IAPT CHROMOSOME DATA

IAPT chromosome data 39

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IAPT chromosome data 39/1

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All materials for the chromosome column should be submitted electronically to: Karol Marhold, karol.marhold@savba.sk. The full version of this contribution is available in the online edition of TAXON appended to this article. The following citation format is recommended: Korobkov, A.A., Kotseruba, V.V. & Krivenko, D.A. 2019. IAPT chromosome data 30/4. In: Marhold, K. & Kučera, J. (eds.) & al., IAPT chromosome data 30. *Taxon* 68: 882, E1–E2.

All materials CHN; collectors: *EMA* = E.M. Almeida, *JPC* = J.P. Castro, *LPF* = L.P. Felix; vouchers in EAN (Herbarium Prof. Jayme Coelho de Moraes).

ARACEAE

Anthurium affine Schott, 2*n* = 30; Brazil, Alagoas, *LPF 15163*; Brazil, Bahia, *EMA 882*; Brazil, Paraíba, *EMA 524*, *EMA 832*, *LPF 18526*, *LPF 18547*, *LPF 18612*; Brazil, Pernambuco, *EMA 453*, *LPF 14360*. 2*n* = 30 + 1B; Brazil, Bahia, *EMA 966*, *LPF 14802*, *LPF 18816*; Brazil, Minas Gerais, *LPF 19304*; Brazil, Pernambuco, *EMA 462*, *JPC 408*. 2*n* = 30 + 2B; Brazil, Alagoas, *LPF 19447*; Brazil, Paraiba, *LPF 14635*. 2*n* = 30 + 3B; Brazil, Alagoas, *EMA 476*; Brazil, Paraiba, *LPF 18580*. 2*n* = 30 + 4B; Brazil, Bahia, *LPF 18887*.

IAPT chromosome data 39/2

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All materials CHN; collectors: *EMA* = E.M. Almeida, LNGR = *L.N.G. Rocha*, *LPF* = L.P. Felix; vouchers in EAN (Herbarium Jayme Coelho de Moraes).

CACTACEAE

Arrojadoa bahiensis (P.J.Braun & Esteves) N.P.Taylor & Eggli, 2*n* = 22; Brazil, Bahia, *EMA 2979*.
Brasiliopuntia brasiliensis (Willd.) A.Berger, 2*n* = 22; Brazil, Paraíba, *EMA 1584*.
Epiphyllum phyllanthus (L.) Haw. subsp. *phyllanthus*, 2*n* = 22; Brazil, Pernambuco, *EMA 1690*.
Facheiroa squamosa (Gürke) P.J.Braun & Esteves, 2*n* = 22; Brazil, Bahia, *EMA 1943*.
Facheiroa ulei (Gürke) Werderm., 2*n* = 22; Brazil, Bahia, *EMA 1789*.
Harrisia adscendens (Gürke) Britton & Rose, 2*n* = 22; Brazil, Pernambuco, *EMA 1735*.
Hylocereus setaceus (Salm-Dyck) Ralf Bauer, 2*n* = 44; Brazil, Paraíba, *EMA 1596*.
Lepismium cruciforme (Vell.) Miq., 2*n* = 22; Brazil, Pernambuco, *EMA 1636*.
Micranthocereus flaviflorus Buining & Brederoo, 2*n* = 22; Brazil, Bahia, *EMA 1820*.
Micranthocereus polyanthus (Werderm.) Backeb., 2*n* = 22; Brazil, Bahia, *EMA 1767*.
Pereskia aculeata Mill., 2*n* = 22; Brazil, Minas Gerais, *EMA 1594*.
Pereskia grandifolia Haw., 2*n* = 22; Brazil, Sergipe, *LPF 18045*.
Quiabentia zehntneri (Britton & Rose) Britton & Rose, 2*n* = 22; Brazil, Bahia, *LNGR 847*.
Rhipsalis cereuscula Haw., 2*n* = 22; Brazil, Pernambuco, *EMA 1631*.
Rhipsalis floccosa Salm-Dyck ex Pfeiff. subsp. *floccosa*, 2*n* = 44; Brazil, Pernambuco, *EMA 1692*.
Tacinga armata J.G.Freitas & E.M.Almeida, 2*n* = 66; Brazil, Pernambuco, *EMA 3172*.
Tacinga inamoena (K.Schum.) N.P.Taylor & Stuppy, 2*n* = 44; Brazil, Pernambuco, *EMA 1645*.
Tacinga werneri (Eggli) N.P.Taylor & Stuppy, 2*n* = 66; Brazil, Bahia, *EMA 2631*.

IAPT chromosome data 39/3

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The work was done within the research project 21T-1F132 "Biomorphological and palyno-karyological analysis of some wild and cultivated fruit plants of Armenia (Rosaceae: *Malus*, *Prunus*, *Pyrus*) and their conservation" supported by the Science Committee of the Ministry of Education, Science, Culture and Sports of the Republic of Armenia.

All materials CHN; collected in Armenia; collectors: *AGG* = *A.G. Ghukasyan*, *AVR* = *A.V. Rudov*, *GMZ* = *G.M. Zaroyan*, *GP* = *G. Parolly*, *GSG* = *G.S. Gabrielyan*, *JAA* = *J.A. Akopian*, *MEO* = *M.E. Oganesian*, *NK* = *N. Korotkova*, *ZA* = *Z. Asanidze*, *ZhHH* = *Zh.H. Hovakimyan*, *ZMP* = *Z.M. Paravyan*.

ROSACEAE

Pyrus caucasica Fed., 2*n* = 34; Armenia, Ararat Province, 03 Jul 2022, *JAA, GSG, AVR & GMZ s.n*. (ERE 291412).
Pyrus ×daralagezii Mulk., 2*n* = 34; Armenia, Vayots Dzor Province, 23 May 2019, *JAA, AGG, MEO & ZhHH s.n*. (ERE 201408).
Pyrus hyrcana var. *yeghegisi* Akopian, 2*n* = 34; Armenia, Vayots Dzor Province, 11 Aug 2019, *JAA, AGG & MEO s.n*. (ERE 199486).
Pyrus medvedevii Rubtzov, 2*n* = 34; Armenia, Vayots Dzor Province, 11 Aug 2019, *JAA, AGG & MEO s.n*. (ERE 201409).
Pyrus oxyprion Woronow, 2*n* = 34; Armenia, Ararat Province, 18 Jun 2017, *JAA, ZhHH & ZMP s.n*. (ERE 201411).
Pyrus takhtadzhianii Fed., 2*n* = 34; Armenia, Vayots Dzor Province, 26 Aug 2018, *JAA, NK, GP & ZA s.n*. (ERE 201410).

IAPT chromosome data 39/4

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All materials CHN; collectors: *JMPC* = J.M.P. Cordeiro, *LPF* = L.P. Felix; vouchers in EAN (Herbarium Jayme Coelho de Moraes).

MALVACEAE

Malvastrum coromandelianum (L.) Garcke, 2*n* = 24. Brazil, Paraíba, *JMPC 1389*.
Sida acuta Burm.f., 2*n* = 28; Brazil, Paraíba, *JMPC 1387*.
Sida castanocarpa Krapov., 2*n* = 16; Brazil, Piauí, *LPF 17632*.
Sida cordifolia L., 2*n* = 28; Brazil, Paraíba, *JMPC 1472*.
Sida galheirensis Ulbr., 2*n* = 14; Brazil, Paraíba, *JMPC 1498*.

Sida glomerata Cav., 2*n* = 14; Brazil, Paraíba, *JMPC 1388*.
Sida jussiaeana DC., 2*n* = 16; Brazil, Paraíba, *JMPC 1468*.
Sida rhombifolia L., 2*n* = 14; Brazil, Paraíba, *JMPC 1390*. 2*n* = 28; Brazil, Paraíba, *JMPC 1391*.
Sidastrum multiflorum (Jacq.) Fryxell, 2*n* = 32; Brazil, Paraíba, *JMPC 1526*.
Sidastrum paniculatum (L.) Fryxell, 2*n* = 16; Brazil, Paraíba, *LPF 17645*.

IAPT chromosome data 39/5

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All materials CHN; collector: *GFS* = G.F. Smith; vouchers in PRU.

CRASSULACEAE

Kalanchoe alticola Compton, 2*n* = 34; South Africa, Mpumalanga, *GFS 1151*.
Kalanchoe gideonsmithii N.R.Crouch & Figueiredo, 2*n* = 34; South Africa, KwaZulu-Natal, *GFS 1153*.
Kalanchoe krigeae Gideon F.Sm. & Figueiredo, 2*n* = 34; South Africa, Mpumalanga, *GFS 1170*.
Kalanchoe laciniata (L.) DC., 2*n* = 34; Angola, Huílla, *GFS 1156*.
Kalanchoe leblanciae Raym.-Hamet, 2*n* = 34; South Africa, KwaZulu-Natal, *GFS 1142*.
Kalanchoe luciae Raym.-Hamet, 2*n* = 34; South Africa, Mpumalanga, *GFS 1144*.
Kalanchoe sexangularis N.E.Br., 2*n* = 34; South Africa, Mpumalanga, *GFS 1149*.

IAPT chromosome data 39/6

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APIACEAE

Alepidea peduncularis Steud. ex A.Rich., 2*n* = 16; Ethiopia, Arussi Prov., *MT 1628*.

ASTERACEAE

Eclipta prostrata (L.) L., 2*n* = 22; Tanzania, Dodoma Distr., *MT & B. Mhoro 550*.

CAMPANULACEAE

Lobelia dregeana (C.Presl) A.DC., 2*n* = 14; South Africa, Eastern Cape, *O.M. Hilliard & B.L. Burtt 10773*.
Lobelia walkeri (C.B.Clarke) W.J.de Wilde & Duyfjes, 2*n* = 28; Sri Lanka, Nuwara Eliya Distr., *N. Lundqvist 9040*.
Trachelium caeruleum L., 2*n* = 32; Algeria, W of Alger, *MT 2297*.
Wahlenbergia capensis (L.) A.DC., 2*n* = 18; South Africa, Cape Peninsula, *MT 2621*.
Wahlenbergia ecklonii H.Buek, 2*n* = 14; South Africa, Namaqualand, *MT 2237*.
Wahlenbergia flexuosa (Hook.f. & Thomson) Thulin, 2*n* = 16; Ethiopia, Arussi Prov., *MT 1340*.
Wahlenbergia patula A.DC., 2*n* = 18; Namibia, Karas, *MT 2629*.
Wahlenbergia pulchella subsp. *paradoxa* Thulin, 2*n* = 16; Tanzania, Iringa Distr., *B. Mhoro 1046*.

CARYOPHYLLACEAE

Silene burchellii Otth ex DC., 2*n* = 24; Tanzania, Njombe Distr., *MT & B. Mhoro 1148*.
Spergularia rubra (L.) J.Presl & C.Presl, 2*n* = 18; Ethiopia, Arussi Prov., *MT 1605*.

CRASSULACEAE

Crassula alsinoides (Hook.f.) Engl., 2*n* = 48; Ethiopia, Arussi Prov., *MT 1582*.
Sedum crassularia Raym.-Hamet, 2*n* = 88; Ethiopia, Arussi Prov., *MT 1657*.

FABACEAE

Alysicarpus rugosus subsp. *perennirufus* J.Léonard, 2*n* = 16; Ethiopia, Arussi Prov., *MT 1620*.
Argyrolobium confertum Polhill, 2*n* = 26; Ethiopia, Shoa Prov., *MT 1463*.
Argyrolobium rupestre subsp. *remotum* (Hochst. ex A.Rich.) Polhill, 2*n* = 30; Ethiopia, Arussi Prov., *MT 1393*.
Astragalus atropilosulus subsp. *burkeanus* (Benth. ex Harv.) J.B.Gillett, 2*n* = 16; Ethiopia, Arussi Prov., *MT 1573*.
Astragalus vogelii subsp. *fatimensis* Maire, 2*n* = 16; Ethiopia, Shoa Prov., *MT 1494*.
Crotalaria aculeata De Wild., 2*n* = 16; Tanzania, Njombe Distr., *MT & B. Mhoro 1191*.
Crotalaria rosenii (Pax) Milne-Redh. ex Polhill, 2*n* = 16; Ethiopia, Arussi Prov., *MT 1456*.
Indigofera arrecta Hochst. ex A.Rich., 2*n* = 16; Ethiopia, Arussi Prov., *MT 1348*.
Lotononis laxa Eckl. & Zeyh., 2*n* = 18; Ethiopia, Arussi Prov., *MT 1508*.
Lotus discolor E.Mey., 2*n* = 14; Ethiopia, Arussi Prov., *MT 1655*.
Lotus schoelleri Schweinf., 2*n* = 12; Ethiopia, Arussi Prov., *MT 1575*.
Medicago minima (L.) Bartal., 2*n* = 16; Ethiopia, Arussi Prov., *MT 1540*.
Medicago polymorpha L., 2*n* = 14; Ethiopia, Arussi Prov., *MT 1379*.
Melilotus suaveolens Ledeb., 2*n* = 16; Ethiopia, Arussi Prov., *MT 1436*.
Tephrosia emeroides A.Rich., 2*n* = 22; Ethiopia, Arussi Prov., *MT 1345*.
Trifolium baccarinii Chiov., 2*n* = 16; Ethiopia, Arussi Prov., *MT 1586*.
Trifolium calocephalum Fresen., 2*n* = 16; Ethiopia, Arussi Prov., *MT 1469*.
Trifolium cryptopodium Steud. ex A.Rich., 2*n* = 16; Ethiopia, Arussi Prov., *MT 1352*.
Trifolium lanceolatum (J.B.Gillett) J.B.Gillett, 2*n* = 16; Ethiopia, Arussi Prov., *MT 1646*.
Trifolium polystachyum Fresen., 2*n* = 16; Ethiopia, Arussi Prov., *MT 1556*.
Trifolium rueppellianum Fresen., 2*n* = 16; Ethiopia, Arussi Prov., *MT 1581*.
Trifolium schimperi A.Rich., 2*n* = 16; Ethiopia, Arussi Prov., *MT 1587*.
Trifolium simense Fresen., 2*n* = 16; Ethiopia, Arussi Prov., *MT 1358*.

Trifolium steudneri Schweinf., 2*n* = 16; Ethiopia, Gojam Prov., *J. Kahurananga & A. Ahmed 4482A*.
Vicia hirsuta (L.) Gray, 2*n* = 14; Ethiopia, Arussi Prov., *MT 1516*.
Vicia paucifolia Baker, 2*n* = 14; Ethiopia, Arussi Prov., *MT 1447*.
Vicia sativa subsp. *nigra* (L.) Ehrh., 2*n* = 12; Ethiopia, Arussi Prov., *MT 1382*.
Vigna vexillata (L.) A.Rich., 2*n* = 22; Ethiopia, Arussi Prov., *MT 1451*.

GERANIACEAE

Pelargonium multibracteatum Hochst. ex A.Rich., 2*n* = 18; Ethiopia, Arussi Prov., *MT 1689*.

LAMIACEAE

Coleus maculosus (Lam.) A.J.Paton, 2*n* = 56; Ethiopia, Arussi Prov., *MT 1459*.

PLANTAGINACEAE

Plantago africana Verdc., 2*n* = 48; Ethiopia, Arussi Prov., *MT 1636*.

RANUNCULACEAE

Delphinium dasycaulon Fresen., 2*n* = 16; Ethiopia, Arussi Prov., *MT 1545*.

IAPT CHROMOSOME DATA

IAPT chromosome data 39 – Extended version

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IAPT chromosome data 39/1

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* New cytotype for the species.

ARACEAE

Anthurium affine Schott

$2n = 30$, CHN. Brazil, Alagoas, Ibateguara, 08°58′35″S, 35°53′48″W, 28 Oct 2014, *L.P. Felix 15163* (EAN) [Fig. 1A]; Brazil, Bahia, Santa Brigida, 09°41′14″S, 30°13′50″W, 16 Jan 2014, *E.M. Almeida 882* (EAN) [Fig. 1B]; Brazil, Paraiba, Belem, 06°44′05″S, 35°31′03″W, 12 Jun 2012, *E.M. Almeida 524* (EAN) [Fig. 1C]; Brazil, Paraiba, Barra de Santana, 07°29′01″S, 36°02′59″W, 22 Dec 2013, *E.M. Almeida 832* (EAN) [Fig. 1D]; Brazil, Paraiba, Esperança, 07°01′01″S, 35°52′50″W, 13 Apr 2020, *L.P. Felix 18526* (EAN) [Fig. 1E]; Brazil, Paraiba, Bananeiras, 06°44′29″S, 35°37′03″W, 29 Apr 2020, *L.P. Felix 18547* (EAN) [Fig. 1F]; Brazil, Paraiba, Algodao de Jandaira, 06°48′57″S, 35°55′19″W, 12 Apr 2021, *L.P. Felix*

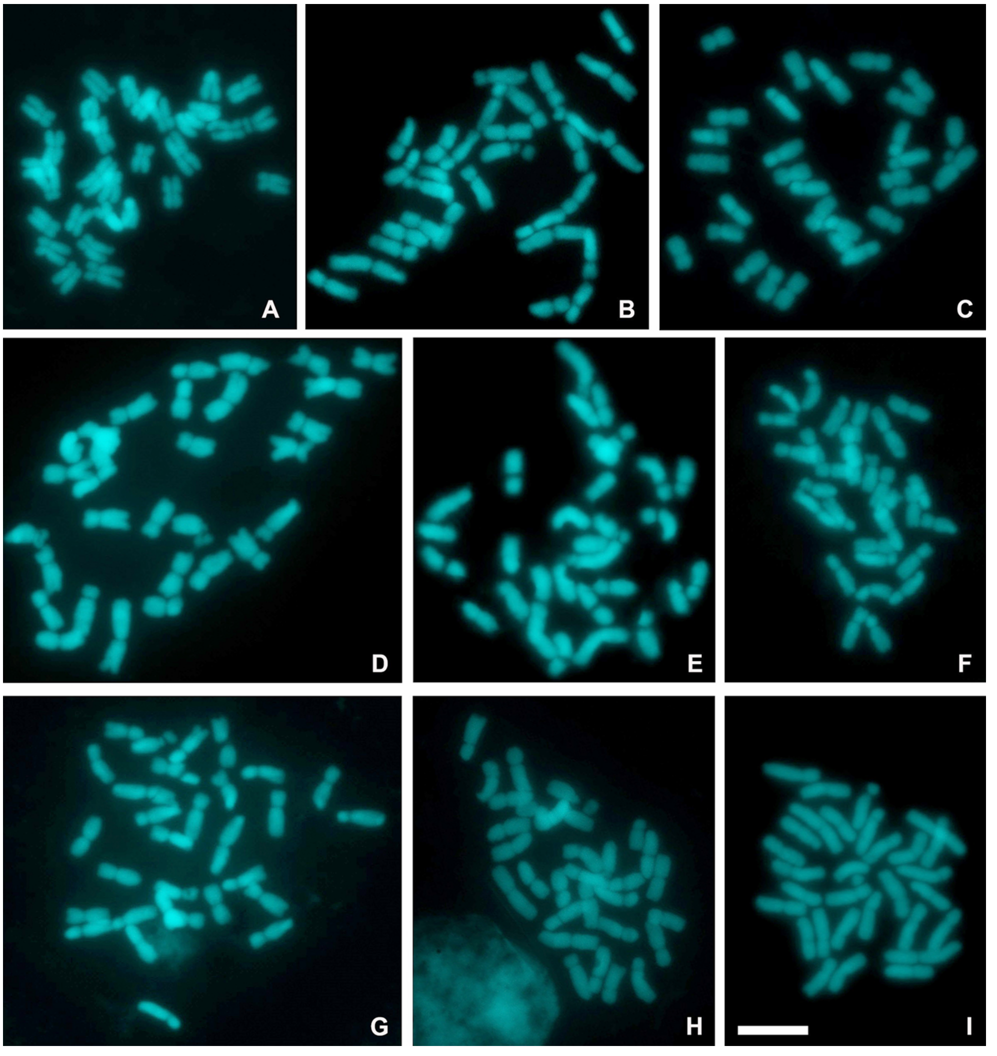

Fig. 1. Chromosome complements belonging to *Anthurium affine*. **A–I**, 2*n* = 30. Scale bar in I = 10 µm.

18612 (EAN) [Fig. 1G]; Brazil, Pernambuco, Aguas Belas, 09°04′10″S, 37°00′42″W, 01 Aug 2012, *E.M. Almeida 453* (EAN) [Fig. 1H]; Brazil, Pernambuco, Garanhuns, 08°53′27″S, 36°29′48″W, 25 Aug 2013, *L.P. Felix 14360* (EAN) [Fig. 1I].

2*n* = 30 + 1B, CHN. Brazil, Bahia, Milagres, 12°53′12″S, 39°49′38″W, 19 Jan 2014, *E.M. Almeida 966* (EAN) [Fig. 2A]; Brazil, Bahia, Andarai, 12°51′16″S, 41°18′48″W, 26 Jan 2014, *L.P. Felix 14802* (EAN) [Fig. 2B]; Brazil, Bahia, Jaguarari, 10°12′44″S, 40°13′54″W, 18 Sep 2021, *L.P. Felix 18816* (EAN) [Fig. 2C]; Brazil, Minas Gerais, Pedra Azul, 16°00′29″S, 41°22′46″W, 03 Oct 2021, *L.P. Felix 19304* (EAN) [Fig. 2D]; Brazil, Pernambuco, Aguas Belas, 09°04′10″S, 37°00′42″W, 02 Aug 2012, *E.M. Almeida 462* (EAN) [Fig. 2E]; Brazil, Pernambuco, Buique, 08°33′32″S, 37°13′09″W, 31 Jul 2014, *J.P. Castro 408* (EAN) [Fig. 2F].

2*n* = 30 + 2B, CHN. Brazil, Paraiba, Queimadas, 07°22′37′S, 35°58′39″W, 18 Dec 2013, *L.P. Felix 14635* (EAN) [Fig. 2G]; Brazil, Alagoas, Maravilha, 09°14′31″S, 37°19′48″W, 12 Feb 2022, *L.P. Felix 19447* (EAN) [Fig. 2H].

2*n* = 30 + 3B, CHN. Brazil, Paraiba, Bananeiras, 06°47′26″S, 35°34′40″W, 28 Feb 2021, *L.P. Felix 18580* (EAN) [Fig. 2I]; Brazil, Alagoas, Quebrangulo, 09°04′10″S, 37°00′42″W, 03 Aug 2012, *E.M. Almeida 476* (EAN) [Fig. 2J].

*2*n* = 30 + 4B, CHN. Brazil, Bahia, Morro do Chapéu, 11°37′41″S, 41°00′04″W, 21 Sep 2021, *L.P. Felix 18887* (EAN) [Fig. 2K].

The Araceae family occurs on all continents (except Antarctica), being absent only in permanently frozen regions, being more diverse in tropical regions. They are herbaceous plants that occupy quite variable habitats (terrestrial, aquatic, rupicolous, epiphytic and hemiepiphytic plants). Araceae comprises 118 genera and approximately 3300 species divided into four subfamilies: Aroideae, Gymnostachydoideae, Lemnoideae, and Orontioideae (Christenhusz & al., 2017; Boyce & Croat, 2018). *Anthurium* Schott is the largest genus in the family, including 950 species of exclusively Neotropical distribution. For Brazil, there are records of 153 species, of which 123 are endemic (Coelho & al., 2022). Among these, *A. affine* Schott stands out, a species endemic to Brazil, from rupicolous or terrestrial habitats, occurring in the phytogeographic domains of the Caatinga (dry forest), Cerrado (savannah vegetation) and Atlantic Forest (Perennial Tropical Forest). There are records of several counts for the species with a predominance of 2*n* = 30 and a variable number of B chromosomes (Carvalheira & al., 1991; Cotias-de-Oliveira & al., 1999; Vilar & al., 2017; Pavlova, 2017).

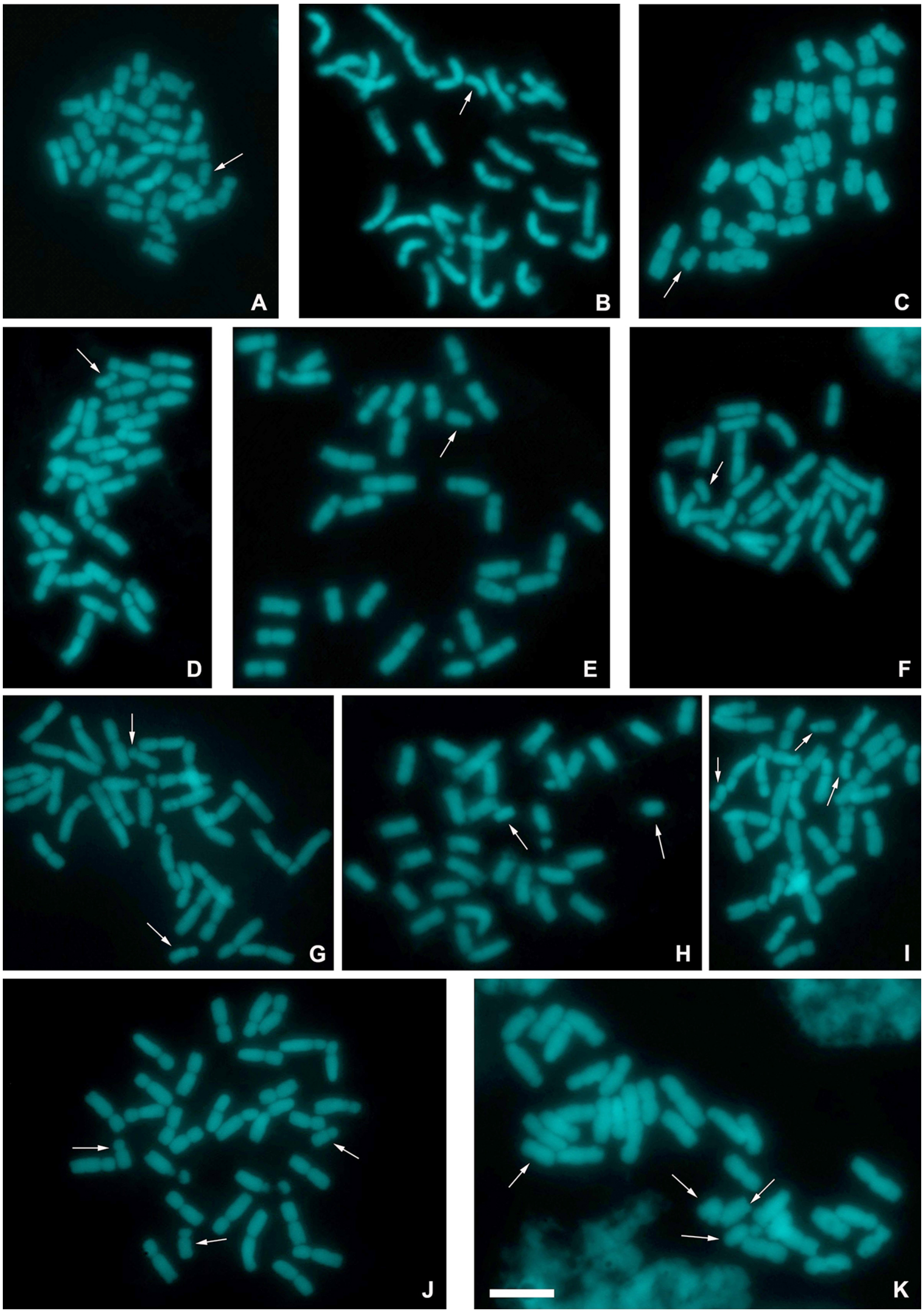

Fig. 2. Chromosome complements belonging to *Anthurium affine*. **A–F**, 2*n* = 30 + 1B; **G** & **H**, 2*n* = 30 + 2B; **I** & **J**, 2*n* = 30 + 3B; **K**, 2*n* = 30 + 4B. — Arrows indicate B chromosomes. Scale bar in K = 10 µm.

B chromosomes can be of autosomal intraspecific origin, when they originate in the same species, and autosomal interspecific, when they originate by hybridization between different species (Camacho & al., 2000; Houben, 2017). This type of chromosome, although considered a dispensable genome, according to more recent studies may have some gene activity, as there is a record of transcription of genes in plants and animals (Silva & al., 2021). In this work, we analyzed the variability of chromosome number in *Anthurium affine* occurring in Brazil in order to identify intraspecific variations of supernumerary chromosomes in different populations.

For cytogenetic analyses, root tips were pre-treated with 0.2% colchicine for 24 h at 10°C, fixed in ethanol–acetic acid 3 : 1 (v/v) for 2 h at room temperature and subsequently stored at –20°C. Then, the material was washed in distilled water and digested in an enzymatic solution containing 2% cellulase and 20% pectinase (w/v) for 1 h at 37°C. The slides were prepared by the crushing method in 60% acetic acid (Guerra & Souza, 2002). The best slides were selected and stained with 10 µl of DAPI (4′,6-Diamidino-2-phenylindole) with glycerol mounting medium and McIlvaine buffer (pH 7.0) (1 : 1, v/v). The slides were photographed in a Zeiss epifluorescence photomicroscope equipped with an AxioCam MRC5 video camera with the aid of Axiovision 4.8 software.

Among the analyzed populations, nine had 2*n* = 30 and absence of B chromosomes (Fig. 1A–I), compatible with previous records in which this type of chromosome was not observed (Vilar & al., 2017; Santos & al., 2018). On the other hand, a variable number of B chromosomes was observed in the other populations, with 2*n* = 30 + 1B in the populations of Milagres, Andarai and Jaguarari (Fig. 2A–C), Pedra Azul, Aguas Belas and Buique (Fig. 1D–F), 2*n* = 30 + 2B in the populations of Queimadas and Maravilha (Fig. 2G,H), 2*n* = 30 + 3B in the populations of Bananeiras and Quebrangulo (Fig. 2I,J) and 2*n* = 30 + 4B in the population of Morro do Chapéu (Fig. 2K). Our analysis of several populations of *Anthurium affine*, corroborated previous analyses with records of B chromosomes in a variable number from 0 to 4 for other populations of the Northeast Region of Brazil (Cotias-de-Oliveira & al., 1999; Nascimento & al., 2019).

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IAPT chromosome data 39/2

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

* First chromosome counts for species.

CACTACEAE

**Arrojadoa bahiensis* (P.J.Braun & Esteves) N.P. Taylor & Eggli
2*n* = 22, CHN. Brazil, Bahia, Canyon Fumacinha Ibiocoara, 13° 17′10″S, 41°15′37″W, 760 m, 23 Dec 2019, *E.M. Almeida 2979* (EAN) [Fig. 3A].

Brasiliopuntia brasiliensis (Willd.) A.Berger
2*n* = 22, CHN. Brazil, Paraíba, Areia, 06°53′30″S, 35°43′42″W, 509 m, 10 Mar 2016, *E.M. Almeida 1584* (EAN) [Fig. 3B].

**Epiphyllum phyllanthus* (L.) Haw. subsp. *phyllanthus*
2*n* = 22, CHN. Brazil, Pernambuco, Maraial, 08°47′47″S, 36° 49′34″W, 222 m, 09 May 2016, *E.M. Almeida 1690* (EAN) [Fig. 3C].

**Facheiroa squamosa* (Gürke) P.J.Braun & Esteves
2*n* = 22, CHN. Brazil, Bahia, Ibotirama, 12°26′42″S, 41°59′ 36″W, 490 m, 01 Dec 2016, *E.M. Almeida 1943* (EAN) [Fig. 3D].

**Facheiroa ulei* (Gürke) Werderm.
2*n* = 22, CHN. Brazil, Bahia, Umburanas, 10°35′54″S, 41°27′ 35″W, 950 m, 08 Dec 2016, *E.M. Almeida 1789* (EAN) [Fig. 3E].

Harrisia adscendens (Gürke) Britton & Rose
2*n* = 22, CHN. Brazil, Pernambuco, Salgueiro, 08°00′37″S, 38°54′15″W, 536 m, 04 Dec 2016, *E.M. Almeida 1735* (EAN) [Fig. 3F].

Hylocereus setaceus (Salm-Dyck) Ralf Bauer
2*n* = 44, CHN. Brazil, Paraíba, Serraria, 06°49′48″S, 35°38′ 40″W, 522 m, 10 Mar 2016, *E.M. Almeida 1596* (EAN) [Fig. 3G].

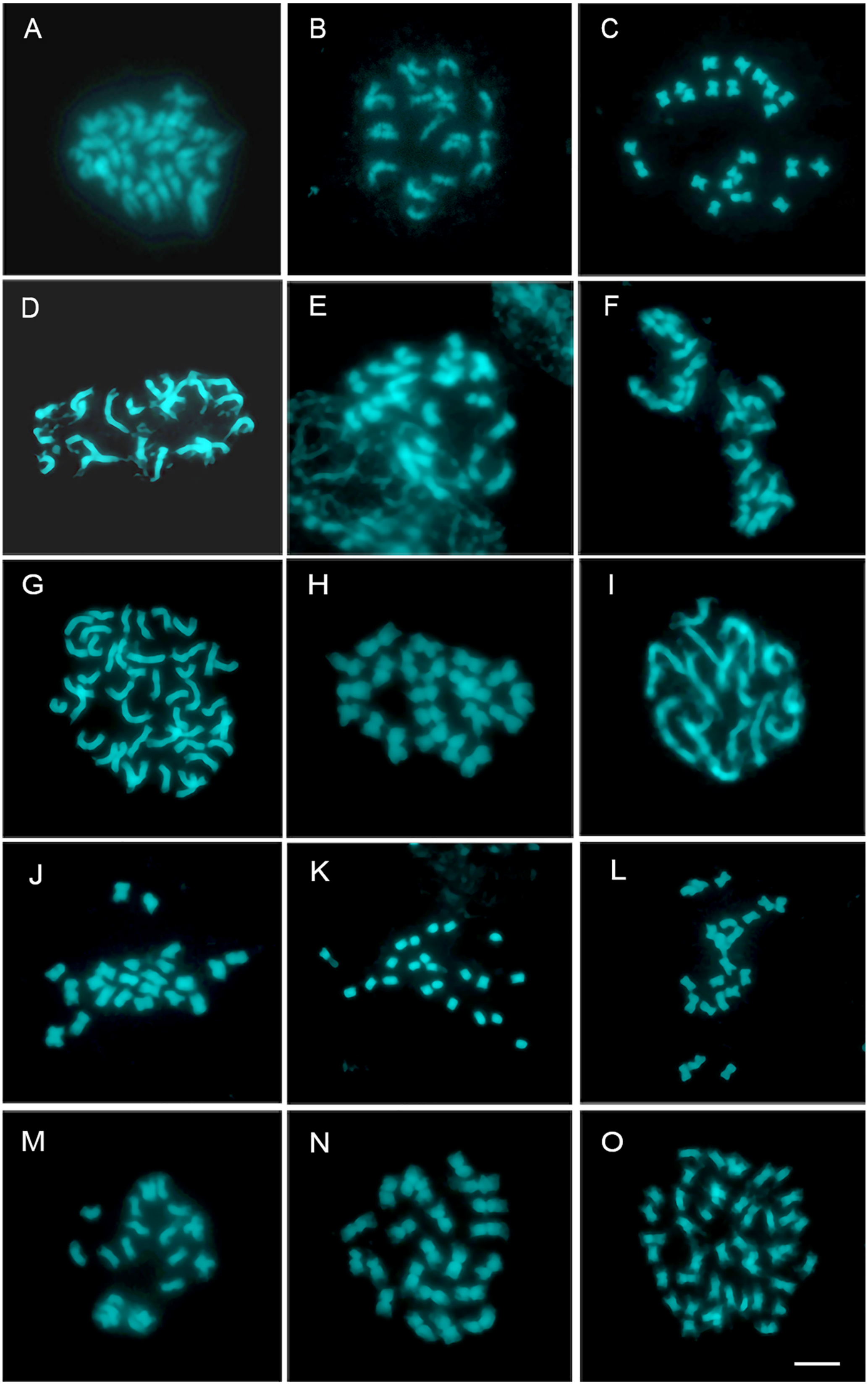

Fig. 3. Mitotic metaphase cells from Cacti species stained by DAPI/Glycerol. **A**, *Arrojadoa bahiensis*; **B**, *Brasiliopuntia brasiliensis*; **C**, *Epiphyllum phyllanthus* subsp. *phyllanthus*; **D**, *Facheiroa squamosa*; **E**, *Facheiroa ulei*; **F**, *Harrisia adscendens*; **G**, *Hylocereus setaceus*; **H**, *Lepismium cruciforme*; **I**, *Micranthocereus flaviflorus*; **J**, *Micranthocereus polyanthus*; **K**, *Pereskia aculeata*; **L**, *Pereskia grandifolia*; **M**, *Quiabentia zehntneri*; **N**, *Rhipsalis cereuscula*; **O**, *Rhipsalis floccosa* subsp. *floccosa* (A–F & H–N, 2*n* = 22; G & O, 2*n* = 44). — Scale bar in O = 5 µm.

Lepismium cruciforme (Vell.) Miq.
2*n* = 22, CHN. Brazil, Pernambuco, Taquaritinga do Norte, 07° 54′18″S, 36°01′35″W, 965 m, 04 May 2016, *E.M. Almeida 1636* (EAN) [Fig. 3H].

Micranthocereus flaviflorus Buining & Brederoo
2*n* = 22, CHN. Brazil, Bahia, Morro do Chapéu, 11°29′21″S, 41°20′31″W, 858 m, 09 Dec 2016, *E.M. Almeida 1820* (EAN) [Fig. 3I].

**Micranthocereus polyanthus* (Werderm.) Backeb.
2*n* = 22, CHN. Brazil, Bahia, Morro do Chapéu, 10°54′43″S, 41° 13′08″W, 652 m, 07 Dec 2016, *E.M. Almeida 1767* (EAN) [Fig. 3J].

Pereskia aculeata Mill.
2*n* = 22, CHN. Brazil, Minas Gerais, Itinga, 16°35′28″S, 41°41′ 05″W, 306 m, 18 Dec 2016, *E.M. Almeida 1594* (EAN) [Fig. 3K].

Pereskia grandifolia Haw.
2*n* = 22, CHN. Brazil, Sergipe, Pinhão, 16°35′28″S, 41°41′ 04″W, 306 m, 18 Dec 2016, *L.P. Felix 18045* (EAN) [Fig. 3L].

**Quiabentia zehntneri* (Britton & Rose) Britton & Rose
2*n* = 22, CHN. Brazil, Bahia, Bom Jesus da Lapa, 10°37′11″S, 37°44′59″W, 133 m, 19 Jul 2021, *L.N.G. Rocha 847* (EAN) [Fig. 3M].

Rhipsalis cereuscula Haw.
2*n* = 22, CHN. Brazil, Pernambuco, Taquaritinga do Norte, 07° 54′27″S, 36°01′13″W, 819 m, 04 May 2016, *E.M. Almeida 1631* (EAN) [Fig. 3N].

**Rhipsalis floccosa* Salm-Dyck ex Pfeiff. subsp. *floccosa*
2*n* = 44, CHN. Brazil, Pernambuco, Maraial, 08°47′57″S, 36° 50′09″W, 281 m, 09 May 2016, *E.M. Almeida 1692* (EAN) [Fig. 3O].

Tacinga armata J.G.Freitas & E.M.Almeida
2*n* = 66, CHN. Brazil, Pernambuco, Poção, 08°08′35″S, 36°42′ 03″W, 1086 m, 20 Nov 2020, *E.M. Almeida 3172* (EAN) [Fig. 4A].

Tacinga inamoena (K.Schum.) N.P.Taylor & Stuppy
2*n* = 44, CHN. Brazil, Pernambuco, Brejo da Madre de Deus, 08°08′43″S, 36°06′43″W, 455 m, 04 May, 2017, *E.M. Almeida 1645* (EAN) [Fig. 4B].

**Tacinga werneri* (Eggli) N.P.Taylor & Stuppy
2*n* = 66, CHN. Brazil, Bahia, Morro do Chapéu, 11°40′49″S, 41°00′34″W, 746 m, 05 Apr 2018, *E.M. Almeida 2631* (EAN) [Fig. 4C].

Cactaceae is composed of 1450 succulent and non-succulent species (Hunt & al., 2006; Hunt, 2016) of arid and semi-arid zones of the Americas. The Brazilian Semiarid (BS) is one of the most important regions for both diversity and endemism of this group (Taylor & Zappi, 2004). More specifically, there are around 90 native species, of which 34 are endemic. According to Lima-Nascimento & al. (2019) and Zappi & al. (2011), 20 of those cacti species are endangered and 9 are critically endangered due to habitat fragmentation or the specific relationship between species and their habitats (Goettsch & al., 2015). Despite the numerous and significant morphological and anatomical variations in Cactaceae and their importance to many local ecosystems, karyological and evolutionary studies are still incipient (Castro & al., 2020; Majure & al., 2022).

Information on the chromosome numbers of plants is important not only for developing species conservation strategies, but also increasing knowledge about genetic variability and potential intercrossing between populations (Levin, 2002; Guerra, 2008), supporting genetic breeding programs, preservation approaches (Freitas & al., 2021) and multidisciplinary studies (Pinkava & al., 1977; González & al., 2016; Castro & al., 2020). Thus, chromosome counts of 18 BS cacti species are presented in Table 1.

Root tips were pre-treated with 0.002 M 8-Hydroxyquinoline (8HQ) for 24 h at 6°C and subsequently fixed in 3 : 1 Carnoy solution (absolute ethanol : glacial acetic acid, v/v) for 2 h at room temperature and stored at −20°C. For chromosome slide preparations, root tips were washed twice in distilled H_2O (dH_2O) for 5 min and digested in an enzymatic solution containing 2% cellulase

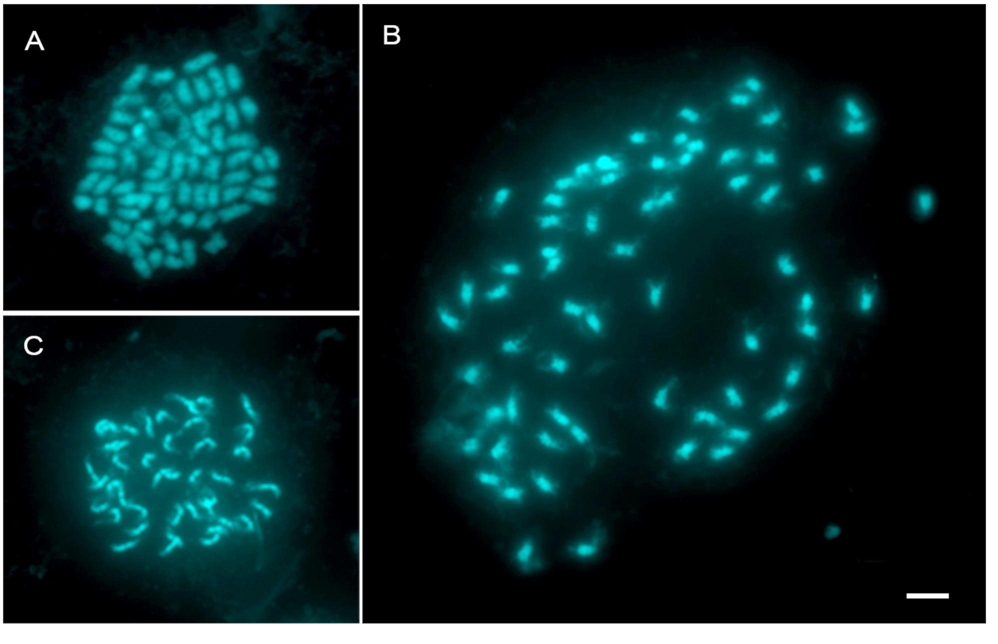

Fig. 4. *Tacinga* mitotic metaphase cells stained by DAPI/Glycerol. **A**, *Tacinga armata* (2*n* = 66); **B**, *Tacinga inamoena* (2*n* = 44); **C**, *Tacinga werneri* (2*n* = 66). — Scale bar in B = 5 µm.

(Onozuka) and 20% pectinase (Sigma) for 40 min at 37°C. Subsequently, they were squashed in a drop of 45% acetic acid (Guerra & Souza, 2002; with some modifications). For each species, the best slides were aged for three days at room temperature and stained with DAPI (1 µg/ml) and Glycerol (1 : 1 – v/v). The metaphase images were captured on a Zeiss epifluorescent microscope AX10, using an Axio Cam 506 color video camera and Zen v.2.6 Blue Edition (Mirzaghaderi & Marzangi, 2015) software, in the cytogenetic lab of Semi Arid National Institute of (Instituto Nacional do Semiárido, INSA), Paraiba State, Brazil.

The most frequently observed chromosome number among the 18 analyzed species was 2*n* = 22, with polyploidy, 2*n* = 44, found in *Hylocereus setaceus*, *Rhipsalis floccosa* subsp. *floccosa* and *Tacinga inamoena*, and 2*n* = 66 in *T. armata* and *T. werneri*. For five species we present here new counts. All species possess symmetrical karyotypes with predominance of metacentric-submetacentric chromosomes and sizes between 1 and 3 µm (Figs. 3, 4), corroborating the hypothesis of chromosome stability in Cactaceae and its basic number *x* = 11 (Las Penas & al. 2009; Majure & al., 2012; Castro & al. 2020).

Natural selection, DNA repair mechanisms (Wachsmuth & al., 2008), as well as interspecific reproductive barriers contribute to chromosomal stability in plants. In general, these barriers prevent recombination between different genomes and reduce fixation of chromosomal rearrangements (Hörandl, 2022; Heslop-Harrison & al., 2023) that, in association with other characteristics like the presence of repetitive and heterochromatic regions, may reduce the rate of chromosomal recombination and the probability of structural changes, ensuring genomic stasis (Guerra, 2000; Avramova, 2002).

On the other hand, the small chromosome size (Li & al., 2017) and the presence of repetitive and heterochromatic regions in Cactaceae increase the probability of hybridization and polyploidization (Eng & Ho, 2019; Madani & al., 2021; Heslop-Harrison & al., 2023). This is a positive situation for the expansion of chromosome sets as a whole (Gomes & al., 2012; Heslop-Harrison & al., 2023), but has a negative effect on dysploidy (Luceño & Guerra, 1996; Marinho & al., 2019).

Some climatic factors, mainly temperature gradients, either in altitude or latitude, associated with both fragmentation and isolation of populations, have large impact on polyploidy in cacti, as this is an important response to the environment, especially when extreme factors limit taxa present there (Rice & al., 2019; Bauk & al., 2023).

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Bauk, K., Gurvich, D.E. & Las Peñas, M.L. 2023. Cytogenetic characteristics of four *Gymnocalycium* (Cactaceae) species

Table 1. Chromosome data of the studied Cactaceae species.

Taxon	Locality*	2*n*	Figure	Previous counts[#]	Status (IUCN Red List)[§]
Arrojadoa bahiensis	Ibiocoara, BA	22	1A	UCN	VU
Brasiliopuntia brasiliensis	Areia, PB	22	1B	C13, P14	LC
Epiphyllum phyllanthus subsp. *phyllanthus*	Maraial, PE	22	1C	C13	LC
Facheiroa squamosa	Ibotirama, BA	22	1D	UCN	LC
Facheiroa ulei	Umburanas, BA	22	1E	UCN	LC
Harrisia adscendens	Salgueiro, PE	22	1F	C13, C20	LC
Hylocereus setaceus	Serraria, PB	44	1G	M14, C20	LC
Lepismium cruciforme	Taquaritinga do Norte, PE	22	1H	FM20	LC
Micranthocereus flaviflorus	Morro do Chapéu, BA	22	1I	C13, C20	NT
Micranthocereus polyanthus	Morro do Chapéu, BA	22	1J	UCN	EN
Pereskia aculeata	Itinga, MG	22	1K	LP09, C13	LC
Pereskia grandifolia	Pinhão, SE	22	1L	LP13, C13	LC
Quiabentia zehntneri	Bom Jesus da Lapa, BA	22	1O	UCN	LC
Rhipsalis cereuscula	Taquaritinga do Norte, PE	22	1M	G81, C12	LC
Rhipsalis floccosa subsp. *floccosa*	Maraial, PE	44	1N	UCN	LC
Tacinga armata	Poção, PE	66	2A	UCN	LC
Tacinga inamoena	Brejo da Madre de Deus, PE	44	2B	C13, M18	LC
Tacinga werneri	Morro do Chapéu, BA	66	2C	A19	LC

* States of Brazil: BA = Bahia; MG = Minas Gerais; PB = Paraíba; PE = Pernambuco; SE = Sergipe.
[#] Abbreviation of previous counts: C13 = Castro & al., 2013; P14 = Pitrez & al., 2014; M14 = Moreno, 2014; FM20 = Forni-Martins & al., 2020; C12 = Castro, 2012; C20 = Castro & al., 2020; LP09 = Las Peñas & al., 2009; LP13 = Las Peñas & al., 2013; A19 = Alves & al., 2019; UCN = unpublished chromosome number.
[§] Status categories: LC = Least Concern, NT = Near Threatened, EN = Endangered, VU = Vulnerable

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IAPT chromosome data 39/3

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All materials were fixed from seedlings produced from the living collection “Flora and Vegetation of Armenia” of the A. Takhtajan Institute of Botany of the National Academy of Sciences of the Republic of Armenia.

* First chromosome count for the taxon.

ROSACEAE

Pyrus caucasica Fed.

2*n* = 34, CHN. Armenia, Ararat Province, hills in the vicinity of village Getazat, 930 m, 40°02′18″N, 44°33′49″E, 03 Jul 2022, *J.A. Akopian, G.S. Gabrielyan, A.V. Rudov & G.M. Zaroyan s.n.* (ERE 291412).

**Pyrus ×daralagezii* Mulk.

2*n* = 34, CHN. Armenia, Vayots Dzor Province, in the vicinity of village Kechut, in the forest along the road, 2072 m, 39°49′21″N, 45°40′38″E, 23 May 2019, *J.A. Akopian, A.G. Ghukasyan, M.E. Oganesian & Zh.H. Hovakimyan s.n.* (ERE 201408).

**Pyrus hyrcana* var. *yeghegisi* Akopian

2*n* = 34, CHN. Armenia, Vayots Dzor Province, Yeghegis river gorge, in the vicinity of village Vardahovit, near open woodland, 1970 m asl, 39°53′N, 45°27′E, 11 Aug 2019, *J.A. Akopian, A.G. Ghukasyan & M.E. Oganesian s.n.* (ERE 199486).

**Pyrus medvedevii* Rubtzov

2*n* = 34, CHN. Armenia, Vayots Dzor Province, right bank of the river Yeghegis, in the vicinity of village Vardahovit, 2000 m, 39°53′52″N, 45°28′12″E, 11 Aug 2019, *J.A. Akopian, A.G. Ghukasyan & M.E. Oganesian s.n.* (ERE 201409).

**Pyrus oxyprion* Woronow

2*n* = 34, CHN. Armenia, Ararat Province, in the vicinity of village Narek, 1030 m, 39°59′57″N, 44°39′58″E, 18 Jun 2017, *J.A. Akopian, Zh.H. Hovakimyan & Z.M. Paravyan s.n.* (ERE 201411).

**Pyrus takhtadzhianii* Fed.

2*n* = 34, CHN. Armenia, Vayots Dzor Province, Noravank gorge, 1480 m asl, 39°41′07″N, 45°13′50″E, 26 Aug 2018, *J.A. Akopian, N. Korotkova, G. Parolly & Z. Asanidze s.n.* (ERE 201410).

IAPT chromosome data 39/4

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* First chromosome count for the species

MALVACEAE

Malvastrum coromandelianum (L.) Garcke

2*n* = 24, CHN. Brazil, Paraíba, Areia, 06°58′12″S, 35°42′15″W, 27 Sep 2018, *J.M.P Cordeiro 1389* (EAN) [Fig. 5A].

Sida acuta Burm.f.

2*n* = 28, CHN. Brazil, Paraíba, Areia, 06°58′12″S, 35°42′15″W, 27 Sep 2018, *J.M.P. Cordeiro 1387* (EAN) [Fig. 5B].

**Sida castanocarpa* Krapov.

2*n* = 16, CHN. Brazil, Piauí, Parnaíba, 03°04′07″S, 41°46′42″W, 22 Jul 2018, *L.P. Felix 17632* (EAN) [Fig. 5C].

Sida cordifolia L.

2*n* = 28, CHN. Brazil, Paraíba, Sertãozinho, 06°44′06″S, 35°27′30″W, 14 Jun 2019, *J.M.P. Cordeiro 1472* (EAN) [Fig. 5D].

**Sida galheirensis* Ulbr.
2*n* = 14, CHN. Brazil, Paraíba, Arara, 06°54′07″S, 35°47′42″W, 26 Mar 2021, *J.M.P. Cordeiro 1498* (EAN) [Fig. 5E].

Sida glomerata Cav.
2*n* = 14, CHN. Brazil, Paraíba, Areia, 06°58′12″S, 35°42′15″W, 27 Sep 2018, *J.M.P. Cordeiro 1388* (EAN) [Fig. 5F].

Sida jussiaeana DC.
2*n* = 16, CHN. Brazil, Paraíba, Sertãozinho, 06°44′06″S, 35°27′30″W, 14 Jun 2019, *J.M.P. Cordeiro 1468* (EAN) [Fig. 5G].

Sida rhombifolia L.
2*n* = 14, CHN. Brazil, Paraíba, Areia, 06°58′12″S, 35°42′15″W, 27 Sep 2018, *J.M.P. Cordeiro 1390* (EAN) [Fig. 5H].
2*n* = 28, CHN. Brazil, Paraíba, Areia, 06°58′12″S, 35°42′15″W, 27 Sep 2018, *J.M.P. Cordeiro 1391* (EAN) [Fig. 5I].

**Sidastrum multiflorum* (Jacq.) Fryxell
2*n* = 32, CHN. Brazil, Paraíba, Sertãozinho, 06°44′06″S, 35°27′30″W, 20 Jul 2021, *J.M.P Cordeiro 1526* (EAN) [Fig. 5J].

Sidastrum paniculatum (L.) Fryxell
2*n* = 16, CHN. Brazil, Paraíba, Areia, 06°58′12″S, 35°42′15″W, 20 Jul 2021, *L.P Felix 17645* (EAN) [Fig. 5K].

The Malvaceae family is composed of approximately 244 genera and 4465 species (Christenhusz & Byng, 2016; WFO, 2022), subdivided into nine subfamilies: Bombacoideae, Brownlowioideae, Byttnerioideae, Dombeyoideae, Grewioideae, Helicteroideae,

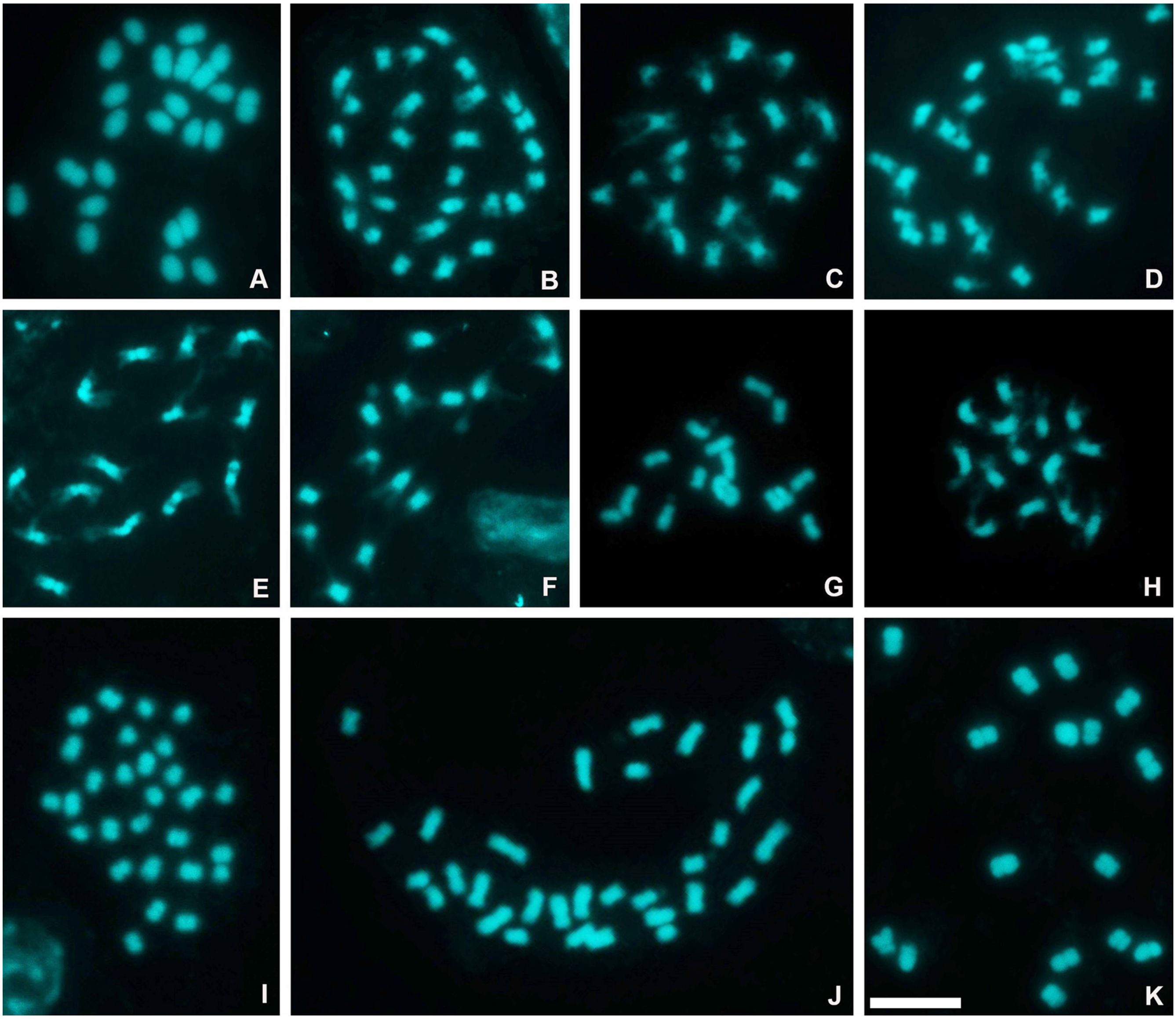

Fig. 5. Chromosome complements of species belonging to Malvaceae. **A**, *Malvastrum coromandelianum*, 2*n* = 24; **B**, *Sida acuta*, 2*n* = 28; **C**, *Sida castanocarpa*, 2*n* = 16; **D**, *Sida cordifolia*, 2*n* = 28; **E**, *Sida galheirensis*, 2*n* = 14; **F**, *Sida glomerata*, 2*n* = 14; **G**, *Sida jussiaeana*, 2*n* = 16; **H**, *Sida rhombifolia*, 2*n* = 14; **I**, *Sida rhombifolia*, 2*n* = 28; **J**, *Sidastrum multiflorum*, 2*n* = 32; **K**, *Sidastrum paniculatum*, 2*n* = 16. — Scale bar in K = 10 µm.

Malvoideae, Sterculioideae and Tilioideae. Within the genera of the Malvoideae, some of them stand out due to the number of species they contain, *Malvastrum* (153), *Sida* (1248), and *Sidastrum* (7) (WFO, 2022). From the cytogenetic point of view, species from the genus *Malvastrum* possess chromosome numbers $n = 6$, 12, 18 and 24 (Tate & al., 2005). Within the *Sida* species studies up until now, chromosome number records of $2n = 14$, 16, 28, 32 and 42 are known (Rice & al., 2015; Venkatesh & al., 2015), suggesting that this group went through several polyploidy and dysploidy events throughout its evolutionary process. However, for the genus *Sidastrum*, all previous records for the genus were limited to $2n = 32$ (Krapovickas, 1957, 1969).

In this work, the chromosome numbers of one species belonging to the genus *Malvastrum*, seven species from the genus *Sida* and two species from the genus *Sidastrum* were analyzed. For the chromosome number counts, tips from roots obtained from plants cultivated in pots were pre-treated with 8-Hydroxyquinoline (0.002 M) for 20 h at 10°C, fixed in Carnoy (3 : 1 ethanol : acetic acid) for 2–24h at room temperature, and stored in a freezer at −20°C to be used in further analyses. Slides were squashed in a drop of acetic acid 45%, with a coverslip retrieved from liquid nitrogen (Guerra & Souza, 2002). The best slides were selected and stained with DAPI (4′,6-Diamidino-2-phenylindole) for 30 minutes and mounted in a buffer medium of glycerol/McIlvaine. Slides were photographed by a Zeiss epifluorescence microscope with an AxioCam MRC5 video camera, with assistance from the software Axiovision v.4.8.

For *Malvastrum coromandelianum*, the $2n = 24$ count (Fig. 5A) corroborated the previous records for this species reported by Cheng & Tsai (1999) for a population from Taiwan, suggesting that it is a tetraploid species with the base number $x = 6$ and cosmopolitan distribution (Fryxell & Hill, 1977). Regarding the genus *Sida*, counts of $2n = 16$ (with four satellites) for *S. castanocarpa* (Fig. 5C) and $2n = 14$ for *S. galheirensis* (Fig. 5E) are unprecedented, while previous counts for *S. acuta* ($2n = 28$, Fig. 5B), *S. cordifolia* ($2n = 28$, Fig. 5D), *S. glomerata* ($2n = 14$, Fig. 5F) and *S. jussiaeana* ($2n = 16$, Fig. 5G) were confirmed. Recordings of those chromosome numbers confirm the importance of polyploidy and dysploidy events in the chromosome evolution of the genus based on $x = 7$ and $x = 8$ as the suggested numbers of chromosomes for the genus (Aguilar & al., 2003). In *S. rhombifolia*, two individuals of the same population belonging to the distinct cytotypes were analyzed, with $2n = 14$ (Fig. 5H) and $2n = 28$ (Fig. 5I). *Sida rhombifolia* is morphologically one of the most variable species within the genus *Sida* (Ugborogho, 1982). This same variation was already previously reported for distinct populations of this same species (Rice & al., 2015).

The genus *Sidastrum* was represented by two species in this study, with an unprecedented count of $2n = 32$ (Fig. 5J) for *S. multiflorum* and a confirmation of the previous count of $2n = 16$ (Fig. 5K) for *S. paniculatum*. The base chromosome number proposed for *Sidastrum*, $x = 8$ (Fryxell, 1978), coincides with one of the base numbers proposed for the genus *Sida*. The two genera present less than accurate morphological limits, making a broader caryological and molecular analysis necessary to confirm the limits between the two taxa (Aguilar & al., 2003).

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IAPT chromosome data 39/5

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* First chromosome count from Angola.

** First chromosome count for the species.

In a review of the cytotaxonomy of *Kalanchoe* Adans. (Crassulaceae subfam. Kalanchooideae) (Smith, 2022), it was shown that to date chromosome numbers had been published for just more than 80 species, infraspecific taxa, and nothospecies, which represent counts for about one-third of the taxa presently recognised in the genus. With very few exceptions, the chromosome numbers previously reported for *Kalanchoe*, are all divisible by 17, 18, or 20; of these basic numbers (x), 17 is often presented as primary. Smith (2022) recorded that haploid numbers (n) were most often given as 17, 18, 20, and 51; and $2n$ as 34, 36, and 40 (all diploid); or as 68 or 72 (both tetraploid), but with 51 (triploid), 102 (hexaploid), 140 (octoploid), and 176 (decaploid) also documented.

Although most diverse in Madagascar, *Kalanchoe* also occurs naturally on nearby Indian Ocean islands, across most of sub-Saharan

Africa, and in the Near, Middle, and Far East. The kalanchoes of Madagascar and eastern Africa are cytologically best studied (Smith, 2022). However, up to now not a single count has been published for material from southwestern Angola, nor for material unambiguously from southern Africa (Namibia, Botswana, Eswatini, Lesotho, South Africa). Both regions are known present-day centres of high species diversity for the genus (Smith & al., 2019; Figueiredo & Smith, 2020; Smith & Figueiredo, 2021).

Cytological investigations were carried out on immature, unopened flower buds fixed in 95% ethyl alcohol : glacial acetic acid (3 : 1, v/v) for 24 h at 4°C and then transferred to 70% ethyl alcohol for storage at −20°C. Meiotic chromosome squashes followed the

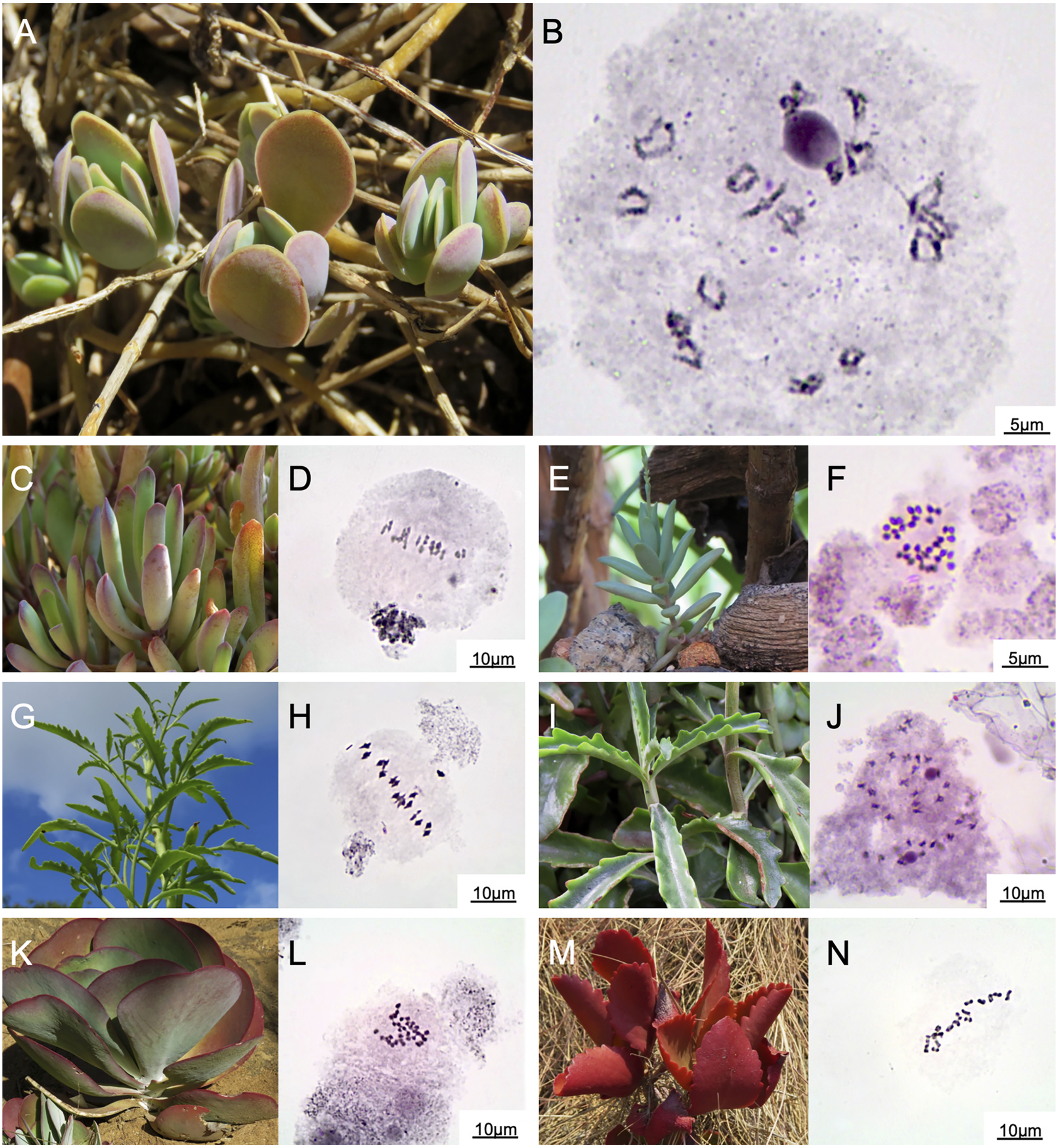

Fig. 6. A, Plant of *Kalanchoe alticola*; **B**, *K. alticola*, diakinesis with 17 bivalents; **C**, Plant of *K. gideonsmithii*; **D**, *K. gideonsmithii*, metaphase I with 17 bivalents; **E**, Plant of *K. krigeae*; **F**, *K. krigeae*, metaphase I with 17 un-orientated bivalents; **G**, Plant of *K. laciniata*; **H**, *K. laciniata*, metaphase I with 17 bivalents; **I**, Plant of *K. leblanciae*; **J**, *K. leblanciae*, diakinesis with 17 bivalents; **K**, Plant of *K. luciae*; **L**, *K. luciae*, metaphase I with 17 un-orientated bivalents; **M**, Plant of *K. sexangularis*; **N**, *K. sexangularis*, metaphase I with 17 bivalents. — Photographs of plants by Gideon F. Smith. Photographs of chromosomes by Damian Vaz de Sousa.

approach described by Windham & al. (2020). Slides with dissected anther material were stained using acetocarmine prior to squashing. Chromosome counts of pollen mother cells were obtained using a Nikon Eclipse E200 light microscope, equipped with a mounted Nikon E950 digital camera.

Except for the most general, locality data of material studied are not given. This is justified by the fact that poaching of succulent plants from the wild in South Africa is a severe and escalating problem (Smith & al. 2023), and the decision was made not to provide any information regarding the exact whereabouts of the species.

CRASSULACEAE

**Kalanchoe alticola* Compton

2*n* = 34, CHN. South Africa, Mpumalanga, 14 May 2021, *G.F. Smith 1151* (PRU) [Fig. 6A,B].

**Kalanchoe gideonsmithii* N.R.Crouch & Figueiredo

2*n* = 34, CHN. South Africa, KwaZulu-Natal, 26 Jun 2021, *G.F. Smith 1153* (PRU) [Fig. 6C,D].

**Kalanchoe krigeae* Gideon F.Sm. & Figueiredo

2*n* = 34, CHN. South Africa, Mpumalanga, 26 Feb 2022, *G.F. Smith 1170* (PRU) [Fig. 6E,F].

**Kalanchoe laciniata* (L.) DC.

2*n* = 34, CHN. Angola, Huílla, 03 Jul 2021, *G.F. Smith 1156* (PRU) [Fig. 6G,H].

For *Kalanchoe laciniata*, a very widespread and variable species as circumscribed at present, diploid chromosome numbers of 2*n* = 34 and 68 (Baldwin, 1938: 576; Raadts, 1989: 171) and 2*n* = 68 and 72 have also been reported (Sharma & Ghosh, 1967: 319).

**Kalanchoe leblanciae* Raym.-Hamet

2*n* = 34, CHN. South Africa, KwaZulu-Natal, 21 Mar 2021, *G.F. Smith 1142* (PRU) [Fig. 6I,J].

**Kalanchoe luciae* Raym.-Hamet

2*n* = 34, CHN. South Africa, Mpumalanga, 21 Mar 2021, *G.F. Smith 1144* (PRU) [Fig. 6K,L].

**Kalanchoe sexangularis* N.E.Br.

2*n* = 34, CHN. South Africa, Mpumalanga, 03 May 2021, *G.F. Smith 1149* (PRU) [Fig. 6M,N].

Uhl (1948: 701) stated that material analysed by Baldwin (1938: 576) under the name *Kalanchoe longiflora* Schltr. ex J.M.Wood was of *K. sexangularis*. However, this could not be verified.

All the species included in this analysis are diploid with 2*n* = 34.

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IAPT chromosome data 39/6

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Counts of mitotic metaphase chromosomes were made in root tips fixed in chrome-acetic formalin, stained in gentian violet, embedded in paraffin and sectioned. The fixations were made on plants cultivated in the Botanic Garden of Uppsala University.

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

APIACEAE

Alepidea peduncularis Steud. ex A.Rich.

2*n* = 16, CHN. Ethiopia, Arussi Prov., 4 km S of Asella, 2500 m, 11 Nov 1971, *M. Thulin 1628* (UPS).

ASTERACEAE

Eclipta prostrata (L.) L.

2*n* = 22, CHN. Tanzania, Dodoma Distr., Ikowa Dam, 900 m, 29 Jul 1970, *M. Thulin & B. Mhoro 550* (UPS).

CAMPANULACEAE

**Lobelia dregeana* (C.Presl) A.DC.

2*n* = 14, CHN. South Africa, Eastern Cape, Graaff Reinet, NW of town, 1675 m, 29 Nov 1977, *O.M. Hilliard & B.L. Burtt 10773* (UPS).

*Lobelia walkeri (C.B.Clarke) W.J.de Wilde & Duyfjes
2n = 28, CHN. Sri Lanka, Nuwara Eliya Distr., 2.5 km WSW of Pattipola, 13 Feb 1974, *N. Lundqvist 9040* (UPS).

Trachelium caeruleum L.
2n = 32, CHN. Algeria, forest just W of Alger, 30 May 1974, *M. Thulin 2297* (UPS).

**Wahlenbergia capensis* (L.) A.DC.
2n = 18, CHN. Progeny of *P. Goldblatt 3323*, South Africa, Cape Peninsula, Kalk Berg Mts, 12 Nov 1974, *M. Thulin 2621* (UPS).

**Wahlenbergia ecklonii* H.Buek
2n = 14, CHN. Progeny of *K. Bremer 407*, South Africa, Namaqualand, Khamiesberg, 27 Oct 1972, *M. Thulin 2237* (UPS).

**Wahlenbergia flexuosa* (Hook.f. & Thomson) Thulin
2n = 16, CHN. Ethiopia, Arussi Prov., 20 km NW of Asella, Chebbi, 1800 m, 04 Oct 1971, *M. Thulin 1340* (UPS).

**Wahlenbergia patula* A.DC.
2n = 18, CHN. Progeny of *W. Giess 13791*, Namibia, Karas, Farm Spitzkopp, 01 Oct 1975, *M. Thulin 2629* (UPS).

**Wahlenbergia pulchella* subsp. *paradoxa* Thulin
2n = 16, CHN. Tanzania, Iringa Distr., Nduli, 1500 m, 01 May 1971, *B. Mhoro 1046* (UPS).

CARYOPHYLLACEAE

Silene burchellii Otth ex DC.
2n = 24, CHN. Tanzania, Njombe Distr., between Lisitu and Lugalawa, 1900 m, 23 Sep 1970, *M. Thulin & B. Mhoro 1148* (UPS).

Spergularia rubra (L.) J.Presl & C.Presl
2n = 18, CHN. Ethiopia, Arussi Prov., 30 km S of Asella, Sagure, 2500 m, 04 Nov 1971, *M. Thulin 1605* (UPS).

Spergularia rubra is widespread in Europe, the Mediterranean region, Asia, North America and a few countries in tropical and southern Africa (Hultén & Fries, 1986). It has also been introduced in South America and Australia. 2n = 36 is the most commonly recorded chromosome number in the species, but counts of 2n = 18 and 2n = 54 have also been made (Ratter, 1990). An example of a previous count of 2n = 18 is Kliphuis & Barkoudah (1977) in material from Syria. The material of *S. rubra* from Ethiopia is characterized by having nearly smooth seeds, in contrast to the minutely spiny-papillate seeds normally found in the species (Gilbert, 2000).

CRASSULACEAE

***Crassula alsinoides* (Hook.f.) Engl.
2n = 48, CHN. Ethiopia, Arussi Prov., 3 km S of Asella, 2400 m, 31 Oct 1971, *M. Thulin 1582* (UPS).

A previous count of 2n = ca. 56 was reported in plants from Cameroun by Morton (1993).

**Sedum crassularia* Raym.-Hamet
2n = 88, CHN. Ethiopia, Arussi Prov., Mt Chilalo, W slope, 3700 m, 14 Nov 1971, *M. Thulin 1657* (UPS).

FABACEAE

Alysicarpus rugosus subsp. *perennirufus* J.Léonard
2n = 16, CHN. Ethiopia, Arussi Prov., 5 km N of Asella, Kulumsa farm, 2100 m, 10 Nov 1971, *M. Thulin 1620* (UPS).

**Argyrolobium confertum* Polhill
2n = 26, CHN. Ethiopia, Shoa Prov., 15 km S of Mojo, 1700 m, 12 Oct 1971, *M. Thulin 1463* (UPS).

**Argyrolobium rupestre* subsp. *remotum* (Hochst. ex A.Rich.) Polhill
2n = 30, CHN. Ethiopia, Arussi Prov., 3 km S of Asella, 2400 m, 07 Oct 1971, *M. Thulin 1393* (UPS).

Astragalus atropilosulus subsp. *burkeanus* (Benth. ex Harv.) J.B.Gillett
2n = 16, CHN. Ethiopia, Arussi Prov., Wabe Shebelle R., near Asasa, 2250 m, 28 Oct 1971, *M. Thulin 1573* (UPS).

Astragalus vogelii subsp. *fatimensis* Maire (= *A. fatmensis* Chiov.)
2n = 16, CHN. Ethiopia, Shoa Prov., 60 km N of Shashemane, 1700 m, 13 Oct 1971, *M. Thulin 1494* (UPS).

Crotalaria aculeata De Wild.
2n = 16, CHN. Tanzania, Njombe Distr., Rudewa, 800 m, 26 Sep 1970, *M. Thulin & B. Mhoro 1191* (UPS).

Crotalaria rosenii (Pax) Milne-Redh. ex Polhill
2n = 16, CHN. Ethiopia, Arussi Prov., 3 km S of Asella, 2400 m, 11 Oct 1971, *M. Thulin 1456* (UPS).

Indigofera arrecta Hochst. ex A.Rich.
2n = 16, CHN. Ethiopia, Arussi Prov., 20 km NW of Asella, Chebbi, 1800 m, 04 Oct 1971, *M. Thulin 1348* (UPS).

Lotononis laxa Eckl. & Zeyh.
2n = 18, CHN. Ethiopia, Arussi Prov., 5 km N of Asella, Kulumsa farm, 2100 m, 17 Oct 1971, *M. Thulin 1508* (UPS).

Lotus discolor E.Mey.
2n = 14, CHN. Ethiopia, Arussi Prov., Mt Chilalo, 3100 m, 14 Nov 1971, *M. Thulin 1655* (UPS).

Lotus schoelleri Schweinf.
2n = 12, CHN. Ethiopia, Arussi Prov., Wabe Shebelle R., near Asasa, 2250 m, 28 Oct 1971, *M. Thulin 1575* (UPS).

Medicago minima (L.) Bartal.
2n = 16, CHN. Ethiopia, Arussi Prov., 30 km SW of Asella, Golja, 2100 m, 06 Oct 1971, *M. Thulin 1540* (UPS).

Medicago polymorpha L.
2n = 14, CHN. Ethiopia, Arussi Prov., 5 km N of Asella, Kulumsa farm, 2100 m, 06 Oct 1971, *M. Thulin 1379* (UPS).

Melilotus suaveolens Ledeb.
2n = 16, CHN. Ethiopia, Arussi Prov., 3 km S of Asella, 2300 m, 08 Oct 1971, *M. Thulin 1436* (UPS).

**Tephrosia emeroides* A.Rich.

$2n = 22$, CHN. Ethiopia, Arussi Prov., 20 km NW of Asella, Chebbi, 1800 m, 04 Oct 1971, *M. Thulin 1345* (UPS).

Trifolium baccarinii Chiov.

$2n = 16$, CHN. Ethiopia, Arussi Prov., 3 km S of Asella, 2300 m, 01 Nov 1971, *M. Thulin 1586* (UPS).

**Trifolium calocephalum* Fresen.

$2n = 16$, CHN. Ethiopia, Arussi Prov., 10 km N of Koffale, Gobe Livestock Farm, 2700 m, 12 Oct 1971, *M. Thulin 1469* (UPS).

***Trifolium cryptopodium* Steud. ex A.Rich.

$2n = 16$, CHN. Ethiopia, Arussi Prov., 60 km S of Asella, Bekoji, 2700 m, 05 Oct 1971, *M. Thulin 1352* (UPS).

Previous counts of $2n = 48$ and $2n =$ c. 48 were reported in material of *Trifolium cryptopodium* from, respectively, 3950 m altitude in Ethiopia and 3200 m altitude in Kenya by Hedberg & Hedberg (1977).

Trifolium lanceolatum (J.B.Gillett) J.B.Gillett

$2n = 16$, CHN. Ethiopia, Arussi Prov., 50 km SW of Asella, Kersa, 2700 m, 12 Nov 1971, *M. Thulin 1646* (UPS).

Trifolium polystachyum Fresen.

$2n = 16$, CHN. Ethiopia, Arussi Prov., between Siré and Robi, 2600 m, 25 Oct 1971, *M. Thulin 1556* (UPS).

Trifolium rueppellianum Fresen.

$2n = 16$, CHN. Ethiopia, Arussi Prov., 10 km N of Koffale, Gobe Livestock Farm, 2700 m, 29 Oct 1971, *M. Thulin 1581* (UPS).

**Trifolium schimperi* A.Rich.

$2n = 16$, CHN. Ethiopia, Arussi Prov., 3 km S of Asella, 2300 m, 01 Nov 1971, *M. Thulin 1587* (UPS).

***Trifolium simense* Fresen.

$2n = 16$, CHN. Ethiopia, Arussi Prov., 60 km S of Asella, Bekoji, 2700 m, 05 Oct 1971, *M. Thulin 1358* (UPS).

Previous counts of $2n = 32$ were reported in material of *Trifolium simense* from Kenya (Pritchard, 1969), Cameroun (Morton, 1993) and Ethiopia (Badr, 1995).

Trifolium steudneri Schweinf.

$2n = 16$, CHN. Ethiopia, Gojam Prov., 6 km E of Chagni on the road to Injibara, 1800 m, 16 Nov 1983, *J. Kahurananga & A. Ahmed 4482A* (UPS).

Vicia hirsuta (L.) Gray

$2n = 14$, CHN. Ethiopia, Arussi Prov., Mt Chilalo, N slope, 2900 m, 20 Nov 1971, *M. Thulin 1516* (UPS).

**Vicia paucifolia* Baker

$2n = 14$, CHN. Ethiopia, Arussi Prov., 3 km S of Asella, 2400 m, 09 Oct 1971, *M. Thulin 1447* (UPS).

Vicia sativa subsp. *nigra* (L.) Ehrh.

$2n = 12$, CHN. Ethiopia, Arussi Prov., 5 km N of Asella, Kulumsa farm, 2100 m, 06 Oct 1971, *M. Thulin 1382* (UPS).

Vigna vexillata (L.) A.Rich.

$2n = 22$, CHN. Ethiopia, Arussi Prov., 5 km N of Asella, Kulumsa farm, 2100 m, 11 Oct 1971, *M. Thulin 1451* (UPS).

GERANIACEAE

***Pelargonium multibracteatum* Hochst. ex A.Rich.

$2n = 18$, CHN. Ethiopia, Arussi Prov., 5 km N of Asella, Kulumsa farm, 2100 m, 17 Nov 1971, *M. Thulin 1689* (UPS).

A previous count of $2n = 36$ was reported in material of *Pelargonium multibracteatum* from Yemen by Podlech (1986).

LAMIACEAE

***Coleus maculosus* (Lam.) A.J.Paton (= *Plectranthus punctatus* (L.f.) L'Hér.)

$2n = 56$, CHN. Ethiopia, Arussi Prov., 3 km S of Asella, 2400 m, 11 Oct 1971, *M. Thulin 1459* (UPS).

A previous count of $2n = 28$ was reported in plants from Cameroun (as *Plectranthus punctatus* subsp. *punctatus*) by Morton (1993).

PLANTAGINACEAE

**Plantago africana* Verdc.

$2n = 48$, CHN. Ethiopia, Arussi Prov., 4 km SE of Asella, 2500 m, 11 Nov 1971, *M. Thulin 1636* (UPS).

RANUNCULACEAE

**Delphinium dasycaulon* Fresen.

$2n = 16$, CHN. Ethiopia, Arussi Prov., 20 km SW of Asella, Katar R., 2200 m, 23 Oct 1971, *M. Thulin 1545* (UPS).

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