lakeside of saline lake, 2 Oct 1999, *A.A. Korobkov 99-70* (LE); Russia, Altaiskii Krai, Aleyskii Raion, the highway Barnaul–Aleisk, 30 km NE of Aleisk, the valley of a stream, 30 Sep 1999, *A.A. Korobkov 99-71* (LE).

2*n* = 36, CHN. Russia, West Siberia, Altaiskii Krai, Slavgorodskii Raion, W lakeside of the saline lake Burlinskoe, flat slope to the lake, 5 Oct 1999, *A.A. Korobkov 99-68* (LE); Russia, Altaiskii Krai, Mikhailovskii Raion, near Nevodnoe settlement, the moist saline lakeside of the lake Gornostaevo, 4 Oct 1999, *A.A. Korobkov 99-81* (LE), *A.A. Korobkov 99-82* (LE).

Artemisia pauciflora Weber ex Stechm.

2*n* = 18, CHN. Russia, West Siberia, Altaiskii Krai, Uglovskii Raion, the Bol'shoi Tassor Lake, solonets, 16 Sep 2003, *A.Yu. Koroliuk 04-05* (LE).

Artemisia phaeolepis Krasch.

2*n* = 18, CHN. Russia, West Siberia, Republic of Altai, Kosh-Agachskii Raion, between Ortalyk and Mukhor-Tarkhata villages, 18 Aug 1999, *A.N. Kuprianov 99-36* (ALTB); Russia, West Siberia, Republic of Altai, Kosh-Agachskii Raion, the upper part of the Dzhazator River, 21 Aug 1998, *A.N. Kuprianov 99-37* (ALTB).

2*n* = 36, CHN. Russia, West Siberia, Republic of Altai, Ulaganskii Raion, the valley of the Chuya River, in vicinity of Kurai village, S slope of a hill, grassy-forb mountain steppe at the edge of *Larix* forest, 23 Sep 1999, *A.A. Korobkov 99-191* (LE), *A.A. Korobkov 99-192* (LE), *A.A. Korobkov 99-193* (LE); Russia, West Siberia, Republic of Altai, Kosh-Agachskii Raion, plateau Ukok, the valley of the Srednaya Argimadzhi River in its lower part, on pebbles, 28 Aug 2007, *S.V. Smirnov & R.A. Zubov 10-09* (ALTB).

Artemisia rutifolia Steph. ex Spreng.

2*n* = 18, CHN. Russia, West Siberia, Republic of Altai, Kosh-Agachskii Raion, right riverside of the Chuya River, 5 km above Chagan-Uzun village, outcrop of speckled rocks, S slope of a hill, bench on the rocks, 22 Sep 1999, *A.A. Korobkov 99-172* (LE); Russia, West Siberia, Republic of Altai, Ulaganskii Raion, the highway Aktash–Ust'-Ulagan, the *Pinus*, *Larix* and *Picea* forest belt, the bottom of abrupt rubbly slope, near the road, 25 Sep 1999, *A.A. Korobkov 99-173* (LE), *A.A. Korobkov 99-174* (LE).

Artemisia schischkinii Krasch.

2*n* = 18, CHN. Russia, West Siberia, Republic of Altai, Kosh-Agachskii Raion, right riverside of the Chagan-Uzun River, above Chagan-Uzun village, outcrop of speckled rocks, dry bottom of a stream, 22 Sep 1999, *A.A. Korobkov 99-72* (LE), *A.A. Korobkov 99-73* (LE).

Artemisia schrenkiana Ledeb.

2*n* = 36, CHN. Russia, West Siberia, Altaiskii Krai, Mikhailovskii Raion, near Nevodnoe settlement, the lakeside of Gornostaevo Lake, 4 Oct 1999, *A.A. Korobkov 99-77* (LE); Russia, West Siberia, Altaiskii Krai, Rubtsovskii Raion, in vicinity of Kuibyshevo settlement, flat slope to the saline lake, 3 Oct 1999, *A.A. Korobkov 99-78* (LE), *A.A. Korobkov 99-80* (LE); Russia, West Siberia, Altaiskii Krai, Slavgorodskii Raion, the Bol'shoe Yarovoe Lake (bitter-saline), flat lakeside with hillocks, 5 Oct 1999, *A.A. Korobkov 99-79* (LE).

Artemisia sublessingiana Krasch. ex Poljakov

2*n* = 18, CHN. Russia, West Siberia, Altaiskii Krai, Loktevskii Raion, the highway Staroaleisk–Gornyak, the above flood-plain terrace of the Solonovka River, near the bridge, 2 Oct 1999, *A.A. Korobkov 99-83* (LE).

Doellingeria scabra (Thunb.) Nees

2*n* = 18, CHN. Russia, Far East, Amurskaya Oblast', near Mokhovaya Pad' settlement, *Quercus* forest with *Lespedeza*, 1 Sep 2005, *A.V. Shatokhina 63* (VLA).

Pyrethrum abrotanifolium Bunge ex Ledeb.

2*n* = 18, CHN. Russia, West Siberia, Republic of Altai, Kosh-Agachskii Raion, Terektinskii Ridge, the upper course of the Bol'shoi Il'gumen' River, 2000 m, 19 Aug 2008, *A.I. Shmakov & S.V. Smirnov 10-20* (ALTB).

Tanacetum vulgare L.
2*n* = 18, CHN. Russia, West Siberia, Altaiskii Krai, Biiskii Raion, the highway Biisk–Barnaul, roadside, 2 Sep 2011, *A.A. Gnutikov 2013-71* (LE), *A.A. Gnutikov 2013-72* (LE).

CYPERACEAE
Carex siderosticta Hance
2*n* = 24, CHN. Russia, Far East, Primorskii Krai, Peter the Great Bay, Russkii Island, the watershed of Voevoda and Boyarin bays, forest edge, 24 Sep 1999, *N.S. Probatova & V.P. Seledets 7969* (VLA).

GERANIACEAE
Geranium wilfordii Maxim.
2*n* = 28, CHN. Russia, Far East, Amurskaya Oblast', Blagoveshchensk city, Pervomaiskii nature park, broadleaved forest, 14 Jun 2012, *A.V. Shatokhina*, *V.M. Starchenko & G.F. Darman 193* (VLA).

IRIDACEAE
Sisyrinchium septentrionale E.P.Bicknell
2*n* = 32, CHN. Russia, Far East, Primorskii Krai, Nadezhdinskii Raion, near Shmidtovka village, the coast of Amurskii Bay, meadow, 17 Jun 2006, *V.A. Nechaev 10279* (VLA).

LAMIACEAE
Prunella asiatica Nakai
2*n* = 28, CHN. Russia, Far East, Amurskaya Oblast', in vicinity of Shimanovsk town, coniferous-broadleaved forest, 17 Sep 2011, *A.V. Shatokhina 227* (VLA).

POACEAE
Deschampsia cespitosa (L.) P.Beauv.
2*n* = 26, CHN. Russia, Far East, Khabarovskii Krai, Ul'chskii Raion, near De-Castri settlement, Chikhacheva Gulf, Severnaya Bay, marine terrace, 15 Jul 2005, *I.V. Enushchenko 9944* (VLA).

ROSACEAE
Potentilla anserina L.
2*n* = 28, CHN. Russia, Far East, Amurskaya Oblast', Ivanovskii Raion, outskirts of Ivanovka settlement, near the canal bank, 14 Jul 2006, *A.V. Shatokhina 93* (VLA).

Potentilla chinensis Ser.
2*n* = 14, CHN. Russia, Far East, Amurskaya Oblast', Blagoveshchenskii Raion, right riverside of Zeya River, near Pryadchino village, forb meadow, 2 Sep 2005, *A.V. Shatokhina 3* (VLA).

Potentilla flagellaris Schltdl.
2*n* = 14, CHN. Russia, Far East, Amurskaya Oblast', Tambovskii Raion, Muravëvskii nature park, 7 Jun 2006, *A.V. Shatokhina 96* (VLA).

Potentilla freyniana Bornm.
2*n* = 14, CHN. Russia, Far East, Amurskaya Oblast', Tambovskii Raion, Muravëvskii park of sustainable development, 6 Jun 2006, *A.V. Shatokhina 97* (VLA).

Potentilla semiglabra Juz.
2*n* = 28, CHN. Russia, Far East, Amurskaya Oblast', Blagoveshchensk city, the square at the rehabilitation center, 28 Aug 2004, *A.V. Shatokhina 17* (VLA).
2*n* = 56, CHN. Russia, Far East, Amurskaya Oblast', Tambovskii Raion, Muravëvskii nature park, waste ground, 8 Jun 2006, *A.V. Shatokhina 94* (VLA).

Spiraea media F. Schmidt
2*n* = 27, CHN. Russia, Far East, Amurskaya Oblast', Blagoveshchenskii Raion, locality Mukhinka, mixed forest, 26 Jul 2001, *Polyakova 8933* (VLA).

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Mitotic chromosomes were examined in root tips of seedlings. Method is described in Smirnov (1968). Chromosome numbers in literature were checked using *IPCN* (Goldblatt & Johnson, 1979+).

* First chromosome count from China.

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CHENOPODIACEAE
Atriplex patens (Litv.) Iljin
* 2*n* = 36, CHN. China, Xinjiang Uyghur Autonomous Province, Altai Prefecture, surroundings of Altai city, solonchak, 47°38′N, 87°59′E, 22 Sep 2012, *D. Shaulo, S. Smirnov & A. Erst 1c/303*, *D. Shaulo, S. Smirnov & A. Erst 1c/305*, *D. Shaulo, S. Smirnov & A. Erst 1a/312* (NS). [Fig. 7A]

Atriplex tatarica L.
* 2*n* = 18, CHN. China, Xinjiang Uyghur Autonomous Province, Altai Prefecture, surroundings of Altai city, solonchak, 47°38′N, 87°59′E, 22 Sep 2012, *D. Shaulo, S. Smirnov & A. Erst 1c/304*, *D. Shaulo, S. Smirnov & A. Erst 1c/*306, *D. Shaulo, S. Smirnov & A. Erst 1a/314* (NS); China, Xinjiang Uyghur Autonomous Province, Altai Prefecture, Fuhai (Burultokay) County, 100 km SE Lake Ulyungur, by the roadsides, 46°16′N, 87°50′E, 22 Sep 2012, *D. Shaulo, S. Smirnov & A. Erst 4/313* (NS). [Fig. 7B]

Bassia prostrata (L.) A.J.Scott (≡ *Kochia prostrata* (L.) Schrad.)
* 2*n* = 36, CHN. China, Xinjiang Uyghur Autonomous Province, Altai Prefecture, surroundings of Altai city, dry steppe, 47°38′N, 87°59′E, 22 Sep 2012, *D. Shaulo, S. Smirnov & A. Erst 1b/250* (NS). [Fig. 7C]

Bassia scoparia (L.) A.J.Scott (≡ *Kochia scoparia* (L.) Schrad.)
2*n* = 18, CHN. China, Xinjiang Uyghur Autonomous Province, Altai Prefecture, surroundings of Altai city, solonchak on the bank of the irrigational system, 47°38′N, 87°59′E, 22 Sep 2012, *D. Shaulo, S. Smirnov & A. Erst 1a/262* (NS).

Camphorosma lessingii Litv.
* 2*n* = 12, CHN. China, Xinjiang Uyghur Autonomous Province, Altai Prefecture, surroundings of Altai city, solonchak on the bank of the irrigational system, 47°38′N, 87°59′E, 22 Sep 2012, *D. Shaulo, S. Smirnov & A. Erst 1a/300* (NS). [Fig. 7D]

Chenopodiastrum hybridum (L.) S.Fuentes & al.
(≡ *Chenopodium hybridum* L.)
* 2*n* = 18, CHN. China, Xinjiang Uyghur Autonomous Province, Altai Prefecture, Lake Kanas vicinities, the waste place near buildings, 48°43′N, 87°01′E, 21 Sep 2012, *D. Shaulo, S. Smirnov & A. Erst 2c/311* (NS).

Chenopodium novopokrovskianum (Aellen) Uotila
* 2*n* = 36, CHN. China, Xinjiang Uyghur Autonomous Province, Altai Prefecture, surroundings of Altai city, solonchak on the bank of the irrigational system, 47°38′N, 87°59′E, 22 Sep 2012, *D. Shaulo, S. Smirnov & A. Erst 1a/286* (NS); China, Xinjiang Uyghur Autonomous Province, Altai Prefecture, Lake Kanas vicinities, waste side near buildings, 48°43′N, 87°01′E, 21 Sep 2012, *D. Shaulo, S. Smirnov & A. Erst 2c/290* (NS).

Grubovia dasyphylla (Fisch. & C.A.Mey.) Freitag & G.Kadereit (≡ *Bassia dasyphylla* (Fisch. & C.A.Mey.) O.Kuntze
* 2*n* = 18, CHN. China, Xinjiang Uyghur Autonomous Province, Altai Prefecture, surroundings of Altai city, dry steppe, 47°38′N, 87°59′E, 22 Sep 2012, *D. Shaulo, S. Smirnov & A. Erst 1b/252* (NS).

Halogeton glomeratus (Bieb.) C.A.Mey.
* 2*n* = 18, CHN. China, Xinjiang Uyghur Autonomous Province, Altai Prefecture, surroundings of Altai city, solonchak on the bank of the irrigational system, 47°38′N, 87°59′E, 22 Sep 2012, *D. Shaulo, S. Smirnov & A. Erst 1a/265* (NS).

Kali paulsenii (Litv.) Akhani & Roalson (≡ *Salsola paulsenii* Litv.)
* 2*n* = 36, CHN. China, Xinjiang Uyghur Autonomous Province, Altai Prefecture, surroundings of Altai city, dry steppe, 47°38′N, 87°59′E, 22 Sep 2012, *D. Shaulo, S. Smirnov & A. Erst 1b/315* (NS).

Kalidium foliatum (Pall.) Moq.
* 2*n* = 18, CHN. China, Xinjiang Uyghur Autonomous Province, Altai Prefecture, surroundings of Altai city, solonchak, 47°38′N, 87°59′E, 22 Sep 2012, *D. Shaulo, S. Smirnov & A. Erst 1c/296* (NS). [Fig. 7E]

Salicornia perennans Willd.
* 2*n* = 18, CHN. China, Xinjiang Uyghur Autonomous Province, Altai Prefecture, surroundings of Altai city, solonchak, 47°38′N, 87°59′E, 22 Sep 2012, *D. Shaulo, S. Smirnov & A. Erst 1c/255*, *D. Shaulo, S. Smirnov & A. Erst 1a/254* (NS). [Fig. 7F]

Suaeda corniculata (C.A.Mey.) Bunge subsp. *corniculata*
* 2*n* = 54, CHN. China, Xinjiang Uyghur Autonomous Province, Altai Prefecture, surroundings of Altai city, solonchak on the bank of the irrigational system, 47°38′N, 87°59′E, 22 Sep 2012, *D. Shaulo, S. Smirnov & A. Erst 1a/245* (NS).

Suaeda heterophylla (Kar. & Kir.) Bunge
* 2*n* = 18, CHN. China, Xinjiang Uyghur Autonomous Province, Altai Prefecture, surroundings of Altai city, solonchak, 47°38′N, 87°59′E, 22 Sep 2012, *D. Shaulo, S. Smirnov & A. Erst 1c/245*, *D. Shaulo, S. Smirnov & A. Erst 1a/244* (NS). [Fig. 7G]

Suaeda linifolia Pall.
* 2*n* = 18, CHN. China, Xinjiang Uyghur Autonomous Province, Altai Prefecture, surroundings of Altai city, solonchak on the bank

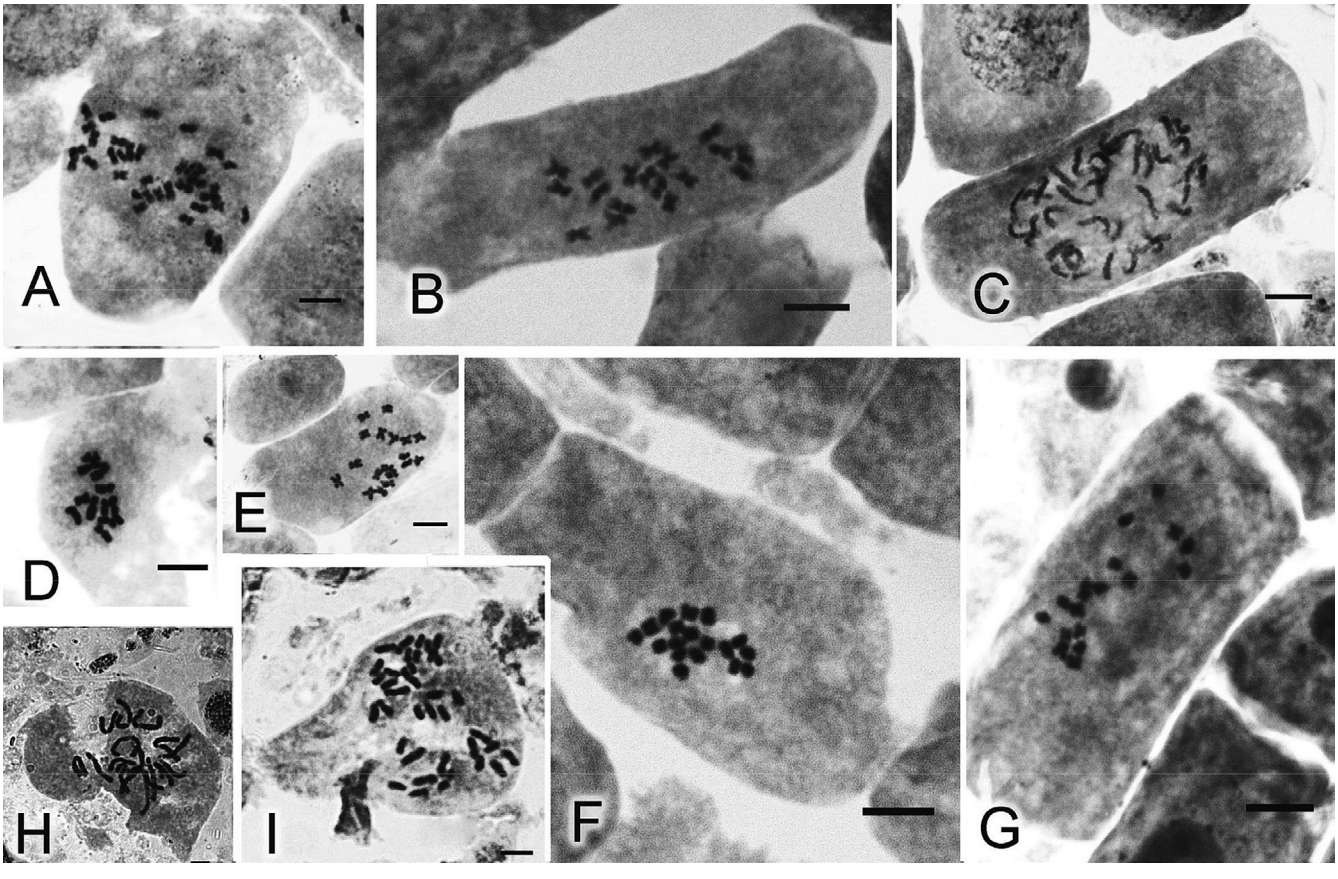

Fig. 7. Mitotic metaphases: **A,** *Atriplex patens*, 2*n* = 36; **B,** *Atriplex tatarica*, 2*n* = 18; **C,** *Bassia prostrata*, 2*n* = 36; **D,** *Camphorosma lessingii*, 2*n* = 12; **E,** *Kalidium foliatum*, 2*n* = 18; **F,** *Salicornia perennans*, 2*n* = 18; **G,** *Suaeda heterophylla*, 2*n* = 18; **H,** *Clematis orientalis*, 2*n* = 16; **I,** *Halerpestes sarmentosa*, 2*n* = 32. — Scale bars = 5 µm.

of the irrigational system, 47°38′ N, 87°59′ E, 22 Sep 2012, *D. Shaulo, S. Smirnov & A. Erst 1a/246* (NS).

Suaeda olufsenii Paulsen

* 2*n* = 18, CHN. China, Xinjiang Uyghur Autonomous Province, Altai Prefecture, surroundings of Altai city, solonchak on the bank of the irrigational system, 47°38′ N, 87°59′ E, 22 Sep 2012, *D. Shaulo, S. Smirnov & A. Erst 1a/239* (NS).

Suaeda salsa (L.) Pall.

* 2*n* = 36, CHN. China, Xinjiang Uyghur Autonomous Province, Altai Prefecture, surroundings of Altai city, solonchak on the bank of the irrigational system, 47°38′ N, 87°59′ E, 22 Sep 2012, *D. Shaulo, S. Smirnov & A. Erst 1a/238* (NS).

Suaeda stellatiflora G.L.Chu

* 2*n* = 18, CHN. China, Xinjiang Uyghur Autonomous Province, Altai Prefecture, surroundings of Altai city, solonchak, 47°38′ N, 87°59′ E, 22 Sep 2012, *D. Shaulo, S. Smirnov & A. Erst 1c/243, D. Shaulo, S. Smirnov & A. Erst 1a/242* (NS); China, Xinjiang Uyghur Autonomous Province, Altai Prefecture, Fuhai (Burultokay) County, 90 km SE Lake Ulyungur, solonchak by the road, 577 m, 46°16′ N, 87°47′ E, 23 Sep 2012, *D. Shaulo, S. Smirnov & A. Erst 5/241* (NS).

RANUNCULACEAE

Clematis orientalis L.

2*n* = 16, CHN. China, Xinjiang Uyghur Autonomous Province, Altai Prefecture, Fuhai (Burultokay) County, 40 km SE Lake Ulyungur, riparian forest, 577 m, 46°46′ N, 87°42′ E, 23 Sep 2012, *D. Shaulo, S. Smirnov & A. Erst 3/108* (NS) [Fig. 7H].

* 2*n* = 32, CHN. China, Xinjiang Uyghur Autonomous Province, Altai Prefecture, Fuhai (Burultokay) County, 40 km SE Lake Ulyungur, riparian forest, 577 m, 46°46′ N, 87°42′ E, 23 Sep 2012, *D. Shaulo, S. Smirnov & A. Erst 3/109* (NS)

Halerpestes sarmentosa (Adams) Kom.

2*n* = 32, CHN. China, Xinjiang Uyghur Autonomous Province, Altai Prefecture, surroundings of Altai city, solonchak on the bank of the irrigational system, 566 m, 47°37′ N, 87°55′ E, 22 Sep 2012, *D. Shaulo, S. Smirnov & A. Erst 1a/110* (NS) [Fig. 7I].

Ranunculus natans C.A.Mey.

* 2*n* = 16, CHN. China, Xinjiang Uyghur Autonomous Province, Altai Prefecture, Lake Kanas vicinities, bog in a fir forest, 1340 m, 48°43′ N, 87°01′ E, 21 Sep 2012, *D. Shaulo, S. Smirnov & A. Erst 2b/113* (NS).

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Chromosome numbers counted by E. Michalková and ploidy level estimated by D.R. Letz.

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CHN: Chromosome numbers were determined in mitotic metaphase cells from root tips taken from germinating seeds collected in situ. The root tips were pretreated in 0.002 M aqueous solution of 8-hydroxyquinoline for 3–9 h at 4°C, and fixed in a mixture of 96% ethanol and concentrated acetic acid (3 : 1) for 24 h at 4°C. For maceration a mixture of concentrated hydrochloric acid and 96% ethanol was used (ca. 5 min). Squashes were made using a cellophane square (Murín, 1960) and stained in 10% Giemsa stock solution in 0.2 M Sörensen phosphate buffer for 1 h.

FCM: Measurements were done with Partec CyFlow ML flow cytometer equipped with an HBO-100 mercury arc lamp, nuclei were stained using the AT-selective DAPI fluorochrome (4′,6-diamidino-2-phenylindole). Individuals with known chromosome numbers were analyzed simultaneously along with an internal standard (*Lycopersicon esculentum* 'Stupnické polní rané', 2C = 1.96 pg; Doležel & al., 1992), and the ratio of their G1 peak positions was recorded. The DNA ploidy levels of the analyzed plants (of unknown chromosome numbers) were then assessed by their peak position relative to the standard peak. Fresh leaves or cotyledons were used for analysis.

AMARANTHACEAE

Salsola collina Pall.

2*n* ~ 2*x* ~ 18, FCM. Hungary, Bács-Kiskun county, Soltszentimre village, sandy rally hill on NE edge of the village near Vörösmarty Street, 46°46′21″ N, 19°17′37″ E, ca. 100 m, 26 Sep 2013, *D.R. Letz & E. Michalková HU4-1*, *D.R. Letz & E. Michalková HU4-2*, *D.R. Letz & E. Michalková HU4-3* (SAV).

Salsola kali subsp. *ruthenica* (Iljin) Soó

2*n* = 36, CHN. Slovakia, Bratislavský kraj county, Stupava town, Vrchná hora hill, SW slope with sandy outcrops under the top of the hill, 48°15′39″ N, 17°02′48″ E, ca. 255 m, 8 Oct 2012, *E. Michalková Stup1* (SAV); Slovakia, Bratislavský kraj county, Bratislava city, Devínska Nová Ves city part, Sandberg hill, slope of former sand quarry on W foot of the hill, 48°12′02″ N, 16°58′19″ E, ca. 155 m, 15 Oct 2012, *E. Michalková DNV1* (SAV); Slovakia, Nitriansky kraj county, Nesvady village, on the margin of the sandy field near the sand dunes Líščie diery, 47°55′20″ N, 18°09′22″ E, ca. 110 m, 13 Dec 2011, *D.R. Letz Nesv1* (SAV).

2*n* ~ 4*x* ~ 36, FCM. Austria, Burgenland, Nickelsdorf village, sand quarry at N edge of the village, 47°57′03″ N, 17°03′50″ E, ca. 150 m, 25 Sep 2013, *D.R. Letz & E. Michalková A1-1*, *D.R. Letz & E. Michalková A1-2*, *D.R. Letz & E. Michalková A1-3*, *D.R. Letz & E. Michalková A1-4* (SAV); Austria, Wien city, Donaustadt city quarter, island Donauinsel, gravelly bank under the bridge Donaustadtbrücke, 48°12′34″ N, 16°26′11″ E, ca. 160 m, 25 Sep 2013, *D.R. Letz & E. Michalková A4-1*, *D.R. Letz & E. Michalková A4-2*, *D.R. Letz & E. Michalková A4-3*, *D.R. Letz & E. Michalková A4-4* (SAV); Austria, Niederösterreich, Untersiebenbrunn village, road Bergfeldweg, gravelly roadside at gravel mining pit, 48°15′36″ N, 16°45′40″ E, ca. 150 m, 25 Sep 2013, *D.R. Letz & E. Michalková A5-1*, *D.R. Letz & E. Michalková A5-2*, *D.R. Letz & E. Michalková A5-3* (SAV); Austria, Niederösterreich, Schönfeld im Marchfeld village, gravelly slope of former gravel mining pit at railway ca. 1.3 km SW of the village, 48°14′59″ N, 16°47′33″ E, ca. 145 m, 25 Sep 2013, *D.R. Letz & E. Michalková A7-1*, *D.R. Letz & E. Michalková A7-2*, *D.R. Letz & E. Michalková A7-3*, *D.R. Letz & E. Michalková A7-4* (SAV); Czech Republic, Jihomoravský kraj county, Oslavany town, coal ash slag heap near railway station, 49°07′08″ N, 16°20′54″ E, ca. 235 m, 24 Sep 2013, *D.R. Letz & E. Michalková CZ2-1*, *D.R. Letz & E. Michalková CZ2-2*, *D.R. Letz & E. Michalková CZ2-3*, *D.R. Letz & E. Michalková CZ2-4*, *D.R. Letz & E. Michalková CZ2-5* (SAV); Czech Republic, Jihomoravský kraj county, Mikulov town, Mušlov settlement, former sand quarry on NW edge of the settlement, 48°47′30″ N, 16°40′47″ E, ca. 190 m, 24 Sep 2013, *D.R. Letz & E. Michalková CZ4-1*, *D.R. Letz & E. Michalková CZ4-2*, *D.R. Letz & E. Michalková CZ4-3*, *D.R. Letz*

& E. Michalková CZ4-4, *D.R. Letz & E. Michalková CZ4-5* (SAV); Hungary, Pest county, Inárcs village, M5 highway rest area "Inárcsi pihenőhely", 47°16′35″ N, 19°19′22″ E, ca. 115 m, 26 Sep 2013, *D.R. Letz & E. Michalková HU1-1*, *D.R. Letz & E. Michalková HU1-2*, *D.R. Letz & E. Michalková HU1-3*, *D.R. Letz & E. Michalková HU1-4* (SAV); Hungary, Bács-Kiskun county, Soltszentimre village, sandy rally hill on NE edge of the village near Vörösmarty Street, 46°46′21″ N, 19°17′37″ E, ca. 100 m, 26 Sep 2013, *D.R. Letz & E. Michalková HU2-1*, *D.R. Letz & E. Michalková HU2-2*, *D.R. Letz & E. Michalková HU2-3*, *D.R. Letz & E. Michalková HU2-4* (SAV); Hungary, Pest county, island Csepel, between the villages Tökö̈l and Szigetcsép, sandy ground near the road Csépi út, 47°17′49″ N, 18°58′36″ E, ca. 100 m, 26 Sep 2013, *D.R. Letz & E. Michalková HU3-1*, *D.R. Letz & E. Michalková HU3-2*, *D.R. Letz & E. Michalková HU3-3*, *D.R. Letz & E. Michalková HU3-4* (SAV); Slovakia, Bratislavský kraj county, Bratislava city, Karlova Ves city part, margin of the road Dúbravská cesta near the Institute of Botany, 48°10′23″ N, 17°04′01″ E, ca. 190 m, 5 Sep 2012, *E. Michalková S1* (SAV); Slovakia, Bratislavský kraj county, Šajdíkove Humence village, on railway embankment near the entrance to the sand pit Kerkosand Ltd. E of the village, 48°39′24″ N, 17°16′49″ E, ca. 185 m, 24 Jul 2012, *E. Michalková S2* (SAV); Slovakia, Bratislavský kraj county, Stupava town, Vrchná hora hill, SW slope with sandy outcrops under the top of the hill, 48°15′39″ N, 17°02′48″ E, ca. 255 m, 8 Oct 2012, *E. Michalková Stup1* (SAV); Slovakia, Nitriansky kraj county, Nesvady village, on the margin of the sandy field near the sand dunes Líščie diery, 47°55′20″ N, 18°09′22″ E, ca. 110 m, 13 Dec 2011, *D.R. Letz Nesv1-1*, *D.R. Letz Nesv1-2*, *D.R. Letz Nesv1-3* (SAV); Slovakia, Nitriansky kraj county, Marcelová village, part Krátke Kesy village, area of former sand pit "Marcelovské piesky" near the cemetery, 47°47′53″ N, 18°16′08″ E, ca. 115 m, 17 Sep 2012, *D.R. Letz & E. Michalková S7-1*, *D.R. Letz & E. Michalková S7-2* (SAV); Slovakia, Nitriansky kraj county, Mužla village SW, settlement Čenkov, Čenkovská step nature reserve, steppe on sand dune NW of the settlement, 47°46′08″ N, 18°31′11″ E, ca. 110 m, 17 Sep 2012, *D.R. Letz & E. Michalková S8-1*, *D.R. Letz & E. Michalková S8-2* (SAV); Slovakia, Bratislavský kraj county, Bratislava city, Devínska Nová Ves city part, Sandberg hill, slope of former sand quarry on W foot of the hill, 48°12′02″ N, 16°58′19″ E, ca. 155 m, 29 Jul 2012, *E. Michalková DNV2-1*, *E. Michalková DNV2-2* (SAV); Slovakia, Bratislavský kraj county, Šaštín-Stráže town, little gravelly bank at the road from Šaštín-Stráže to Borský Sv. Mikuláš, 48°37′56″ N, 17°10′01″ E, ca. 175 m, 15 Sep 2013, *D.R. Letz SK1* (SAV); Slovakia, Bratislavský kraj county, Bratislava city, Danube harbour, on railway embankment under the bridge Prístavný most, 48°08′13″ N, 17°08′35″ E, ca. 135 m, 25 Sep 2013, *P. Mereďa jun. SK2* (SAV).

Salsola soda L.

$2n \sim 2x \sim 18$, FCM. Greece, Euboea island, Nea Artaki town, ruderalized sandy loam margin of the beach at the Aegean Sea in S part of the town, 38°30′18″ N, 23°38′05″ E, ca. 2 m, 18 Jun 2014, *D.R. Letz GR5-1*, *D.R. Letz GR5-2* (SAV); Greece, Thessalia Sterea Ellada municipality, between the towns Arkitsa and Livanates, sandy loam beach at the Aegean Sea, 38°43′42″ N, 23°03′22″ E, ca. 2 m, 20 Jun 2014, *D.R. Letz GR7-1*, *D.R. Letz GR7-2*, *D.R. Letz GR7-3* (SAV); Hungary, Bács-Kiskun county, Fülöpszállás village SW, Kelemenszék salt lake, dried littoral of the lake, 46°47′48″ N, 19°10′16″ E, ca. 90 m, 25 Jul 2014, *D.R. Letz & E. Michalková HU5-1*, *D.R. Letz & E. Michalková HU5-2*.

Salsola tragus L.

$2n \sim 4x \sim 36$, FCM. Bulgaria, Varna province, Shkorpilovtsi village NE, sand dune at the beach at the Black Sea, 42°58′48″ N, 27°53′33″ E, ca. 3 m, 14 Jun 2014, *D.R. Letz BG1-1*, *D.R. Letz BG1-2*, *D.R. Letz BG1-3*, *D.R. Letz BG1-4*, *D.R. Letz BG1-5* (SAV); Bulgaria, Burgas province, Emona village NE, Irakli beach, on sandy beach at the Black Sea, 42°44′48″ N, 27°53′23″ E, ca. 5 m, 14 Jun 2014, *D.R. Letz BG2-1*, *D.R. Letz BG2-2*, *D.R. Letz BG2-3*, *D.R. Letz BG2-4* (SAV); Croatia, Cres island, Orlec village ESE, Mali Bok beach, gravel margin of the beach at the Adriatic Sea, 42°52′38″ N, 14°26′75″ E, ca. 10 m, 2 Aug 2014, *E. Michalková HR1*, *E. Michalková HR2*, *E. Michalková HR3* (SAV); Greece, Chalkidiki Peninsula, Aristotelis municipality, Tripiti village, sandy beach on the W edge of the village, 40°21′51″ N, 23°55′16″ E, ca. 3 m, 16 Jun 2014, *D.R. Letz GR1* (SAV); Greece, Kavala municipality, Kavala town, sandy beach at the Aegean Sea E of the town, 40°56′47″ N, 24°26′16″ E, ca. 1 m, 16 Jun 2014, *D.R. Letz GR2-1*, *D.R. Letz GR2-2*, *D.R. Letz GR2-3* (SAV); Greece, Kavala municipality, Nea Iraklitsa village, sandy beach at the Aegean Sea N of the village, 40°52′31″ N, 24°18′56″ E, ca. 1 m, 16 Jun 2014, *D.R. Letz GR3-1*, *D.R. Letz GR3-2*, *D.R. Letz GR3-3*, *D.R. Letz GR3-4* (SAV); Greece, Chalkidiki Peninsula, Aristotelis municipality, Ouranopoli town, sandy beach NW of the town, 40°19′54″ N, 23°58′29″ E, ca. 3 m, 16 Jun 2014, *D.R. Letz GR4* (SAV); Greece, Korinthos municipality, between the towns of Korinthos and Loutraki, sandy beach at the Ionian Sea, 37°57′26″ N, 22°57′56″ E, ca. 2 m, 19 Jun 2014, *D.R. Letz GR6-1*, *D.R. Letz GR6-2*, *D.R. Letz GR6-3* (SAV); Greece, Thessalia Sterea Ellada municipality, Kalamaki village SW of the town Kaparelli, gravel beach at the Ionian Sea, 38°11′59″ N, 23°07′29″ E, ca. 2 m, 19 Jun 2014, *D.R. Letz GR8-1*, *D.R. Letz GR8-2* (SAV); Turkey, Antalya district, Kizilot village (SE of Side), Sea Planet Resort & Spa, sandy beach ca. 10–15 m from surf zone, 36°42′31″ N, 31°34′04″ E, ca. 3 m, 4 Oct 2013, *V. Feráková TUR1*, *V. Feráková TUR2*, *V. Feráková TUR3*, *V. Feráková TUR4*, *V. Feráková TUR5* (SAV).

In the Pannonian region of Central Europe the genus *Salsola* L. is represented by three taxa: *S. collina*, occasionally adventive or rarely naturalized alien species; *S. kali* subsp. *ruthenica*, autochthonous (or rather archeophytic) taxon; and *S. soda*, rare autochthonous taxon restricted to salt lakes. There are only few data on their chromosome numbers reported from this territory: *Salsola kali* subsp. *ruthenica*, $2n = 36$; Slovakia: Váchová & Májovský (1978), Hindáková & Schwarzová (1980); Czech Republic: Tomšovic (1990), based on the unpublished chromosome number count of the plant from Mušlov (distr. Břeclav) counted by L. Kirschnerová (V. Jarolímová, pers. comm.). *Salsola soda*, $2n = 18$; Hungary: Pólya (1948); Romania: Tarnavschi (1948).

Salsola collina was found by Vidéki (2005) as a new alien species to the flora of Hungary. We confirmed its naturalized occurrence in one of two published localities. The estimated diploid level of the analyzed plants is in agreement with the chromosome number $2n = 18$ published on the basis of the analyses of the plants from the U.S.A. (Pohl & Gillespie, 1959) and from Siberia and the Far East in Russia (Lomonosova & Krasnikov, 1993; Lomonosova & al., 2005; Probatova & al., 2005). Presented ploidy level record is new not only for Hungary, but for whole Europe as well.

For *Salsola kali* subsp. *ruthenica* tetraploid populations were found in Slovakia, Austria, Hungary and the Czech Republic. Our presented results confirmed previously published chromosome number for this taxon not only for two localities which were already analyzed by other authors (Mušlov, Czech Republic—Tomšovic, 1990 and Jarolímová, pers. comm.; Marcelová, Slovakia—Váchová & Májovský, 1978; Hindáková & Schwarzová, 1980), but also from 16 other localities in the Pannonian region of Central Europe. Central European inland populations of *S. kali* subsp. *ruthenica* (syn. *S. kali* subsp. *rosacea*) were recently classified by some authors as *S. tragus* (Mosyakin, 1996; Rilke, 1999; Walter, 2008; Danihelka & al., 2012) and vice versa, to *S. tragus* the name *S. kali* subsp. *pontica* (Pall.) Mosyakin was misapplied (Mosyakin, 1996; Rilke, 1999 [as *S. tragus* subsp. *pontica* (Pall.) Rilke]). *Salsola tragus* was described by Linnaeus (1756: 13) from sandy coastal habitats of the Mediterranean Sea (according to the specimen collected by Sauvages in the region of Montpellier, LINN 315.3) and the name should be used in this original sense. It has the same ploidy level as *S. kali* subsp. *ruthenica*,

however, morphology (distinctly succulent leaves, bracts and bracteoles; bracts long spine-tipped) and ecology of coastal *S. tragus* is different from that of inland *S. kali* subsp. *ruthenica*. Therefore *S. kali* subsp. *ruthenica* should not be simply included in *S. tragus*.

Our analysis of *S. tragus* from ten localities on the coast of the Mediterranean and Black Sea confirmed the chromosome number record $2n = 36$ from Bulgaria (Grozeva 2013).

For both the inland and coastal plants of *S. soda* diploid level was estimated in accordance with the chromosome number $2n = 18$ published for the plants from France, Italy, Portugal and Russia (cf. Lomonosova, 2013; Goldblatt & Johnson, 2014). For this species also tetraploid number $2n = 36$ was sporadically reported from seashores, e.g., from Greece (cf. Tan, 1997). These records are most likely caused by misidentification of coastal species *S. tragus*.

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Methods for chromosome analysis are according to Guerra & Souza (2002).

* First chromosome count for the genus.
** First chromosome count for the species.
*** New cytotype for the species.
S, saxicolous; T, terrestrial; TS, terrestrial and saxicolous.

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AGAVACEAE

TS *Furcraea foetida* (L.) Haw.

$2n = 60$, CHN. Brazil, Paraíba, Areia, Chã de Jardim, 06°57′48″ S, 35°41′30″ W, 13 Apr 2005, *L.P. Felix s.n.* (EAN 11029). [Fig. 8B]

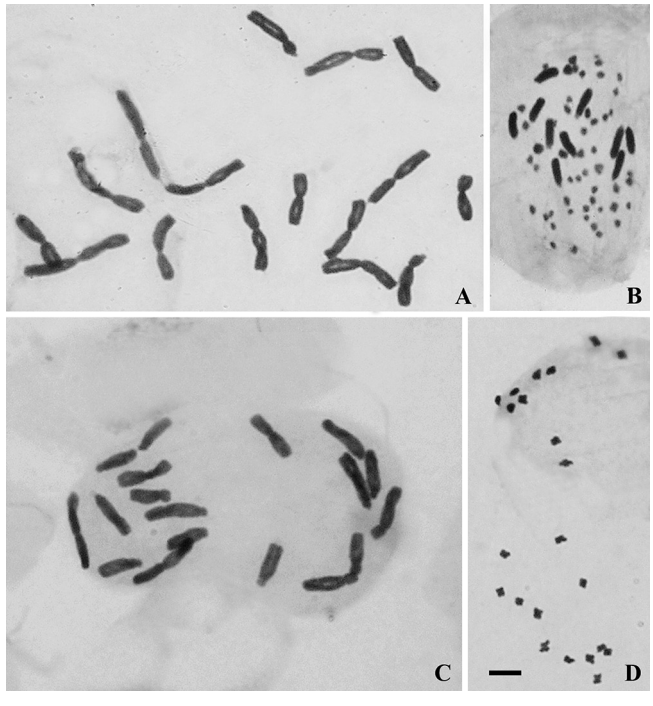

Fig. 8. A, *Alstroemeria longistaminea*, $2n = 16$; **B,** *Furcraea foetida*, $2n = 60$; **C,** *Bomarea edulis*, $2n = 18$; **D,** *Brasilopuntia brasiliensis*, $2n = 22$. — Scale bar = 5 µm.

ALSTROEMERIACEAE

** TS *Alstroemeria longistaminea* Mart. ex Schult. & Schult.f.

2*n* = 16, CHN. Brazil, Paraíba, Fagundes, Pedra de Santo Antônio, 07°20′46″ S, 35°47′51″ W, 15 Jun 2006, *L.P. Felix s.n.* (EAN 15466). [Fig. 8A]

TS *Bomarea edulis* (Tussac) Herb.

2*n* = 18, CHN, Brazil, Pernambuco, Taquaritinga do Norte, 07°54′11″ S, 36°02′39″ W, 3 Nov 2005, *L.P. Felix s.n.* (EAN 11184). [Fig. 8C]

AMARANTHACEAE

** T *Alternanthera paronychioides* A.St.-Hil.

2*n* = 64, CHN. Brazil, Paraíba, Monteiro, 07°53′36″ S, 37°08′36″ W, 22 Feb 2003, *F.C. Ramalho 502* (EAN). [Fig. 9A]

** T *Alternanthera tenella* Colla.

2*n* = 28, CHN. Brazil, Rio Grande do Norte, Carnaúba dos Dantas, 06°03′27″ S, 36°33′27″ W, 15 Dec 2002, *F.C. Ramalho 564* (EAN). [Fig. 10B]

* T *Blutaparon vermiculare* (L.) Mears

2*n* = 30, CHN. Brazil, Paraíba, Alagoa Grande, 07°09′30″ S, 35°37′48″ W, 23 Apr 2013, *L.P. Felix 15026* (EAN). [Fig. 9J]

AMARYLLIDACEAE

TS *Hippeastrum psittacinum* Herb.

2*n* = 22, CHN. Brazil, Paraíba, Fagundes, 07°20′46″ S, 35°47′51″ W, 24 Feb 2005, *S. Pitrez 587* (EAN). [Fig. 9D]

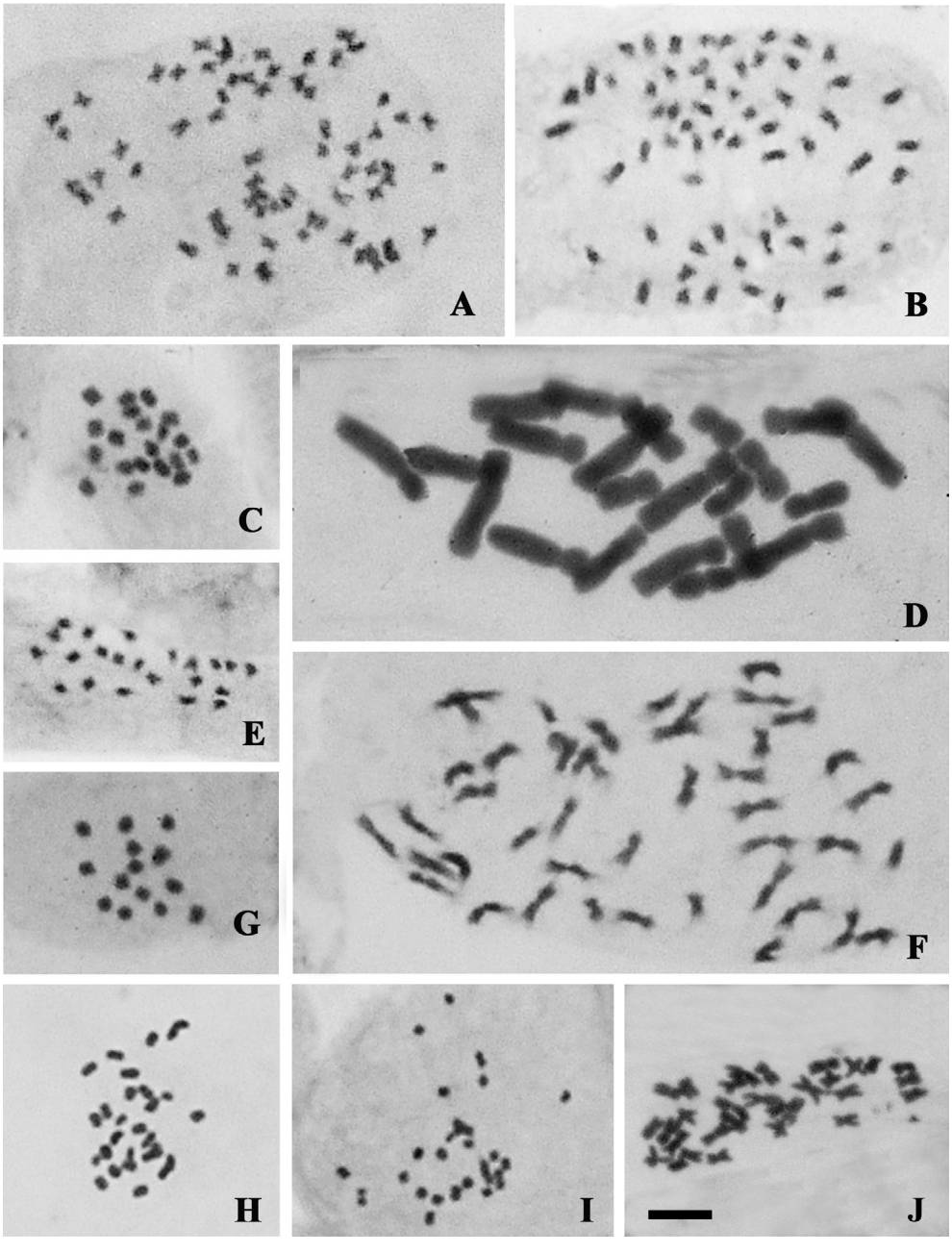

Fig. 9. A, *Alternanthera paronychioides*, 2*n* = 64; **B,** *Clusia nemorosa*, 2*n* = 60; **C,** *Mandevilla tenuifolia*, 2*n* = 20; **D,** *Hippeastrum psittacinum*, 2*n* = 22; **E,** *Rauvolfia ligustrina*, 2*n* = 22; **F,** *Melocactus ernesti*, 2*n* = 44; **G,** *Aristolochia birostris*, 2*n* = 14; **H,** *Paliavana tenuiflora*, 2*n* = 26; **I,** *Sinningia nordestina*, 2*n* = 26; **J,** *Blutaparon vermiculare*, 2*n* = 30. — Scale bar = 5 µm.

APOCYNACEAE

** S *Mandevilla tenuifolia* (J.C.Mikan) Woodson.

2*n* = 20, CHN. Brazil, Paraíba, Serraria, 06°49′02″ S, 35°37′55″ W, 11 Feb 2004, *S. Pitrez 507* (EAN). [Fig. 9C]

** *Rauvolfia ligustrina* Willd. ex Roem. & Schult.

2*n* = 22, CHN. Brazil, Paraíba, Araruna, 06°33′21″ S, 35°44′51″ W, 16 Jan 2003, *S. Pitrez 355* (EAN). [Fig. 9E]

ARISTOLOCHIACEAE

T *Aristolochia birostris* Duch.

2*n* = 14, CHN. Brazil, Paraíba, Esperança, 07°01′59″ S, 35°51′26″ W, 3 Jul 2003, *A. Almeida 383* (EAN). [Fig. 9G]

ASTERACEAE

*** T *Conocliniopsis prasiifolia* (DC.) R.M.King & H.Rob.

2*n* = 20, CHN. Brazil, Paraíba, Serraria, 06°49′02″ S, 35°37′55″ W, 18 Jun 2003, *S. Pitrez 297* (EAN). [Fig. 10C]

CACTACEAE

TS *Cereus jamacaru* DC.

2*n* = 22, CHN. Brazil, Paraíba, Itabaiana, 07°19′46″ S, 35°19′60″ W, 26 May 2004, *L.P. Felix 10203* (EAN) [Fig. 10A].

T *Brasilopuntia brasiliensis* (Willd.) A.Berger

2*n* = 22, CHN, Brazil, Areia, Pirauá, 06°58′10″ S, 35°42′48″ W, 5 Dec 2004, *L.P. Felix 10794* (EAN). [Fig. 8D]

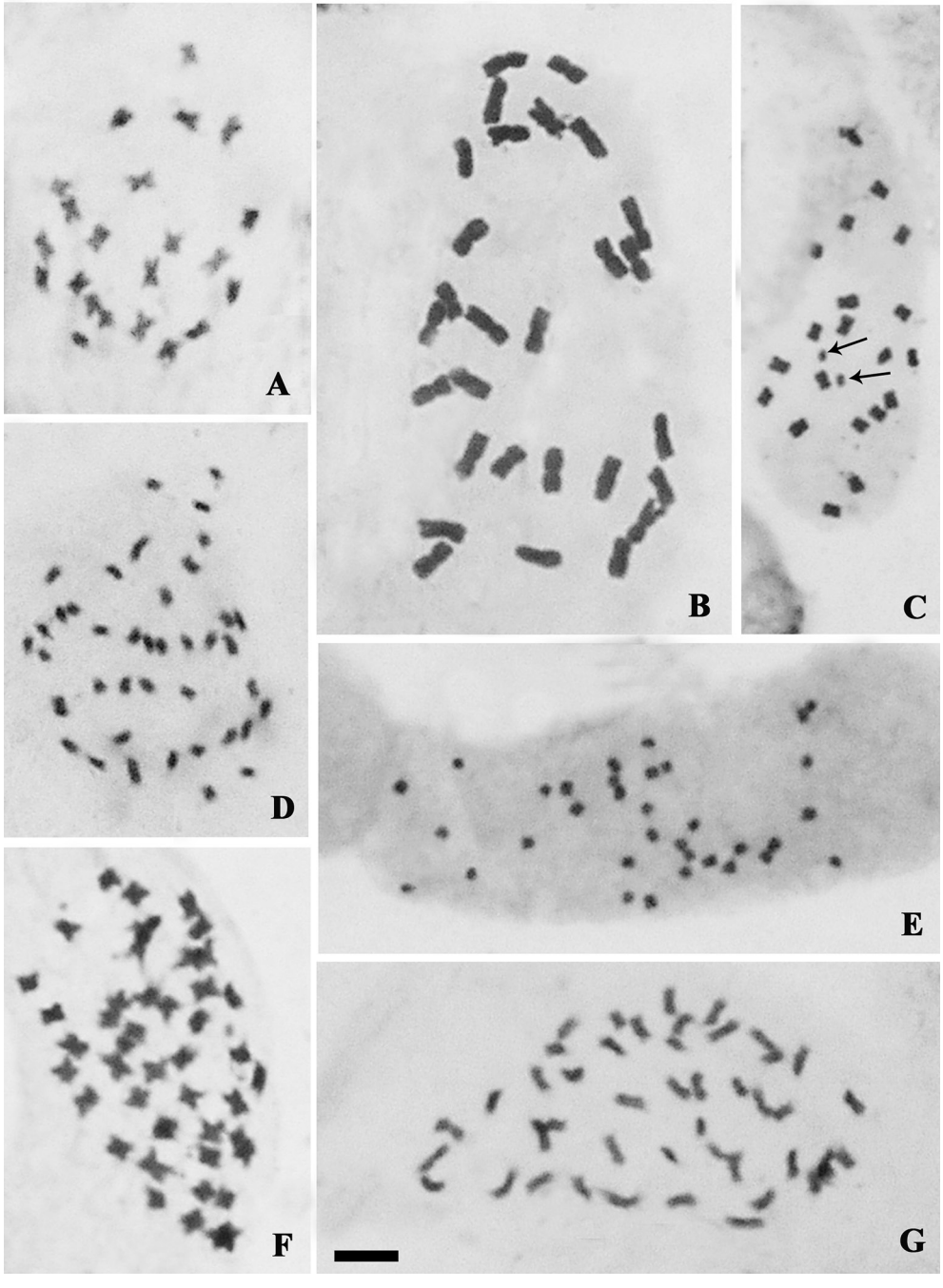

Fig. 10. A, *Cereus jamacaru*, 2*n* = 22; **B,** *Alternanthera tenella*, 2*n* = 28; **C,** *Conocliniopsis prasiifolia*, 2*n* = 22 (arows indicate satellites); **D,** *Euphorbia comosa*, 2*n* = 40; **E,** *Cissus decidua*, 2*n* = 34; **F,** *Pilosocereus pachycladus* subsp. *pernambucoensis*, 2*n* = 44; **G,** *Melocactus bahiensis*, 2*n* = 44. — Scale bar = 5 µm.

TS *Melocactus bahiensis* Luetzelb.
2*n* = 44, CHN. Brazil, Rio Grande do Norte, Acari, 06°27′36″ S, 36°38′28″ W, 26 Feb 1993, *L.P. Felix 5595* (EAN). [Fig. 10G]

S *Melocactus ernestii* Vaupel
2*n* = 44, CHN. Brazil, Paraíba, Esperança, 07°01′59″ S, 35°51′26″ W, 1 Nov 2002, *A. Almeida 240* (EAN). [Fig. 9F]

TS *Pilosocereus pachycladus* subsp. *pernambucoensis* (F.Ritter) Zappi
2*n* = 44, CHN. Brazil, Paraíba, Areial, 07°03′41″ S, 35°55′33″ W, 5 Nov 2013, *A.S. Barbosa 09* (EAN). [Fig. 10F]

CLUSIACEAE
** TS *Clusia nemorosa* G.Mey.
2*n* = 60, CHN. Brazil, Pernambuco, Buíque, 08°37′23″ S, 37°09′21″ W, 20 Nov 2008, *L.P. Felix 12616* (EAN). [Fig. 9B]

COMMELINACEAE
S *Tradescantia ambigua* Mart.
2*n* = 24, CHN. Brazil, Paraíba, Pocinhos, 07°04′26″ S, 36°03′40″ W, 6 Jan 2005, *S. Pitrez 611* (EAN). [Fig. 11A]

CONVOLVULACEAE
** TS *Evolvulus filipes* Mart.
2*n* = 26, CHN. Brazil, Paraíba, Teixeira, 07°13′26″ S, 37°15′11″ W, 16 Sep 2003, *L.P. Felix 10202* (EAN). [Fig. 11B]

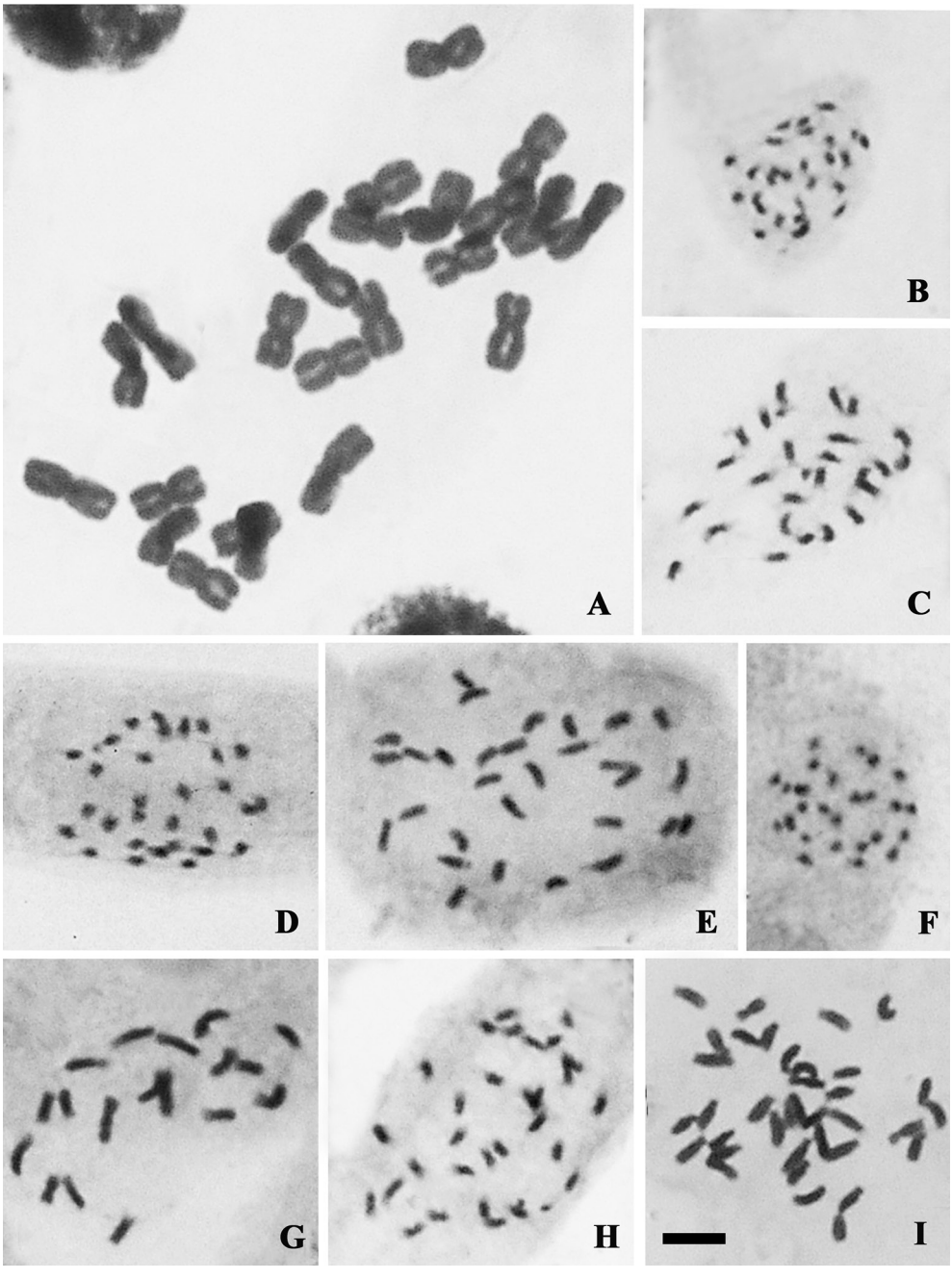

Fig. 11. A, *Tradescantia ambigua*, 2*n* = 24; **B,** *Evolvulus filipes*, 2*n* = 26; **C,** *Evolvulus glomeratus*, 2*n* = 26; **D,** *Ipomoea longeramosa*, 2*n* = 30; **E,** *Ipomoea marcellia*, 2*n* = 30; **F,** *Phyllanthus clausseni*, 2*n* = 26; **G,** *Jacquemontia densiflora*, 2*n* = 18; **H,** *Merremia aegyptia*, 2*n* = 30; **I,** *Stillingia trapezoidea*, 2*n* = 36. — Scale bar = 5 µm.

** TS *Evolvulus glomeratus* Nees & Mart.
2*n* = 26, CHN. Brazil, Paraíba, Pocinhos, 07°04′26″ S, 36°03′40″ W, 15 May 2003, *A. Almeida 405* (EAN). [Fig. 11C]

** TS *Ipomoea longeramosa* Choisy
2*n* = 30, CHN. Brazil, Paraíba, Pocinhos, 07°04′26″ S, 36°03′40″ W, 15 May 2003, *A. Almeida 396* (EAN). [Fig. 11D]

** TS *Ipomoea marcellia* Meisn.
2*n* = 30, CHN. Brazil, Paraíba, Pocinhos, 07°04′26″ S, 36°03′40″ W, 15 May 2003, *S. Pitrez 250* (EAN). [Fig. 11E]

** TS *Jacquemontia densiflora* (Meisn.) Hallier
2*n* = 18, CHN. Brazil, Paraíba, Pocinhos, 07°04′26″ S, 36°03′40″ W, 23 Jul 2003, *S. Pitrez 409* (EAN). [Fig. 11G]

** TS *Merremia aegyptia* (L.) Urb.
2*n* = 30, CHN. Brazil, Paraíba, Monteiro, 07°54′09″ S, 37°08′67″ W, 5 Apr 2003, *F.C. Ramalho 619* (EAN). [Fig. 11H]

EUPHORBIACEAE

** S *Euphorbia comosa* Vell.
2*n* = 40, CHN. Brazil, Paraíba, Esperança, 07°01′59″ S, 35°51′26″ W, 15 Mar 2003, *S. Pitrez 446* (EAN). [Fig. 10D]

** S *Stillingia trapezoidea* Ule
2*n* = 36, CHN. Brazil, Paraíba, Esperança, 07°01′59″ S, 35°51′26″ W, 18 Nov 2002, *S. Pitrez 200* (EAN). [Fig. 11I]

GESNERIACEAE

* S *Paliavana tenuiflora* Mansf.
2*n* = 26, CHN. Brazil, Paraíba, Fagundes, 07°20′46″ S, 35°47′51″ W, 17 Jul 2003, *S. Pitrez 379* (EAN). [Fig. 9H]

** TS *Sinningia nordestina* Chautems, Baracho & J.A.Siqueira
2*n* = 26, CHN. Brazil, Paraíba, Serraria, 06°49′02″ S, 35°37′55″ W, 26 Jun 2003, *A. Almeida 363* (EAN). [Fig. 9I]

PHYLLANTHACEAE

** TS *Phyllanthus claussenii* Müll.Arg.
2*n* = 26, CHN. Brazil, Paraíba, Araruna, 06°33′21″ S, 35°44′51″ W, 15 Jul 2003, *S. Pitrez 335* (EAN). [Fig. 11F]

VITACEAE

** TS *Cissus decidua* Lombardi
2*n* = 34, CHN. Brazil, Paraíba, Esperança, 07°01′59″ S, 35°51′26″ W, *S. Pitrez 566* (EAN). [Fig. 10E]

In north-eastern Brazil, the occurrence of granite rock outcrops, called inselbergs, is frequent. The major part of these regions host a semi-arid forest vegetation as the ecoregion "Caatinga", as well as inselbergs, are experiencing high temperatures and water-stress. Plants well adapted to physically stressed ecosystems, like anthropogenic (Stebbins, 1971) and arctic environments (Brochmann & al., 2004), tend to comprise higher amount of polyploids than plants commonly found in more stable environments. In relation to plants found on inselbergs it was observed that, in at least three genera, there is a correlation between polyploidy and saxicolous habitat adaptation (Felix & Guerra, 2000; Yamagishi-Costa & Forni-Martins, 2009; Felix & Guerra, 2010), suggesting that in other saxicolous plant groups there might be the same tendency. In the present work, ploidy level variation was analyzed in plants with exclusive or simultaneous occurrence on inselbergs and/or Caatinga by Giemsa conventional staining (Guerra & Souza, 2002). The main objective of this work was to analyze the polyploidy occurrence in such plants and to verify the relationships between polyploidy, taxonomic groups and occurrence on rock outcrops.

In total, 30 analyzed species belong to 26 genera and 15 families; for two genera (*Blutaparon* and *Paliavana*) and 20 species no previously published chromosome records were available. For the other species previously published counts were confirmed, except for *Conocliniopsis prasiifolia*, for which the present count of 2*n* = 20 diverged from other records published for this species (2*n* = 10, 30, reported as for *Eupatorium ballotaefolium*; Moore, 1973). Chromosome numbers varied from 2*n* = 14 in *Aristolochia birostris* to 2*n* = 64 in *Alternanthera paronychioides*. Of these records, only the counts of 2*n* = 64 in *Alternanthera paronychioides* and 2*n* = 44 in *Melocactus bahiensis*, *M. ernestii* and *Pilosocereus pachycladus* differed from the diploid numbers reported for congeneric taxa (see, e.g., Castro & al., 2013). These data corroborate the idea that inselberg orchids of the genera *Oncidium* (Felix & Guerra, 2000), *Epidendrum* (Felix & Guerra, 2010; Assis & al., 2013) and *Cattleya* (Yamagishi-Costa & Forni-Martins, 2009), could present higher ploidy levels than cytotypes of the same genera distributed in other environments. On the other hand, the other species did not present any tendency to polyploidy that could be related to inselberg colonization or to semi-arid vegetation of Caatinga. Similarly, in the analyses of 18 species and 5 genera of Convolvulaceae occurring in saxicolous habitat, no tendency to polyploidy related to this kind of habitat was observed (Pitrez & al., 2008). In general, the data presented here, as well as the data gathered from the literature, suggest that in the majority of inselberg plants, the occurrence of polyploids is a random process, without any correlation to this kind of habitat, except some orchid groups with a possible epiphytic ancestor. In *Melocactus* a high occurrence of polyploidy was observed (Castro & al., 2013), but in this genus polyploidy occurs not only in inselberg species (Anderson, 2001).

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* First chromosome count for the species.

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EUPHORBIACEAE

* *Acalypha multicaulis* Müll.Arg.

2*n* = 38, CHN. Brazil, Pernambuco, Brejo Madre de Deus, Serra do Amaro, 08°08′33″ S, 36°22′22″ W, 26 Feb 2006, *L.P. Felix 10942* (EAN). [Fig. 12A]

Astraea lobata (L.) Klotzsch

2*n* = 18, CHN. Brazil, Paraíba, Areia, Engenho Quatí, 06°57′42″ S, 35°41′43″ W, 29 Oct 2006, *L.P. Felix 11278* (EAN). [Fig. 12B]

* *Croton argenteus* L.

2*n* = 30, CHN. Brazil, Bahia, Jacobina, 11°11′08″S, 40°32′10″ W, 11 Aug 2006, *L.P. Felix & N.A. Porto 11227* (EAN). [Fig. 12C]

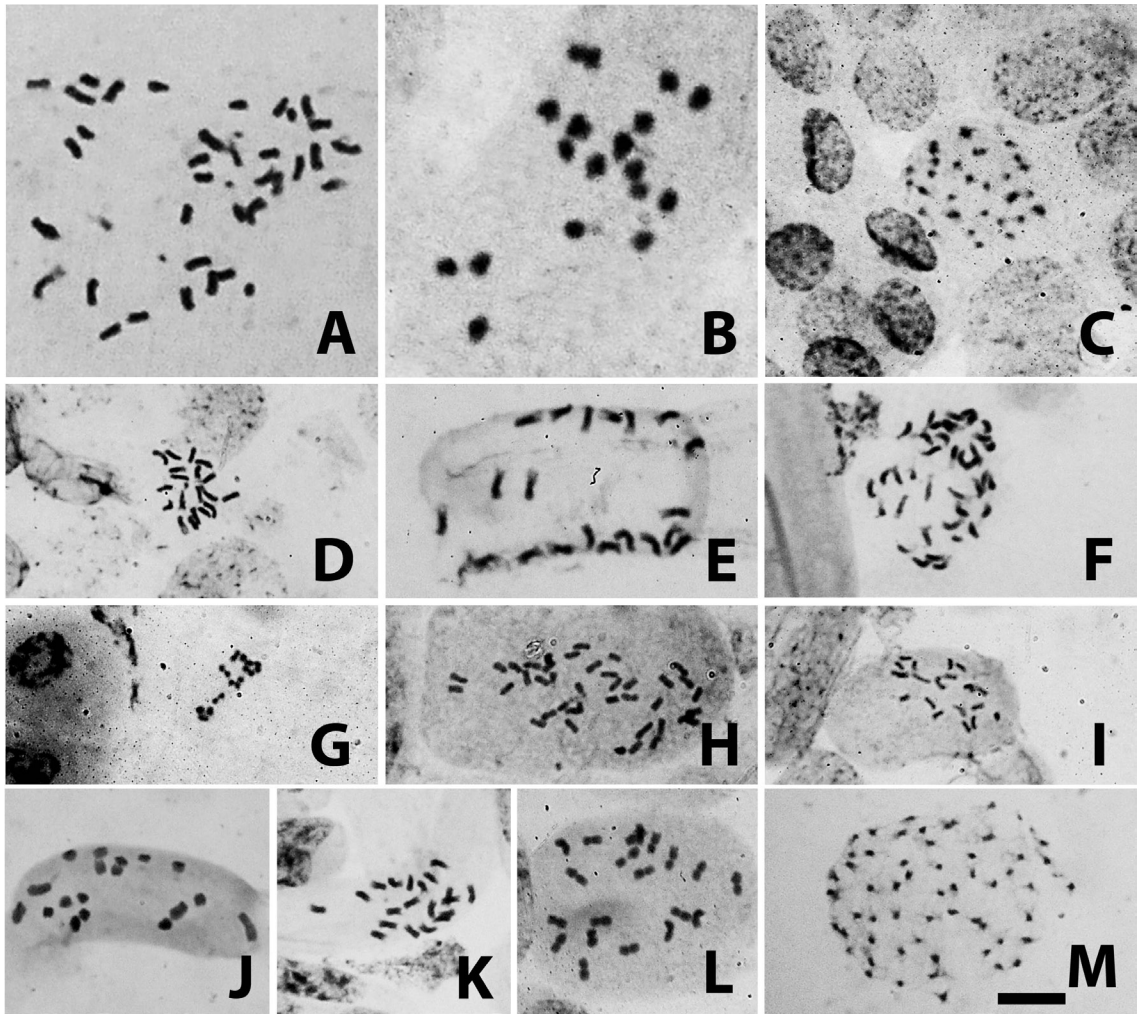

Fig. 12. Mitotic chromosomes of **A,** *Acalypha multicaulis* (*L.P. Felix 10942*), 2*n* = 38; **B,** *Astraea lobata* (*L.P. Felix 11278*), 2*n* = 18; **C,** *Croton argenteus* (*L.P. Felix & N.A. Porto 11227*), 2*n* = 30; **D,** *Croton argyrophyllus* (*L.P. Felix & N.A. Porto 11194*), 2*n* = 20; **E,** *Croton blanchetianus* (*L.P. Felix 14836*), 2*n* = 20; **F,** *Croton grandivelus* (*L.P. Felix & M.F.O. Pires 10860*), 2*n* = 38; **G,** *Croton glandulosus* (*L.P. Felix 14837*), 2*n* = 16; **H,** *Croton heliotropiifolius* (*N.A. Porto 06*), 2*n* = 40; **I,** *Croton jacobinensis* (*L.P.Felix & M.F.O. Pires 11860*), 2*n* = 20; **J,** *Croton pedicellatus* (*L.P. Felix 10675*), 2*n* = 18; **K,** *Croton pulegioides* (*L.P. Felix 11121*), 2*n* = 20; **L,** *Croton urticifolius* (*L.P. Felix 11467*), 2*n* = 20; **M,** *Euphorbia sarcodes* (*L.P. Felix 10501*), 2*n* = 60. — Scale bar = 10 µm.

* *Croton argyrophyllus* Kunth
2*n* = 20, CHN. Brazil, Paraíba, Algodão de Jandaíra, Pedra do Caboclo, 06°48′40″ S, 35°54′55″ W, 19 Jul 2006, *L.P. Felix & N.A. Porto 11194* (EAN). [Fig. 12D]

* *Croton blanchetianus* Baill.
2*n* = 20, CHN. Brazil, Paraíba, Barra de Santa Rosa, 06°43′18″ S, 36°03′46″ W, 10 Apr 2007, *L.P. Felix 14836* (EAN). [Fig. 12E]

Croton glandulosus L.
2*n* = 16, CHN. Brazil, Paraíba, Areia, Universidade Federal da Paraíba, Centro de Ciências Agrárias, Campus II, 06°57′42″ S, 35°41′43″ W, 12 Dec 2006, *L.P. Felix 14837* (EAN). [Fig. 12G]

* *Croton grandivelus* Baill.
2*n* = 38, CHN. Brazil, Piauí, Altos, 05°02′24″ S, 42°27′41″ W, 24 Mar 2006, *L.P. Felix 11036* (EAN); Brazil, Piauí, Campo Maior, 04°49′42″ S, 42°10′10″ W, 25 Mar 2006, *L.P. Felix 11096* (EAN); Brazil, Ceará, Viçosa do Ceará, 03°33′48″ S, 41°05′41″ W, 1 Feb 2006, *L.P. Felix & M.F.O. Pires 10860* (EAN). [Fig. 12F]

* *Croton heliotropiifolius* Kunth
2*n* = 40, CHN. Brazil, Paraíba, Areia, Chã de Jardim, 06°57′42″ S, 35°41′43″ W, 10 Jul 2006, *N.A. Porto 06* (EAN). [Fig. 12H]

* *Croton jacobinensis* Baill.
2*n* = 20, CHN. Brazil, Pernambuco, Itambé, 07°26′49″ S, 35°14′27″ W, 3 Mar 2006, *L.P. Felix 11107* (EAN); Brazil, Ceará, Viçosa do Ceará, 03°29′01″ S, 44°04′44″ W, 1 Feb 2006, *L.P. Felix & M.F.O. Pires 11860* (EAN). [Fig. 12I]

* *Croton pedicellatus* Kunth
2*n* = 18, CHN. Brazil, Piauí, Campo Maior, 04°49′42″ S, 42°10′10″ W, 24 Mar 2006, *L.P. Felix 11040* (EAN); Brazil, Piauí, Campo Maior, 04°49′42″ S, 42°10′10″ W, 24 Mar 2006, *L.P. Felix 11046* (EAN); Brazil, Piauí, Castelo, 05°19′18″ S, 41°33′11″ W, 24 May 2005, *L.P. Felix 10675* (EAN). [Fig. 12J].

* *Croton pulegioides* Müll.Arg.
2*n* = 20, CHN. Brazil, Paraíba, Itapororoca, 06°49′51″ S, 35°14′49″ W, 1 May 2006, *L.P. Felix 11121* (EAN). [Fig. 12K]

* *Croton urticifolius* Lam.
2*n* = 20, CHN. Brazil, Paraíba, Areia, 06°57′42″ S, 35°41′43″ W, 14 Jun 2006, *L.P. Felix 11467* (EAN); Brazil, Paraíba, Areia, 06°57′42″ S, 35°41′43″ W, 14 Jun 2006, *L.P. Felix 11305* (EAN); Brazil, Ceará, Viçosa do Ceará, 03°34′02″ S, 41°09′58″ W, 2 Feb 2006, *L.P. Felix & M.F.O. Pires 10868* (EAN). [Fig. 12L]

* *Euphorbia sarcodes* Boiss.
2*n* = 60, CHN. Brazil, Pernambuco, Bezerros, Serra Negra, 08°14′00″ S, 35°47′45″ W, 14 Jun 2004, *L.P. Felix 10501* (EAN). [Fig. 12M]

Manihot carthaginensis subsp. *glaziovii* (Müll.Arg.) Allem
2*n* = 36, CHN. Brazil, Paraíba, Areia, Centro de Ciências Agrárias, 06°57′48″ S, 35°41′30″ W, 30 Jan 2008, *L.P. Felix 12763* (EAN); Brazil, Paraíba, Cubati, 06°52′06″ S, 36°22′31″ W, 30 Apr 2008, *L.P. Felix 12764* (EAN); Brazil, Paraíba, Esperança, 07°01′59″ S, 35°51′26″ W, 24 Oct 2007, *L.P. Felix 12036* (EAN); Brazil, Pernambuco, Fernando de Noronha Island, 03°50′25″ S, 32°34′39″ W, 1 Feb 2007, *L.P. Felix 11520* (EAN); Brazil, Pernambuco, Vertentes, 07°54′10″ S, 35°59′18″ W, 11 Feb 2007, *L.P. Felix 11528* (EAN); Brazil, Rio Grande do Norte, Acari, road BR 427 to Currais Novos, 06°22′42″ S, 36°38′03″ W, 5 Jun 2007, *L.P. Felix 11936* (EAN); Brazil, Rio Grande do Norte, Carnaúba dos Dantas, Serra Rajada, 06°32′35″ S, 36°38′58″ W, 5 Jun 2007, *L.P. Felix 11924* (EAN); Brazil, Rio Grande do Norte, Acari, Gargalheiras, 06°25′34″ S, 36°36′25″ W, 11 Mar 2008, *L.P. Felix 12154* (EAN). [Fig. 13A].

* *Manihot dichotoma* Ule
2*n* = 36, CHN. Brazil, Rio Grande do Norte, Canguaretama, road BR 101, 06°26′25″ S, 35°08′30″ W, 5 Dec 2006, *L.P. Felix 11423* (EAN). [Fig. 13D]

Manihot esculenta Crantz ‘Manipeba’
2*n* = 36, CHN. Brazil, Pernambuco, Goiana, 07°33′38″ S, 35°00′09″ W, 24 Oct 2007, *L.P. Felix 12037* (EAN). [Fig. 13C]

Manihot esculenta Crantz ‘Pornunça’
2*n* = 36, CHN. Brazil, Paraíba, Serraria, Fazenda Santa Helena, 06°49′45″ S, 35°38′21″ W, 26 Jan 2007, *L.P. Felix 11510* (EAN). [Fig. 13B]

* *Manihot leptophylla* Pax
2*n* = 36, CHN. Brazil, Rio Grande do Norte, Goianinha, Usina Estivas, 06°12′43″ S, 35°12′55″ W, 5 Dec 2006, *L.P. Felix 11425* (EAN). [Fig. 13E]

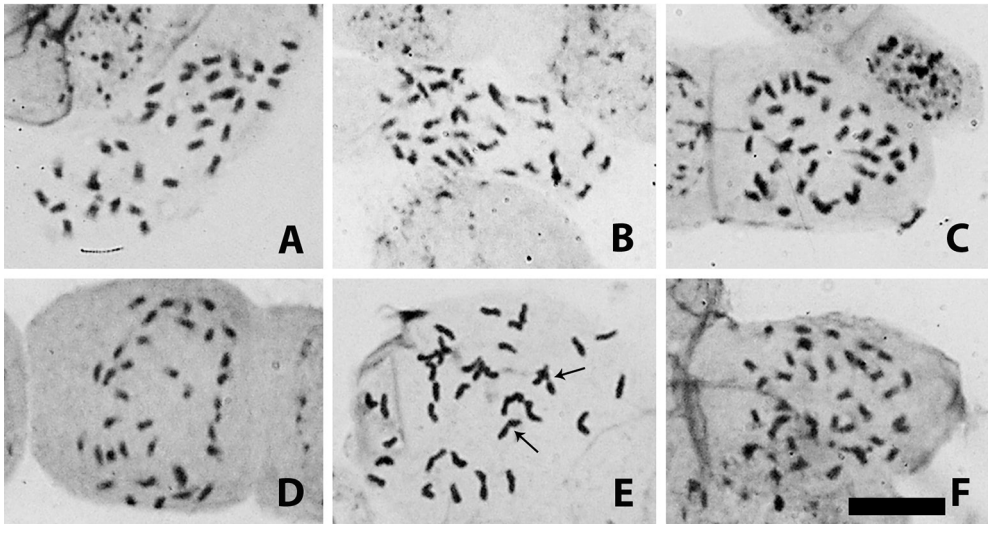

Fig. 13. Mitotic chromosomes of **A,** *Manihot carthaginensis* subsp. *glaziovii* (*L.P. Felix 11528*), 2*n* = 36; **B,** *Manihot esculenta* ‘Pornunça’ (*L.P. Felix 11510*), 2*n* = 36; **C,** *Manihot esculenta* ‘Manipeba’ (*L.P. Felix 12037*), 2*n* = 36; **D,** *Manihot dichotoma* (*L.P. Felix 11423*), 2*n* = 36; **E,** *Manihot leptophylla* (*L.P. Felix 11425*), 2*n* = 36; **F,** *Manihot tripartita* subsp. *tripartita* (*L.P. Felix 12035*), 2*n* = 36. — Scale bar = 10 µm.

Manihot tripartita (Spreng.) Müll.Arg. subsp. *tripartita*

2*n* = 36, CHN. Brazil, Bahia, Jacobina, 11°10′50″ S, 40°31′06″ W, 24 Oct 2007, *L.P. Felix 12035* (EAN). [Fig. 13F].

The Euphorbiaceae family comprises 218 genera and 5735 species with pantropical distribution (Stevens, 2014). *Croton* L., one of the main Euphorbiaceae genera, is subdivided in 40 sections with more than 1300 species, of those 314 species and 29 sections occur in Brazil (Cordeiro & al., 2014) and 52 species and 18 sections occur specifically in the northeast region of Brazil (Cordeiro & Carneiro-Torres, 2006). Cytologically, the *Croton* chromosome numbers range from 2*n* = 16 (Perry, 1943) to 2*n* = 64 (Fedorov, 1969), even though they are known only for 39 species, which represents less than 3% of all 1300 described species.

The genus *Manihot* Mill. has 110 Neotropical species and Brazil is considered as its diversity center, encompassing 72 species, including 66 endemic ones (Cordeiro & al., 2014). It is very stable regarding chromosome number, prophase condensation pattern and interphase nucleus structure. These characteristics were confirmed in the present work, as well as in other studies of *Manihot* species in the northeast and west-central regions of Brazil (Perry, 1943; Nassar, 1978, 1980; Carvalho & Guerra, 2002).

The aim of this work was to confirm previous chromosome counts and present new counts for *Croton*, *Manihot*, *Acalypha* L., *Astraea* Klotzsch (previously classified as *Croton*) and *Euphorbia* L. species collected in northeast Brazil, in order to identify chromosome number variation among species, sections and correlate these data with phylogeny assumptions.

In the genus *Croton*, all species showed symmetric karyotypes, mostly metacentric and submetacentric chromosomes, except *C. pedicellatus* with a bimodal karyotype. Prophase condensation pattern and interphase nucleus structure were stable, with no variation among species although differences of chromosome numbers were found among sections and species. Considering the phylogeny hypothesis and the chromosome number variation observed in *Croton*, it is possible to suggest $x_1 = 8$ as the primary basic chromosome number of the genus. Secondary chromosome numbers as $x = 7$, 9 and 10 and their polyploids may have arisen by dysploidy. The analysis of sympatric species with the same chromosome number but with minor dissimilarities in interphase nucleus structure suggests other reproductive isolation barriers acting to local speciation in *Croton*.

For the genus *Manihot*, only one karyotypic differentiation was observed, namely in *M. leptophylla* (*Manihot* sect. *Peruvianae* D.J.Rogers & Appan): a chromosome pair with proximal secondary constriction. As other species from this section, *M. leptophylla* has scandent habit and wide distribution, occurring from Ecuador to northeast Brazil (Pernambuco state) (Rogers & Appan, 1973). Similar karyotypic behavior was also observed in a *Manihot* sp. with scandent habit collected in Piaui (northeast Brazil; Carvalho & Guerra, 2002), suggesting that a proximal secondary constriction should be a cytotaxonomic marker also of other species from *Manihot* sect. *Peruvianae*.

For the other genera, we found 2*n* = 38 for *Acalypha multicaulis*, 2*n* = 60 for *Euphorbia sarcodes* (first chromosome counts) and 2*n* = 18 for *Astraea lobata* (confirming previous count).

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* First chromosome count for the species.

** New chromosome number (cytotype) for the species.

▲ Chromosome counts made by A.P. Sokolovskaya (unpub.).

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ALISMATACEAE

Alisma plantago-aquatica L.

▲ 2*n* = 14, CHN. Kyrgyzstan, 3 km of Anan'evo town, the lakeside of the Issyk-Kul' Lake, waterlogged plots of the bank, 28 Jul 1978, *N.S. Probatova & V.P. Seledets 5153* (VLA).

ASTERACEAE

Phalacroloma septentrionale (Fernald & Wiegand) Tzvelev

2*n* = 27, CHN. Russia, North Caucasus, Krasnodarskii Krai, Abinskii Raion, 18 km S of Abinsk town, near Shapsugskaya settlement, riverside of the Abin River, 1 Sep 2009, *N.S. Probatova & V.P. Seledets 11532* (VLA).

Pterocypsela indica (L.) C.Shih

2*n* = 18, CHN. Russia, Far East, Primorskii Krai, Peter the Great Bay, Elena Island, Cape Larionova, lower part of the slope, among tall herbs, 19 Sep 1997, *N.S. Probatova & V.P. Seledets 7563* (VLA).

Plants with dissected leaves.

Saussurea pulchella (Fisch.) Fisch.

2*n* = 26, CHN. Russia, Far East, Amurskaya Oblast', Arkharinskii Raion, 50 km SE of Arkhara town, 10 km of the railway station Uril, S slope nearby the limits of the Khinganskii nature reserve, light oak forest with steppe herb layer, 17 Sep 2004, *N.S. Probatova & V.P. Seledets 9448* (VLA).

Sonchus oleraceus L.

2*n* = 32, CHN. Russia, European part, Leningradskaya Oblast', Sankt-Peterburg, Botanical Institute of the Russian Academy of Sciences, as a weed in the park, among trees and shrubs, 16 Sep 2009, *N.S. Probatova & V.P. Seledets 11543* (VLA).

CHENOPODIACEAE

Atriplex patens Iljin

2*n* = 36, CHN. Russia, Far East, Primorskii Krai, Peter the Great Bay, Elena Island, near Cape Larionova, spray zone, 19 Sep 1997, *N.S. Probatova & V.P. Seledets 7531* (VLA).

Kali komarovii (Iljin) Akhani & Roalson

2*n* = 36, CHN. Russia, Far East, Primorskii Krai, Khassanskii Raion, Gamova Peninsula, Astafjeva Bay, sandy beach, 19 Oct 2013, *O.A. Chernyagina 12463* (VLA).

CONVALLARIACEAE

Clintonia udensis Trautv. & C.A.Mey.

2*n* = 14, CHN. Russia, Far East, Primorskii Krai, Muravëv-Amurskii Peninsula, NW slope of the Okeanskii mountain ridge, the area of Bogatinskoe reservoir, *Abies* forest, 18 Sep 2013, *E.M. Bulakh 12425* (VLA).

CRASSULACEAE

Hylotelephium pallescens (Freyn) H.Ohba

2*n* = 24, CHN. Russia, Far East, Primorskii Krai, Peter the Great Bay, Russkii Island, 3 km SE of Glavnaya Mt., the edge of the *Fraxinus* valley forest, 17 Oct 1998, *N.S. Probatova & V.P. Seledets 7723* (VLA).

EUPHORBIACEAE

Euphorbia lucorum Rupr.

▲2*n* = ca. 40, CHN. Russia, Far East, Primorskii Krai, Dal'negorskii Raion, near Dal'negorsk town, Partizanskaya Pad', Sep 1985, *N.S. Probatova & V.P. Seledets 6723* (VLA).

IRIDACEAE

Iris mandshurica Maxim.

2*n* = 24, CHN. Russia, Far East, Primorskii Krai, Mikhailovskii Raion, W outskirts of Novoshakhtinskii town, near the forest shelterbed attached to the railroad, 13 May 2008, *V.T. Lapenko 10961* (VLA).

LAMIACEAE

Scutellaria strigillosa Hemsl.

2*n* = 16, CHN. Russia, Far East, Primorskii Krai, Amurskii Bay, west coast, Cape Ugol'nyi, sea shore, 10 Sep 2011, *E.B. Volynets 11906* (VLA).

PAPAVERACEAE

Chelidonium asiaticus (Hara) Krahulc.

▲2*n* = 10, CHN. Russia, Far East, Primorskii Krai, Terneiskii Raion, Sikhote-Alinskii biosphere reserve, near cordon Zabolochennyi, the riverside of Zabolochennaya River, damp forest edge, 5 Sep 1979, *N.S. Probatova 5469* (VLA).

POACEAE

Agropyron cristatum (L.) P.Beauv.

▲2*n* = 28, CHN. Russia, East Siberia, Republic of Yakutia, 10 km SW of Yakutsk city, Chuchur-Muran Mt., *Festuca* and *Stipa* steppe on the slope, 30 Jul 1973, *N.S. Probatova & V.P. Seledets 3769* (VLA); Russia, East Siberia, Republic of Yakutia, 10 km SW of Yakutsk city, Chuchur-Muran Mt., the slope covered with steppe vegetation, 30 Jul 1973, *N.S. Probatova 3849* (VLA); Russia, East Siberia, Republic of Yakutia, 12 km SW of Yakutsk city, the *Pinus* forest edge, sandy roadside, 12 Aug 1973, *N.S. Probatova & V.P. Seledets 3780* (VLA).

Agrostis scabra Willd.

▲2*n* = 42, CHN. Russia, Far East, Khabarovskii Krai, Verkhnebureinskii Raion, in vicinity of Chegdomyn town, eroded clay-rubbly slope, along the roadside, 16 Sep 1976, *N.S. Probatova & V.P. Seledets 4478* (VLA).

×*Agrotrygia hajastanica* (Tzvelev) Tzvelev (*Agropyron* aggr. *cristatum* (L.) Gaertn. × *Elytrigia repens* (L.) Nevski)

*2*n* = 42, CHN. Russia, Far East, Amurskaya Oblast', Arkharinskii Raion, Leninskoe village, roadside, 27 Jul 2005, *T.N. Tolmacheva 10541* (VLA).

Alopecurus brachystachyus M.Bieb.

▲2*n* = >100, CHN. Russia, Far East, Amurskaya Oblast', Dzheltulakskii (Tyndinskii) Raion, near Tyndinskii (Tynda) town, the right riverside of the Tynda River, at the old sandy embankment of the BAM (Baikalo-Amurskaya trunk-railway), 6 Jun 1975, *N.S. Probatova & E.G. Rudyka 4004* (VLA).

Anisantha tectorum (L.) Nevski

▲2*n* = 14, CHN. Russia, Volga region, Volgogradskaya Oblast', Sredneakhtubinskii Raion, Krasnoslobodsk settlement, dry slope of a dam, 21 Jun 1979, *V.V. Makarov 6348* (VLA).

Anisantha tectorum var. *hirsuta* (Regel) Tzvelev

▲2*n* = 14, CHN. Russia, Republic of Daghestan, nearby Kumtor-Kala railway station, on sands, 13 Jun 1979, *N.S. Probatova 5559* (VLA).

Bromopsis angrenica (Drobow) Holub

*▲2*n* = 42, CHN. Tadzhikistan, Gissarskii Ridge, Anzob Pass, 3390 m, alpine meadow, 2 Jul 1973, *N.S. Probatova & V.P. Seledets 3741* (VLA).

Calamagrostis brachytricha Steud.

▲2*n* = 42, CHN. Russia, Far East, Primorskii Krai, Khassanskii Raion, Kedrovaya Pad' nature reserve, the clearing near the office, 3 Oct 1976, *Yu. Murdakhaev 4500* (VLA).

Calamagrostis lapponica (Wahlenb.) Hartm.

▲2*n* = >100, CHN. Russia, Far East, Khabarovskii Krai, Verkhnebureinskii Raion, in vicinity of Chegdomyn town, the edge of *Larix* forest with *Ledum*, 16 Sep 1976, *N.S. Probatova & V.P. Seledets 4479* (VLA).

Calamagrostis purpurea Trin.

▲2*n* = 28, CHN. Russia, Far East, Kamchatka Peninsula, Elizovskii Raion, Kronotskii nature reserve, caldera of the Uzon Volcano, 600 m, at the edge of a loose slope to geothermal field, abundant, 1 Aug 1982, *N.S. Probatova & E.G. Rudyka 6057* (VLA).

Chloris virgata Sw.

2*n* = 20, CHN. Russia, Far East, Khabarovskii Krai, Bikinskii Raion, Bikin town, on the railway embankment, between tracks, 20 Sep 2009, *L.A. Antonova 12361* (VLA).

Danthonia riabuschinskii (Kom.) Kom.

▲2*n* = 36, CHN. Russia, Far East, Kamchatka Peninsula, Elizovskii Raion, Kronotskii nature reserve, the upper course of the Listvennichnaya River, the light *Larix* forest, dry meadow, 25 Aug 1980, *V.V. Yakubov 6032* (VLA); Russia, Far East, Kamchatka Peninsula, Elizovskii Raion, Kronotskii nature reserve, left riverside of the Listvennichnaya River, near its mouth (the basin of Kronotskoe Lake), dry meadow at the edge of *Larix* forest, 31 Aug 1980, *V.V. Yakubov 6035* (VLA).

Deschampsia paramushirensis Honda

2*n* = 26, CHN. Russia, Far East, Primorskii Krai, Terneiskii Raion, Sikhote-Alinskii biosphere reserve, the locality Golubichnoe, on the bank of the branch of Golubichnaya River, 15 Sep 2002, *I.A. Nesterova 8913* (VLA).

Digitaria asiatica Tzvelev

2*n* = 18, CHN. Russia, Far East, Khabarovskii Krai, the Bol'shekhekhtsyrskii nature reserve, right riverside of the Ussuri River, sandbank near the mouth of the Chirka River, 1 Sep 1993, *N.S. Probatova & V.P. Seledets 7150* (VLA).

The specimen was misidentified as "*D. ischaemum*" by Probatova & al. (1996).

Digitaria sanguinalis (L.) Scop.

2*n* = 36, CHN. Russia, North Caucasus, Krasnodarskii Krai, Krymskii Raion, 117 km W of Krasnodar city, near Nizhne-Bakanskaya settlement, roadside, 3 Sep 2009, *N.S. Probatova & V.P. Seledets 12345* (VLA).

Elymus dahuricus Turcz.

▲2*n* = 42, CHN. Kyrgyzstan, 3 km of Anan'evo town, the lakeside of the Issyk-Kul' Lake, 28 Jul 1978, *N.S. Probatova & V.P. Seledets 5152* (VLA).

Elymus subfibrosus (Tzvelev) Tzvelev

▲2*n* = 28, CHN. Russia, East Siberia, Republic of Yakutia, Bulunskii Raion, left riverside of the Lena River, near Bulun settlement, on sands, 4 Aug 1973, *N.S. Probatova & V.P. Seledets 3776* (VLA).

Elytrigia elongatiformis (Drobow) Nevski

▲2*n* = 42, CHN. Tadjikistan, West Pamir, Porshnev, the bank of the Pyandzh River, 31 Jul 1936, *A.P. Sokolovskaya & O.S. Strelkova 90* (VLA).

Elytrigia repens (L.) Nevski

▲2*n* = 42, CHN. Russia, European part, Leningradskaya Oblast', Gatchinskii Raion, near Vyra settlement, along the bank of the Oredezh River, 29 Jun 1974, *A.P. Sokolovskaya 9* (VLA); Russia, East Siberia, Republic of Yakutia, 10 km SW of Yakutsk city, near Chuchur-Muran Mt., meadow, 28 Jul 1973, *N.S. Probatova & V.P. Seledets 3761* (VLA); Ukraine, left riverside of the Dnepr River, 12 km above Kiev city, at the mouth of the Desna River, sandy bank, 21 Jul 1976, *N.S. Probatova 4381* (VLA).

Hierochloe arctica J.Presl

▲2*n* = 56, CHN. Russia, Komi Republic, in vicinity of Vorkuta town, 1967, *A.P. Sokolovskaya s.n.* (LE).

The specimen was misidentified as "*H. odorata*" in Sokolovskaya (1970).

Hierochloe baltica (G.Weim.) Czerep.

▲2*n* = 42, CHN. Russia, European part, Leningradskaya Oblast', Oranienbaumskii Raion, near Glyadino village, the small grassy bog, 26 Jun 1976, *N.S. Probatova 4349* (VLA).

Hordeum violaceum Boiss. & Hohen.

▲2*n* = 14, CHN. Russia, Republic of Daghestan, Buinakskii Raion, 16 km W of Buinaksk town, near Manas-aul village, at the bottom of Gimrinskii Ridge, 960 m, the tourist centre "Termenlik", mountain slope, 18 Jun 1979, *N.S. Probatova 5411* (VLA).

Phleum phleoides H.Karst.

▲2*n* = 28, CHN. Kazakhstan, Chimkentskaya Oblast', the Aksu-Dzhabagly nature reserve, the canyon of the Dzhabagly River, in the *Juniperus* forest, on the slope, 12 Jul 1974, *V.V. Fedyaeva 3976* (VLA).

Poa filiculmis Roshev.

* 2*n* = 42, CHN. Russia, Far East, Kamchatskii Krai, Penzhinskii Raion, Parapol'skii dale, E of the Talovskoe Lake, the nature reserve "Koryakskii", shrubs and lichens tundra, 24 Jul 2013, *V.V. Yakubov 12444* (VLA).

Poa palustris L.

2*n* = 28, CHN. Russia, European part, Leningradskaya Oblast', Sankt-Peterburg, near the railway station Udel'naya, on the lawn at the building, 29 Sep 2009, *N.S. Probatova & V.P. Seledets 11806* (VLA).

Poa sichotensis Prob.

▲2*n* = ca.56, CHN. Russia, Far East, Primorskii Krai, Terneiskii Raion, the Sikhote-Alinskii biosphere reserve, near cordon Zabolochennyi, the riverside of Zabolochennaya River, forest edge, 5 Sep 1979, *N.S. Probatova 5472* (VLA).

Poa skvortzovii Prob.

▲2*n* = 42, CHN. Russia, Far East, Primorskii Krai, Terneiskii Raion, the Sikhote-Alinskii biosphere reserve, near cordon Zabolochennyi, on pebbles of the Zabolochennaya River, 5 Sep 1979, *N.S. Probatova 5471* (VLA).

Setaria faberi R.A.W.Herrm.

2*n* = 36, CHN. Russia, Far East, Khabarovskii Krai, the Bol'shekhekhtsyrskii nature reserve, right riverside of the Ussuri River, 31 Aug 1993, *N.S. Probatova & V.P. Seledets 7189* (VLA).

Setaria pachystachys (Franch. & Sav.) Matsum.

2*n* = 18, CHN. Russia, Far East, Primorskii Krai, Peter the Great Bay, Elena Island, Cape Larionova, rocky slope, at the path, 19 Sep 1997, *N.S. Probatova & V.P. Seledets 7523* (VLA).

Setaria pumila (Poir.) Roem. & Schult.

2*n* = 36, CHN. Russia, North Caucasus, Krasnodarskii Krai, near Erivanskaya settlement, the Abin River, on pebbles, 5 Sep 2009, *N.S. Probatova & V.P. Seledets 11597* (VLA).

POLYGONACEAE

Persicaria lapathifolia (L.) Gray

2*n* = 22, CHN. Russia, Far East, Amurskaya Oblast', the outskirts of Blagoveshchensk city, paleontological monument "Dinosaurus fossil area", as a weed on the waste ground, 3 Oct 2007, *N.S. Probatova & V.P. Seledets 11123* (VLA).

Truellum dissitiflorum (Hemsl.) Tzvelev

2*n* = 20, CHN. Russia, Far East, Primorskii Krai, Muravëv-Amurskii Peninsula (Vladivostok), Akademgorodok, among shrubs near the building, 2003, *N.S. Probatova & V.P. Seledets 11591* (VLA).

Seeds previously have been deposited into liquid nitrogen for seven years.

RANUNCULACEAE

Adonis amurensis Regel & Radde

2*n* = 16, CHN. Russia, Far East, Khabarovskii Krai, Khabarovskii Raion, in vicinity of Korfovskii settlement, the Bol'shekhekhtzyrskii nature reserve, deciduous forest on the slope, 8 Apr 1985, *V. Bavrin 6523* (VLA).

ROSACEAE

Potentilla fragarioides L.

2*n* = 14, CHN. Russia, Far East, Amurskaya Oblast', Arkharinskii Raion, near the limit of the Khinganskii nature reserve, left riverside of the brook Sokolovskogo, roadside of the federal highway, 17 Sep 2004, *N.S. Probatova & V.P. Seledets 9464* (VLA); Russia, Far East, Primorskii Krai, Nadezhdinskii Raion, in vicinity of Taëzhnoe settlement, the country place "Kiparis", 29 Sep 2013, *N.S. Probatova & V.P. Seledets 12434* (VLA).

Potentilla intermedia L.

2*n* = 28, CHN. Russia, Far East, Amurskaya Oblast', Arkharinskii Raion, 10 km S of Kundur settlement, nearby the Khinganskii

nature reserve, the bank of the Mutnaya River, the recreation place, on rubbly ground, 17 Sep 2004, *N.S. Probatova & V.P. Seledets 9462* (VLA).

Potentilla norvegica L.

2*n* = 56, CHN. Russia, Far East, Amurskaya Oblast', Arkharinskii Raion, 60 km SE of Arkhara town, the Khinganskii nature reserve, 28-th part of Khinganskoe forestry, near Tarmanchukanskii railway tunnel, on roadside, 17 Sep 2004, *N.S. Probatova & V.P. Seledets 9490* (VLA).

Potentilla paradoxa Nutt. ex Torr. & A.Gray

2*n* = 28, CHN. Russia, East Siberia, Irkutskaya Oblast', Irkutsk city, waste ground at the retaining wall of the hotel "Vostok-Zapad", 18 Sep 2007, *N.S. Probatova & V.P. Seledets 10686* (VLA); Russia, Far East, Amurskaya Oblast', outskirts of Blagoveshchensk city, paleontological monument "Dinosaurus fossil area", on the waste ground, 3 Oct 2007, *Probatova & V.P. Seledets 11259* (VLA); Russia, Far East, Primorskii Krai, Muravëv-Amurskii Peninsula, Ussuriyskii Gulf, Murav'inaya (Tavaiza) Bay, marine terrace, the recreation place, 21 Oct 2004, *N.S. Probatova & V.P. Seledets 9675* (VLA); Russia, Far East, Primorskii Krai, Vladivostok, Ovchinnikova Street, as a weed on the lawn, 14 Nov 2007, *N.S. Probatova & V.P. Seledets 10775* (VLA).

RUBIACEAE

Galium dahuricum Turcz.

2*n* = 44, CHN. Russia, Far East, Amurskaya Oblast', 18 km E of Shimanovsk town, near the railway station Seletkan, at the edge of *Larix* and *Pinus* forest, 6 Sep 1976, *N.S. Probatova & V.P. Seledets 4646* (VLA); Russia, Far East, Primorskii Krai, Peter the Great Bay, Naumova Island, 29 May 1978, *V.P. Seledets 4956* (VLA).

Earlier the specimen *4646* was misidentified as "*G. verum*" (Probatova & al., 2005). The specimen *4956* was published as "*G. verum*" (Probatova & Sokolovskaya, 1981) and, later, as "*G. ruthenicum*" (Probatova & Sokolovskaya, 1989).

SCROPHULARIACEAE

Veronica biloba L.

** 2*n* = ca.24, CHN. Russia, Far East, Primorskii Krai, Vladivostok, Dal'zavodskaya Street, as a weed on the slope, near the building, 2003, *N.S. Probatova & V.P. Seledets 9075* (VLA).

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* First chromosome count for the species.
** First chromosome count for the genus.

Cc = Carpological collection of the Botanical Garden of the Moscow State University.

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UMBELLIFERAE/APIACEAE

Aegopodium tadshikorum Schischk.

2*n* = 22, CHN. Uzbekistan, Kashka-Darja prov., near Djawuz village, basin of Djindy-darja, Kitab geological reserve, Chodja-kurgan stream, 39°11′N, 67°17′E, 19 Jul 2010, *M.G. Pimenov & E.V. Kljuykov s.n.* (Cc). [Fig. 14A]

Four chromosome number reports from Kazakhstan and Kyrgyzstan were published with *n* = 11 or 2*n* = 22 (Retina & Pimenov, 1977; Rostovtzeva, 1982; Vasil'eva & al., 1994).

Aulacospermum simplex Rupr.

2*n* = 18, CHN. Kazakhstan, Almaty prov., Transili ridge, vicinity of Medeo, Chimbulak, 2800 m, 43°07′49″N, 77°04′55″E, 30 Aug 2011, *M.G. Pimenov & E.V. Kljuykov 3* (MW). [Fig. 15A]

Three chromosome number reports from Kyrgyzstan were published with 2*n* = 18 (Vasil'eva & al., 1981; Pimenov & Vasil'eva, 1983; Shner & al., 2012).

Aulacospermum tianschanicum (Korovin) C.Norman

2*n* = 18, CHN. Kyrgyzstan, Chuja Province & District, S slope of Kirgiz Ridge, middle reaches of Shamsi River, 42°30′N, 75°13′E, 18 Aug 10, *U.A. Ukrainskaya & E.A. Zakharova 26* (MW). [Fig. 14B]

This is the second chromosome number report for this species; the previous one (*n* = 9) was published from Kyrgyzstan as well (Vasil'eva & al., 1991).

Heracleum dissectum Ledeb.

2*n* = 22, CHN. Kazakhstan, Almaty prov., Transili ridge, vicinity of Medeo, 43°08′29″N, 77°02′50″E, 28 Aug 2011, *M.G. Pimenov & E.V. Kljuykov s.n.* (Cc). [Fig. 15B]

More than sixteen chromosome number reports were published for this species from Siberia and the Russian Far East region; all are *n* = 11 or 2*n* = 22 (Pimenov & al., 2002). The material from the Middle Asia was studied here for the first time.

Lomatocarpa albomarginata (Schrenk ex Fisch. & C.A.Mey.) Pimenov & Lavrova

2*n* = 22, CHN. Kyrgyzstan, Issyk Kul prov., Terskey Alatau ridge, Barskaun pass, 42°04′09″N, 77°35′42″E, 16 Aug 2010, *U.A. Ukrainskaya & E.A. Zakharova s.n.* (Cc). [Fig. 14C]

Two previous chromosome number reports were published from Tajikistan and Kyrgyzstan are the same (*n* = 11; 2*n* = 22) (Retina & Pimenov, 1977; Vasil'eva & al., 1991).

Pleurospermum uralense Hoffm.

2*n* = 18, CHN. Russia, Autonomous Republic of Buryatia (Transbaikal region), Alchanai Mt., 50°52′36″N, 113°22′34″E, 10 Aug 2010, *N. Formozov s.n.* (MW). [Fig. 15C]

At least fifteen earlier chromosome number reports were published for this species (Pimenov & al., 2002); the majority of them

are $n = 9$ or $2n = 18$; there are, however, earlier reports of $2n \approx 50$ (Sokolovskaja, 1963), and $2n = 22$ and 44 (Gurzenkov & Gorovoy, 1971; Krogulevich, 1976).

**Prangos herderi* (Regel) Herrnst. & Heyn

$2n = 22$, CHN. Kazakhstan, Almaty prov., SW extremity of Djungar Alatau mountain system, Chulaktau Mts., Taldy-sai gorge, 43°57′42″ N, 78°05′23″ E, 2 Sep 2011, *M.G. Pimenov & E.V. Kljuykov s.n.* (Cc). [Fig. 14D]

This is the first chromosome number report for this species. It corresponds with most chromosome numbers, known for other *Prangos* Lindl. species, although polyploids with $2n = 36$, 44 and 66 also were found in this genus (Pimenov & al., 2002).

Pseudotrachydium dichotomum (Korovin) Pimenov & Kljuykov

$2n = 18$, CHN. Uzbekistan, Kashka-Darja prov., near Djawuz village, basin of Djindy-darja, Kitab geological reserve, Chodja-kurgan stream, 39°11′ N, 67°17′ E, 20 Jul 2010, *M.G. Pimenov & E.V. Kljuykov*, *22* (MW). [Fig. 14E]

There is a chromosome number report ($n = 9$) published from Tajikistan (Vasil'eva & al., 1991); plants from Uzbekistan has been studied here for the first time.

Scandix stellata Banks & Sol.

$2n = 20$, CHN. Kazakhstan, Almaty prov., mountain system of Djungar Alatau, Chulaktau Mts., Taldy-sai gorge, 43°57′42″ N, 78°55′23″ E, 2 Sep 2011, *M.G. Pimenov & E.V. Kljuykov s.n.* (Cc). [Fig. 14F]

This species was previously studied at least eight times (Pimenov & al., 2002); the usual chromosome number reported was $n = 10$ ($2n = 20$), other numbers, $n = 8$, $2n = 16$ (Garde & Malheiros-Garde, 1949) and $2n = 22$ (Vasil'eva & al., 1991) also were found.

**Schulzia prostrata* Pimenov & Kljuykov

$2n = 22$, CHN. Kyrgyzstan, Naryn prov., eastern extremity of Chatyr-kul hollow, alpine steppe with *Leucopoa olgae*, takyr, 40°40′02″N, 75°24′18″ E, 1 Sep 2011, *G. Lazkov s.n.* (MW). [Fig. 14G]

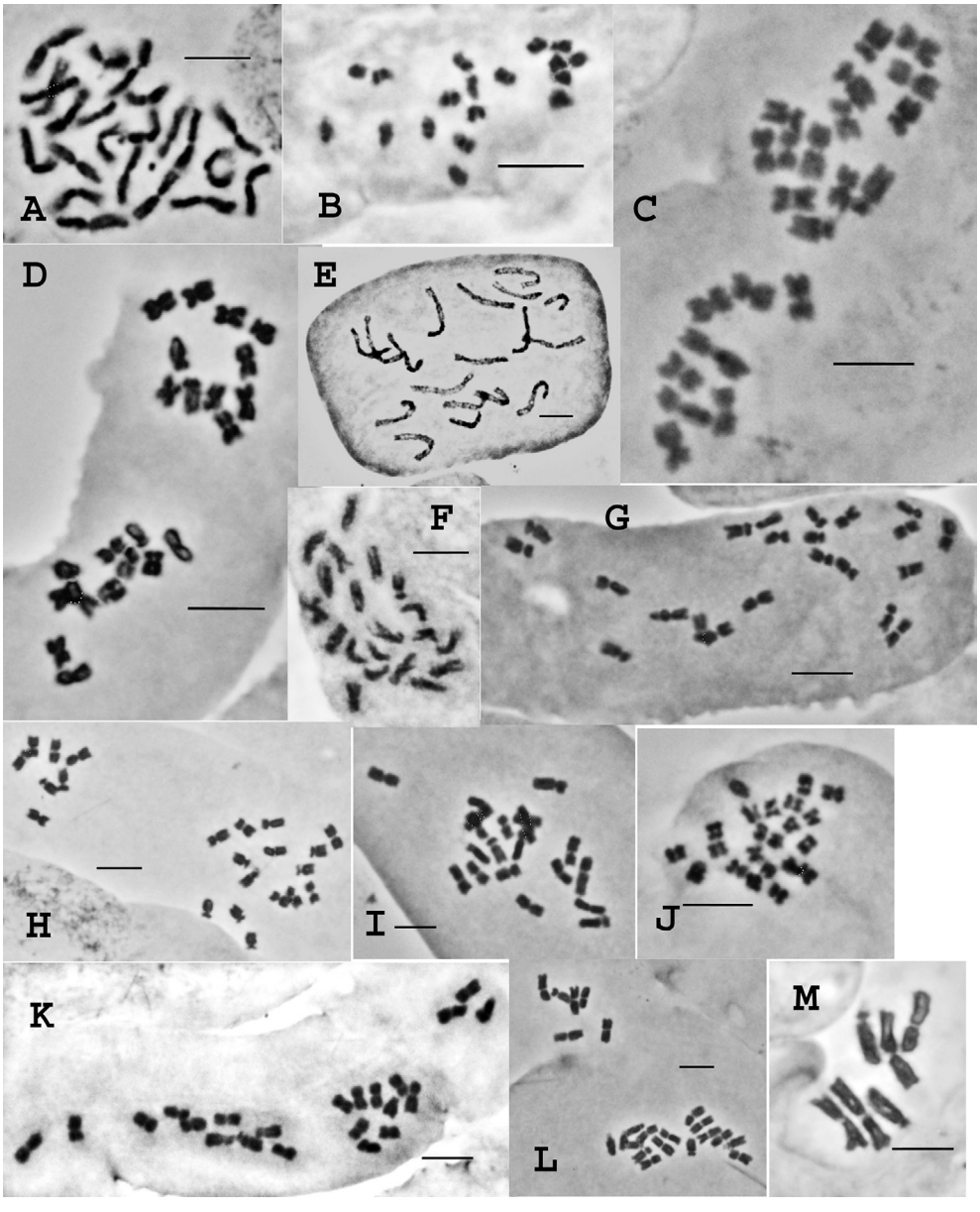

Fig. 14. Mitotic chromosomes. **A,** *Aegopodium tadshikorum*, $2n = 22$, late prophase; **B,** *Aulacospermum tianschanicum*, $2n = 18$; **C,** *Lomatocarpa albomarginata*, $2n = 22$; **D,** *Prangos herderi*, $2n = 22$; **E,** *Pseudotrachydium dichotomum*, $2n = 18$, prophase; **F,** *Scandix stellata*, $2n = 20$, late prophase; **G,** *Schulzia prostrata*, $2n = 22$; **H,** *Seseli abolinii*, $2n = 22$; **I,** *Seseli eriocephalum*, $2n = 20$; **J,** *Seseli mucronatum*, $2n = 22$; **K,** *Seseli schrenkianum*, $2n = 22$; **L,** *Tschulaktavia saxatilis*, $2n = 22$; **M,** *Zozima korovinii*, $2n = 6$. — Scale bars = 5 µm.

This species was investigated here karyologically for the first time. The chromosome number determined corresponds to those known for other studied species of the genus *Schulzia* Spreng., *S. crinita* (Pall.) Spreng. (Pimenov & al., 2002) and *S. albiflora* (Kar & Kir.) Popov (Pimenov & al., 2006).

Seseli abolinii (Korovin) Schischk.

2*n* = 22, CHN. Kazakhstan, Almaty prov., SW extremity of Djungar Alatau mountain system, Altyn-emel pass, 44°21′30″ N, 78°22′51″ E, 1 Sep 2011, *M.G. Pimenov & E.V. Kljuykov 4* (MW). [Fig. 14H]

Two previous chromosome number reports published for the species were identical (Retina & al., 1977; Pimenov & Vasil'eva, 1983).

**Seseli eriocephalum* (Pall. ex Spreng.) Schischk.

2*n* = 20, CHN. Kazakhstan, Almaty prov., mountain system of Djungar Alatau, saline dry river-bed in foothills of Chulaktau Mts., 43°52′58″ N, 78°23′06″ E, 1 Sep 2011, *M.G .Pimenov & E.V. Kljuykov 5* (MW). [Fig. 14I]

This species was investigated here karyologically for the first time.

Seseli mucronatum (Schrenk ex Fisch. & C.A.Mey.) Pimenov & Sdobnina

2*n* = 22, CHN. Kazakhstan, Almaty prov., Transili ridge, vicinity of Medeo, Chimbulak, 43°07′49″ N, 77°04′55″ E, 30 Aug 2011, *M.G.Pimenov & E.V. Kljuykov s.n.* (Cc). [Fig. 14J]

Seven chromosome number reports were published for this species; the majority of them were 2*n* = 22 (Pimenov & al., 2002). The polyploid/aneuploid series with 2*n* = 22, 32, 132 was revealed, however, in Kyrgyzstan (Retina & al., 1977).

Seseli schrenkianum (C.A.Mey. ex Schischk.) Pimenov & Sdobnina

2*n* = 22, CHN. Kazakhstan, Almaty prov., Transili ridge, Medeo, 43°08′29″ N, 77°02′50″ E, 30 Aug 2011, *M.G.Pimenov & E.V. Kljuykov s.n.* (Cc). [Fig. 14K]

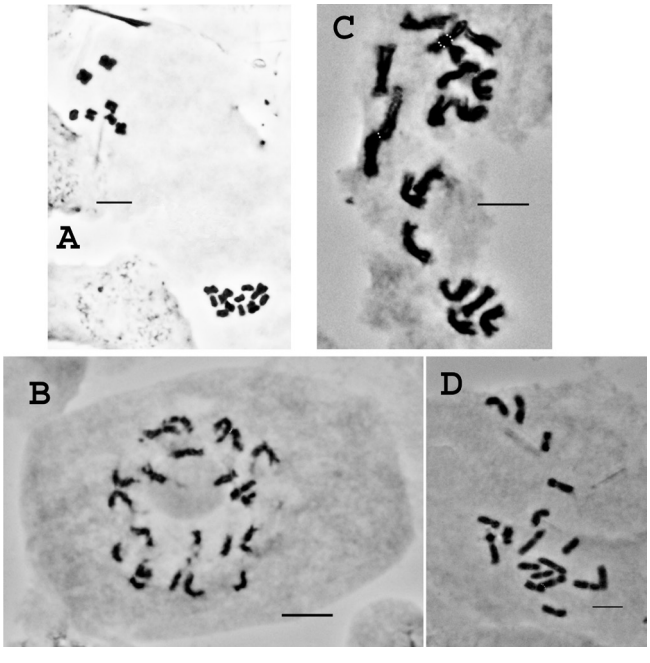

Fig. 15. Mitotic chromosomes. **A,** *Aulacospermum simplex*, 2*n* = 18; **B,** *Heracleum dissectum*, 2*n* = 22, late prophase; **C,** *Pleurospermum uralense*, 2*n* = 18; **D** *Trinia multicaulis*, 2*n* = 18. — Scale bars = 5 µm.

This chromosome number report corresponds to the previous ones from Kazakhstan and Kyrgyzstan (Pimenov & Vasil'eva, 1983; Pimenov & al., 1998).

Trinia multicaulis (Poir.) Schischk.

2*n* = 18, CHN. Russia, Volgograd prov., Ilovlja distr., railway station Kashalino, 49°07′18″ N 44°03′05″ E, 25 Jun 2010, *S. Majorov s.n.* (MW). [Fig. 15D]

The same chromosome numbers (*n* = 9, 2*n* = 18) were previously counted for the plants of this species from Ukraine (Kord'um, 1967; Fedoronchuk, 1979); material from Russia is investigated here for the first time.

***Tschulaktavia saxatilis* (Bajtenov) Bajtenov ex Pimenov & Kljuykov

2*n* = 22, CHN. Kazakhstan, Almaty prov., SW extremity of Djungar Alatau mountain system, Chulaktau Mts., Taldy-sai gorge, 43°57′42″ N, 78°05′23″ E, 2 Sep 2011, *M.G. Pimenov & E.V. Kljuykov 6* (MW). [Fig. 14L]

This is the first chromosome number count for this very rare species, belonging to the monotypic genus (Pimenov & al., 2012).

Zozima korovinii Pimenov

2*n* = 6, CHN. Kyrgyzstan, Chuy prov., Kirghiz Alatau ridge, Chamsi gorge, 42°38′02″ N, 75°22′24″ E, 18 Aug 2010, *U.A. Ukrainskaya & E.A. Zakharova s.n.* (Cc). [Fig. 14M]

We confirmed the previous count of *Z. korovinii*, rare for the Umbelliferae, from Kyrgyzstan (Retina & Pimenov, 1981).

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