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Chromosome numbers of Mongolian Angiosperms. I.

Chromozómové počty mongolských krytosemenných. I.

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Chromosome numbers are reported for 24 collections of Mongolian plants representing 22 species. The first chromosome records are reported for the species *Androsace gmelinii* (2n = 20), *Astragalus miniatus* (2n = 16) and *Polygala tenuifolia* (2n = 32, 34). Counts partly differing from those previously recorded are given for *Crypsis aculeata* (2n = 16) and *Scrophularia incisa* (2n = 50). Chromosome numbers of the following taxa were confirmed: *Allium altaicum* (2n = 16), *Androsace incana* (2n = 20), *A. maxima* subsp. *turczaninovii* (2n = 40), *A. septentrionalis* (2n = 20), *Aster alpinus* (2n = 18), *Astragalus laguroides* (2n = 32), *Carduus crispus* (2n = 18), *Castilleja rubra* (2n = 24+0-2B), *Cirsium esculentum* (2n = 34), *Euphorbia humifusa* (2n = 22), *Filifolium sibiricum* (2n = 18), *Gentiana decumbens* (2n = 26), *Glaux maritima* (2n = 30), *Lagotis integrifolia* (2n = 43, 44), *Medicago lupulina* (2n = 16), *Onobrychis sibirica* (2n = 28) and *Valeriana alternifolia* (2n = 56). Karyotypes are given for *Euphorbia humifusa*, *Filifolium sibiricum* and *Gentiana decumbens*. Dysploidy in *Crypsis aculeata* and polysomy in *Carduus crispus* are briefly discussed. A new combination *Androsace maxima* L. subsp. *turczaninovii* (Freyn) Měšíček et Soják stat. novus is proposed.

Introduction

Although the Mongolian flora is not very rich, containing less than 2000 species, it is still poorly understood karyologically. Chromosome numbers for about 250 native species have been reported so far. In the last twenty years, however, numerous cytological records concerning many Mongolian species have been accumulated from areas adjacent to northern Mongolia, especially by Russian karyologists.

Material and methods

The chromosome observations, camera lucida drawings and photomicrographs were 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-propionic-orceine. 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 follow the nomenclature of Levan, Fredga et Sandberg (1964).

Complete sets of validating herbarium specimens are on file in the herbarium of the National Museum in Prague (PR); the specimen numbers are listed in Table 1.

The karyological observations were made by J. Měšíček, the taxonomy of plants was studied mostly by J. Soják.

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Table 1. - Chromosome numbers of the taxa examined and localities of voucher specimens

Taxon	2n	Locality	Voucher
Alliaceae			
Allium altaicum Pall.	16	Mong. austr.: Altai Gobicus, in declivibus bor. jugi Baga-Bogd-úl (Baga-Bogdo); locis stepposis; 2000-3000 m; 44° 57', 101° 35'.	S. et V. *) 7377, 20/8, 1966
Asteraceae			
Aster alpinus L.	18	Mong. austr.: Altai Gobicus, montes Gurvan-Sajchan-úl (Gurban-Sajchan), 25-40 km versus occid. ab oppido Dalanzagdad; declivia bor. montium et ad cacumina; 1600-2800 m; 43° 36', 103° 50' - 104° 03'.	S. et V. 7988, 25/8, 1966
Carduus crispus L.	18	Mong. bor.: vallis silvatica Baga-Tenger (ad declivia montium Bogd-úl) versus austro-orient. ab oppido Ulánbátar; 1500-2000 m; 47° 52', 106° 59'.	D. et S. 4947, 1/9, 1965
	18	Mong. bor.: declivia 10-15 km versus occid. a pago Zúnmod; ad rivulum; 1400-1500 m; 47° 46', 106° 50'.	S. et V. 8892, 29/8, 1966
Cirsium esculentum (Siev.) C. A. Mey.	34	Mong. bor.: ad ripam dextram rivi Tola et in collibus supra vicum Songino, cca 25 km austro--occid. ab opp. Ulánbátar; in pratis; 1300-1500 m; 47° 51', 106° 40'.	V. 9996, 15/9, 1966
Filifolium sibiricum (L.) Kitam.	18	Mong. bor.: ad ripam dextram rivi Tola et in collibus supra vicum Songino, cca 25 km austro-occid. ab opp. Ulánbátar; 1300-1500 m; 47° 51', 106° 40'.	V. 9976, 15/9, 1966
Euphorbiaceae			
Euphorbia humifusa Willd.	22	Mong. austr.: ad viam inter opp. Chovd et Bulgan, in deserto arenoso (cum *Haloxylone*) cca 60 km austro-orient. a pago Chovd; 1300-1500 m; 44° 29', 103°.	S. et V. 7720, 23/8, 1966
Fabaceae			
Astragalus laguroides Pall.	32	Mong. bor.: inter pagos Baga-Tender et Zajsan, in vicinitate australi urbis Ulánbátar; 1300-1500 m; 47° 51', 106° 56'.	D. et S. 234, 22/7, 1965
Astragalus miniatus Bunge	16	Mong.: locis stepposis ad pagum Gučin-us, cca 100 km merid. ab opp. Arvajchér; 1500 m; 45° 27', 102° 25'.	S. et V. 6402, 16/8, 1966
	16	Mong. austr.: in semideserto 3-5 km versus occid. a pago Barún Bajan-ulán; 1200 m; 45° 09', 101° 20'.	S. et V. 6481, 17/8, 1966
Medicago lupulina L.	16	Mong. bor.: in valle versus orient. a vico Tarialan (Tarjalang), inter oppida Bulgan et Muren; locis stepposis; 1200 m; 49° 37', 102°.	D. et S. 3189, 13/8, 1965

Onobrychis sibirica (Šir.) Turcz. ex Grossh.	28	Mong. bor.: vallis 20 km bor.-occid. ab oppido Bulgan; in pratis siccis; 1200-1600 m; 48° 57', 103° 22'.	D. et S. 2313, 6/8, 1965
Gentianaceae			
Gentiana decumbens L.	26	Mong. bor.: montes Chentej in valle rivi Gaccurt 30-50 km versus bor.-orient. ab opp. Ulánbátar; in pratis; 1600 m; 48° 06', 107° 05'.	V. 9214, 6/9, 1966
Poaceae			
Crypsis aculeata (L.) Ait.	16	Mong. austr.: ad marginem austr. pagi Barún Bajan-Ulán et ad ripam bor. et bor.-occid. lacus Tácyn-Cagan-Núr; in graminosis et paludosis prope rivum; 1200 m; 45° 08', 101° 25'.	S. et V. 6876, 18/8, 1966
	16	Hortus Botanicus Academiae Scient. Hungaricae Vácrátót, in indice seminum 1969-70, No. 139/3369.	
Polygalaceae			
Polygala tenuifolia Willd.	32, 34	Mong. bor.: in valle silvatica Zajsan ad declivia bor. montium Bogd-úl versus merid. ab oppido Ulánbátar; declivia stepposa; 1400-2000 m; 47° 51', 106° 55'.	S. et V. 5442, 10/8, 1966
Primulaceae			
Androsace gmelinii (Gärtn.) Roem. et Schult.	20	Mong. bor.: inter portum aeroplanorum 15 km ab opp. Ulánbátar et vicum Songino in valle rivi Tola; pratum subhumidum; 1300-1400 m; 47° 51', 106° 48'.	D. et S. 1067, 28/7, 1965
Androsace incana Lam.	20	Mong. bor.: montes Chentej: in valle rivi Gacurt 30-50 km versus bor.-orient. ab opp. Ulánbátar; in pratis; 1600 m; 48° 06', 107° 05'.	V. 9727, 6/9, 1966
Androsace maxima L. subsp. *turczaninovii* (Freyn) Měsíček et Soják	40	Mong. bor.: in declivibus inter pagos Baga-Tender et Zajsan ad marginem borealem montium Bogd-úl in vicinitate austr. urbis Ulánbátar; locis stepposis; 1300-1500 m; 47° 52', 106° 57'.	D. et S. 837, 26/7, 1965
Androsace septentrionalis L.	20	Mong. bor.: montes Chentej: in valle rivi Terelž 1-20 km versus merid. a monte Asralt-Chajrchan (Asaralt); in pratis; 1700-2200 m; 48° 17' - 27', 107° 28'.	V. 9597, 8/9, 1966
Glaux maritima L.	30	Mong. austr.: ad marginem australem pagi Barún Bajan-ulán et ad ripam bor. et bor.-occid. lacus Tácyn-Cagan-núr; in graminosis et paludosis prope rivum; 1200 m; 45° 08', 101° 25'.	S. et V. 6786, 18/8, 1966
Scrophulariaceae			
Castilleja rubra (Drob.) Rebr.	24+ 0-2B	Mong. austr.: Altai Gobicus, in declivibus bor. jugi Baga-Bogd-úl (Baga Bogdo); in valle glareosa rivuli; 2000-3000 m; 44° 57', 101° 35'.	S. et V. 7234, 20/8, 1966
Lagotis integrifolia (Willd.) Schischk.	43, 44	Mong. austr.: Altai Gobicus: in declivibus bor. jugi Baga-Bogd-úl (Baga Bogdo); in pratis montanis; 2000-3000 m; 44° 57', 101° 35'.	S. et V. 7233, 20/8, 1966

Scrophularia incisa Weinm.	50	Mong. austr.: 3-5 km versus occid. a pago Barún Bajan-ulán; in semideserto; ca 1200 m; 45° 09', 101° 20'.	S. et V. 6495, 17/8, 1966
Valerianaceae			
Valeriana alternifolia Ledeb.	56	Mong. bor.: in valle silvatica Zajsan ad declivia bor. montium Bogd-úl versus merid. ab opp. Ulánbátar; ad ripam rivuli; 1400-2000 m; 47° 51', 106° 55'.	S. et V. 5246, 10/8, 1966

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

Results and discussion

This report presents chromosome numbers for 22 species (24 populations) of the Mongolian flora. The results are listed in Table 1, where the chromosome numbers for which an illustration of chromosome complements is provided are given in italics. The comments are confined to those cases in which further elaboration appears to be useful.

Aster alpinus L. Fig. 1A

In her reclassification of the *Aster alpinus* complex, Tamamšjan (1959) segregated its narrow-leaved representatives growing in Siberian and Central-Asiatic mountain steppes (with an exclave in the northern part of Far East) and recognized them as a distinct species *A. serpentimontanus* Tamamsch. Májovský et al. (1978) redefined *A. serpentimontanus* to encompass tetraploid derivatives (2n = 36) of the diploid (2n = 18) *A. alpinus* s. str. throughout the range of the complex. They characterized the expanded species: "Because of the gradual continentalization of the Eurasian climate during the Tertiary period *A. alpinus* was replaced by the more vital tetraploid populations of *A. serpentimontanus*, which originated most probably in the mountains of Central Asia." In their concept, therefore, the occurrence of tetraploid *A. serpentimontanus* was to be expected especially in those Eurasiatic territories which are characterized by the continental climate.

Most recently a remarkably broad sampling of chromosome numbers in the *A. alpinus* complex has cast certain doubt on the above conclusion. Both diploids and tetraploids are apparently widespread in South Siberia and occur commonly in the same type of habitats. The numbers of 2n = 18, 38, 32+2B have been reported for collections determined as *A. serpentimontanus* (Krogulevič 1971, 1978) and 2n = 18, 36 for *A. korshinskyi* Tamamsch. (Krogulevič in Krogulevič et Rostovceva 1984).

In addition, it appears that without information on the environmental influences upon morphological variations in the *A. alpinus* complex any conclusion about the precise taxonomic status of *A. serpentimontanus* remains tenuous. In Mongolia, plants morphologically referring to *A. serpentimontanus* with conspicuously narrow leaves are entirely dominant in mountain steppes. However, individuals with the leaves corresponding to the normal *A. alpinus* occur rather frequently in humid or shady habitats. Such phenotypes can hardly be distinguished from the Middle European *A. alpinus*. Our count of 2n = 18 was obtained from those particular specimens.

There is no doubt that the cytotypes of *A. alpinus* s.l. represent natural biological units but biosystematic studies are obviously needed to provide better insight into complex variation pattern in *A. alpinus* and to define its derivatives in appropriate taxonomic terms.

Carduus crispus L. Fig. 3:1-2

The classification of this complex has been subjected to a liberal and conservative interpretation. In arriving at her taxonomic disposition, Tamamšjan (1953, 1963) has assigned considerable importance to the expression of the involucre hairiness and has pointed out that the Mongolian *C. crispus* may be reliably distinguished from the other representatives of the complex in having involucral bracts densely covered by "connected" horizontal floccose hairs. Consequently she has recognized the Mongolian populations to be a distinct microspecies and has described it under the name *C. modestii* Tamamsch. This was followed by Malyšev et Peškova (1979). On the contrary, Tamamšjan's concept has not been accepted by Grubov (1982).

Our specimens, including the collection no. 4947 from locus classicus of *C. modestii*, are entirely consistent with the Tamamšjan's description for *C. modestii*. Yet comprehensive taxonomic examination of both European and Asiatic materials shows that, in fact, plants with floccose-hairy involucral bracts and individuals without this hairiness occur commonly in diverse localities of central and western Europe. Moreover, no other distinctive morphological differences were found between the European and Mongolian plants. By the present authors, therefore, *C. modestii* is not considered to be a taxonomically significant entity within the variable complex of *C. crispus*.

Extensive previous sampling of chromosome numbers indicate that the widely ranging *C. crispus* s. l. is entirely diploid with 2n = 16, the same number being also recorded for Slovakian plants by one of the present authors (unpubl.). In view of the pattern of morphological variations, it should not be surprising that slightly different numbers of 2n = 18, 17-20, 21 have also been reported for plants from Poland, Siberia, Russian Far East and Japan by Górecka (1956), Rostovceva (1979) Krogulevič in Krogulevič et Rostovceva (1984), Probatova et Sokolovskaja (1981) and Arano (1957). Górecka concluded that accessory chromosomes occassionally occurred in chromosome sets of some plants; they did not differ from A chromosomes in their size. We examined karyologically numerous seedlings raised from seeds of two geographically different Mongolian samples. Without any exception, 18 chromosomes were found in all mitoses studied. From the available evidence, however, it was not possible to be sure about the nature of two supernumerary chromosomes. Nevertheless, the plants with the supernumerary chromosomes seem to be most likely trisomics or multiple trisomics. This is true at least for a marker chromosome with a macrosatellite attached to the shorter arm: it was constantly represented three times in the mitotic plates examined. Our opinion is also supported by results of a more detailed karyotype analysis made by Arano (1957, 1963) who has studied Japanese collections of *C. crispus* with 2n = 21 and 2n = 16, respectively. The chromosome sets of his plants with 2n = 21 proved to include, besides three regular chromosome pairs, five distinct groups each consisting of three morphologically identical chromosomes.

A similar variation in chromosome number was found in populations of some other *Carduus* species, for example in the *C. defloratus* agg. (Favarger et Küpfer 1970, Holub, Měsíček et Javůrková unpubl.)

Fig. 1. - Somatic metaphases. A - *Aster alpinus* (2n = 18); B - *Cirsium esculentum* (2n = 34); C - *Filifolium sibiricum* (2n = 18); D - *Euphorbia humifusa* (2n = 22); E - *Gentiana decumbens* (2n = 26); F - *Scrophularia incisa* (2n = 50); G - *Valeriana alternifolia* (2n = 56). Scale = 10 μm. Del. J. Měsíček except of E (del. V. Javůrková).

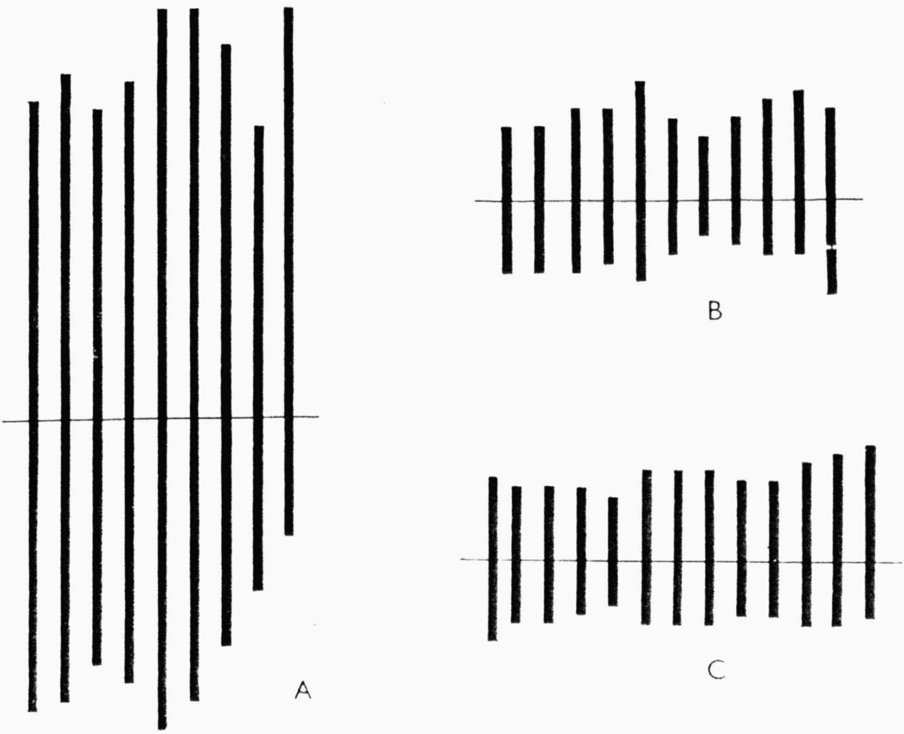

Fig. 2. - Idiograms. A - *Filifolium sibiricum*; B - *Euphorbia humifusa*; C - *Gentiana decumbens*. Del. J. Soják.

Filifolium sibiricum (L.) Kitam. Figs. 1C, 2A, 3:3

This monotypic genus which is most closely related to *Artemisia* L. ranges from the Sayan Mts. eastwards to Manchuria, Korea and Chukotka. It is common and abundant in northern Mongolia (from the Hangayn Nuruu Mts. to the Greater Khingan) inhabiting steppes and mountain steppes.

Čuksanova in Bolkhovskikh et al. (1969 - sub *Tanacetum sibiricum* L.) and Volkova et Boyko (1985) have reported the same number of 2n = 18. Žukova (1982), however, found 2n = 16 in plants from Chukotka. The diploid set of *F. sibiricum* contains the following chromosome pairs: K (asymetrical) = 1M + 7m + 1 st (Table 2, Fig. 2A). The chromosome length ranges from 5.1 to 7.9 µm. The total length of the diploid complement found was 59.3 µm.

Euphorbia humifusa Willd. Figs. 1D, 2B, 3:4-5

Syn.: *Chamaesyce humifusa* (Willd.) Prokh.

This xerophyte occurs naturally in Asia, from whence it was naturalized in the Mediterranean area. Occasionally it has become introduced to almost all Europe. In Mongolia *E. humifusa* grows on stony and sandy soils; its both primary and secondary locations are dispersed throughout semidesert, desert and steppe zones.

Our count is in agreement with three previous reports (Reese in Löve et Löve 1961, Probatova et Sokolovskaja 1986, Sokolovskaja et Probatova 1986). The following chromosome pairs were found to compose the diploid set of the species: K = 2M + 4m + 5sm (cf. Table 3 and Fig. 2B). A microsatellite is attached to the shorter arm of the pair no. 11. The total genome length is 18.4 µm.

Table 2. - Karyotype of *Filifolium sibiricum*.

Chromosome pair	l µm	s µm	c µm	l:s	Type
1	3.5	3.2	6.7	1.09	M
2	3.8	3.1	6.9	1.23	m
3	3.4	2.7	6.1	1.26	m
4	3.7	2.9	6.6	1.28	m
5	4.5	3.4	7.9	1.32	m
6	4.5	3.1	7.6	1.45	m
7	4.1	2.5	6.6	1.64	m
8	3.2	1.9	5.1	1.68	m
9	4.5	1.3	5.8	3.46	st

Astragalus laguroides Pall.

A. laguroides is distributed in the southern part of central Siberia and in northern Mongolia from where it is extending to some mountain ridges of southern part of the country. Throughout its range it inhabits steppes and mountain steppes.

The chromosome number of 2n = 32 has been reported previously for plants from the Altai by Kartašova, Malachova et Plennik (1968) and Malachova (1971) but a diploid race with 2n = 16 was also found in their collections and, additionally, in plants from Tuva Rep. (Plennik et Rostovceva 1977). - An astonishing amount of aneuploid cells with 2n = 31 did occur in root tip meristems of the species.

Astragalus miniatus Bunge — Fig 3:6-9

A. miniatus inhabits saline soils in steppe zone of central Mongolia. It was also found in mountain positions of southern Mongolia and rarely in southeastern Transbaikalia.

No chromosome number has been previously reported for the species.

Table 3. - Karyotype of *Euphorbia humifusa*.

Chromosome pair	l µm	s µm	c µm	l:s	Type
1	0.8	0.8	1.6	1.00	M
2	0.8	0.8	1.6	1.00	M
3	1.0	0.8	1.8	1.25	m
4	1.0	0.7	1.7	1.43	m
5	1.3	0.9	2.2	1.44	m
6	0.9	0.6	1.5	1.50	m
7	0.7	0.4	1.1	1.75	sm
8	0.9	0.5	1.4	1.80	sm
9	1.1	0.6	1.7	1.83	sm
10	1.2	0.6	1.8	2.00	sm
11	1.0	0.5	2.0	2.00	sm

Onobrychis sibirica Turcz. ex Grossh.

Syn.: *O. tanaitica* Spreng.

A Siberian element inhabiting meadows and mountain steppes in the middle part of northern Mongolia. It has been considered to be a geographical race of *O. arenaria* (Kit.) Ser. [subsp. *sibirica* (Turcz. ex Grossh.) P.W.Ball] by some authors.

The numbers of 2n = 14, 28 have been previously reported for *O. sibirica* (under the name *O. tanaitica* Spreng.) by Rostovceva (1977) and Krasnikov et Šaulo (1990).

Gentiana decumbens L. f. Figs. 1E, 2C, 3:11

This Siberian species is widespread in steppes and mountain steppes of northern Mongolia and in South-Mongolian mountains.

The same number of 2n = 26 has been previously reported by Kroguleyič (1978) who examined plants from the E. Sayan Mts. The symmetrical karyotype of *G. decumbens* is composed of the following chromosome pairs: K = 1M + 10m + 2sm (cf. Table 4 and Fig. 2C). The total length of the diploid chromosome set is 21.1 μm.

Table 4. - Karyotype of *Gentiana decumbens*.

Chromosome pair	l μm	s μm	c μm	l:s	Type
1	0.9	0.9	1.8	1.00	M
2	0.8	0.7	1.5	1.14	m
3	0.8	0.7	1.5	1.14	m
4	0.8	0.6	1.4	1.33	m
5	0.7	0.5	1.2	1.40	m
6	1.0	0.7	1.7	1.43	m
7	1.0	0.7	1.7	1.43	m
8	1.0	0.7	1.7	1.43	m
9	0.9	0.6	1.5	1.50	m
10	0.9	0.6	1.5	1.50	m
11	1.1	0.7	1.8	1.57	m
12	1.2	0.7	1.9	1.71	sm
13	1.3	0.6	1.9	2.17	sm

Crypsis aculeata (L.) Ait.

This halophyte is distributed in both submeridional and meridional zones of Eurasia, with an exclave in Africa. In Mongolia it occurs in the central part of the country and in the Gobi desert inhabiting saline meadows and salt steppes mainly along rivers and on lake shores.

Three different chromosome numbers have been formerly reported for the species. Pólya (1948) has found 2n = 16 in Hungarian plants. Avdulov in Hubbard (1947), Tarnavschi (1948) and Uhríková in Májovský et al. (1974) have recorded the number of 2n = 18. Finally Stebbins' count of 2n = 54 has been published by Myers (1947). For that reason the present record was checked using seed material from Botanical garden Vácrátót (Hungary). All 13 individuals examined proved consistently to possess 2n = 16. Since the taxonomic confusion (possibly except of the Stebbins' record) or

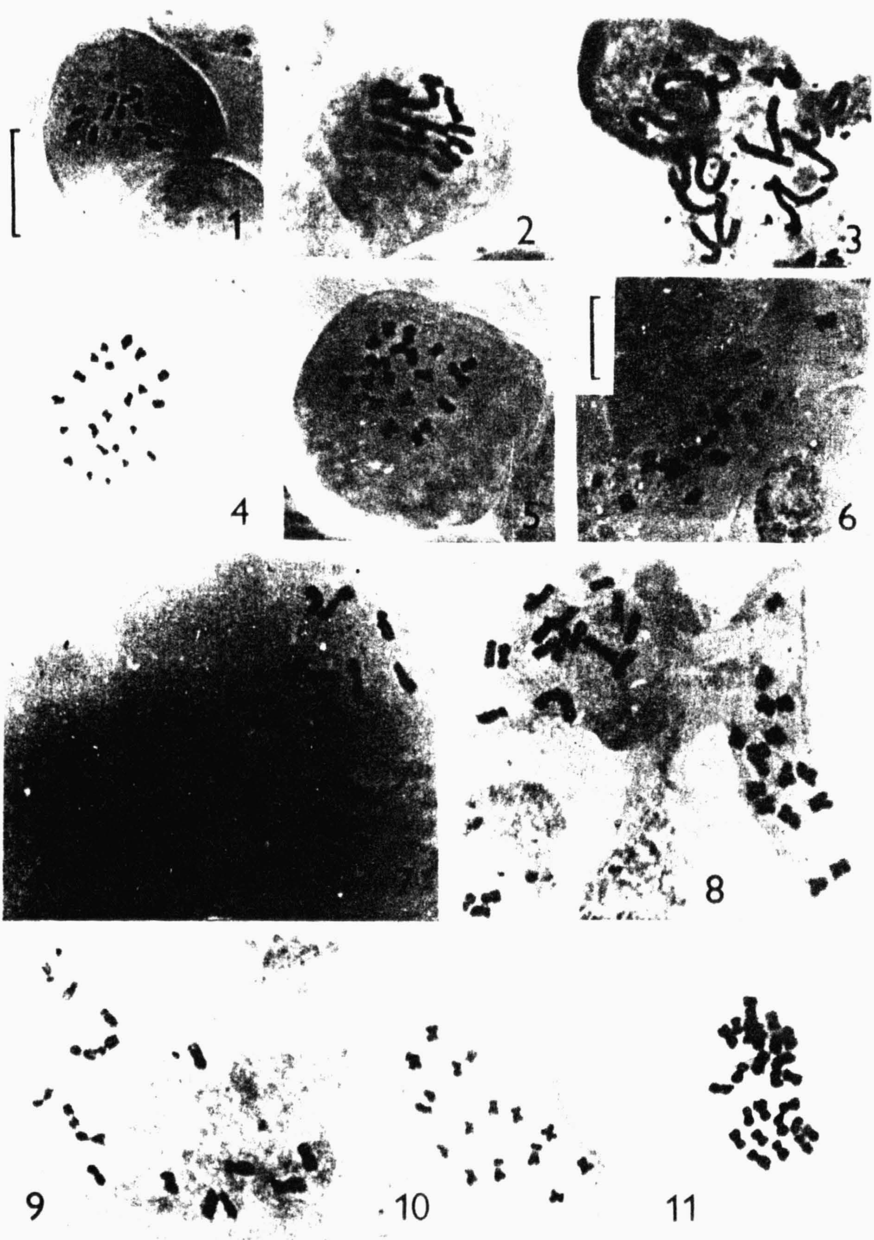

Fig. 3. - Somatic metaphases. 1,2 - *Carduus crispus* (2n = 18); 3 - *Filifolium sibiricum* (2n = 18); 4,5 - *Euphorbia humifusa* (2n = 22); 6,7,8,9 - *Astragalus miniatus* (2n = 16); 10 - *Medicago lupulina* (2n = 16); 11 - *Gentiana decumbens* (2n = 26). Scale = 10 μm; the scale drawn in no. 6 refers also to no. 7-9. Photo J. Měsíček.

misinterpretations of the mitotic plates observed appear to be excluded in *C. aculeata*, both diploid counts based on two different basic numbers are apparently correct. A similar dysploidy seems also to exist in *C. alopecuroides* (Pill. et Millerp.) Schrad. [=*Heleochloa alopecuroides* (Pill. et Millerp.) Host ex Roem.] and *C. schoenoides* (L.) Lam. [=*Heleochloa schoenoides* (L.) Host]. Whereas Hammond et Reeder (1979) have obtained the numbers of 2n = 16 and 2n = 32, respectively, in these species, Tarnavschi (1948) has found 2n = 18 in *C. alopecuroides* and several authors reported on 2n = 36 in *C. schoenoides* (except of 2n = 32 in Tarnavschi 1938). It is evident, in our opinion, that two dysploid cytotypes occur in some species of the genus *Crypsis* (incl. *Heleochloa*).

Although the basic number of x = 8 is rather unusual entity within the family *Poaceae* and x = 9 is normally confined to plants of the chloridoid alliance, the former number is known in several different chloridoid grasses (*Blepharoneuron, Chaboissaea, Eleusine, Erioneuron*). In addition, the dysploidy based on x = 8 and x = 9 is known to occur in some grasses, for example in the panicoid group [*Brachiaria ramosa* (L.) Stapf, *B. stapfiana* Basappa et Muniyama, *Panicum maximum* Jacq.].

Polygala tenuifolia Willd.

The distribution of this species ranges from the Altai to coastal regions of the Pacific (Russia, northern China). In Mongolia it occurs frequently in northern and eastern parts of the country.

No chromosomal information has been published so far for the species. The numbers of 2n = 34, 68 have been reported for the related *P. sibirica* L. and 2n = 14, 42 for *P. japonica* Houtt. The number of 2n = 32 was found in the only plant of our collection.

Androsace gmelinii (Gaertn.) Roem. et Schult.

A. gmelinii is distributed in eastern Siberia and Manchuria. Its occurrence in Mongolia is rare, being restricted to well-watered habitats in the Hangayan Nuruu as well as in the Khentey Mts.

No chromosomal information has been published so far for this taxon. Hsu (1968) reported on n = 9 for the closely allied *A. umbellata* (Lour.) Merr. from Taiwan.

Androsace incana Lam.

A. incana is an East-Siberian species inhabiting rocky substrates of steppes and mountain steppes. In Mongolia it is distributed in the northern part of the country and in South-Mongolian mountains.

Žukova, Petrovskij et Plijeva (1973) have found the same chromosome number of 2n = 20 in plants from Buryatya.

Androsace maxima L. subsp. *turczaninovii* (Freyn) Měsíček et Soják

Šiškin et Bobrov (1952) separated the populations of *A. maxima* indigenous to Ukraine, the Caucasus, Russia, Central Asia and Mongolia from those distributed in central and western Europe and recognized the former to be a different species *A. turczaninovii* Freyn. Recently, their concept has not been followed by Russian authors, for example by Malyšev et Peškova (1979) and Grubov (1982) who identified *A. turczaninovii* with *A. maxima*.

Our taxonomic revision of the Mongolian, South-Siberian and European specimens showed the diagnostic characters given by Freyn for *A. turczaninovii* to be not reliable and, in fact, taxonomically unimportant. However, some other morphological features of a taxonomic value were found. The Asiatic plants clearly differ from the European populations of *A. maxima* in having very short calyx tubes and long capsules with valves as long as calyx lobes or slightly shorter. Within the *A. maxima* complex the Asiatic representatives constitute a distinct entity. We consider them to be a geographical race; hence they ought to be accepted as a subspecies[1].

The range of this taxon is yet not reliably known as the distribution given for *A. turczaninovii* by Šiškin et Bobrov (l.c.) refers partly to *A. maxima* subsp. *maxima.* In Mongolia the subsp. *turczaninovii* inhabits commonly mountain steppes in the northern part of the country and occurs frequently also in South-Mongolian mountain ridges.

The number of 2n = 40 has been previously reported for *A. turczaninovii* Freyn by Matvejeva et Tichonova in Bolkhovskikh et al. (1969). In addition, the records published for *A. maxima* L. by Krasnoborov, Rostovceva et Ligus (1980, 2n = 20, 38) and Zakireva et Nafanailova (1988, 2n = 40) may refer to subsp. *turczaninovii.* Four ploidy levels have been found in *A. maxima* L. s.l.

Castilleja rubra (Drob.) Rebr.

An East-Siberian element sparsely occurring also in mountainous regions of northern Mongolia and in the Gobi Altai Mts. It is closely related to *C. pallida* (L.) Kunth. Some authors even consider these two species as conspecific. However, the specific status of *C. rubra* seems to be well supported by the chromosome number variation pattern in *Castilleja* ser. *Rubrae* and ser. *Pallidae.* While *C. pallida* has yet been found to be tetraploid only throughout its extensive range, the diploid chromosome number of 2n = 24 has been reported for *C. rubra* (Beljajeva et Siplivinskij 1977, Žukova et Petrovskij 1977, 1980) and for *C. elegans* Ostenf. ex Malte.

Accessory chromosomes were found only in one plant of our collection.

Lagotis integrifolia (Willd.) Schischk.

This Central-Asiatic and East-Siberian species grows in almost all Mongolian mountains; it prefers humid habitats.

Our count is in agreement with several previous records. The number of 2n = 43 was found in the only plant.

Scrophularia incisa Weinm. Fig. 1F

S. incisa is a Central-Asiatic and Siberian species. In Mongolia it occurs in stony and sandy habitats in the northern half of the country as well as in the Gobi Altai Mts.

Three different chromosome numbers have been previously reported for this species. Vaarama et Hiirsalmi (1967) found 2n = 50-56 in plants from the Tian-Shan. Beljajeva et Siplivinskij (1975) recorded 2n = ca 70 in plants collected on the Baikal shore. Finally, Rostovceva, Krasnoborov et Krasnikova (1981) reported on plants with 2n = 24 from the West-Sayan Mts.

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[1] *Androsace maxima* L. subsp. *turczaninovii* (Freyn) Měsíček et Soják, stat. novus. - Bas.: *A. turczaninovii* Freyn Oesterr. Bot. Zeitschr. 40:157, 1890.

Valeriana alternifolia Ledeb. Fig. 1G

The distribution area of *V. alternifolia* extends from the South Yenisey region to northern Mongolia, the Amur River mouth and northern Manchuria; the species also occurs in the surroundings of Vladivostok. In Mongolia it appears to be the commonest representative of the genus *Valeriana*. Our specimens were kindly determined by prof. V. N. Vorošilov, a monographer of the *V. officinalis* complex.

The same number of 2n = 56 has been formerly reported for Siberian and Mongolian collections by Krogulevič (1978) and Murín, Háberová et Žamsran (1984). Svetozarovaja in Vorošilov (1959) has found 2n = 42 in *V. alternifolia* cultivated in the Central Botanical Garden of the Academy of Sciences (Moscow).

Souhrn

V práci je shrnuta část výsledků karyologického studia mongolské flóry. Byly zjištěny chromozómové počty u 22 druhů z 24 lokalit (cf. tab. I), z toho pro 3 druhy poprvé; u 2 druhů se zde uváděný počet částečně liší od dosud publikovaných údajů. Morfologie chromozómů byla podrobněji studována u 3 druhů. Je potvrzena existence dysploidie u *Crypsis aculeata*. V práci je navržena nová kombinace *Androsace maxima* L. subsp. *turczaninovii* (Freyn) Měsíček et Soják.

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