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Chromosome Studies in Mongolian Plants

Chromozómové počty mongolských rostlin

Josef Měsíček[1] and Jiří Soják[2])

Měsíček J. et J. Soják (1972): Chromosome studies in Mongolian plants. — Preslia, Praha, 44 : 334—358. — Chromosome numbers are reported for 41 collections of Mongolian plants representing 34 species. The first chromosome records are reported for the genera *Anoplocaryum*, *Dontostemon* and *Haplophyllum*, and the following 23 species: *Aconogonum angustifolium* (2n = 20), *Anoplocaryum compressum* (2n = = 23, 24), *Astragalus melilotoides* (2n = 16), *A. tenuis* (2n = 48), *Axyris hybrida* (2n = 18), *Bassia dasyphylla* (2n = 18), *Berteroa macrocarpa* (2n = 16, 17), *Dontostemon crassifolius* (2n = 14), *D. integrifolius* (2n = 14), *D. senilis* (2n = 28), *Echinops gmelinii* (2n = 26), *Erodium stephanianum* (2n = 16), *E. tibetanum* (2n = 18), *Haplophyllum dauricum* (2n = 18), *Lycium ruthenicum* (2n = 24), *Parietaria micrantha* (2n = 16), *Peganum nigellastrum* (2n = 24), *Plantago minuta* (2n = 10), *Ptilotrichum tenuifolium* (2n = 88), *Scabiosa comosa* (2n = 16), *Scutellaria tuvensis* (2n = 22), *Senecio pricei* (2n = 48), *Tragopogon trachycarpus* (2n = 12). Counts differing from those previously reported are given for *Carex arnellii* (2n = 40), *Lespedeza dahurica* (2n = 40, 42) and *Stipa sibirica* (2n = 22, 23). Chromosome numbers of the following taxa were confirmed: *Acroptilon repens* (2n = 26), *Aristida heymannii* (2n = 22), *Chloris virgata* (2n = 20), *Limosella aquatica* (2n = 40), *Rhaponticum uniflorum* (2n = 26), *Tillaea aquatica* (2n = 42) and *Urtica cannabina* (2n = 52). Karyotypes are given for *Berteroa macrocarpa*, *Chloris virgata*, *Dontostemon integrifolius*, *Echinops gmelinii*, *Erodium stephanianum*, *E. tibetanum* and *Plantago minuta*. — A new species *Ribes mediatum* Měs. et Soják (2n = 16) is described. The hybrid origin of *Tragopogon trachycarpus* is briefly discussed. — *Scutellaria tuvensis* and *Tragopogon trachycarpus* are reported as new for the Mongolian flora. — [1]) *Botanical Institute, Czechoslovak Academy of Sciences, Průhonice near Praha, Czechoslovakia.* [2])*Botanical Department, National Museum, Průhonice near Praha, Czechoslovakia.*

Introduction

This is the second in a series of chromosome number reports and taxonomic notes on Mongolian plants. The following listing of chromosome counts and the accompanying comments are intended to help in rounding out the chromosome information and to elucidate some problems of the Mongolian flora. Many of the chromosome numbers reported here (23 species, 3 genera) were previously unknown. This is not unexpected, since few papers have yet dealt with the karyology of Mongolian plants. Previous references are given in the first part of our studies (Měsíček et Soják 1969). Since that time only five new papers concerning this subject have been published. Hanelt (1970a) reported karyological data for *Papaver nudicaule* L. (chromosome numbers from six Mongolian localities) and for the other Mongolian species of the sect. *Scapiflora* Reichenb. (Hanelt 1970b). Jankun (1968) examined *Delphinium grandiflorum* L. from the Gobi Altai and Jonsell (1971) studied a collection of *Rorippa palustris* (L.) Bess. from the Khentei Mts. Finally Malachova (1971a, b) reported chromosome counts for 134 species of the flora of the West Sayan Mts. and the southwestern Altai (U.S.S.R.) including many taxa also growing in Mongolia. In addition, numerous comparable results have been recently published mainly by Soviet authors.

Tab. 1. — Chromosome numbers of Mongolian plants and localities of voucher specimens

Taxon	2n	Locality	Voucher
Boraginaceae			
Anoplocaryum compressum (Turcz.) Ledeb.	23, 24	Mong. bor.: inter pagos Delgerchán et Bajan--Under; locis saxosis; 1700—1800 m; 46°35′, 104°20′.	S. & V.* 6006, 13/8, 1966
	24	Mong. austr.: Altai Gobicus, montes Gurvan--Sajchan-úl ca 20—40 km occid. ab opp. Dalanzadgad; 1600—2800 m; 43°36′, 103°50′—104°03′.	S. & V. 7903, 25/8, 1966
Chenopodiaceae			
Axyris hybrida L.	18	Mong. austr.: Altai Gobicus, montes Gurvan--Sajchan-úl ca 20—40 km occid. ab opp. Dalanzadgad; locis stepposis, in rupibus; 1600—2500 m; 43°36′, 103°50′—104°03′.	S. & V. 8074, 25/8, 1966
Bassia dasyphylla (Fisch. et Mey.) O. Kuntze	18	Mong. austr.: Altai Gobicus, montes Gurvan--Sajchan-úl ca 20—40 km a Dalanzadgad; locis stepposis; 1600—2800 m; 43°36′, 103°50′—104°03′.	S. & V. 7782, 25/8, 1966
Compositae			
Acroptilon repens (L.) DC.	26	Mong. austr.: 15—20 km austro-austro-occid. a pago Cogt-Ovó; in semideserto; ca 1400 m; 44°18′, 105°12′.	S. & V. 8348, 26/8, 1966
Echinops gmelinii Turcz.	26	Mong. austr.: 3—5 km occid. a pago Barún Bajan-ulán; in semideserto; 1200 m; 43°09′, 101°20′.	S. & V. 6515, 17/8, 1966
Rhaponticum uniflorum (L.) DC.	26	Mong. bor.: in declivibus inter pagos Baga--Tenger et Zajsan prope Ulan-Bator; locis stepposis; 1300—1500 m; 47°52′, 106°57′.	D. & S. 894, 26/7, 1965
Senecio pricei Simps.	48	Mong. austr.: Altai Gobicus, ad cacumina montium Baga Bogd-úl; 3300—3500 m; 44°55′, 101°35′.	S. & V. 7526, 20/8, 1966
Tragopogon trachycarpus S. Nikit.	12	Mong. bor.: 20 km bor.-occid. ab oppido Bulgan; in pratis; 1200—1600 m; 48°57′, 103°22′.	D. & S. 2348, 6/8, 1965
Crassulaceae			
Tillaea aquatica L.	42	Mong. bor.: in urbe Ulan-Bator; ad marginem rivi; ca 1300 m.	S. & V. 8960, 1/9, 1966
Cruciferae			
Berteroa macrocarpa Ik. — Gal.	16, 17	Mong. austr.: Altai Gobicus, montes Gurvan--Sajchan-úl ca 25—40 km a Dalanzadgad; in pratis montanis ad declivia bor. montium; 1600—2800 m; 43°36′, 103°50′—104°03′.	S. & V. 8091, 25/8, 1966
Dontostemon crassifolius Bunge	14	Mong.: inter pag. Cogt-Ovó et oppidum Mandalgov (Mandal-Gobi); semidesertum; 1300 m; 45°07′, 105°38′.	S. & V. 8416, 27/8, 1966
Dontostemon integrifolius (L.) C. A. Mey.	14	Mong. bor.: prope vicum Onžuul; locis stepposis; ca 1300 m; 46°52′, 105°15′.	S. & V. 5998, 13/8, 1966
	14	Mong. centr.: prope pagum Ulzijt (Uldzit); locis stepposis; 1800—1900 m; 46°09′, 103°25′.	S. & V. 6032, 14/8, 1966

*D. = M. Deyl, S. = J. Soják, V. = V. Vašák (collectors).

Taxon	2n	Locality	Voucher
Dontostemon senilis Maxim.	28	Mong. austr.: 3—5 km occid. a pago Barún Bajan-ulán; in semideserto; 1200 m; 45°09′, 101°20′.	S. & V. 6476, 17/8, 1966
Ptilotrichum tenuifolium (Steph.) C. A. Mey. in Ledeb.	88	Mong. bor.: ad ripam rivi Tola et in collibus supra vicum Songino prope Ulan-Bator; declivia stepposa et saxosa; 1300—1500 m; 47°51′, 106°40′.	V. 10065, 15/9, 1966
Cyperaceae			
Carex arnellii Christ ex Scheutz	40	Mong. bor.: in valle Nucht (ca 15 km ab opp. Ulan-Bator); in pratis humidis in silvis; 1500—2000 m; 47°50′, 106°54′.	S. & V. 5063, 7/8, 1966
Dipsacaceae			
Scabiosa comosa Fisch. ex Roem. et Schult.	16	Mong. bor.: in declivibus inter pagos Baga-Tenger et Zajsan prope Ulan-Bator; locis stepposis; 1300—1500 m; 47°52′, 106°57′.	D. & S. 893, 26/7, 1965
Geraniaceae			
Erodium stephanianum Willd.	16	Mong. austr.: „Šijr Chajrchan" inter pagos Gučin-us et Barún Bajan-ulán; locis saxosis, arenoso-glareosis et stepposis; ca 1600 m; 45°19′, 102°05′.	S. & V. s. n., 16/8, 1966
Erodium tibetanum Edgew. in Hook.	18	Mong. austr.: 3—5 km occid. a pago Barún Bajan-ulán; in semideserto; 1200 m; 45°09′, 101°20′.	S. & V. 6524, 17/8, 1966
Gramineae			
Aristida heymannii Regel	22	Mong. austr.: ad marginem pagi Bogd; in semideserto, in declivibus saxosis; 1200 m: 45°12′, 100°46′.	S. & V. 6676, 17/8, 1966
Chloris virgata Swartz	20	Mong. austr.: inter pagos Bogd et Barún Bajan-ulán (ca 25 km a Bogd); in deserto arenoso; ca 1200 m; 45°10′, 101°03′.	S. & V. 6454, 17/8, 1966
Stipa sibirica (L.) Lam.	22, 23	Mong. centr.: in vicinitate opp. Arvajchér (Arbajcher); locis stepposis et lapidosis; 1800—2100 m; 46°15′, 102°45′.	S. & V. 6183, 15/8, 1966
Labiatae			
Scutellaria tuvensis Juz.	22	Mong. austr.: Altai Gobicus, montes Gurvan-Sajchan-úl ca 25—40 km a Dalanzadgad; in rupibus ad ripam rivuli; 1600—2000 m; 43°36′, 103°50′—104°03′.	S. & V. 7963, 25/8, 1966
Leguminosae			
Astragalus melilotoides Pall.	16	Mong. bor.: in valle vers. orient. a vico Tarialan (Tarjalang); locis stepposis; 1100 m; 49°37′, 102°.	D. & S. 3240, 13/8, 1965
Astragalus tenuis Turcz.	48	Mong. bor.: in collibus supra vicum Songino; decl. stepposa et saxosa; 1300—1500 m; 47°51′, 106°40′.	V. 10025, 15/9, 1966
Lespedeza dahurica (Laxm.) Schindl.	42, 40	Mong. bor.: in collibus supra vicum Songino; declivia stepposa et saxosa; 1300—1500 m; 47°51′, 106°40′.	V. 9991, 15/9, 1966
Plantaginaceae			
Plantago minuta Pall.	10	Mong. austr.: 3—5 km occid. a pago Barún	S. & V.

Taxon	2n	Locality	Voucher
		Bajan-ulán; in semideserto; ca 1200 m; 45°09′, 101°20′.	6588, 17/8, 1966
Polygonaceae			
Aconogonum angustifolium (Pall.) Hara	20	Mong. bor.: in valle Zajsan; declivia stepposa; 1400—2000 m; 47°51′, 106°55′.	S. & V. 5369, 10/8, 1966
Rutaceae			
Haplophyllum dauricum (L.) G. Don	18	Mong. bor.: supra vicum Songino; decl. stepposa et saxosa; 1300—1500 m; 47°51′, 106°40′.	S. & V. 9060, 3/9, 1966
	18	Mong. bor.: inter pagos Baga Tenger et Zajsan; in pratis stepposis; 1500—1800 m; 47°51′, 106°57′.	S. & V. 5822, 12/8, 1966
	18	Mong. austr.: Altai Gobicus, in declivibus bor. jugi Baga-Bogd-úl; locis stepposis; 2000 m; 44°57′, 101°35′.	S. & V. 7032, 20/8, 1966
	18	Mong. austr.: Altai Gobicus, ad pedem mont. Baga-Bogd-úl; locis lapidosis et stepposis; 1300—1600 m; 45°, 101°25′.	S. & V. 6988, 19/8, 1966
Saxifragaceae			
Ribes mediatum Měsíček et Soják	16	Mong. bor.: versus orient. a valle Zajsan; in declivi lapidoso; 1500—1800 m; 47°51′, 106°56′.	S. & V. 9112, 4/9, 1966
Scrophulariaceae			
Limosella aquatica L.	40	Mong. bor.: in urbe Ulan-Bator; ad marginem rivi; ca 1300 m.	S. & V. 8964, 1/9, 1966
Solanaceae			
Lycium ruthenicum Murr.	24	Mong. austr.: ad marginem austr. pagi Barún Bajan-ulán et ad ripam bor.-occid. lacus Tácyn-Cagan-núr; in semideserto lapidoso et arenoso; 1200 m; 45°08′, 101°25′.	S. & V. 6907, 18/8, 1966
Urticaceae			
Parietaria micrantha Ledeb.	16	Mong. bor.: 6 km merid. a vico Uňt; in declivibus saxosis in *Laricetis* subhumidis; 1200—1600 m; 49°04′, 102°50′.	D. & S. 2924, 11/8, 1966
Urtica cannabina L.	52	Mong. bor.: in valle Nucht prope Ulan-Bator; ad viam; 1500—2000 m; 47°50′, 106°54′.	S. & V. s. n., 7/8, 1966
	52	Mong. centr.: ad marginem bor. oppidi Mandalgov; locis stepposis; ca 1400 m; 45°48′, 106°18′.	S. & V. 8604, 28/8, 1966
Zygophyllaceae			
Peganum nigellastrum Bunge	24	Mong.: ad pagum Gučin-us; locis stepposis et graminosis; ca 1500 m; 45°27′, 102°25′.	S. & V. 6377, 16/8, 1966
	24	Mong. centr.: ad viam inter Dalanzadgad et Cogt-Ovó (80 km a Dalanzadgad); in semideserto; 1400—1600 m; 44°—44°06′, 105°.	S. & V. 8295, 26/8, 1966

Material and methods

The chromosome observations, camera lucida drawings and photomicrographs were almost exclusively made on mitoses in root tips of young seedlings. Smear slides were prepared from material treated by p-dichloro-benzene and 8-hydroxy-quinoline, fixed in the standard AAA

solution and stained with lacto-orceine, aceto-carmine, aceto-nigrosine and lacto-resorcin blue. The chromosomes were measured in camera lucida drawings; an average of at least 5 plates is always given. The following symbols are used in karyotype descriptions: l = longer chromosome arm; s = shorter arm; c = total length of a chromosome; formulae for centromeric position (cf. LEVAN, FREDGA et SANDBERG 1964): M (r-index = 1 : s = 1. 0 — 1. 09); m (r = 1. 10 — — 1. 70); sm (r = 1. 70 — 3. 0); st (r = 3. 0 — 7. 0).

Complete sets of validating herbarium specimens have been deposited in the herbarium of the National Museum in Prague (PR); the specimen numbers are listed in Tab. 1.

The karyological observations were made by J. MĚSÍČEK, the taxonomy of plants was studied by J. SOJÁK. The latter had an opportunity to compare the collections examined with a comprehensive herbarium material in the Botanical Institute of the Academy of Sciences of the U.S.S.R., Leningrad (LE).

The numbers reported here are consistently compared with those previously published for plants of the same or related species from other parts of their area. Unfortunately, the application of these data to more detailed solutions of particular problems often appears to be hardly possible.

The authors are greatly indebted to Mrs. V. Javůrková for his interest and help. For some critical comments we owe a debt of gratitude to Dr. M. Kovanda, CSc.

Results

This report presents chromosome numbers for 34 species (41 populations) of the Mongolian flora. The results are listed in Tab. 1.

Discussion

Anoplocaryum compressum (TURCZ.) LEDEB. 2n = 23, 24

Plate XXII : a

This interesting annual species is strongly specialized ecologically. It appears to be a characteristic plant of caves and shady sites under overhanging rocks but inhabits also deeper holes between large stones of screes or shady fissures of rocks. Its occurrence, however, is not dependent upon high humidity. The continuous area of *A. compressum* is restricted to the northern part of Mongolia and adjacent region of Dahuria. In the latter, however, the species is very rare (three localities; cf. PESCHKOVA 1966); its isolated occurrence in southern Mongolia (the Gobi Altai) has not been formerly known (cf. GRUBOV 1955).

No species of the genus *Anoplocaryum* has been previously examined karyologically. *A. compressum* seems to be diploid with x = 12, this basic number being rather common in the family *Boraginaceae*. One monosomic was found in the population from Delgerkhan.

Axyris hybrida L. 2n = 18

Plate XXII : b

The species is distributed in Middle Asia (the Iran-Turanian region) and in Siberia. From its natural habitats (stony and rocky steppes) it occasionally invades synanthropic communities.

A single species of the small genus *Axyris* has been previously examined. MULLIGAN (1957), LÖVE Á. et D. (1964) and BASSETT et CROMPTON (1971) reported the number of 2n = 18 for *A. amaranthoides* L. from Canada; it is obvious that *Axyris* like most other members of the family *Chenopodiaceae* has a base number of x = 9. The former author figured somatic chromosomes of his species: their length is shown to range from 0.7 to 1.0 μm, the total length of the diploid set being 14.6 μm. The respective values were found to be considerably higher in *A. hybrida*: 1.2—3.0 μm (the range of

chromosome length) and 27.9 μm (length of the diploid set). One chromosome pair (m) bearing microsatellites is included in the set.

A salient mixoploidy was recorded in root meristems of three individuals examined (more than 50% of tetraploid and hexaploid cells). In the other five plants the polyploid cells occurred sporadically or were quite absent.

Bassia dasyphylla (FISCH. et MEY.) O. KUNTZE 2n = 18

Plate XXII : c

Syn.: *Echinopsilon divaricatum* KAR. et KIR. — A Central Asiatic psammophyte ranging from Kashmir to the Balkhash L. area and eastwards to the desert and semi-desert regions of northern China and Mongolia.

No karyological data have been formerly reported for this species but the count of 2n = 18 seems to be standard in the genus (cf. BOLKHOVSKIKH et al. 1969).

Acroptilon repens (L.) DC. 2n = 26

Fig. 1; Plate XXII : d

Syn.: *Centaurea picris* PALL. — *A. repens* has an astonishing range of variation in both morphology and habitat preference. It is distributed from southeastern Ukraine and the easternmost part of the Balkan Peninsula eastwards to Mongolia and western China, reaching the northern limit of its distribution in southern Siberia and extending southwards to Iran (cf. WEINERT et BREITKOPF 1967 : 147). The species has been occasionally introduced also in other regions (Central and Western Europe, U.S.A., Canada, Argentine, southern Africa, Australia; cf. JEHLÍK in HEJNÝ et al. 1972). Throughout its primary as well as secondary range it often becomes a cumbersome weed of field cultures. Our plants were collected in a natural habitat at the eastern limit of the primary area.

The count of 2n = 26 is in agreement with five previous reports:

California	HEISER et WHITAKER 1948 (as n = 13)
Canada: British Columbia, Summerland	MOORE et FRANKTON 1954
Armenia: Vedi	TONJAN 1968
Etchmiadzin	TONJAN 1968
Afghanistan: distr. Kabul: Kotal-i-Chair Khana, 1950 m a. s. l.	PODLECH et DIETERLE 1968

The basic number of the species is apparently 13. It is, therefore, interesting that ČUKSANOVA, SVEŠNIKOVA et ALEKSANDROVA (1968) found a different number of 2n = 28 in the closely allied *A. australe* ILJIN. TONJAN (l. c.) demonstrated that the occurrence of four satellited chromosomes is a uniform condition of all genera assigned to the subtribe *Centaureinae* O. HOFFM. According to the author, two satellites usually appear to be somewhat larger and better stainable. Our observations concerning the chromosome morphology of *A. repens* are consistent with the TONJAN's statement.

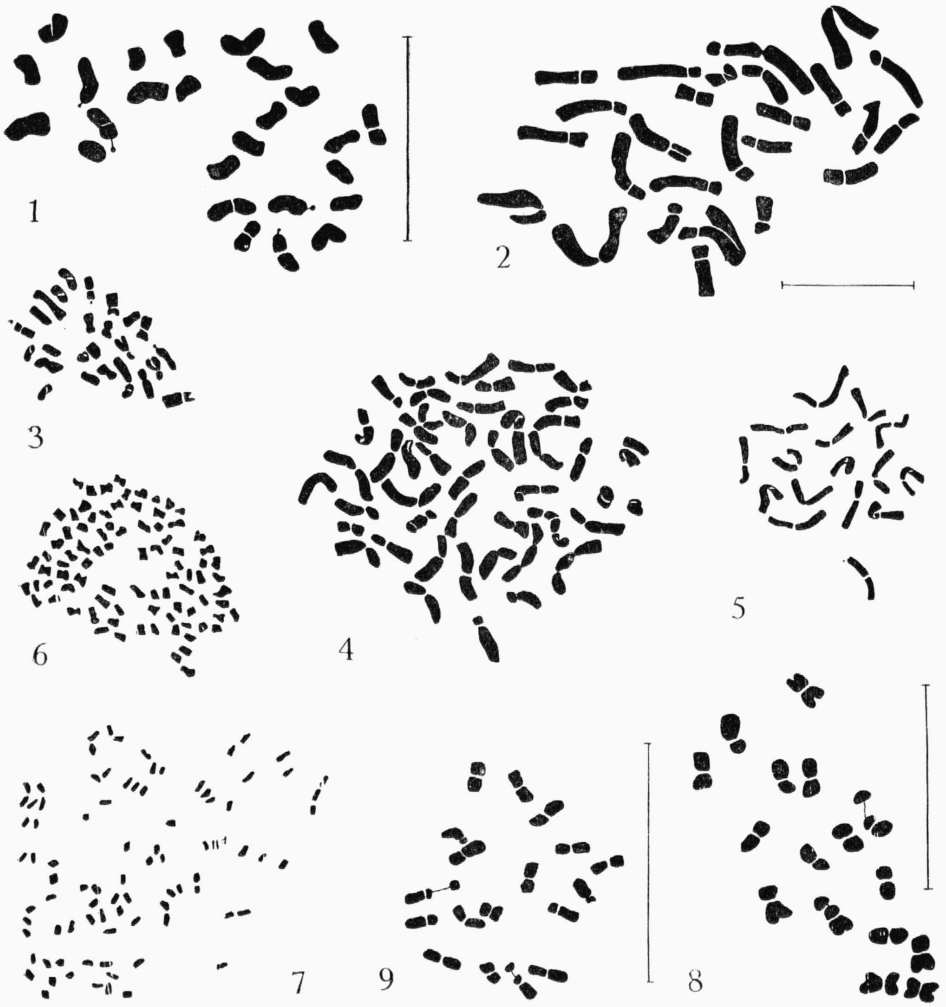
Echinops gmelinii TURCZ. 2n = 26

Fig. 2

An annual psammophyte of the desert and semi-desert zone, ranging from the Narymskiy khrebet Mts. (S. part of the Altai) to northern China.

No chromosome number has been previously reported for this species. ČUKSANOVA, SVEŠNIKOVA et ALEKSANDROVA (1968) found 2n = 28 in the

related *E. nanus* BUNGE (sect. *Nanechinops* BUNGE). In addition, the count of 2n = 26 is a new record for the genus. The following chromosome numbers have been previously obtained for its various members: 2n = 14 (once), 22 (once), 28, 30, 32; they clearly suggest occurrence of a dysploid series



Figs. 1—9. — Somatic metaphases. — 1: *Acroptilon repens* (2n = 26); — 2: *Echinops gmelinii* (2n = 26); — 3: *Rhaponticum uniflorum* (2n = 26); — 4: *Senecio pricei* (2n = 48); — 5: *Berteroa macrocarpa* (2n = 16); — 6: *Ptilotrichum tenuifolium* (2n = 88); — 7: *P. tenuifolium* (2n = 88); — 8: *Erodium stephanianum* (2n = 16); — 9: *E. tibetanum* (2n = 18). — Scale = 10 µm; the scale drawn in Fig. 2 refers also to Figs. 2—7. — Del. J. MĚSÍČEK and V. JAVŮRKOVÁ (Figs. 1, 8).

referable to the multiples of 7, 8, 11(?), 13, 15. The number 7 seems to be of greatest importance. We assume our plants to be hypotetraploids of local occurrence.

The clearly asymmetrical karyotype of *E. gmelinii* is composed of 3 pairs m, 5 pairs sm and 4 pairs st. The other two chromosomes belong to the type sm but they differ considerably in their size. The total absolute length of the chromosome complement is ca. 133 μm. The relative values for the longest and the shortest chromosome pairs are 13% and 4%, respectively.

Rhaponticum uniflorum (L.) DC. 2n = 26

Fig. 3

Syn.: *Centaurea monanthos* GEORGI. — A plant of steppe and forest-steppe communities, less commonly of light forests, occurring in the north of Mongolia. The distribution area of the species extends from the Sayan Mts. to the Amur R. Basin and southward to Korea and China.

Our count is in agreement with LEE's report (1967) who examined Korean plants. The genus *Rhaponticum* is near uniformity of that number (cf. LÖVE Á. et D. 1961, BOLKHOVSKIKH et al. 1969, DITTRICH 1968). SOKOLOVSKAJA et STRELKOVA (1948) and ŽUKOVA (1964; cf. etiam 1967) counted 2n = 24 in *R. carthamoides* (WILLD.) M. ILJIN; recently, however, MALACHOVA (1971a, b) has reported 2n = 26 for this plant. — Four and occasionally three chromosomes with microsatellites attached to the shorter arm were observed in *R. uniflorum*.

Senecio pricei SIMPS. 2n = 48

Fig. 4

This high-mountain species is distributed in the Altai and reaches Tannu-Ola Mts. and Khangai Mts. in the east, extending through the Mongolian Altai to the mountain ranges of Gobi. It was yet unknown from the Baga-Bogdo Mts.

No chromosomal information has been published thus far for this taxon. SOKOLOVSKAJA et STRELKOVA (1960; U.S.S.R., Buchta Tiksi), JOHNSON et PACKER (1968; Alaska, Ogotoruk Creek), ŽUKOVA et PETROVSKIJ (1971, 1972; U.S.S.R., Vrangel Island), and ŽUKOVA et TICHONOVA (1971; Chukotski reg., Anadyrskoye nagorye) reported the same number of 2n = 48 for the closely allied *S. atropurpureus* (LEDEB.) B. FEDTSCH. However, ŽUKOVA (1965) recorded a quite different count of 2n = 28(!) for plants of *S. atropurpureus* from the Chukotski Peninsula. Another ally, *S. pseudoaurantiacus* KOM. was found to be highly polyploid, with 2n = ca 96 (SOKOLOVSKAJA 1968; U.S.S.R., Koryackaya zemlya). Finally MALACHOVA*) (1971b) examined *S. turczaninovii* DC. from the Western Sayan Mts. and obtained the count of 2n = 92. All these species belong to the ser. *Frigidi* SCHISCHK. Unfortunately, no conclusions may be drawn on the basis of these fragmentary data.

Tragopogon trachycarpus S. NIKIT. 2n = 12

A new species for the Mongolian flora (cf. GRUBOV 1955, POPOV 1959 and BORISSOVA 1964). Of the genus *Tragopogon*, only *T. orientalis* (GRUBOV l. c.) and *T. sabulosus* KRASCH. et S. NIKIT. (BORISSOVA l. c.) have been known

*) This record has been erroneously referred to *S. sumneviczii* SCHISCHK. et SERG. in MALACHOVA (1971a); we are greatly indebted to the author for her kind information.

to occur in that country; the two differ from *T. trachycarpus* by a number of characters, most distinctly in that they have yellow flowers. In *T. trachycarpus*, however, the colour of ligules varies in vivo from yellowish to dull violet; they are often light yellow above and violet below, being light violet or bluish-violet in herbarium specimens. *T. trachycarpus* is akin to the Siberian *T. sibiricus* but the latter is readily distinguished by its deeply red or blackish violet ligules which are conspicuously shortened. In addition, its achenes are smooth, while those of *T. trachycarpus* are coarsely sculptured, the sculpture being visible with the naked eye.

The possibility of *T. trachycarpus* having arisen by hybridization between *T. orientalis* and *T. sibiricus* GANESCH. was mentioned by POPOV (1959). Contrary to this opinion, BORISSOVA (1964) considered the hybrid origin of *T. trachycarpus* to be doubtful because of the geographical barrier between the putative parents. Considering the present distribution patterns of the species concerned, her objection appears justified. *T. orientalis* is distributed in the westernmost part of Siberia where it is certainly native; however, its occurrence in central Siberia is not necessarily autochthonous. The area of *T. sibiricus* extends from the Irtysh R. distr. to the Angara-Sayan distr., whilst *T. trachycarpus* appears to be a Dahurian element with an area reaching from the Upper Angara R. to the Shilka R. in Dahuria and southwards to northern Mongolia. Nonetheless, several facts support an interpretation of *T. trachycarpus* as being derivative of an interbreeding process. 1. All important morphological characters clearly indicate that this taxon occupies an intermediate position between the putative parents. 2. The coloration of ligules is known to be typical of some fixed derivatives of crossings between yellow-flowered and red- or violet-flowered plants, respectively. We assume that the geographical isolation between *T. orientalis* and *T. sibiricus* did not exist in the past and that both the species were once brought into contact in western or, maybe, central Siberia. Their vigorous hybrid derivative started to spread independently and exceeded the areas of the parental species. Unfortunately, no information is available concerning the chromosome number in *T. sibiricus* and the interbreeding relations of all three taxa. Biosystematic studies are needed to give better insight into the problem of origin of *T. trachycarpus* and to test the validity of our view.

No chromosome number has been previously reported for the species. There is near uniformity of the basic number of x = 6 in *Tragopogon*.

Tillaea aquatica L. 2n = 42

This is a very rare plant in Mongolia, known hitherto from two localities in central part of northern Mongolia (Ulan-Bator, the Onon R.). The distribution patterns of the species are remarkable (cf. MEUSEL, JÄGER et WEINERT 1965, BORISSOVA 1966). Its area has two main centres: Europe (except for the South and East) and Far East (coastal areas of the U.S.S.R., Korea, Japan, the southern Kurile Isl.). Several single localities [Ural, western Pamir, Yeniseysk and NW. edge of the Baical L. (EGOROVA et SIPLIVINSKI 1969) in Siberia, and Mongolian localities] connecting these centres are isolated by vast disjunctions. Ecological characteristics of Mongolian and central-European habitats do not differ at all.

Two authors have previously reported the same chromosome number of 2n = 42 for plants from Norway (HAGERUP 1941; Raabjerg Mile Søerne near Skagen; as n = 21) and Iceland (LÖVE Á. et D. 1956).

Berteroa macrocarpa Ik.-Gal. 2n = 16, 17

Figs. 5, 10; Plate XXII : e, f

This very conspicuous plant is an endemic of the Gobi Altai and the adjacent Transaltaian Gobi. It differs considerably by its habit from the European species of the genus (cf. Ikonnikov-Galickij 1936 : 191, Fig. 1); for that reason Ikonnikov-Galickij (l.c.) suggested that it be treated as a distinct genus. Unfortunately, some other transitional taxa [e.g. *B. spathulata* (Willd.) C. A. Mey.] are known to connect these two extreme entities and make it impossible — at least at the present time — to separate *B. macrocarpa* (along with *B. potaninii* Maxim.) at the generic level.

Tab. 2. — Karyotype of *Berteroa macrocarpa*

Chromosome pair	c µm		l : s	Type
	$\bar{x} \pm 3s_{\bar{x}}$	s*		
1	5.0 ± 0.2	0.7	1.06	M
2	4.2 ± 0.2	0.5	1.02	M
3	4.0 ± 0.2	0.4	1.10	m
4	4.3 ± 0.1	0.4	1.28	m
5	4.1 ± 0.3	0.7	1.36	m
6	4.0 ± 0.2	0.7	1.52	m
7	4.0 ± 0.2	0.4	1.55	m
8	4.2 ± 0.2	0.4	2.08	sm

* standard deviation

No chromosome number has been previously reported for this taxon. Only two other *Berteroa* species have been examined karyologically and were found to have 2n = 16, too. The symmetrical karyotype of *B. macrocarpa* is composed of the following chromosome pairs: K = 2M + 5m + 1sm (cf. Tab. 2 and Fig. 10). The total length of the diploid chromosome set is 67.9 ± 3 × 3.6 µm (s = 7.3 µm). The number of 2n = 17 was found in one individual only.

Dontostemon Andrz.

Our counts found in three species of *Dontostemon* seem to be the first records for the genus. In addition all series of the section *Symphyodynamis* Turcz. are represented by those species (cf. Golubkova 1950). *D. crassifolius* Bunge belongs to the ser. *Crassifolii* V. Golubk. (along with a Mongolian endemic, *D. elegans* Maxim.), *D. integrifolius* (L.) C. A. Mey. to the ser. *Annui* V. Golubk. and *D. senilis* Maxim. is a member of the ser. *Perennes* V. Golubk. There is considerable lack of agreement as to the position of the genus within the family of *Cruciferae* (cf. e. g. Golubkova 1950 : 75). The present results suggest that the basic number is 7 in *Dontostemon*. This fact as well as the size and the appearance of chromosomes seem to indicate that the genus is more related to the tribus *Hesperidae* than to *Arabidae* and *Sisymbrieae* (cf. etiam Dvořák 1971 : 424).

Dontostemon crassifolius Bunge 2n = 14

This perennial species is distributed in desert and semi-desert areas of western (the Great Lakes Basin) and southeastern Mongolia (districts of the Gobi Altai and of Eastern Gobi).

Outside Mongolia it was yet collected in a single locality in an adjacent region of the U.S.S.R. (the Altai: the Tschuyskaya Step region); its occurrence in the Chinese part of the Gobi desert is not excluded. The plant is very conspicuous by its fleshy leaves.

Dontostemon integrifolius (L.) C. A. MEY. 2n = 14

Fig. 11; Plate XXII: g

D. integrifolius encompasses two distinct varieties; according to GOLUBKOVA (1950) they are isolated neither geographically nor ecologically. All the individuals examined belonged to the var. *eglandulosus* (DC.) TURCZ. Glandular plants were collected only in the Gobi Altai during our expedition. The species is widespread throughout Mongolia except for the most southern regions of the country where it is absent. Its area extends from the Altai to the Upper Amur R.

Tab. 3. — Karyotype of *Dontostemon integrifolius* (Ulzijt)

Chromosome pair	l μm	s μm	c μm	l : s	Type
1	1.6	1.5	3.1	1.07	M
2	2.0	1.8	3.8	1.11	m
3	3.2	2.5	5.7	1.28	m
4	1.8	1.2	3.0	1.50	m
5	1.7	1.1	2.8	1.55	m
6	1.9	1.2	3.1	1.58	m
7	2.2	1.2	3.4	1.83	sm

The following chromosome pairs were found to compose the diploid set of the species: K = 1M + 5m + 1sm (cf. Tab. 3, Fig. 11). The total length of the somatic chromosomes is 49.6 μm.

Dontostemon senilis MAXIM. 2n = 28

An endemic of stony deserts and semi-deserts of western Mongolia (cf. GOLUBKOVA 1950). Unlike the preceding species, this tetraploid appears to be perennial.

Ptilotrichum tenuifolium (STEPH.) C. A. MEY. in LEDEB. 2n = 88

Figs. 6, 7

Syn.: *P. elongatum* (STEPH.) C. A. MEY. — A xerophilous petrophyte, ranging from the Altai to Dahuria. In Mongolia it occurs rather sporadically in the north of the country and, according to GRUBOV (1955), also in the Gobi Altai. HANELT et DAVAŽAMC (1965) recently reclassified this taxon as a subspecies of its nearest relative *P. canescens* C. A. MEY. This, however, does not seem to be in line with our results obtained by field observations and by comparison of herbarium specimens of both the taxa. The Mongolian *P. tenuifolium* clearly differs by some characters, mainly in having larger petals and longer styles. In the field the two also are quite distinct. On the other hand, they often occupy the same type of habitat and their ranges overlap considerably. It is obvious that biosystematic approach is needed to test the validity of different views.

The chromosome number for *P. tenuifolium* is here reported for the first time. Only two species of the genus have been previously examined karyologically. PUECH (1968) found the number of 2n = 32 in *P. spinosum* (L.) BARREL, and KÜPFER (1971) has recently reported the same result (i.e. n = = 16) for *P. halimifolium* BOISS. Thus the basic number is 8 in the genus and *P. tenuifolium* appears to be highly polyploid.

Carex arnellii CHRIST ex SCHEUTZ 2n = 40

A forest species, widely ranging from the European part of the U.S.S.R. to Japan. Its occurrence in Mongolia is restricted to the Khentei Mts. The plants examined karyologically differ from the typical form in that they have only one male spikelet.

HARLING (1945) examined a material from near Voroshilov (U.S.S.R., distr. Vladivostok) and found a slightly different count of 2n = 42. Of the two closely related Eurasiatic species — *C. silvatica* HUDS. and *C. hypaneura* V. KRECZ. — the former only was investigated karyologically (cf. BOLKHOVSKIKH et al. 1969 — 4 records) and was found to have 2n = 58.

Scabiosa comosa FISCH. ex ROEM. et SCHULT. 2n = 16

Plate XXIII: i, j

Syn.: *S. fischeri* DC. – A steppe element ranging from the Angara-Sayan region to Dahuria and to northern Mongolia where it is abundant mainly in the eastern part of the country. In the Far East it is substituted by related species of the section *Prismakena* BOBR.

No chromosome number has been previously reported for this taxon. To date three other members of the section were examined karyologically. SOKOLOVSKAJA (1966) recorded a different count of 2n = 18 for the related *S. lachnophylla* KITAG. ex NAKAI, HONDA et KITAG., TAHARA (in ISHIKAWA 1916) and FREY (1970) found the number of 2n = 16 in *S. japonica* MIQ., and LEE (1967) reported the same number for *S. mansenensis* NAKAI f. *alpina* NAKAI. The present authors verified the SOKOLOVSKAJA's result using a seed collection of *S. lachnophylla* from nature distributed by the Botanical Garden of the Academy of Sciences of the U.S.S.R., Vladivostok (seed list 1971, No. 236) and found it has 2n = 16. The respective plants are cultivated in the experimental garden but were not yet identified taxonomically. — Two satellite chromosomes are included in the diploid set of *S. comosa*.

Erodium stephanianum WILLD. 2n = 16

Figs. 8, 13

E. stephanianum is distributed throughout most Mongolia where it grows in primary but often also in secondary habitats (for example in villages, fields, etc.). Its area extends from the Pamir to the Altai and eastwards to the Far East (U.S.S.R., Manchuria, China proper).

The count of 2n = 16 is not merely the first record for the species but also a new entity within the genus. All previous counts found in *Erodium* may be considered to be derived from two basic numbers: x = 9 and x = 10. Our result, however, corresponds with x = 8.

The symmetrical karyotype of *E. stephanianum* is composed of the following chromosome pairs: K = 7m + 1sm, its total length being 29.2 μm. The length of chromosomes ranges from 1.5 μm to 1.9 μm in the m chromosomes reaching 2.7 μm in the sm pair. In the latter a macrosatellite is attached to the longer arm. The chromosomes of the pair No. 5 differ considerably by their l/s ratio (cf. Tab. 4, Fig. 13); similar difference was also found in *E. tibetanum* (chromosome pair No. 6, Tab. 5, Fig. 14).

Tab. 4. — Karyotype of *Erodium stephanianum*

Chromosome pair	l μm	s μm	c μm	l : s	Type
1	0.8	0.7	1.5	1.14	m
2	0.8	0.7	1.5	1.14	m
3	1.0	0.8	1.8	1.25	m
4	1.0	0.8	1.8	1.25	m
5	1.0	0.8	1.8	1.25	m
5′	1.2	0.7	1.9	1.71	sm
6	1.0	0.7	1.7	1.43	m
7	1.1	0.7	1.8	1.57	m
8	0.4 + 0.8 + 0.6	0.9	2.7	2.00	sm

Erodium tibetanum Edgew. in Hook. 2n = 18

Figs. 9, 14; Plate XXII: h; XXIII: k, l

The distribution area of this Central Asiatic xerophyte consists of two parts: one including Tibet, Pamir and adjacent region of the Himalaya, the other being restricted to northwestern Mongolia and the Gobi desert. *E. tibetanum* appears to be a plant of alpine communities in Tibet (where it ascends up to 5000 m a.s.l.), while in Mongolia it inhabits stony and rocky sites of deserts and semi-deserts.

Tab. 5. — Karyotype of *Erodium tibetanum*

Chromosome pair	l μm	s μm	c μm	l : s	Type
1	0.5	0.5	1.0	1.00	M
2	0.7	0.7	1.4	1.00	M
3	0.8	0.7	1.5	1.14	m
4	0.9	0.8	1.7	1.12	m
5	0.8	0.6	1.4	1.33	m
6	0.9	0.6	1.5	1.53	m
6′	0.7	0.6	1.3	1.16	m
7	0.3 + 0.8 + 0.4	0.8	2.3	1.87	sm
8	0.9	0.4	1.3	2.25	sm
9	0.9	0.3	1.2	3.00	sm—st

No chromosomal information has been published thus far for the species. Its diploid set contains the following chromosome pairs: K (asymmetrical) = = 2M + 4m + 2sm + 1st (Tab. 5, Fig. 14). The chromosome length ranges from 1.0 μm to 2.3 μm reaching its maximum in the only satellited pair. The total length of the diploid complement was found to be 26.4 μm.

Aristida heymannii Regel 2n = 22

Plate XXIII: o

The species has been passing under the name *A. adscensionis* L. from Mongolia. Cvelev (1968), however, subdivided the widespread *A. adscensionis* complex into four species: *A. adscensionis* L. s. str. (subtropical and tropical Africa and America), *A. coerulescens* Desf. (the Mediterranean region), *A. heymannii* Regel (ranging from the eastern Mediterranean region through the Iran-Turanian region to the western Himalaya, Mongolia and northern China) and *A. vulpioides*

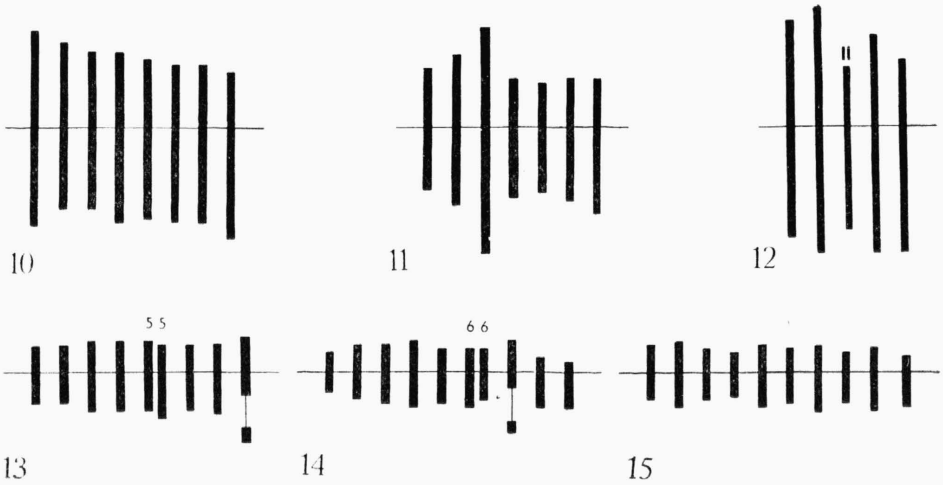
HANCE (eastern China). Recently the first two taxa have been relegated to the rank of subspecies (*A. adscensionis* L. subsp. *adscensionis* and subsp. *coerulescens* (DESF.) BOURREIL et TROUIN) by BOURREIL et TROUIN (1970) and a new combination *A. adscensionis* subsp. *heymannii* (REGEL) TZVEL. has also been proposed by TZVELEV (1971). In Mongolia the occurrence of the annual *A. heymannii* is restricted to the zone of desert and semi-desert communities.

Tab. 6. — Chromosome counts in the *Aristida adscensionis* complex. (All previous data except for those designated by asterisks have been reported under the name *A. adscensionis* L.)

Country	Locality	n	2n	References
U.S.A.	Texas, Jeff Davis Co.	11	—	GOULD 1960
	Texas, San Saba Co.	11	—	DELISLE 1969
Mexico	Coahuila, W. of Saltillo	—	22	GOULD 1966
	Yucatán	—	22	GOULD et SODERSTROM 1970a
	Chihuahua	—	22	REEDER 1971
Argentina	Godoy Cruz, Mendoza	—	22	COVAS et BOCKLET 1945
Canary Isl.	Gran Canaria	—	22	BORGEN 1969
Greece	Crete	11	22	BOURREIL et TROUIN 1970*
Morocco	Djebel Kourati — Bot. garden of I.S.C. of Rabat	11	22	BOURREIL et TROUIN 1970*
Tunisia	Djebel Bou Hedma	—	22	GOULD et SODERSTROM 1970b
Libya	—	11	22	BOURREIL et TROUIN 1970**
Kenya	Kilifi, Coast Prov.	—	22	TATEOKA 1965
India	Udaipur, Rajastan	11	—	MALIK et TRIPATHI 1970
Mongolia	cf. Tab. 1	—	22	present authors
unspecified	—	—	22	AVDULOV 1933

* *A. adscensionis* L. subsp. *coerulescens* (DESF.) BOURREIL et TROUIN
** *A. adscensionis* L. subsp. *adscensionis* var. *festucoides* (POIR.) HENR.

Previous sampling of chromosome numbers, involving apparently all these taxa except for *A. vulpioides*, indicates that the complex may be diploid throughout its extensive area. — One large satellited chromosome has been



Figs. 10—15. — Idiograms. — 10: *Berteroa macrocarpa*; — 11: *Dontostemon integrifolius*; — 12: *Plantago minuta*; — 13: *Erodium stephanianum*; — 14: *E. tibetanum*; — 15: *Chloris virgata*. — Del. V. MATĚJOVIČOVÁ.

found by BOURREIL et TROUIN (l. c.) in the haploid set of both the subspecies examined by them.

Chloris virgata SWARTZ 2n = 20

Figs. 15, 17

The feather fingergrass is widespread in the tropics and subtropics almost around the globe; in Asia it reaches the northern extremity of its distribution in northern Mongolia and Manchuria. It often occurs as an anthropophyte. In Mongolia its native occurrence is restricted to the southern half of the country from where it was introduced to the steppe zone in the north of Mongolia. Our plants were collected in a natural habitat.

Tab. 7. — Chromosome counts in *Chloris virgata*

Country	Locality	n	2n	References
U.S.A.	Texas, Castro Co.	—	20	GOULD 1968
	Texas,	—	20	BROWN 1950
	Texas	10	—	BROWN 1951
Mexico	Coahuila, W. of Saltillo	—	20	GOULD 1966
	Queretaro: Queretaro	—	20	GOULD 1966
	Baja California, sur La Paz	—	20	GOULD 1966
S. Africa	Mafeking, Cape	—	20	MOFFET et HURCOMBE 1949
India	Gorakhpur	10	—	GUPTA 1969
	Udaipur, Rajasthan	10	—	MALIK et TRIPATHI 1970
Mongolia	cf. Tab. 1	—	20	present authors
Australia	unspecified	—	20	PRITCHARD et GOULD 1964
—	Bot. Garden Berlin	10	20	SINGH et GODWARD 1960
Dubious counts				
—	cultivated plants	—	14	NIELSEN et HUMPHREY 1937
—	without any information	—	26	THOMAS in DARLINGTON et WYLIE 1955
sub *C. virgata* SW.	unspecified	—	30	KRISHNASWAMY 1941
sub *C. caudata* TRIN.	unspecified	—	40	KRISHNASWAMY 1941

Although 16 records have been obtained for this species (cf. Tab. 7), many more will be needed in order to understand its cytogeographic patterns. Existing counts indicate a wide distribution for the diploids. Although the

Tab. 8. — Karyotype of *Chloris virgata*

Chromosome pair	l µm	s µm	c µm	l : s	Type
1	0.7	0.7	1.4	1.00	M
2	0.9	0.8	1.7	1.12	m
3	0.7	0.6	1.3	1.17	m
4	0.6	0.5	1.1	1.20	m
5	0.9	0.7	1.6	1.30	m
6	0.8	0.6	1.4	1.33	m
7	1.0	0.7	1.7	1.43	m
8	0.8	0.5	1.3	1.60	m
9	1.0	0.6	1.6	1.70	sm
10	0.9	0.4	1.3	2.25	sm

species is a very distinctive one, there seems to be a good reason to suppose that the rather great variance in chromosome numbers is due to taxonomic misidentification. All the deviating numbers of 2n = 14, 26, 30 and 40 were found only once and in materials of unknown or unspecified origin. KRISHNASWAMY (1941) reported 2n = 30 for *C. virgata* SW. and 2n = 40 for *C. caudata* TRIN. but both the names are synonymous. The only count of 2n = = 20 may be considered to be reliable.

The symmetrical karyotype of *C. virgata* is composed of the following chromosome pairs: K = 1M + 7m + 2sm (cf. Tab. 8, Fig. 15); the length of its diploid set was found to be 29.0 μm.

Stipa sibirica (L.) LAM. 2n = 22, 23

Fig. 18

A steppe and forest-steppe species ranging from Daghestan and western Siberia to China and Japan. It is common in Mongolia but avoids desert areas.

A different chromosome count of 2n = 24 was recorded for the species by AVDULOV (1928) and LOVE in MYERS (1947). Unfortunately, no additional data concerning the origin of their samples are available. To date the number of 2n = 22 was found only once in the genus (*S. avenacea* L., GOULD 1958). The count of 2n = 22 clearly predominates in Mongolian plants, 2n = 23 having been observed in two individuals only.

Scutellaria tuvensis JUZ. 2n = 22

Fig. 19; Plate: XXIII: p

S. tuvensis is a microspecies most closely related to *S. grandiflora* SIMS. The two differ by the colour of corolla: *S. tuvensis* has bright blue flowers (in vivo as well as in dryish specimens), whereas those of *S. grandiflora* are purple. In addition, differences in the shape of leaf margins have been given by JUZEPCZUK (1951, 1954); the leaves of *S. tuvensis* should be more distinctly toothed with longer teeth. This character is apparent in some individuals but with sufficient comparative materials the statement does not seem to be valid. Recently ČERNEVA (1970) stated that even the colour of flowers is a variable feature: it is said to range from pinky-violet to blue. The author therefore did not accept the specific rank of the taxa concerned and referred the name *S. tuvensis* to the synonymy of *S. grandiflora*. This character, however, was found to be highly constant in Mongolian individuals (localities from the Gobi Altai); our collections differ considerably by the colour of flowers from the Altaian plants of *S. grandiflora* deposited in LE.

The only *S. grandiflora* has been previously reported as occurring in Mongolia and *S. tuvensis* therefore is a new taxon for the Mongolian flora. The only known station of *S. tuvensis* (near Kyzyl, Tuva A.S.S.R.) is very distant from the Mongolian localities, but there is no doubt that the species will also be found in between these places.

The count of 2n = 22 is the first record for the species. To date the same number has been reported for three species of *Scutellaria*, i.e. for *S. alpina* L., *S. chitrovoi* JUZ. and *S. karkaralensis* JUZ. (cf. BOLKHOVSKIKH et al. 1969). Of these taxa only *S. karkaralensis* is closely related to *S. tuvensis*. A detailed karyological analysis is needed to account for the conspicuous and surprising

variation of chromosome numbers within the genus (x = 8, 9, 10, 11, 15, 17). — Two chromosomes bearing macrosatellites attached to the shorter arms were found in *S. tuvensis*.

Astragalus melilotoides PALL. 2n = 16

A diploid steppe species ranging from the eastern Altai to Manchuria and northern China. Along with *A. tenuis* and *A. capillipes* FISCH. (northern China) it belongs to a rather peculiar group within the genus, very conspicuous morphologically (sect. *Melilotopsis* GONTSCH.).

No species of the section has been previously studied karyologically.

Astragalus tenuis TURCZ. 2n = 48

This hexaploid species is the nearest relative of *A. melilotoides* from which it differs by its much narrower, narrowly linear leaflets and by its chromosome number. It is a steppe element with a small area restricted to Dahuria and eastern part of northern Mongolia.

Lespedeza dahurica (LAXM.) SCHINDL. 2n = 40, 42

Figs. 20, 21

A steppe petrophyte and psammophyte, ranging from Dahuria to the Ussuri distr. and southwards to northern China.

Two different chromosome numbers found in a material from unspecified localities (seeds and plants from American institutes) have been previously reported for the species. COOPER (1938) recorded the count of 2n = 36. PIERCE (1939) examined a typical *L. dahurica* and the var. *shimadai* (MASAMUNE) MASAM. et HOSOKAWA and stated the count of 2n = ca 44, i.e. 2n = = 42 or 44, the latter one being taken as more probable. The author's drawings, however, may be interpreted as 2n = 40—44. PIERCE assumes that aneuploidy may have been involved in this species.

The possibility of more than one chromosome number being present within *L. dahurica* has been checked by the present authors. The number of 2n = = 42 was found to be the most common in our plants; it occurred in eight individuals observed. Two plants had undoubtedly 40 somatic chromosomes and in one individiual 2n = 38 was counted; the latter number, however, appears rather uncertain. Considering this result the COOPER's count need not be taken as a priori erroneous. In addition, three basic number are common in the genus *Lespedeza*: x = 9 (2x = 18), x = 10 (2x = 20) and x = = 11 (2x = 22) which correspond to the tetraploid counts of 4x = 36, 40, 44. To understand the chromosome number variation in *L. dahurica*, two possibilities may be considered: 1. an aneuploid series occurs regularly within the species; 2. the correct number is 2n = 36 or 2n = 40 and supernumerary chromosomes are included in the chromosome complements of some plants. Unfortunately, it was not possible to confirm or to challenge the second possibility by the staining methods used.

L. dahurica is the only tetraploid representative of the genus, all the other species being diploid. According to PIERCE, there are hardly any differences between diploids and the tetraploid in size of plants and their organs. The nuclei and the cells of the latter only appear to be somewhat larger. The length of the chromosomes is approximately the same in diploids and the tetraploid (1.0—3.0 μm after PIERCE, 2.0—3.3 μm after COOPER and 0.9—2.8 μm in Mongolian plants). PIERCE stated ca eight chromosome pairs with a median constriction and one satellited pair in *L. dahurica*.

Plantago minuta PALL. 2n = 10

Fig. 12; Plate XXIII: m, n

A xerophyte ranging from the Caucasus and the Caspian Sea to Tibet, Dzungaria and Mongolia where it occurs in the western and southern parts of the country. It appears to be a typical component of Mongolian sandy and stony semi-desert communities. The species exhibits many extremes in its various taxonomic characters; mainly the density of hairiness varies over a wide range in all parts of plants. The individuals examined represent such an extreme entity in having very dense and long hairs on bracts, calyces and leaves. This form has been considered by some authors to be a separate species (*P. mongolica* DECNE. in DC.).

Tab. 9. — Karyotype of *Plantago minuta*

Chromosome pair	l μm	s μm	c μm	l : s	Type
1	2.8	2.7	5.5	1.04	M
2	3.2	3.0	6.2	1.07	M
3	2.6	1.5...0.4	4.6	1.30	m
4	3.2	2.3	5.5	1.39	m
5	3.2	1.7	4.9	1.88	sm

No chromosome count has been previously reported for the species. The symmetrical karyotype of *P. minuta* (K = 2M + 2m + 1sm) is described in Tab. 9 and figured in Fig. 12. Two satellite chromosomes were found in the diploid set (Pl. XXIII : n).

Aconogonum angustifolium (PALL.) HARA 2n = 20

Plate XXIV: r, s

Syn.: *Polygonum angustifolium* PALL. — A steppe species distributed in Mongolia and Dahuria, in the Baical Lake area and in the westernmost part of the Amur R. district.

No chromosome count has been previously reported for this taxon; the basic number of x = 10 is the commonest one in *Polygonum* s. l. Two satellite chromosome pairs were found in the diploid set of the species.

Haplophyllum dauricum (L.) G. DON 2n = 18

Figs. 22, 23

This steppe (less frequently semi-desert) plant is common and abundant in Mongolia except for the most southwestern part of the country. Its area extends from the Altai to Dahuria. The species belongs to the small and rather isolated section *Peganoides* SPACH.

There is probably no chromosomal information in the literature concerning any species of this large genus. Four collections of *H. dauricum* yielded the count of 2n = 18; this fairly broad sampling indicates that the species may be entirely diploid in Mongolia. The basic number of x = 9 appears to be common in the family *Rutaceae*.

Ribes mediatum MĚSÍČEK et SOJÁK 2n = 16

Figs. 16, 24

A comparison of the voucher specimen with a comprehensive herbarium material of *Ribes* deposited in Prague (PR, PRC) and especially in Leningrad

(LE) showed our collection to be a distinctive entity within the *R. diacantha* group. There is good morphological evidence that our plant is closely akin to *R. diacantha* PALL. and *R. pulchellum* TURCZ. but it is readily distinguished from both the species mainly by the shape of the leaves. Unlike *R. diacantha*, its leaves are very deeply divided and have a long middle lobe; on the other

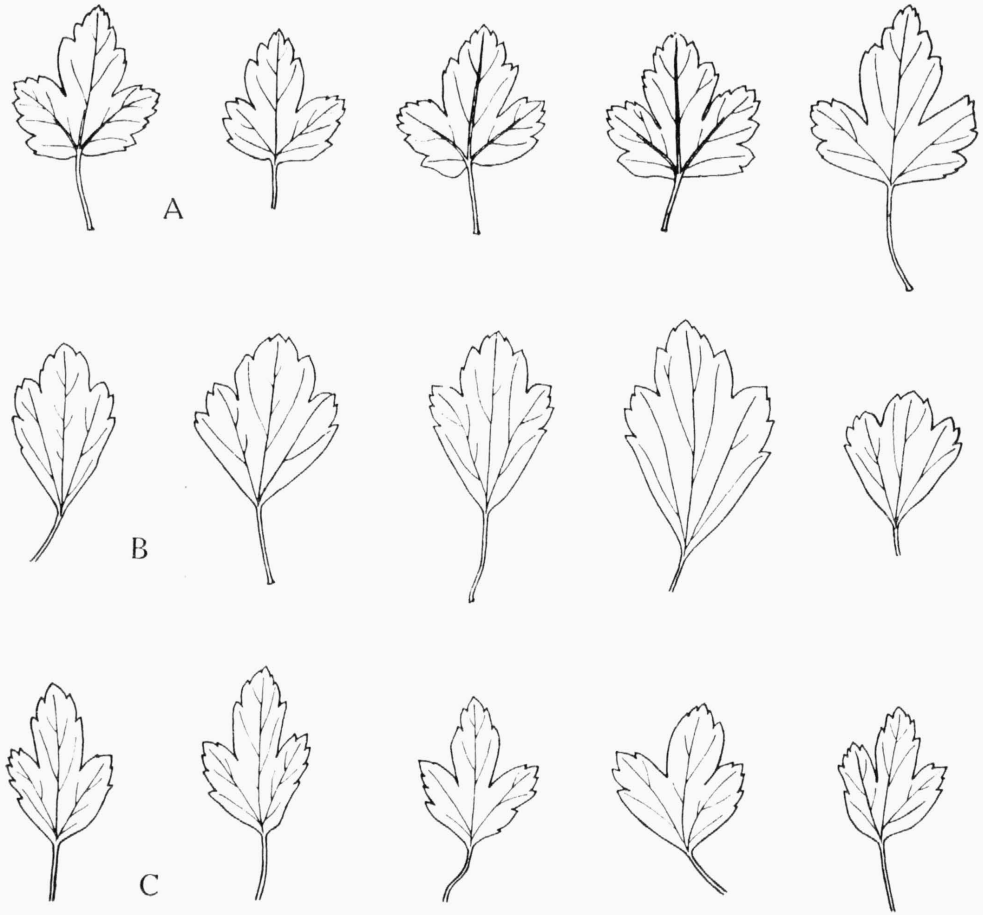


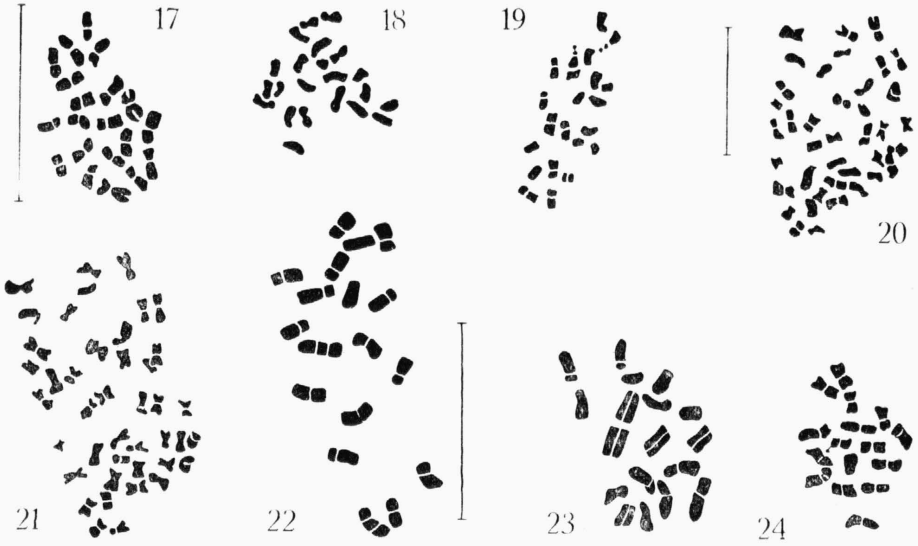
Fig. 16. — Leaf shape of three species of *Ribes* and its variation. — A: *R. pulchellum* TURCZ.; — B: *R. diacantha* PALL.; — C: *R. mediatum* MĚSÍČEK et SOJÁK. — Samples have been taken from fructiferous branches of one individual. — Del. J. SOJÁK.

hand, the blade base of *R. mediatum* differs distinctly from that of *R. pulchellum* by being long and cuneate (as in *R. diacantha*). In *R. pulchellum* the leaf base is abruptly truncate or cordate-rounded. The differences are exemplified by Fig. 16.

The shape of leaves as well as some other features of *R. mediatum* are, in fact, about half-way between those of *R. diacantha* and *R. pulchellum*. *R. mediatum* is a highly fertile plant and produces well developped and viable seeds. We assume it to be a microspecies within the *R. diacantha* complex or,

more likely, a fixed hybridogene from the combination of both the nearest relatives. The putative parents occur rather frequently in the Ulan Bator area. At the present it is, unfortunately, impossible to precise distribution and ecological preferences of the new species.

The chromosome number of 2n = 16 is a uniform entity throughout the genus.



Figs. 17—24. — Somatic metaphases. — 17: *Chloris virgata* (2n = 20); — 18: *Stipa sibirica* (2n = 22); — 19: *Scutellaria tuvensis* (2n = 22); — 20: *Lespedeza dahurica* (2n = 40); — 21: *L. dahurica* (2n = 42); — 22: *Haplophyllum dauricum* (2n = 18), Songino; — 23: *H. dauricum* (2n = 18), Baga-Bogd-úl; — 24: *Ribes mediatum* (2n = 16). — Scale = 10 μm; the scale given in Fig. 20 refers also to Figs. 18, 19, 21, 24. — Del. J. Měsíček and V. Javůrková (Figs. 17, 22, 23).

Ribes mediatum Měsíček et Soják sp. (an hybr.?) n.

Frutex inter *R. pulchellum* Turcz. et *R. diacantha* Pall. intermedius. Folia ramorum fructiferorum basi longe cuneata, tripartita, lobis bene evolutis, lobo medio lateralibus valde longiore, utrimque ± glabra, margine pilis tenuibus, mollibus, brevibus praedita, subtus dilutiora. Ramuli plerumque glabri. Rhaches racemorum glabrae vel pilis tenuibus, ± curvatis, ± sparsis obtectae. Baccae maturae purpureae, 4—6 mm longae.

A *R. pulchello* basi foliorum attenuata, cuneata, a *R. diacantha* praecipue foliis semper evidenter profundius divisis differt.

Typus: Mongolia borealis: declivia collium versus orientem a valle Zajsan (in montibus Bogd-úl prope opp. Ulan-Bator); 47°51′ lat. bor., 106°56′ long. or.; in declivi lapidoso. Alt. ca. 1500—1800 m s. m. Soják et Vašák 9112, 4. IX. 1966 (PR).

Limosella aquatica L. 2n = 40

This is a species with a nearly cosmopolitan type of distribution. In Mongolia it occurs in the northern part of the country (except for its extreme west). The plants observed karyologically are referable to the type form of the species.

L. aquatica seems to have the same tetraploid number of 2n = 40 throughout its range. The Svensson's result of 2n = 36 (published as n = 18) is apparently erroneous. However, the sampling of chromosome numbers is insufficient in this species (cf. Tab. 10).

Tab. 10. — Chromosome counts in *Limosella aquatica*

Country	Locality	2n	References
Greenland	Blue West 1, SW. G., 61° N.	40	Jorgensen, Sorensen et Westergaard 1958
Iceland	unspecified	40	Löve Á. 1954
	unspecified	40	Löve A. et D. 1956
Wales	Morfa Pools, Glamorgan	40	Blackburn in Vachell et Blackburn 1939
Sweden	Dalby near Uppsala	36	Svensson 1928
	Lund	40	Löve Á. et D. 1944
Slovakia	△106 near the Latorica R.	40	Murín et Váchová in Májovský
	Bol′ — E. Slov.	40	et al. 1970
Poland	Wielki Las near Pakosław	40	Jankun in Skalińska, Pogan et Jankun 1968
Greece	central lake of Gamila, 1900 m	40	Quézel et Contandriopoulos 1965*
Mongolia	Ulan Bator	40	present authors

* Fourty one chromosomes are shown in the drawing (l.c.: Tab. 3, Fig. 6, somatic metaphase).

Lycium ruthenicum Murr. 2n = 24

Plate XXIV: t, u

One of the most distinctive species of the genus, a densely prickly small shrub with fleshy leaves. This xerophytic plant is distributed in deserts and semi-deserts of Middle (the Iran--Turanian region) and Central Asia where it inhabits especially saline soils.

The tetraploid count of 2n = 24, known to be the most common in *Lycium*, is the first chromosome record for the species.

Parietaria micrantha Ledeb. 2n = 16

Syn.: *Freirea micrantha* (Ledeb.) Jarm. [nom. altern.] — *P. micrantha* is an Asiatic species widely distributed in the meridional, submeridional and temperate zones. Throughout its area, *P. micrantha* clearly prefers protected, shaded habitats. It is not surprising, therefore, to find that in Mongolia the species is often accompanied by *Anoplocaryum compressum* (Turcz.) Ledeb. Contrary to the latter its ecological amplitude is distinctly broader.

No chromosome number has been previously reported for the species. Recently the same count of 2n = 16 has been found by Nilsson et Lassen (1971) and Dahlgren, Karlsson et Lassen (1971) in *P. lusitanica* L. subsp. *lusitanica* from the Balearic Islands. This record agrees with the taxonomic relationships of both the species. For that reason the Strid's (1971) result reported for *P. lusitanica* L. from Albania (2n = 26) seems to be rather doubtful. The number of 2n = 16, based likely on x = 8 and known to occur also in *P. pensylvanica* Muhl. ex Willd. suggests a complex chromosome number pattern in the genus *Parietaria* (x = 7, 8, 10, 13).

Urtica cannabina L. 2n = 52

The area of this anthropophilous plant extends throughout southern Siberia and adjacent regions of Central Asia to the Far East. The European localities are not autochthonous. *U. cannabina* is abundant and widely distributed in most of Mongolia, distinctly prefering habitats

disturbed by human activities; natural localities of a primary character — where the species may be usually found growing in stony and rocky sites — are less common.

The same count of 2n = 52 has been previously reported by FOTHERGILL (1936). The author studied plants grown from a seed collection obtained from a botanical garden (Lithuania). According to FOTHERGILL the chromosomes of *U. cannabina* are very similar to those of *U. dioica* L.; their length ranges from 0.6—1.3 μm.

Peganum nigellastrum BUNGE 2n = 24

This psammophyte is a Mongolian element very rarely extending to adjacent regions of Dahuria and northern China. It appears to be common in most of Mongolia, representing a characteristic member of semi-desert communities. It is, however, absent from woodland areas in the north of the country.

The tetraploid count of 2n = 24 is the first chromosome record for this species. The only *P. harmala* L. has been previously examined and was found to have the same number.

Souhrn

V práci je shrnuta druhá část výsledků karyologického studia mongolské flóry. Byly zjištěny chromozómové počty u 34 druhů ze 41 lokalit (cf. Tab. 1), z toho pro 23 druhů (a 3 rody) poprvé; u 3 druhů se zde uváděný počet liší od dosud publikovaných. Morfologie chromozómů byla podrobněji studována u 7 druhů. — V práci jej popsán nový druh, *Ribes mediatum* MĚSÍČEK et SOJÁK. *Tragopogon trachycarpus* S. NIKIT. je interpretován jako hybridogenní druh, vzniklý z kombinace žlutokvětého *T. orientalis* L. a fialovokvětého *T. sibiricus* GANESCH. — *Scutellaria tuvensis* JUZ. a *Tragopogon trachycarpus* jsou nové druhy mongolské flóry.

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See also plates XXII.—XXIV. in the appendix.

Addendum. — A further chromosome number of n = 10 has recently been reported for *Chloris virgata* Swartz by Davidse et Pohl, Canad. Journ. Bot. 50 : 1441—1452, 1972. The authors examined plants from Nicaragua (Estelí) and Salvador (Santa Ana, Lago Coatepeque).

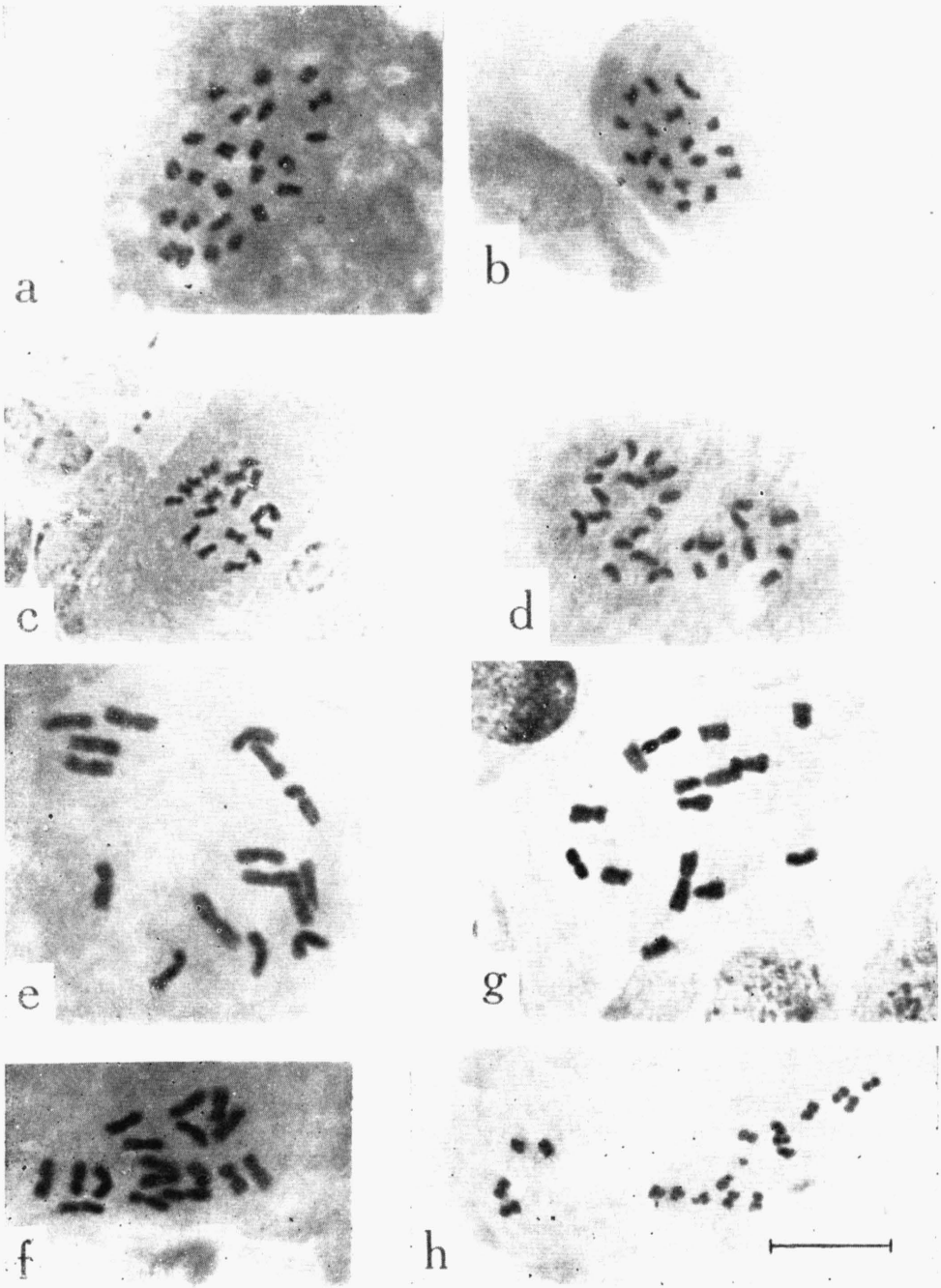

Plate XXII. — Somatic metaphases. — a: *Anoplocaryum compressum* (2n = 24); — b: *Axyris hybrida* (2n = 18); — c: *Bassia dasyphylla* (2n = 18); — d: *Acroptilon repens* (2n = 26); — e: *Berteroa macrocarpa* (2n = 16); — f: *B. macrocarpa* (2n = 17); — g: *Dontostemon integrifolius* (2n = 14); — h: *Erodium tibetanum* (2n = 18). — Scale = 10 µm. — Photo J. Měsíček.

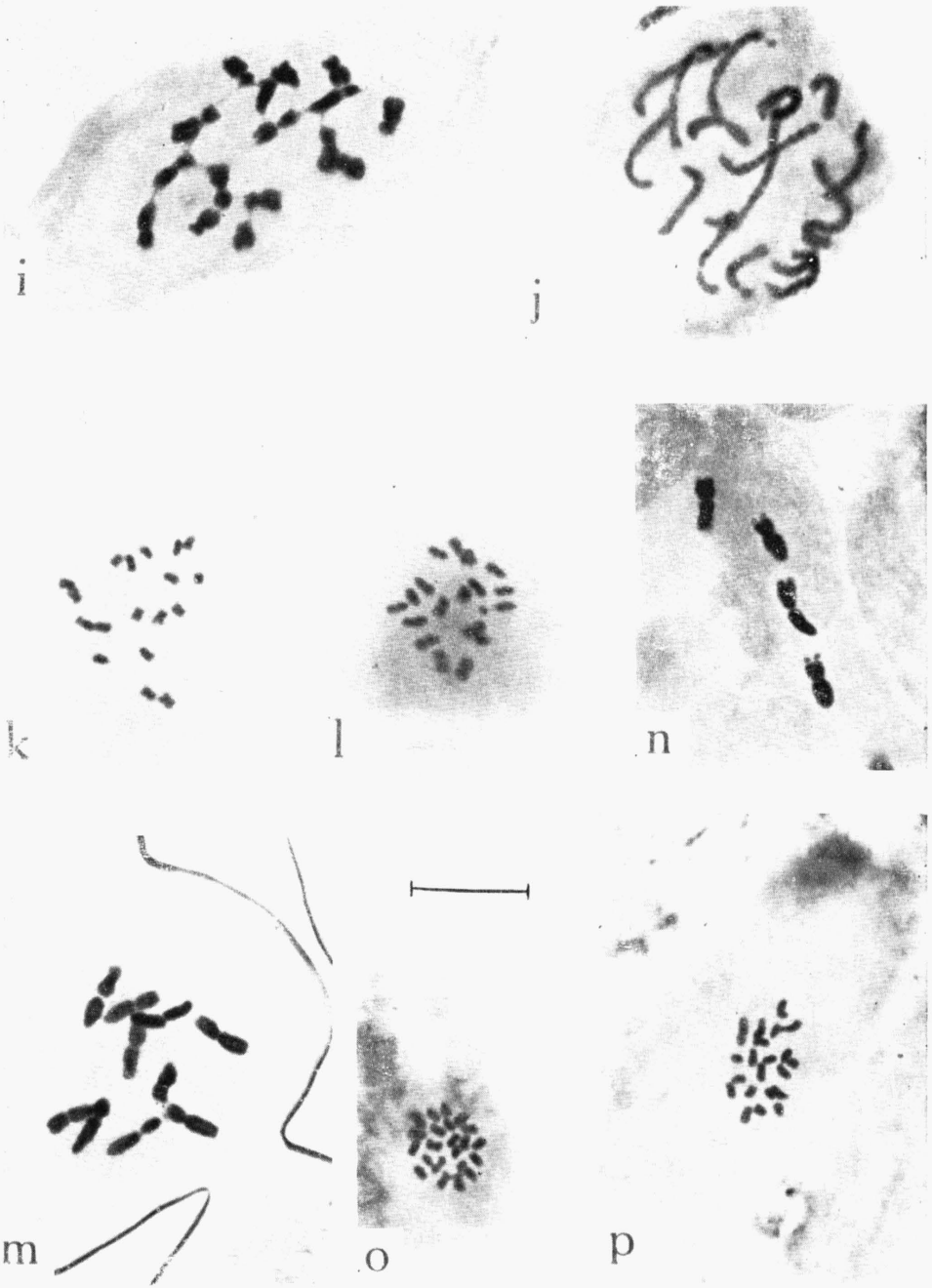

Plate XXIII. — Somatic chromosomes. — i–j: *Scabiosa comosa* (2n = 16); — k–l: *Erodium tibetanum* (2n = 18); — m: *Plantago minuta* (2n = 10); — n: *P. minuta*, satellite chromosomes; — o: *Aristida heymannii* (2n = 22); — p: *Scutellaria tuvensis* (2n = 22). — Scale = 10 μm. — Photo J. Měsíček.

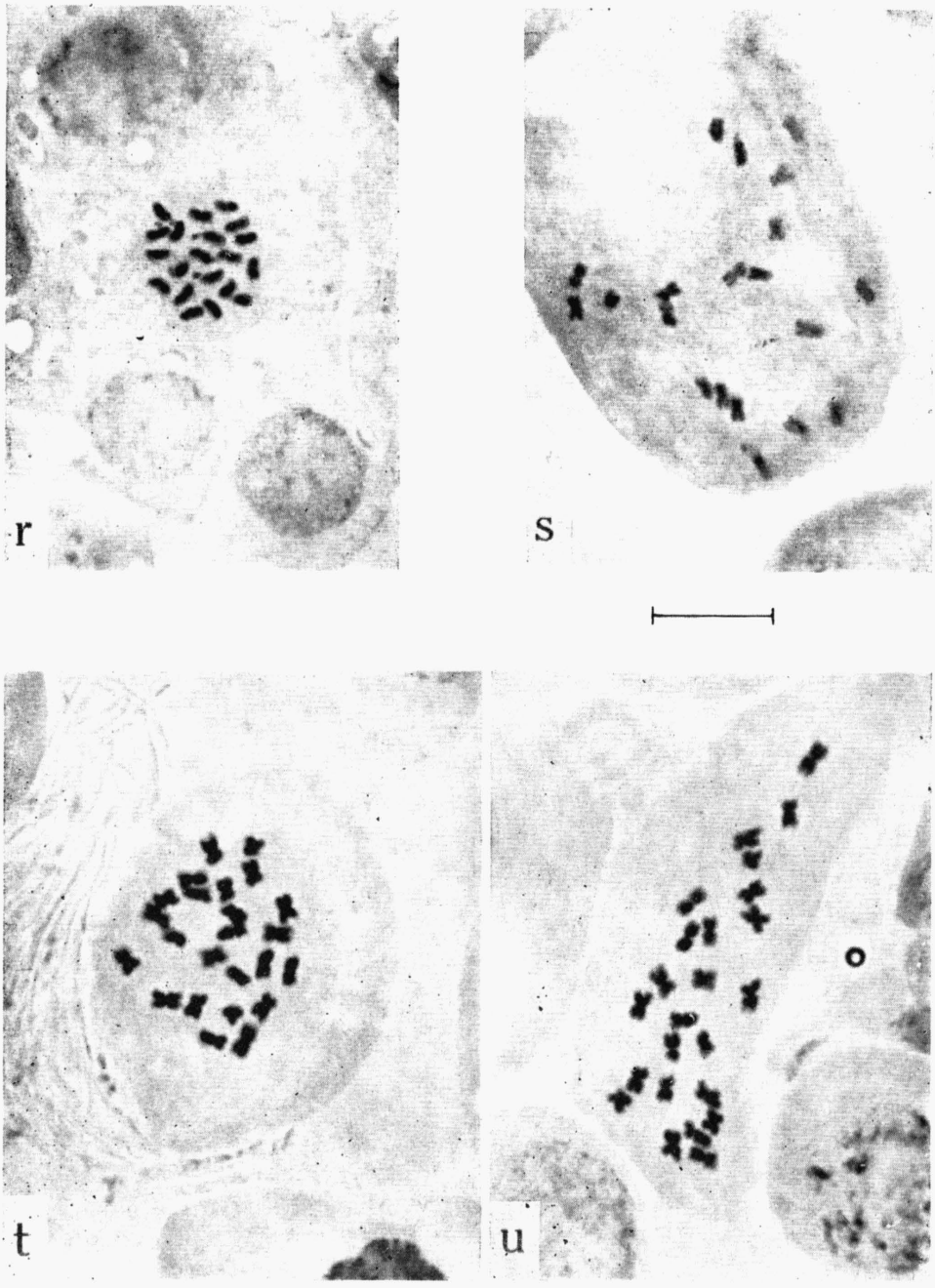

Plate XXIV. — Somatic metaphases. — r—s: *Aconogonum angustifolium* (2n = 20); — t—u: *Lycium ruthenicum* (2n = 24). — Scale = 10 μm. — Photo J. Měsíček.