

CHROMOSOME NUMBERS OF SOME ANGIOSPERMS OF THE SOUTHERN U.S.S.R.

J. CHR. VAN LOON and JOSINA J. M. H. OUDEMANS

Vakgroep populatie- en evolutiebiologie, sectie biosystematiek, Utrecht

SUMMARY

The chromosome numbers of 24 taxa of flowering plants of the southern U.S.S.R. were determined. Three counts were found to be new. Notes on some species are given.

1. INTRODUCTION

The plants and bulbs were collected by the second author during the South Russian Tour (April–May 1973) of the International Dendrology Society. The origin of the collected plants has been indicated on the map of *fig. 1*.

The first stop was made at Kiev, Ukraine, with a visit to the forest area of Goloseyevo. *Carpinus orientalis* Mill., *Quercus robur* L., *Betula verrucosa* Ehrh. dominated the vegetation. A rich undergrowth of *Cytisus ruthenicus* (Fisch.) Klásková, *Convallaria majalis* L., *Asarum europaeum* L., *Asperula* sp., *Pulmonaria* sp., *Viola* sp., and *Lilium martagon* L. was present. Following this the southern range of the Crimean mountains was visited. At an altitude of 1200 m. woodland dominated mostly by *Acer campestre* L., and *Carpinus betulus* L. the following species were collected: *Primula komarovii* Losinsk., *Galanthus plicatus* Bieb. (*fig. 2*), *Muscari racemosum* (L.) Mill., *Corydalis bulbosa* (L.) DC. *ssp. marschalliana* (Pall.) Chater, *Arum orientale* L.

In open meadowland at the highest point in which vegetation occurred *Juniperus communis* L. *ssp. hemisphaerica* (J. & C. Presl) Nyman, *Arabis caucasica* Schlecht., *Saxifraga irrigua* Bieb., *Ornithogalum fimbriatum* Willd. were collected.

Between Krasnodar and Sochi in a limestone area with dwarfplants, *Cotinus coggygia* Scop., *Juniperus oxycedrus* L., *Dictamnus albus* L., *Polygala* sp., *Muscari* sp., *Jasminum fruticans* L., *Iris pumila* L., *Orchis morio* L. *ssp. picta* A. & Gr., *Colchicum umbrosum* Stev., and *Ornithogalum tenuifolium* Guss. were collected.

From Sochi, a resort on the Black Sea with an almost subtropical climate, a brief excursion was made to the Mt. Akhun with its natural forest vegetation of *Fagus orientalis* Lipsky. In the open woodland a rich undergrowth of species such as *Euonymus* sp., *Cyclamen coum* Mill. (*fig. 3*), *Paeonia* sp., *Lilium martagon* L., *Ruscus hypophyllum* L., *Sanicula europaea* L., *Galanthus* sp., *Epimedium pinnatum* Fisch., *Paris quadrifolia* L. was seen.

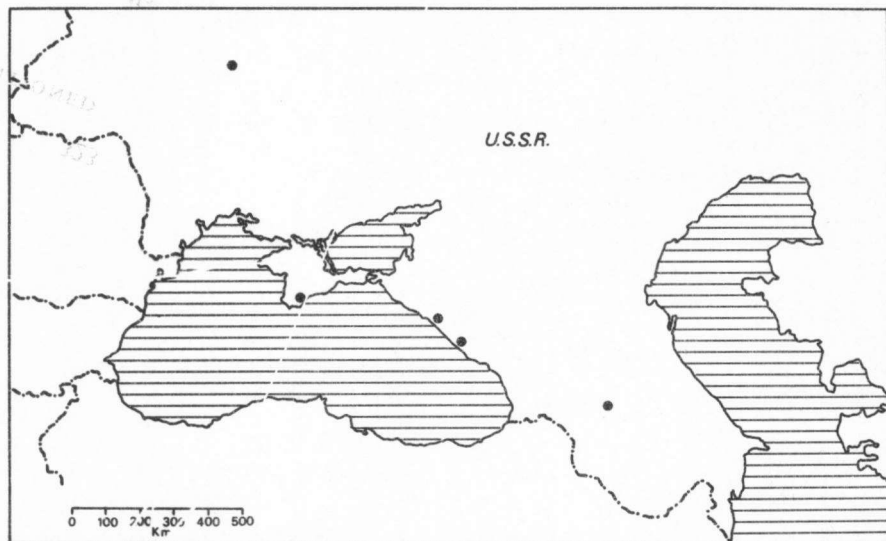


Fig 1. Southern Russia: Ukraine, Crimea, Bolshoy, and Georgia

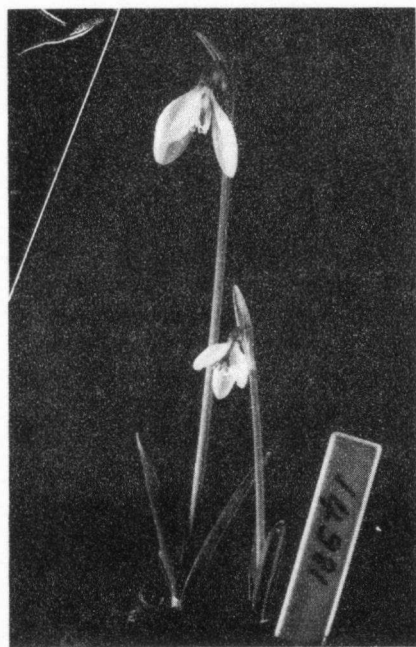
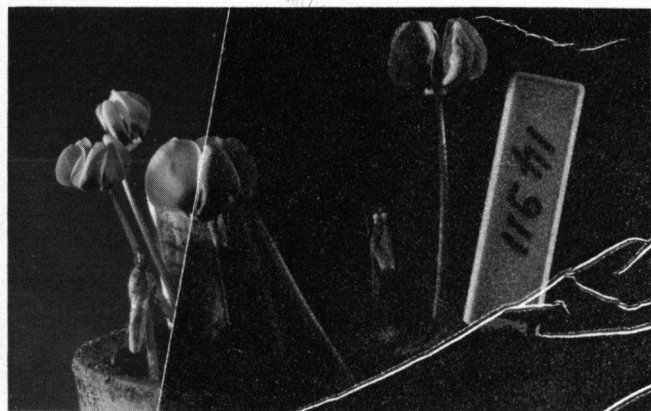
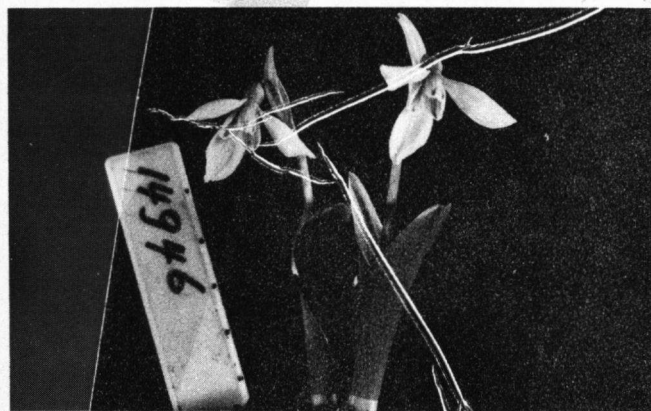


Fig. 2. *Galanthus plicatus*.

Fig. 3. *Cyclamen coum*.Fig. 4. *Galanthus alpinus*.

In the foothills of the S. Caucasus near Lake Ritsa was found *Abies nordmanniana* (Steven) Spach, *Picea orientalis* (L.) Link., *Convallaria majalis* L., *Vaccinium arctostaphylos* L., *Ilex aquifolium* L., *Staphylea* sp., *Carpinus orientalis* Lam., *Symphytum caucasicum* Bieb., and *Platanthera chlorantha* (Cust.) Reichb. Between Sukhumi and Tbilisi a stop was made at the Surami-Pass (900m.) with *Carpinus orientalis* Lam. *Rhododendron ponticum* L., *Crataegus* sp., and where *Primula vulgaris* Hudson ssp. *sibthorpii* Sm. & Forrest. was collected. During a drive along the Georgian military highway *Euphorbia* sp. were observed also near the pass *Prunus cerasifera* Ehrh., *Betula* sp., *Caltha polypetala* Hochst. ex Lorent. On the highest point, still partly covered with snow, *Galanthus alpinus* Sosn. (fig. 4) was found and some plants of *Asarum europaeum* L.

Species	Voucher	Origin	2n	References
Amaryllidaceae				
<i>Galanthus alpinus</i> Sosn.	14946	Georgia, Georgian military highway, 2300 m.	24	F. 2n = 24; RV. 90: 2n = 24
<i>Galanthus plicatus</i> Bieb.	14915- 14917 14976- 14983	Crimea, N. of Yalta, 1200 m.	24	F. 2n = 24; RV. 90: 2n = 24
Apiaceae				
<i>Sanicula europaea</i> L.	14912	Bolshoy, Akhun Mts., 1000 m.	16	F. 2n = 16; RV. 90: 2n = 16; RV. 91: 2n = 16
Apocynaceae				
<i>Vinca herbacea</i> Waldst. & Kit.	14943 14944	Bolshoy, near Sochi	46	F. 2n = 32, 46; RV. 90: 2n = 46
Araceae				
<i>Arum orientale</i> Bieb.	15035- 15037	Crimea, N. of Yalta, 1200 m.	28	F. 2n = 28; RV. 90: 2n = 28
Aristolochiaceae				
<i>Asarum europaeum</i> L.	15011	Georgia, Georgian military highway, 2300 m.	26	F. 2n = 24, 26, 40; RV. 90: 2n = 26; RV. 91: 2n = 26
Berberidaceae				
<i>Epimedium pinnatum</i> Fisch.	14889	Bolshoy, Akhun Mts., 1000 m.	12	F. 2n = 12
Iridaceae				
<i>Iris pumila</i> L.	14939 14942	Bolshoy, near Sochi	30	F. 2n = 30, 32, 31 + f; RV. 90: 2n = 32; LÖVE 1975, IOPB chrom. rep. XLVII: 2n = 32; MAJOVSKÝ et al. 1974: 2n = 30
Liliaceae				
<i>Allium sphaerocephalum</i> L.	14894	Crimea, Yalta, 100 m.	16	F. 2n = 16; RV. 90: 2n = 16, n = 8; NEVES 1973: 2n = 16
<i>Colchicum umbrosum</i> Stev.	14937	Bolshoy, near Sochi	24	F. 2n = 24; RV. 90: 2n = 24
<i>Lilium maritagon</i> L.	14987 14990- 14993	Oekraine, Kiev Bolshoy, Akhun Mts., 1000 m.	24 24	F. 2n = 24, 24 + 1; RV. 90: 2n = 24; RV. 91: 2n = 24; NEVES 1973: 2n = 24
<i>Muscari racemosum</i> (L.) Mill.	14921 14924	Crimea, N. of Yalta, 1200 m.	72	F. 2n = 18, 36, c. 44, 45, 54; RV. 90: 2n = 36, 45, 54, over 70; LÖVE 1973, IOPB chrom. rep. XLI: 2n = 45; Neves 1973: 2n = 36

<i>Ornithogalum fimbriatum</i> Willd.	14919 14922– 14923	Crimea, N. of Yalta, 1200 m.	12	F. 2n = 12; RV. 90: 2n = 12, 35–37; RV. 91: 2n = 12
<i>Ornithogalum pyrenaicum</i> L.	14890– 14893	Crimea, Yalta, 100 m.	16	F. 2n = 16, 32/24; RV. 90: 2n = 16, 18; RV. 91: 2n = 16, 18, 24; NEVES 1973: 2n = 16; LöVE 1974, IOPB chrom. rep. XLVI: n = 8
<i>Ornithogalum tenuifolium</i> Guss.	14932 14934 14936 14895	Bolshoy, near Sochi	16	F. 2n = 16, 18, 19, 20, 27, 28, 29, 36; RV. 90: 2n = 16; RV. 91: 2n = 18, 20, 36
<i>Ruscus hypophyllum</i> L.	14989	Bolshoy, Akhun Mts., 1000 m.	40	F. 2n = 40
Oleaceae				
<i>Jasminum fruticans</i> L.	14957 14961 14962 14925 14929 14962 14974	Bolshoy, near Sochi	26	F. 2n = 26
Orchidaceae				
<i>Gymnadenia odoratissima</i> (L.) Richt.		Georgia, Surami Pass, 900 m.	40	F. 2n = 20, 40; LöVE 1973, IOPB chrom. rep. XLI: 2n = 40
* <i>Orchis morio</i> L. ssp. <i>picta</i> A. & Gr.		Bolshoy, near Sochi	36	
<i>Platanthera chlorantha</i> (Cust.) Reichb.		Georgia, Lake Ritsa, 850 m.	42	F. 2n = 42; SKALÍNSKA & POGAN 1973: 2n = 42
Papaveraceae				
* <i>Corydalis bulbosa</i> (L.) DC. ssp. <i>marschalliana</i> (Pall.) Chater	14984	Crimea, N. of Yalta, 1200 m.	32	
Primulaceae				
<i>Cyclamen coum</i> Mill.	14910 14911 15005– 15007	Bolshoy, Akhun Mts., 1000 m.	30	F. 2n = 28, 30
* <i>Primula komarovii</i> Losinsk.		Crimea, N. of Yalta, 1200 m.	22	
<i>Primula vulgaris</i> L. ssp. <i>sibthorpii</i> W. W. Sm. & Forrest	14994 14995	Georgia, Surami Pass, 900 m.	22	F. 2n = 22

2. MATERIAL AND METHODS

The collected plants and bulbs were transplanted to the Botanical Gardens, State University Utrecht. Root tips were fixed in Karpechenko's fixative, embedded in paraffin wax, sectioned at 15 micron, and stained according to Heidenhain's haematoxylin method. Microscopical slides as well as voucher specimens are preserved in the Biosystematic Department of the State University, Utrecht.

3. RESULTS

The chromosome numbers are presented in a table together with the voucher number.

The species are arranged alphabetically according to the family and genus. The nomenclature is in accordance with that used in the Flora Europaea I, II, and III (TUTIN et al. 1964-1972). For literature references the reader is referred to compilation works, such as FEDOROV 1969 (F.); MOORE 1973, Regnum Vegetabile 90 (RV.90); MOORE 1974, Regnum Vegetabile 91 (RV.91). Counts not listed in these works are recorded by the name of the author. New counts are marked with an asterisk.

4. COMMENTS ON SOME SPECIES

Iridaceae

Iris pumila L. - Bolshoy - $2n = 30$

RANDOLPH & MITRA (1959) published the numbers $2n = 30$ and $2n = 32$. The chromosome number $2n = 30$ was determined in 6 populations, viz. 5 from the South of the U.S.S.R. and 1 from Yugoslavia, whereas $2n = 32$ was counted in 3 Austrian populations. The investigated plants from Sochi have the same karyotype as those examined by Randolph and Mitra. Also in this case one pair of long chromosomes with a secondary constriction in the longer arm proved to be present.

Liliaceae

Muscari racemosum (L.) Mill. - Crimea - $2n = 72$

Up till now the exact octoploid level was not determined. ZHUKOVA (1967) published the number $2n$ more than 70 for plants cultivated in the Arctic-Alpine Botanical Garden.

Two plants were cytologically investigated by the present author; their chromosome number turned out to be $2n = 72$ without any doubt.

Ornithogalum tenuifolium Guss. - Bolshoy - $2n = 16$

The chromosome number $2n = 16$ was previously reported by CULLEN & RATTER (1967) for Turkish populations. CZAPIK (1972) determined $2n = 18$ for plants from Poland. This indicates that two basic numbers exist $x = 8$ and

$x = 9$. Czapik observed a similarity in the karyotype of *O. umbellatum* L. and *O. gussonii* Ten. (syn. *O. tenuifolium* Guss.), but not between *O. gussonii* and *O. tenuifolium*. In her opinion *O. tenuifolium* represents a southern race of the *umbellatum* aggregate.

Further study in this complex will be necessary to prove if there exists a southern species *O. tenuifolium* and a northern *O. gussonii*.

Ruscus hypophyllum L. – Bolshoy – $2n = 40$

The same chromosome number was previously reported by MARTINOLI (1951) for plants spontaneously growing in the Botanical Garden of Cagliari. Orchidaceae

Orchis morio L. ssp. *picta* A. & Gr. – Bolshoy – $2n = 36$

Several authors reported the same chromosome number for *Orchis morio* ssp. *morio*, *O. morio* ssp. *picta* (syn. *O. picta* Lois.) and *O. morio* ssp. *morio* are not always easily distinguishable. The spur of *O. morio* is mostly as long as the lip and that of *O. picta* half as long as the lip. *O. morio* grows in the western and south-western border area of the U.S.S.R. through Scandinavia and northern part of central Europe. *O. picta* can be considered as a mediterranean race of *O. morio*; both are characterized by the chromosome number $2n = 36$.

Papaveraceae

Corydalis bulbosa (L.) DC. ssp. *marschalliana* (Pall.) Chater – Crimea – $2n = 32$
In *Corydalis bulbosa* (syn. *C. cava* (L.) Schweigger & Koerte) three subspecies can be distinguished. Ssp. *marschalliana* has a solid tuber, cream or yellow flowers and is distributed in South-East Europe. The other two subspecies have a hollow tuber, purplish flowers and have a European distribution. The same tetraploid chromosome number was determined by MICHALKOVÁ (1967) in several Czechoslovakian populations of *Corydalis bulbosa*.

Primulaceae

Primula komarovii Losinsk. – Crimea – $2n = 22$.

Primula komarovii belongs to the *Primula vulgaris* Hudson aggregate. The species is characterized by white flowers and a South-East European distribution. Another species with white flowers is *Primula vulgaris* ssp. *balearica* (Willk.) W. W. Sm. & Forrest which occurs in the mountains of Mallorca. As suggested by Valentine and Kriss (Flora Europaea Part III: 16) there could exist a relation between *P. komarovii*, *P. vulgaris* ssp. *balearica* and *P. vulgaris* ssp. *sibthorpii* W. W. Sm. & Forrest. *P. komarovii* has the same chromosome number as reported for *Primula vulgaris*.

ACKNOWLEDGEMENTS

The authors are much indebted to Dr. Th. W. J. Gadella for his valuable comments. Thanks are due to Messrs. P. Brouwer, H. v. d. Klis, W. Nieuman, and D. Smit for technical assistance.

REFERENCES

- CULLEN, J. & J. A. RATTER (1967): Taxonomic and cytological notes on Turkish *Ornithogalum*. *Notes Roy. Bot. Gard. Edinburgh* **27**: 293–339.
- CZAPIK, R. (1972): Cytoembryology of experimental hybrids between two related species of *Ornithogalum* L. *Acta Biol. Craco. Ser. Bot.* **15**: 165–176.
- FEDOROV, A. A. (ed.) (1969): *Chromosome numbers of flowering plants*. Leningrad: 1–927.
- LÖVE, A. (ed.) (1973): IOPB chromosome number reports XLII. *Taxon* **22** (4): 459–464.
- (1974): IOPB chromosome number reports XLVI. *Taxon* **23** (5/6): 801–812.
- (1975): IOPB chromosome number reports XLVII. *Taxon* **24** (1): 143–146.
- MÁJOVSKÝ, J. et al. (1974): Index of chromosome numbers of Slovakian flora (Part 3). *Acta F. R. N. Univ. Comen. Botanica* **22**: 1–20.
- MARTINOLI, G. (1951): Studio cariologico sul genere *Ruscus* (Asparagaceae). *Caryologia* **4** (1): 86–97.
- MICHALKOVÁ, V. (1967): Tetraploide Population der Art *Corydalis cava* (L.) Schweigg. & Koerte (Hohler Lerchensporn) im Wald Dubnik bei Sered'. *Acta F. R. N. Univ. Comen. Botanica* **15**: 49–55.
- MOORE, R. J. (ed.) (1973): Index to plant chromosome numbers 1967–1971. *Regn. Veget.* **90**: 1–539.
- (1974): Index to plant chromosome numbers for 1972. *Regn. Veget.* **91**: 1–107.
- NEVES, J. B. (1973): Contribution à la connaissance cytotaxonomique des Spermatophyta du Portugal. VIII. Liliaceae. *Bol. Soc. Brot. Ser. 2* (7): 157–212.
- RANDOLPH, L. F. & J. MITRA (1959): Karyotypes of *Iris pumila* and related species. *Ann. Journ. Bot.* **46**: 93–102.
- SKALÍNSKA, M. & E. POGAN (1973): A list of chromosome numbers of Polish Angiosperms. *Acta Biol. Cracov. Ser. Bot.* **16**: 145–201.
- TUTIN, T. G. et al. (1964–1972): *Flora Europaea*, Part I, II, and III.
- ZHUKOVA, P. G. (1967): Karyology of some plants, cultivated in the Arctic-Alpine Botanical Garden. In N. A. AVRORIN (ed.): *Plantarum in Zonam Polarem Transportatio*. II. Leningrad: 139–149.