Mediterranean chromosome number reports — 9

edited by G. Kamari, F. Felber & F. Garbari

Abstract

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This is the nineth instalment of a series of reports of chromosome numbers from Mediterranean area, peri-Alpine communities and the Atlantic Islands, in French or English language. It comprises contributions on 80 taxa: *Aetheorhiza, Bellevalia, Dianthus, Leucojum* from Greece and *Iris* from Syria, by E. P. Bareka & G. Kamari (Nos. 1026-1030); *Alliaria, Arabis, Berteroa, Brassica, Cakile, Capsella, Cardamine, Draba* and *Lepidum* from Bulgaria, by M. Ančev & V. Goranova (Nos. 1031-1049); *Centaurea* from Bulgaria, by S. T. Bancheva (Nos. 1050-1054); *Crepis, Hypochoeris* and *Scorzonera* from Bulgaria, by D. Dimitrova (Nos. 1055-1057); *Dryopteris, Polystichum* and *Asplenium* from Bulgaria, by D. Ivanova (Nos. 1058-1063); *Hieracium* from Bulgaria, by D. Pavlova (Nos, 1064-1065); *Centaurea, Helichrysum, Otanthus, Pycnocomon* and *Solidago* from Italy, by I. Amore, G. Bedini & F. Garbari (Nos. 1066-1070); *Cytisus* and *Lupinus* from Sardinia, by T. Cusma Velari, L. Feoli Chiapella, G. Bacchetta & V. Kosovel (Nos. 1071-1072); *Genista* from Morocco and *Cytisus* from Italy, by T. Cusma Velari, L. Feoli Chiapella & C. Cristin (Nos. 1073-1074); *Adenocarpus, Cynoglossum, Ebenus, Lathyrus, Ononis, Rumex, Silene* and *Trifolium* from Morocco, by R. Parra, B. Valdés, I. Gordillo & R. Venanzi (Nos. 1075-1082); *Cistus, Lavandula, Marrubium, Silene* and *Thymus* from Morocco, by B. Valdés, R. Parra, F. J. Pina, R. Álvarez, M. I. Lopez & A. E. Rubio (Nos. 1083-1088); *Allium, Gentiana, Hieracium, Leucojum, Pulsatilla* from Italy, *Rumex, Scilla* from Spain, *Tulipa* from France, by R. Marcucci & N. Tornadore (Nos. 1089-1098); *Allium, Bellevalia, Tulipa, Iris* and *Biarum* from Israel and Jirdan, by A. Borzatti von Löwenstern & F. Garbari (Nos. 1099-1105)

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Reports (1026-1030) by Eleftheria-Perdiko Bareka & Georgia Kamari

1026. ***Aetheorhiza bulbosa*** (L.) Cass. subsp. ***microcephala*** Rech. fil. — $2n = 18$ (Figs. 1a, b, c).

Gr: Peloponnisos, Nomos Lakonias, Elafonisos island, maritime sands of Panagias beach, 36°29'N, 22°56'E, 24 Mar 1993, *Phitos & al. cult. no* F.441 (UPA).

Aetheorhiza bulbosa s.l. is mainly a Mediterranean element distributed from the coast of N.W. France to E. Mediterranean region (Syria, Lebanon). The species has been divided by Rechinger (1974) into three subspecies. The typical subsp. *bulbosa* is distributed throughout most of the range of the species; subsp. *willkommii* (Burnat & W. Barbey) Rech. fil. is endemic to Balearic islands and subsp. *microcephala* Rech. fil. occurs in the Aegean region, Turkey, Cyprus, Syria and Lebanon (Rechinger 1974; the distribution map provided by the author is erroneous and the symbols do not indicate the correct geographical areas of the taxa).

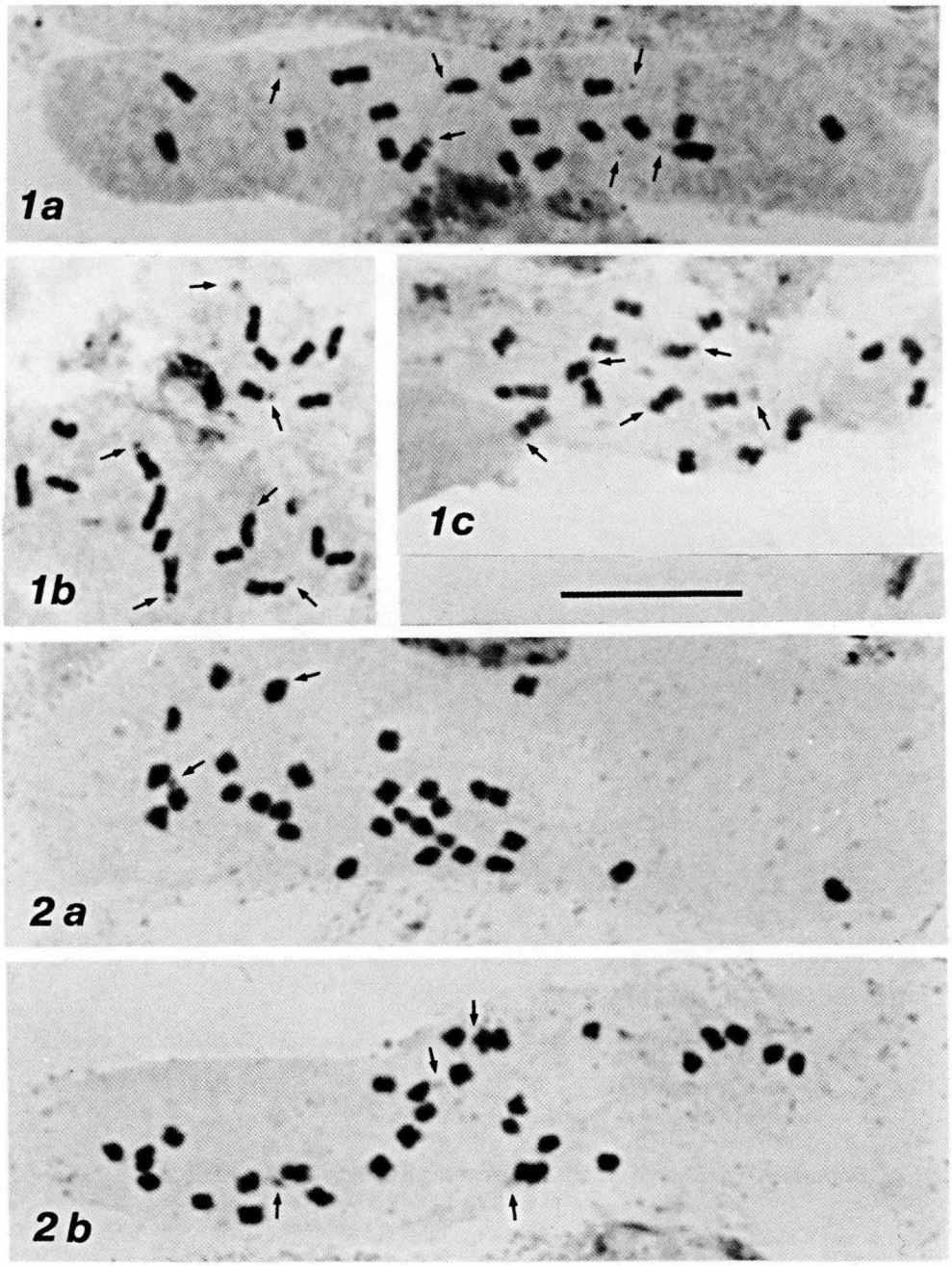
No former record of any chromosome number or karyotype morphology of this subspecies is known. The chromosome number $2n = 18$ counted here for subsp. *microcephala* has also been reported by several authors (see Mejías 1998 for references) for the typical subspecies in plants from various provenances. The karyotype of subsp. *microcephala* is symmetrical, consisting of $2n = 10m + 6m\text{-SAT} + 2sm = 18$ chromosomes, with the longest pair being submetacentric (sm) and the rest mostly metacentric (m), ranging in size from 2.7 to 1.2 μm. The karyotype morphology is in accordance to those given by Mejías (l.c.) for the typical subspecies. It differs only in the presence of an additional m-SAT chromosome pair. Five of the satellites are always visible (Figs. 1a, b, c).

1027. ***Bellevalia hyacinthoides*** (Bertol.) K. Persson & Wendelbo — $2n = 8$ (Figs. 3a, b & 6a).

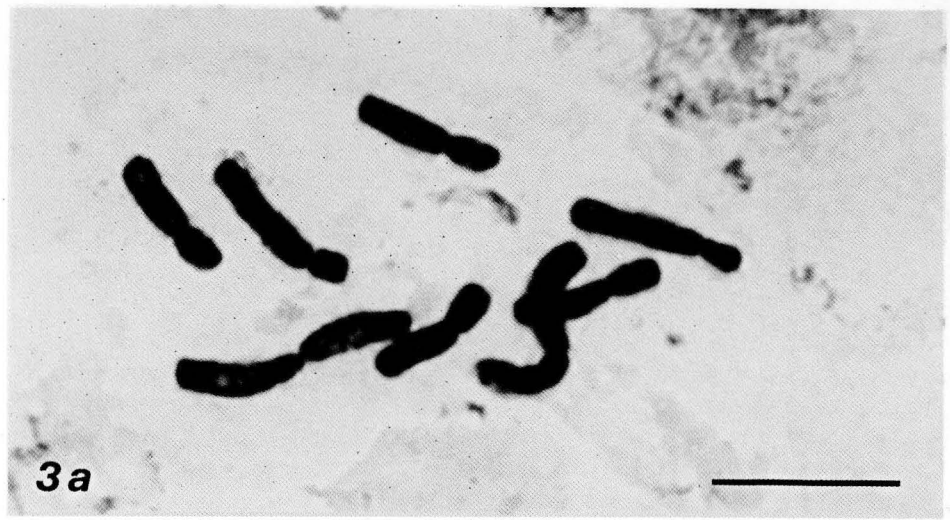
Gr: Ionian islands, Zakinthos, S. E. part of the island, Kalamaki settlement in Laganas bay, sandy places by the sea, 37°44'N, 20°53'E, 5 Apr 1997, *Kamari & al. cult. no* K.19 (UPA).

Bellevalia hyacinthoides is a Greek endemic species, distributed in the Central and South mainland, Kiklades islands and Ionian islands (Persson & Wendelbo 1979, Speta 1979, Mathew 1994).

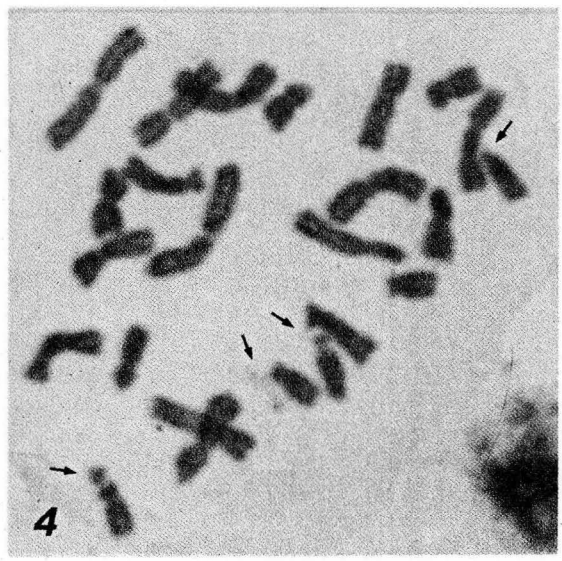
The chromosome number $2n = 8$ and its karyotype has been studied by Persson & Wendelbo (1979) in material from Mt Parnassos and Litochoro and by Speta (1979) in material from Magnisia, Viotia, Korinthia and Argolida. Moreover, Phitos (1988) reported the chromosome number $2n = 8 + 1B$ in material from Peloponnisos and Kefallinia island. Our count originated from Zakinthos (Ionian islands) confirms the already known chromosome number $2n = 8$. Karyotypes and a karyogram of the population studied are presented here. The karyotype formula is described as $2n = 2m + 4sm + 2st = 8$ chromosomes varying in size between 13.4 and 7.5 μm.



Figs. 1-2. Mitotic metaphase plates of: **1a, b, c,** *Aetheorhiza bulbosa* subsp. *microcephala,* $2n = 18$; **2a, b,** *Dianthus fruticosus* subsp. *occidentalis,* $2n = 30$. — Arrows indicate SAT-chromosomes. Scale bar = 10 µm.







Figs. 3-4. Mitotic metaphase plates of: **3a, b,** *Bellevalia hyacinthoides*, $2n = 8$; **4,** *Iris aucheri*, $2n = 24$. — Arrows indicate SAT-chromosomes. Scale bar = 10 µm.

1028. *Dianthus fruticosus* L. subsp. ***occidentalis*** Runem. — $2n = 30$ (Figs. 2a, b).

Gr: Ionian islands, Zakinthos, cape Skinari, 37°56'N, 20°42'E, 7 Apr 1998 *Phitos & Kamari cult. no* K. 185 (UPA).

Dianthus fruticosus s.l. is an endemic unit and an Aegean chasmophytic relict element divided into 8 subspecies (Runemark 1980, Strid 1997). Subsp. *occidentalis* is distributed in W. Kriti, Kithira, S. Peloponnisos, Idra, Zakinthos, Kefallinia and Levkas islands (Runemark l.c., Strid l.c.).

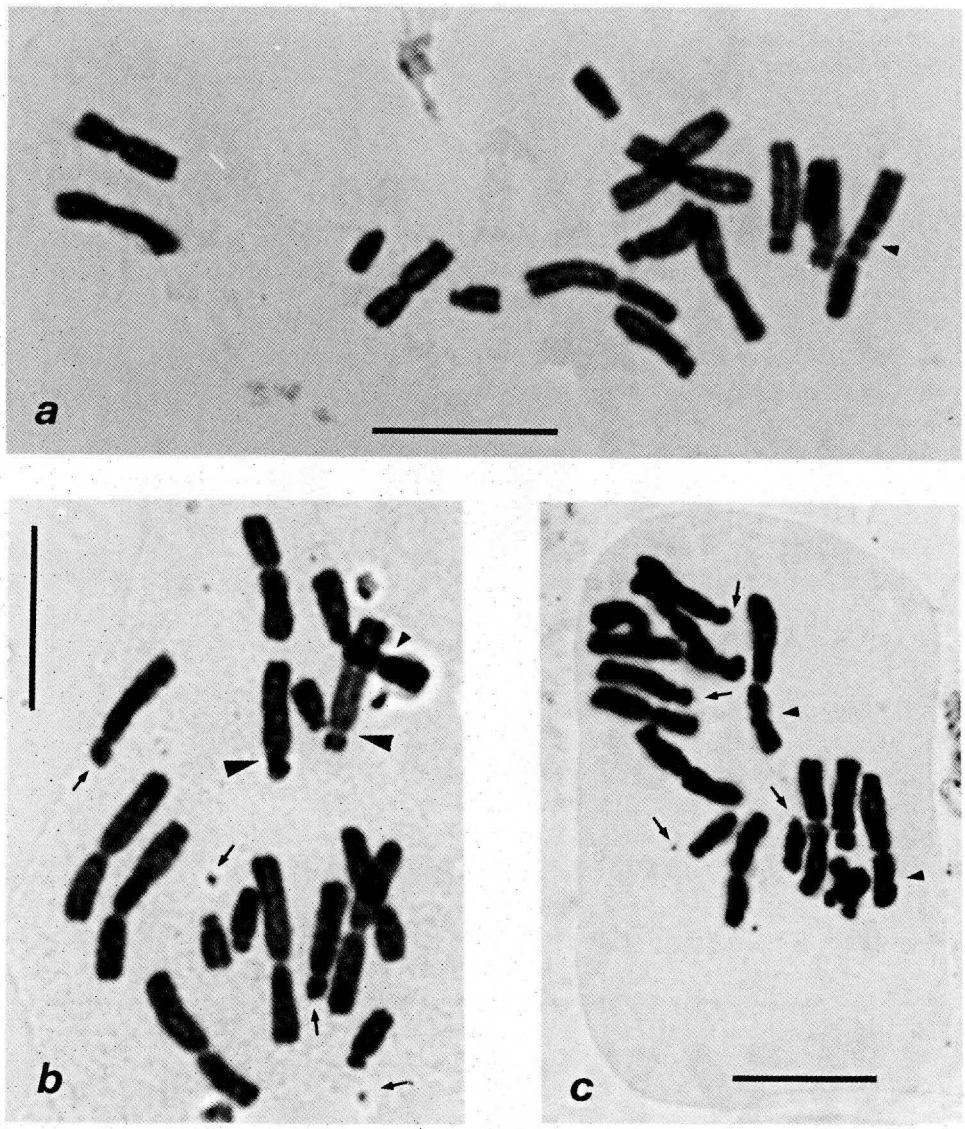


Fig. 5. Mitotic metaphase plates of *Leucojum valentinum* s.l., $2n = 16$: **a,** pop. no L. 9; **b,** pop. no. L. 10; **c,** pop. no L. 5. — Arrows indicate SAT-chromosomes, arrowheads secondary constrictions and large arrowheads (Fig. 5b) structural heterozygosity. Scale bars = 10 µm.

On Zakinthos, *Dianthus fruticosus* subsp. *occidentalis* is localized on maritime precipitous rocks at sea level or often several meters above sea level (Kamari & al. 1998).

To our knowledge, this is the first count for this subspecies. The same chromosome number $2n = 30$ has also been reported for subsp. *creticus* (Miège & Greuter 1973, Runemark 1980, De Montmollin 1984), for subsp. *amorginus* (Runemark 1980) and for subsp. *sitiacus* (De Montmollin 1985).

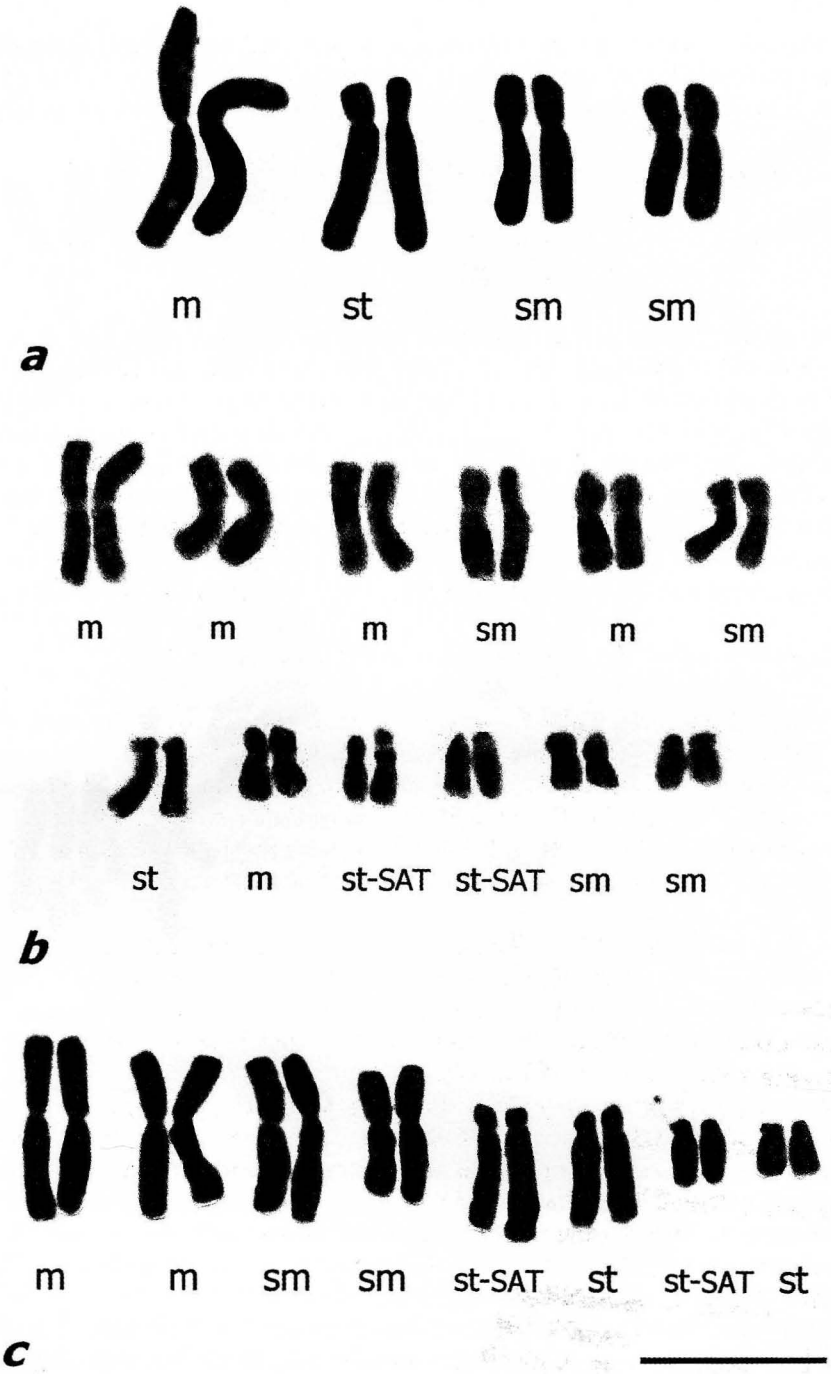


Fig. 6. Karyograms of: **a,** *Bellevalia hyacinthoides*, $2n = 8$; **b,** *Iris aucheri*, $2n = 24$; **c,** *Leucojum valentinum* s.l., $2n = 16$. — Scale bar = 10 µm.

Additionally, a karyotype microphotograph is presented here. The karyotype of the taxon is symmetrical, consisting of mostly metacentric (m) chromosomes, four of which bear small spherical satellites (Figs. 2a, b). Chromosome size varies from 1.6 to 0.8 µm.

1029. ***Iris aucheri*** (Baker) Sealy — 2n = 24 (Figs. 4 & 6b).

Sy: E. of Qualb Lose, steep, north facing chalky rocks, 500 m, 36°17'N, 36°45'E, 4 Oct 1993, *Markus* EM 1081 *cult. no* F.173 (UPA).

Iris aucheri is an Irano-Turanian element distributed in Syria, N. Iraq, N.W. Iran and Jordan (Mouterde 1966, Rechinger 1975, Davis 1984, King & Killens 1997).

The somatic number $2n = 24$ and the karyotype morphology of this taxon has already been given by Chaudhary & al. (1977) in material from N. Syria. The same chromosome number $2n = 24$, a microphotograph (Fig. 4) of the karyotype and a karyogram (Fig. 6b) of the population studied from N. W. Syria are presented. The karyotype consisting of $2n = 10m + 8sm + 2st + 4st\text{-}SAT = 24$ chromosomes, varying in size from 7.9 to 2.9 µm, is similar to those given by Chaudhary & al. (l.c.), except the observation of one more st-SAT chromosome pair of which the satellites are large, spherical and always visible.

1030. ***Leucojum valentinum*** Pau s.l. — $2n = 16$ (Figs. 5a, b, c & 6c).

Gr: Ionian islands, Zakinthos, Agios Nikolaos, rock crevices along the road, 100 m, 37°45'N, 20°46'E, 8 Sep 1989, *Garbari cult. no* L. 10 (UPA).

— Ionian islands, Zakinthos, close to the village of Kampi along road towards village Stavros, 37°47'N, 20°41'E, 12 Oct 1997, *Kamari & al. cult. no* L. 5 (UPA).

— Ionian islands, Zakinthos, N. of Korithi village on the way to cape Skinari, 37°54'N, 20°42'E, 13 Oct 1991, *Kamari & al. cult. no* L. 9 (UPA).

Leucojum valentinum s.l. is a Mediterranean element, distributed in Spain and in W. Greece (Ionian islands and W. Sterea Ellas).

The somatic number $2n = 16$ found in all populations investigated, has already been reported by Damboldt & Phitos (1975) from Kefallinia and by Müller-Doblies & Müller-Doblies (1975) from Levkas and Ithaki islands.

Microphotographs of the karyotypes (Figs. 5a, b, c) and a karyogram (Fig. 6c) are presented here from Zakinthos island. In the karyotype, 4 out of 16 chromosomes are metacentric (m), 4 are metacentric to submetacentric (m/sm) and 8 are acrocentric (st), half of which bear small satellites.

The karyotype formula is given as: $2n = 4m + 4m/sm + 4st + 4st\text{-}SAT = 16$ chromosomes. The karyotype morphology is in accordance with those given by Dambolt and Phitos (1975).

In a population studied (no L.10) one of the acrocentric (st) chromosome pairs shows structural heterozygosity (Fig. 5b, large arrowheads). More precisely, one of the chromosomes is acrocentric (st) while the other is subtelocentric (t). The chromosome size of the complement ranges from 10.0 to 2.8 µm and the satellites are spherical, small and not always visible.

Acknowledgements

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Reports (1031-1049) by Minčo Ančev & Valentina Goranova

1031. ***Alliaria petiolata*** (M. Bieb.) Cavara & Grande — $2n = 42$ (Fig. 1A).

Bu: Znepole region, east of the village G. Uyno, 42°27'N, 22°35'E, 750 m, Si, *Ančev A9713* (SOM).

The hexaploid chromosome number $2n = 42$ ($x = 7$) agrees with earlier reports from Europe, as well as "for material from Ohio, U.S.A." (see Jalas & Suominen 1994: 33 for references). A number $2n = 36$ ($x = 6$) was also found in this species (Ornduff 1969, Goldblatt 1981, 1988, Jalas & Suominen, l.c.). The gametic number $x = 7$ was also reported (see Goldblatt 1981: 151, for reference). The karyotype studied in Bulgarian material consists of small chromosomes without visible position of the centromeres.

1032. ***Arabis auriculata*** Lam. — $2n = 16$ (Fig. 1B).

Bu: Znepole region, Golo Bardo, 42°33'N, 23°04'E, 750 m, Ca, *Ančev A8095* (SOM).

The diploid chromosome number $2n = 16$ confirms previous counts from Europe (see Jalas & Suominen 1994: 202 for references). A deviating number $2n = 14$ was found in material from Morocco (see Jalas & Suominen l.c.)

The karyotype consists of $2n = 2x = 10m + 4sm + 2sm\text{-}SAT = 16$. The chromosomes are medium-sized and short, well differentiated in length. The SAT-pair is with microsatellites.

1033. ***Arabis ciliata*** Clairv. — $2n = 16$ (Fig. 1D).

Bu: Slavjanka Mt, Ambar-dere, 42°25'N, 23°41'E, 1400 m, Ca, *Ančev A94127* (SOM).

The diploid chromosome number $2n = 16$ reported here for *A. ciliata*, a species newly found in Bulgarian flora (Ančev 1997: 72), confirms previous records from S. Europe (see Jalas & Suominen 1994: 196 for references). The karyotype consists of small chromosomes of m and sm- type.

1034. ***Arabis collina*** Ten. — $2n = 32$ (Fig. 1E).

Bu: Pirin Mts, near Banderishka poljana, 41°47'N, 23°28'E, 1850 m, Ca, *Ančev A94199* (SOM).

The tetraploid chromosome number $2n = 4x = 32$ confirms the chromosome counts of this species from S. Europe (see Jalas & Suominen 1994: 199 for references). The counts of $2n = 16$ found by Burdet (1967: 140) in material from the Botanical gardens in Kiel and Geneve (as *Arabis minor* Vill.) seem doubtful. Burdet (l.c.) also reported $2n = 16, 32$ for a population from "France, Savoie, Villarclement". Strid & Titz (1986: 265) consider that the number $2n = 16$ reported by Papanicolaou (1984: 130) from Greece is also "dubius".

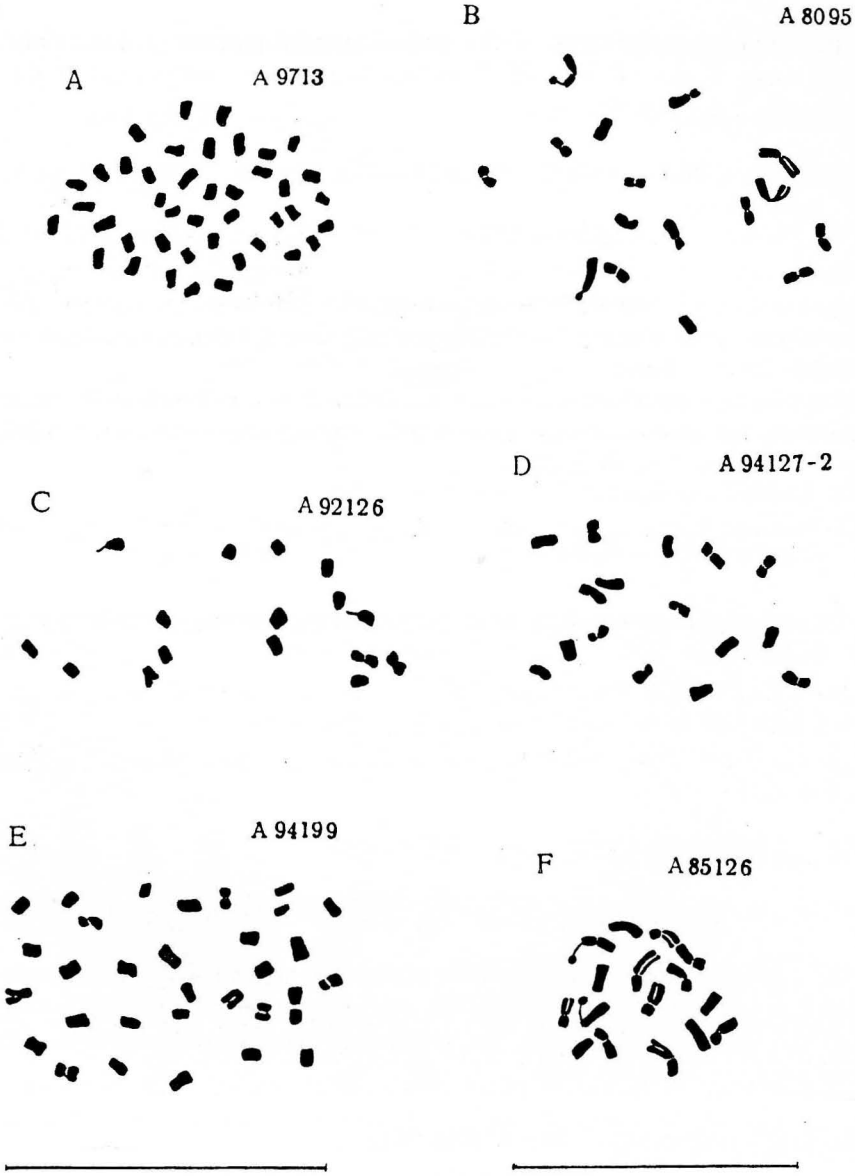


Fig. 1. Mitotic metaphase plates of: **A,** *Alliaria petiolata*, A9713, $2n = 42$; **B,** *Arabis auriculata*, A8095, $2n = 16$; **C,** *A. sudetica*, A92126, $2n = 16$; **D,** *A. ciliata*, A94127, $2n = 16$; **E,** *A. collina*, A94199, $2n = 32$; **F,** *A. hirsuta*, A85126, $2n = 16$. — Scale bars = 10 μm.

1035. *Arabis hirsuta* (L.) Scop. — $2n = 16$ (Fig. 1F).

Bu: Vitoša Mts, 42°34'N, 23°16'E, 700 m, Si, *Ančev A85126* (SOM).

The diploid chromosome number $2n = 16$ confirms an earlier report by Burdet (1967: 137) from S. W. Bulgaria, and other counts from Europe, some of them considered referable to *A. sagittata* (Bertol.) DC. (see Jalas & Suominen 1994: 193 for references).

The karyotype morphology of the studied material consists predominantly of sm-chromosomes. A pair of sm-SAT chromosomes was observed in most of the studied chromosome complements.

1036. ***Arabis sudetica*** Tausch — $2n = 16$ (Fig. 1C).

Bu: W. Rhodope Mts, Beglika, 41°48'N, 24°08'E, 1650 m, Ca, *Ančev A92126* (SOM).

The chromosome number $2n = 16$ confirms an earlier report by Andreev (1982: 576) from Bulgaria, Pirin Mts, and several other records from S. Europe (see Jalas & Suominen 1994: 194 for references).

Here we provide the karyotype which consists of similar in length small chromosomes without distinct centromeres. A pair of SAT-chromosomes with micro-satellites was observed in some of the chromosome sets.

1037. ***Berteroa incana*** (L.) DC. subsp. ***stricta*** (Boiss. & Heldr.) Stoj. & Stef. — $2n = 16$ (Fig. 2A).

Bu: C. Stara planina, Klysura, 42°41'N, 24°27'E, 950 m, Si, *Ančev A5274* (SOM).

The diploid chromosome number $2n = 16$ was reported for *B. incana* subsp. *incana* (Ančev 1981) and *B. incana* s.l. (see Jalas & al. 1996: 64 for references).

The karyotype of the studied material consists of $2n = 2x = 14\text{sm} + 2\text{ sm-SAT} = 16$ chromosomes.

1038. ***Brassica elongata*** Ehrh. — $2n = 22$ (Fig. 2B).

Bu: Balkan foothill region, Tarnovski visochini, 43°03'N, 25°37'E, 360 m, Si, *Ančev A9494* (SOM).

The chromosome number $2n = 22$ confirms the number reported from the Czech Republic and Romania (see Jalas & al. 1996: 236 for references).

The karyotype of the studied plants consists of chromosomes of m- and sm-type. A pair of long chromosomes of sm-type exceeds in length of the rest ones in the chromosome complement.

1039. ***Cakile maritima*** Scop. subsp. ***euxina*** (Pobed.) E. I. Nyárády — $2n = 18$ (Fig. 2C).

Bu: The Black Sea coast, Zlatny pjasatcy, 43°15'N, 27°57'E, Si, *Ančev A89150* (SOM).

The diploid chromosome number $2n = 18$ agrees with a report for the same species from Dagestan (see Jalas & al. 1996: 277 for reference).

The karyotype consists of medium-sized and short chromosomes, most of them of m- and sm- type.

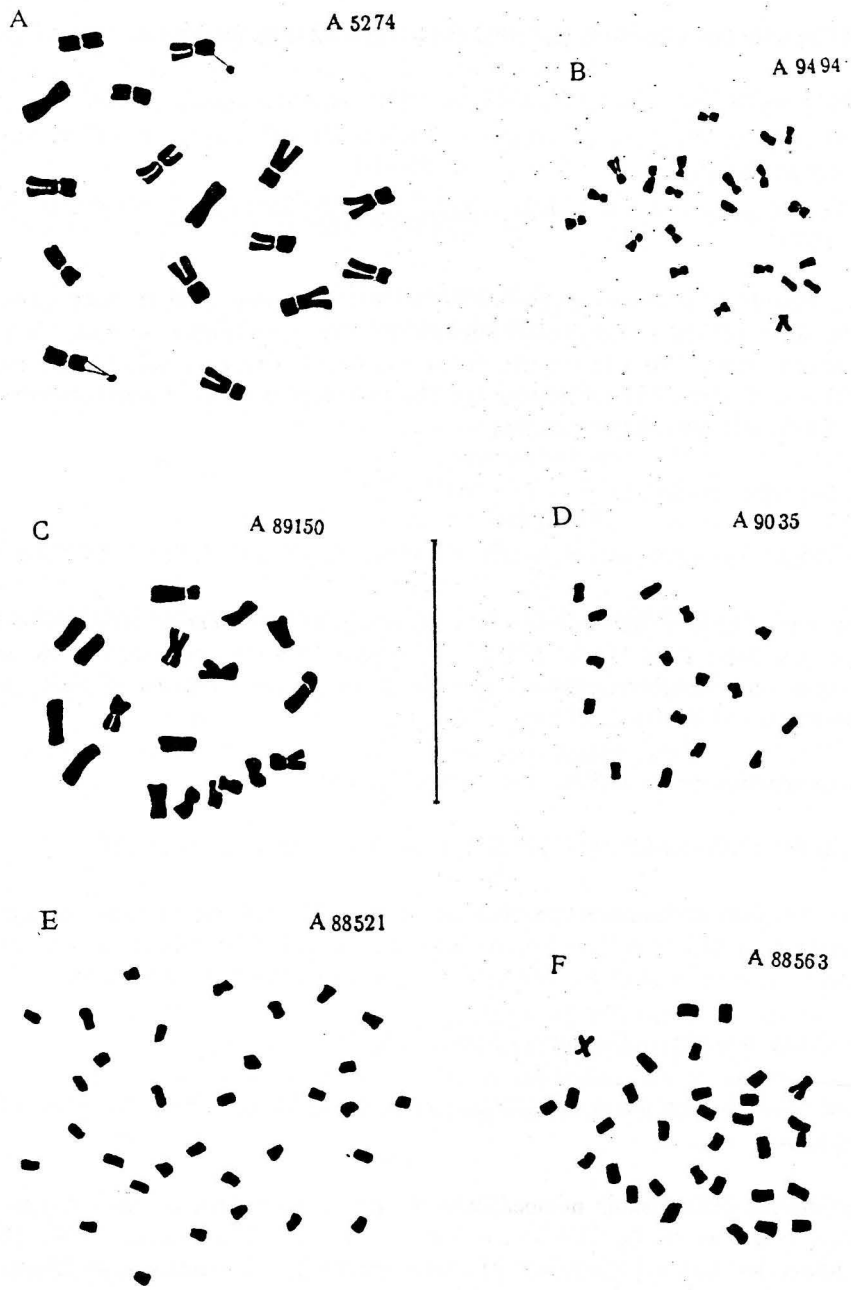


Fig. 2. Mitotic metaphase plates of: **A**, *Berteroa incana* subsp. *stricta*, A5274, $2n = 16$; **B**, *Brassica elongata*, A9494, $2n = 22$; **C**, *Cakile maritima* subsp. *euxina*, A89150, $2n = 18$; **D**, *Capsella rubella*, A9035, $2n = 16$; **E, F**, *C. bursa-pastoris*, A88521 & A88563, $2n = 32$. — Scale bar = 10 µm.

1040. ***Capsella bursa-pastoris*** (L.) Medicus — $2n = 32$ (Fig. 2E, F).

Bu: Sofia region, Sofia, 42°41'N, 23°23'E, 540 m, Si, *Ančev A88521* (SOM).
— Osogovska Mt, above the village of Garljano, 42°14'N, 22°37'E, 880 m, Si, *Ančev A9067* (SOM).
— Sredna gora, near the village Jagoda, 42°32'N, 25°35'E, *R. Hardalova A88563* (SOM).

The tetraploid chromosome number $2n = 4x = 32$ corresponds to numerous earlier reports from different distribution regions of this cosmopolite species. A diploid chromosome number $2n = 16$ was also frequently found in material from Europe and Asia (see Jalas & al. 1996: 131 for references). The karyotype consists of small chromosomes, most of them without distinct centromeres.

1041. ***Capsella rubella*** Reuter — $2n = 16$ (Fig. 2D).

Bu: Tundza hilly region, east of Svilengrad, 41°47'N, 26°13'E, *Ančev A9035* (SOM).

The diploid chromosome number $2n = 16$ agrees with two earlier counts from S. W. Europe (see Jalas & al. 1996: 132 for references). The chromosomes in the studied karyotypes are small, slightly differentiated in length, without distinct primary constrictions.

1042. ***Cardamine flexuosa*** With. — $2n = 32$ (Fig. 3A).

Bu: Rila Mt, Borovec, 42°14'N, 23°38'E, 1350 m, Si, *Ančev A9725* (SOM).

The tetraploid chromosome number $2n = 4x = 32$ confirms previous reports from different regions of Europe (see Jalas & Suominen 1994: 175 for references). Its karyotype consists of small chromosomes, most of which are without visible centromeres.

1043. ***Cardamine glauca*** Spreng. — $2n = 16$ (Fig. 3B).

Bu: Belasitca Mt, near the mount Kongur, 41°22'N, 23°13'E, 1700 m, Si, *Ančev A87106* (SOM).

The diploid chromosome number $2n = 16$ agrees with three previous reports from defferent countries of the Balkan Peninsula (see Jalas & Suominen 1994: 167 for references). Its karyotype consists of small, gradually differentiated in length short chromosomes, most of them without visible position of the primary constrictions.

1044. ***Cardamine graeca*** L. — $2n = 18$ (Fig. 3C).

Bu: Struma valley, Kresnensko defile, 41°52'N, 23°11'E, 350 m, Si, *Ančev A88510* (SOM).

The chromosome number $2n = 2x = 18$ confirms several previous counts from S. Europe (see Jalas & Suominen 1994: 171 for references). The diploid chromosome number $2n = 16$ was also reported from Kriti, Greece and Former Jugoslavia (Jalas & Suominen l.c.). The karyotype of the studied material consists of comparatively medium and short-sized chromosomes, most of them without distinct centromeres.

1045. *Cardamine impatiens* L. — $2n = 16$ (Fig. 3D).

Bu: C. Stara planina, Steneto, 42°42'N, 24°42'E, 750 m, Si, *Ančev A9761* (SOM).
— Znepole region, Ruj Mt, 42°52'N, 22°32'E, 700 m, *V. Goranova, A988* (SOM).

The diploid chromosome number $2n = 16$ confirms several earlier reports from Europe and N. Caucasia (see Jalas & Suominen 1994: 173 for references). Hindakova (1974: 5) has also reported for the same taxon the tetraploid chromosome number $2n = 4x = 32$ on material from Slovakia. The karyotype consists of similar in length chromosomes predominantly of m-type.

1046. *Cardamine pectinata* DC. — $2n = 16$.

Bu: Rila Mts, Borovec, 42°14'N, 23°38'E, 1300 m, Si, *Ančev A9720* (SOM).

The diploid chromosome number $2n = 16$ is probably the first record for this species.

There are different taxonomic treatments for *C. pectinata*. Jalas & Suominen (1994: 173) accepted a broader species *C. impatiens* and included *C. pectinata* as a synonyme. Cullen (1965: 443) previously, considering the morphological similarity of these taxa, has accepted *C. impatiens* var. *impatiens* and *C. impatiens* var. *pectinata* (Pallas ex DC.) Trautv. Stojanov & Stefanov (1948: 509) published the combination *C. impatiens* subsp. *pectinata* (Pallas ex DC.) Stoj. & Stef. According to Assenov (1970: 442) and Strid (1986: 261) these taxa are distinctly separate species. In Bulgarian flora *C. pectinata* and *C. impatiens* are well differentiated morphologically. *C. pectinata* differs from *C. impatiens* by its larger terminal leaflets, petals 3.5-4.5 mm long (2-3 mm in *C. impatiens*), and secund siliquae. *C. pectinata* seems confined to the coniferous forest belt of the high mountains of S. W. Bulgaria between (800) 1000-1700 m a.s.l. *C. impatiens* occurs more frequently in the deciduous forests from 500 up to about 1500 m in the mountains of C. and W. Bulgaria.

1047. *Draba muralis* L. — $2n = 32$ (Fig. 3F).

Bu: Pirin Mts, Rozhenski monastery, 41°32'N, 23°36'E, Si, *Ančev A88501* (SOM).

The tetraploid chromosome number $2n = 4x = 32$ counted here, confirms previous records from Europe (see Jalas & al. 1996: 106 for references).

The karyotype consists of small differentiated in length chromosomes. Some of the comparatively long and medium-sized chromosomes are of m- and sm- type, the rest ones and the short chromosomes are without distinct centromeres.

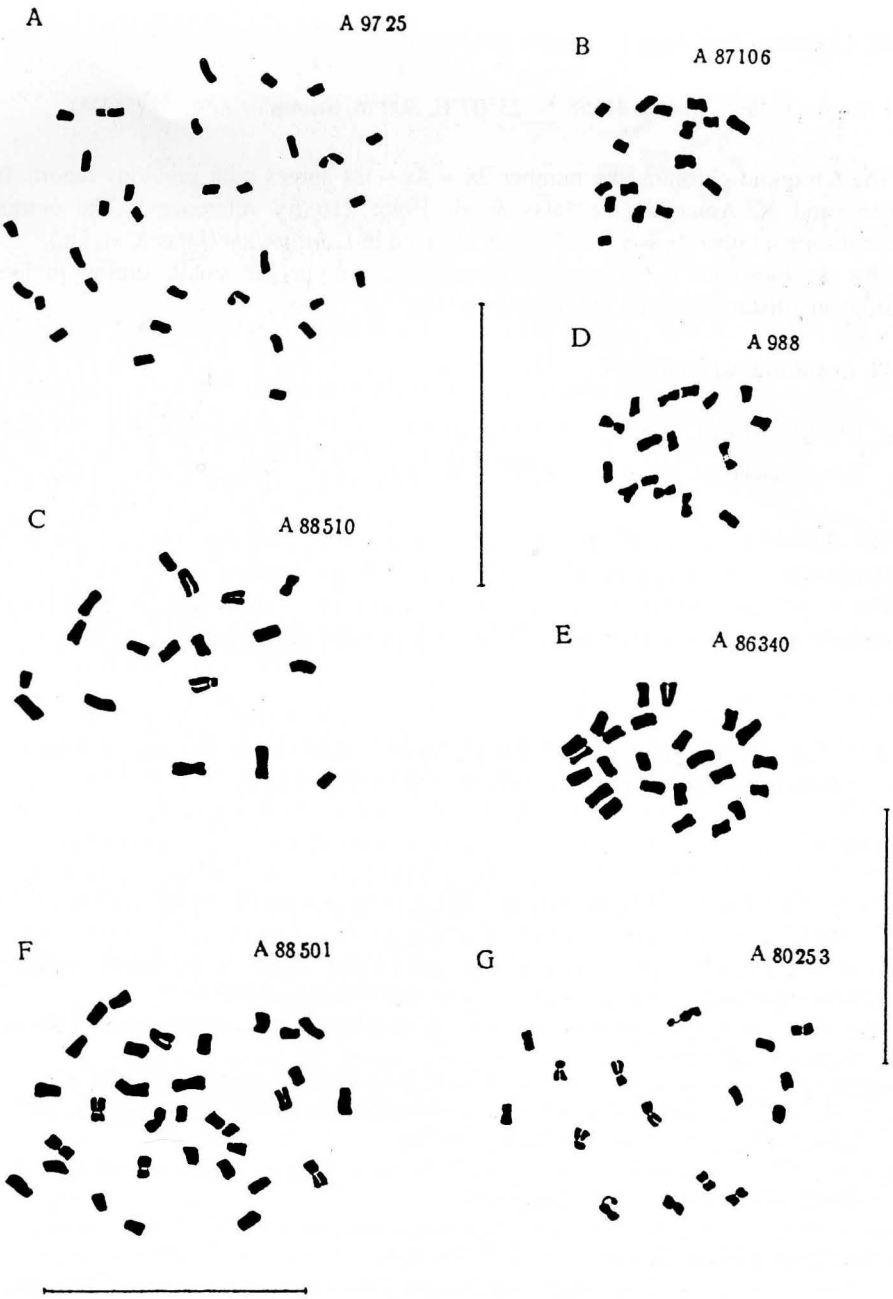


Fig. 3. Mitotic metaphase plates of: **A,** *Cardamine flexuosa*, A9725, $2n = 32$; **B,** *C. glauca*, A87106, $2n = 16$; **C,** *C. graeca*, A88510, $2n = 18$; **D,** *C. impatiens*, A988, $2n = 16$; **E,** *Lepidium latifolium*, A86340, $2n = 24$; **F,** *Draba muralis*, A88501, $2n = 32$; **G,** *L. perfoliatum*, A80253, $2n = 16$. — Scale bars = 10 µm.

1048. *Lepidium latifolium* L. — $2n = 24$ (Fig. 3E).

Bu: Struma valley, Simitly 41°58'N, 23°07'E, 300 m, Si, *Ančev A86340* (SOM).

The tetraploid chromosome number $2n = 4x = 24$ agrees with previous reports from Europe and N. America (see Jalas & al. 1996: 216 for references). The octoploid chromosome number $2n = 8x = 48$ was also found in *L. latifolium* (Jalas & al. l.c.).

The chromosomes in the studied tetraploid karyotype are small, similar in length, without any distinct position of the centromeres.

1049. *Lepidium perfoliatum* L. — $2n = 16$ (Fig. 3G).

Bu: Black Sea coast, Nesebar, 42°39'N, 27°43'E, *Ančev A80253* (SOM)
— Black Sea coast, Kavarna, 43°25'N, 28°20'E, *Ančev A8148* (SOM).

The diploid chromosome number $2n = 16$ confirms previous counts from Europe, Caucasia and N. America (see Jalas & al. 1996: 214 for references).

The karyotype consists of small chromosomes of sm- and m- type. A pair of m-SAT chromosomes was observed in most of the studied chromosome sets.

Acknowledgements

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Reports (1050-1054) by Svetlana T. Bancheva

1050. *Centaurea achtarovii* Urum. — $2n = 22$ (Fig. 1).

Bu: Pirin Mts, below the top Oreljak, 1800–1900 m, 41°27'N, 23°41'E, on limestone, 9 Jul 1998, *Bancheva Sh9820* (SOM).

It is a Bulgarian endemic species known only from Pirin Mt. This count is the first report for the species. The karyotype consists of $2n = 2x = 16$ sm + 4 st + 2 st – SAT = 22 chromosomes.

1051. *Centaurea napulifera* Rochel subsp. ***nyssana*** (Petrović) Dostál — $2n = 20$ (Fig. 2).

Bu: Rhodope Mts, below the top of Chaeva chouka, 1800 m, 41°38'N, 24°30'E, on limestone, high mountain meadows, 8 Aug 1998, *Vladimirov Sh9830* (SOM).

Endemic to the Balkan Peninsula. The chromosome number $2n = 2x = 20$ agrees with those previously reported by Strid & Andersson (1985) from Vitsi Mt, Greece; by Kuzmanov & Georghieva (1987, 1990) as *C. nyssana* Petrović; by Sharkova (1996) and Sharkova & Peev (1997) from Rila and Pirin Mts of Bulgaria. The karyotype consists of $2n = 2x = 4$ m + 12 sm + 2 st + 2 st – SAT = 20 chromosomes.

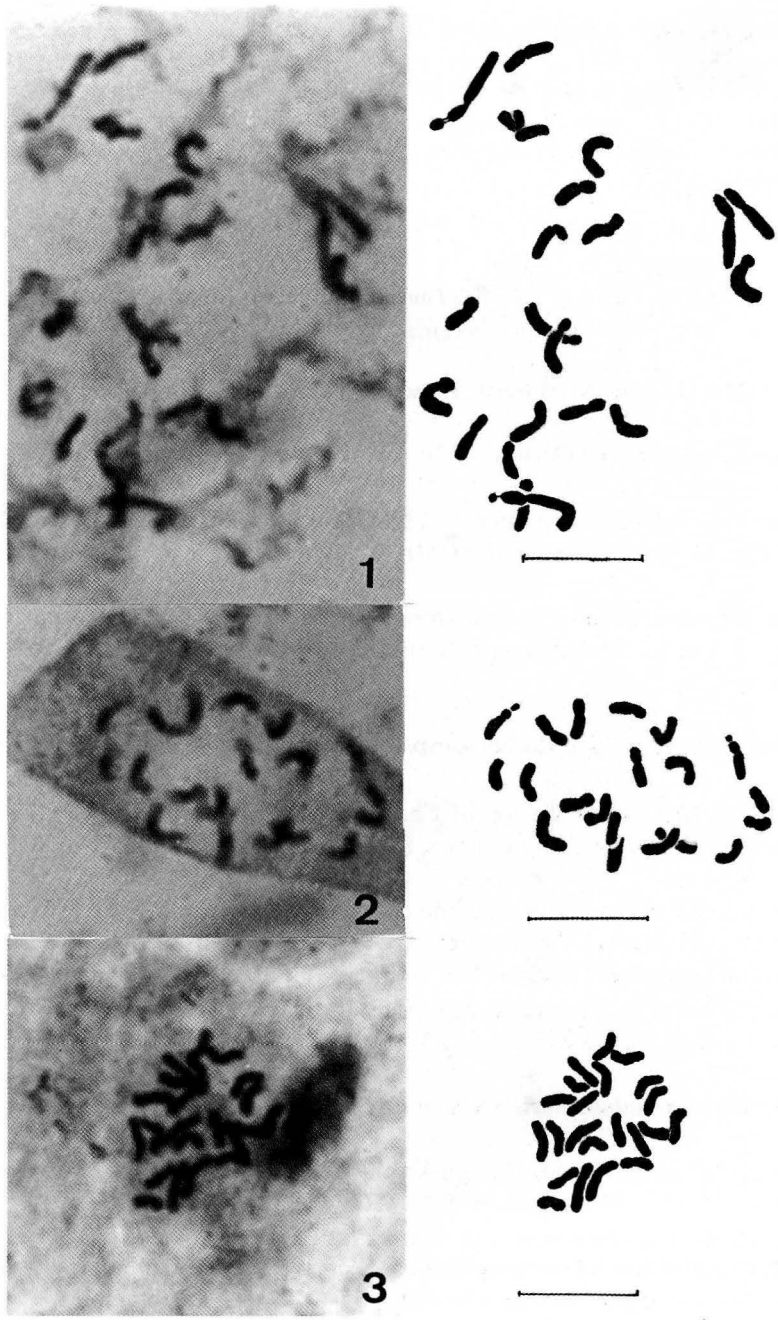
1052. *Centaurea pseudoaxillaris* Stefanov & Georgiev — $2n = 22$ (Fig. 3).

Bu: Upper Tracian Lowland, Besaparski hils, 490 m, 42°07'N, 24°26'E, open grassy places, 26 May 1998, *Bancheva Sh9801* (SOM).

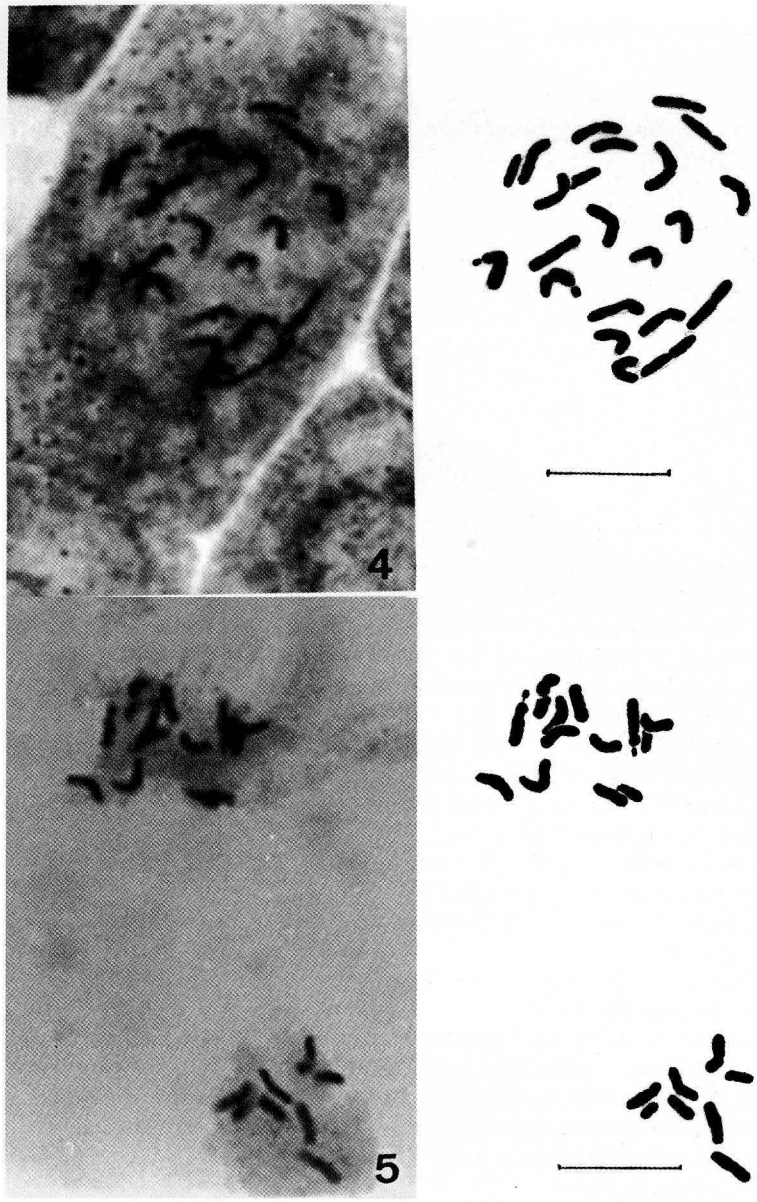
Endemic to Bulgaria. This rare species has been investigated karyologically for the first time here. The karyotype formula is $2n = 2x = 8$ m + 14 sm = 22 chromosomes.

1053. *Centaurea triumfettii* All. subsp. ***cana*** (Sibth. & Sm.) Dostál — $2n = 22$ (Fig. 4).

Bu: Rhodope Mts, above the village of Bjala cherkva, 1550 m, 41°55'N, 24°40'E, 6 Aug 1998, *Bancheva Sh9831* (SOM).



Figs. 1-3. Mitotic metaphase plates and drawings of *Centaurea*: **1,** *C. achtarovii*, $2n = 22$; **2,** *C. napulifera* subsp. *nyssana*, $2n = 20$; **3,** *C. pseudoaxillaris*, $2n = 22$. — Scale bars = 10 µm.



Figs. 4-5. Mitotic metaphase plates and drawings of *Centaurea*: **4,** *C. triumfettii* subsp. *cana*, $2n = 22$; **5,** *C. triumfettii* subsp. *stricta*, $2n = 22$. — Scale bars = 10 µm.

It is distributed in S. E. Europe: Balkan Peninsula, Crimea and Asia (Turkey). In Bulgaria it occurs in the southern regions. This count is the first cytotaxonomical record for the subspecies. The submetacentric chromosomes are dominant in the karyotype, two of them being SAT-chromosomes.

1054. ***Centaurea triumfettii*** All. subsp. ***stricta*** (Waldst. & Kit.) Dostál — $2n = 22$ (Fig. 5).

Bu: Znepole region, along Erma river, 700 m, 42°51'N, 22°45'E, 26 Jun 1997, *Peev Sh9702* (SOM).

It is distributed in E. C. Europe and N. part of Balkan Peninsula.

Our count is in accordance with indications of diploid chromosome numbers of *C. triumfetii* reported by several other authors — Baksay (1956, 1957), Siljak (1977), Kieft & Loon (1978), Monti & al. (1978), Chichiricco & Tammaro (1980), Baltisberger & Huber (1987), Pogan & al. (1989), Sharkova (1996) and Sharkova & Peev (1997).

The chromosome number of this subspecies was hitherto unknown from Bulgaria. The chromosomes can be grouped as follows: $2n = 2x = 4$ m + 14 sm + 2 st + 2 st – SAT = 22 chromosomes.

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Reports (1055-1057) by Dessislava Dimitrova

1055. ***Crepis foetida*** subsp. ***rhoeadifolia*** (M. Bieb.) Čelak. — $2n = 10$ (Fig. 1A).

Bu: Northern Black Sea coast, Zelenka locality near cape Kaliakra, 43°24'N, 28°25'E, limestone, 22 Jul 1995, *Dimitrova DD4434* (SOM).
— Western Balkan foothill region, in Belogradchik as ruderal plant, 43°39'N, 22°43'E, c. 700 m, 14 Jul 1995, *Dimitrova DD45163* (SOM).
— Western Frontier Mountains, near Yana hut above Boboshevo, 42°10'N, 22°59'E, c. 500 m, 19 Jul 1995, *Dimitrova DD45178* (SOM).
— Western Frontier Mountains, along the road between villages Boboshevo and Pastuch, 42°12'N, 22°55'E, c. 370 m, silicate, 19 Jul 1995, *Dimitrova DD45183* (SOM).
— Western Frontier Mountains, along the road Sofia-Kyustendil, 42°25'N, 22°51'E, c. 300 m, silicate, 20 Jul 1995, *Dimitrova DD45196* (SOM).

C. foetida subsp. *rhoeadifolia* is distributed in Central Europe southeastwards to the Balkans and Cyprus, Southern Russia, extending westwards through Iran, Western Syria and Caucasus to Central Asia and North-Western Himalayas (Lamond 1975). In Bulgaria it is a widespread ruderal plant reaching up to 1000 m alt.

The present chromosome counts confirm these of Kuzmanov & Nikolova (1977) and Dimitrova & al. 1999 from Bulgarian accessions. For chromosome counts of foreign localities see Babcock (1947a, b), van Loon (1987), Moore (1973), Goldblatt (1981, 1985), Goldblatt & Johnson (1991, 1994, 1996).

The karyotype of *C. foetida* subsp. *rhoeadifolia* consists of two long submetacentric pairs, two considerably shorter metacentric pairs of very similar size that caused sometimes difficulties in distinguishing of the homologues, and one submetacentric SAT-pair of transitional length. No B-chromosomes were found. All studied accessions showed high uniformity of their chromosomes in contrast to the high variability of the plants' morphology. For more details of the karyology of *C. foetida* subsp. *foetida*, *rhoeadifolia*, and *commutata* (Spreng.) Babc. see Dimitrova & al. (1999).

1056. ***Hypochoeris radicata*** L. — $2n = 8$ (Fig. 1B).

Bu: Central Rhodope Mts, above village Gela along the road to Moursalitsa massif, 41°39'N, 24°33'E, 1500 m, silicate, 23 Jul 1998, *Dimitrova DD4849* (SOM).
— Central Rhodope Mts, in the foothills of Momchil summit, 41°43'N, 24°54'E, 1690 m, silicate, 25 Jul 1998, *Dimitrova DD4878* (SOM).

Hypochoeris radicata occurs in North and Central Europe, Mediterranean region extending to Asia Minor, North America and in Australia as an introduced plant (Vassilev 1964). The chromosome number $2n = 8$ confirms the previous data of Kuzmanov (1975), Kuzmanov & Kožuharov (1970), and van Loon & de Jong (1978) from Bulgarian localities.

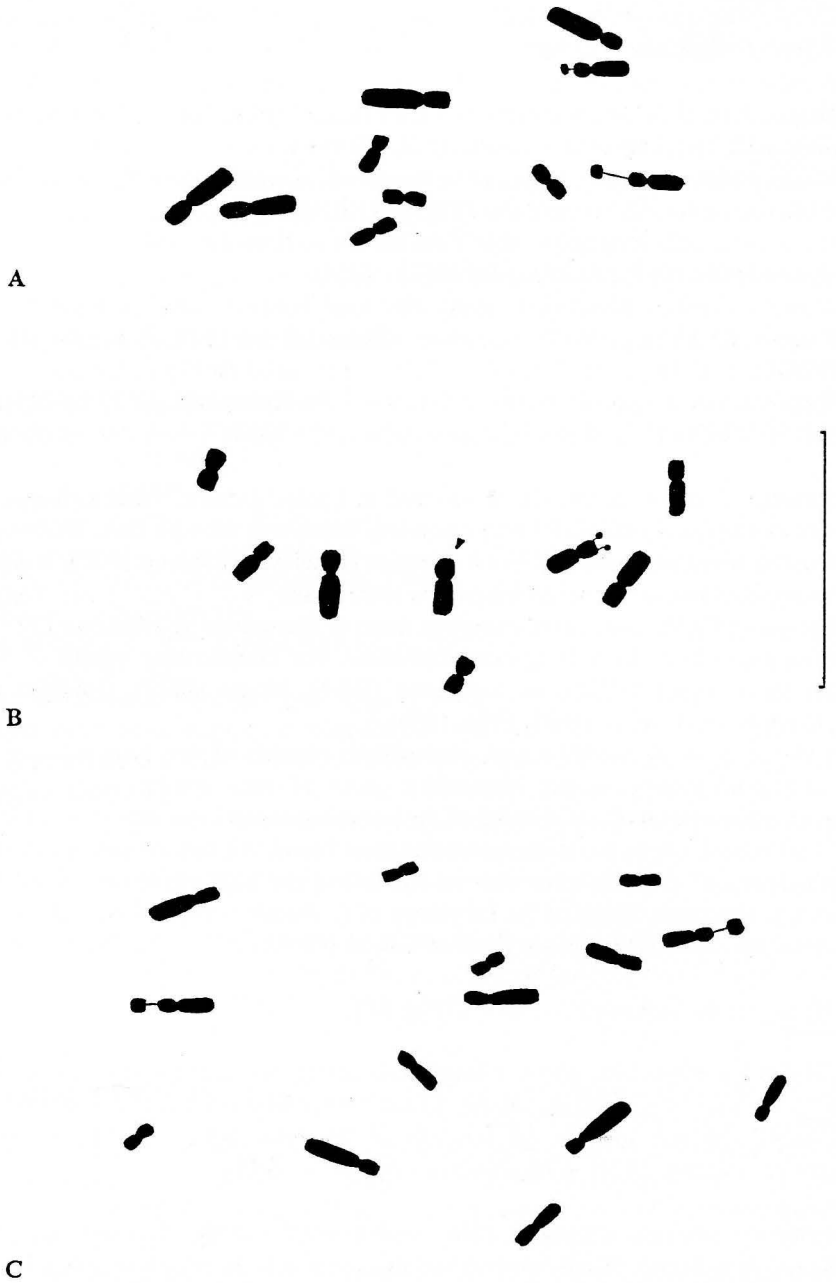


Fig. 1. Karyotype drawings of: **A,** *Crepis foetida* subsp. *rhoeadifolia* (DD45183), $2n = 10$; **B,** *Hypochoeris radicata* (DD4849), $2n = 8$; **C,** *Scorzonera cana* (DD4531), $2n = 14$. — Arrowhead marks the SAT-homologue. Scale bar = 10 μm.

For chromosome counts from foreign accessions see Moore (1970, 1972, 1973), van Loon (1987), Ornduff (1969), Goldblatt (1981, 1984, 1985, 1988), Goldblatt & Johnson (1990, 1991, 1994, 1996).

The chromosome complements of the two populations examined are very similar consisting of four long submetacentrics, one metacentric NOR-pair of intermediate size, and one considerably shorter metacentric pair. No B-chromosomes have been registered so far. Such tendency towards karyotype bimodality is common for other representatives of the tribe *Lactuceae*, for instance *Crepis* L. (Kamari 1992, Dimitrova 1998).

1057. *Scorzonera cana* (C. A. Mey.) O. Hoffm. — $2n = 14$ (Fig. 1C).

Bu: North-Eastern Bulgaria, in neglected vineyards near village Dralfa, 43°09'N, 26°33'E, c. 500 m, limestone, 07 Jun 1995, *Dimitrova DD4531* (SOM).

— North-Eastern Bulgaria, in dry meadows along the road Turgoviste-Shoumen, 43°16'N, 26°37'E, c. 500 m, limestone, 09 Jun 1995, *Dimitrova DD4518* (SOM).

Scorzonera cana occurs in East-Central, and South-East Europe extending eastwards to Iran (Lack & Kilian 1991).

The chromosome number $2n = 14$ supports the counts of Kuzmanov & Georgieva (1983) and Kuzmanov, Jurukova-Grančarova & Georgieva (1993) from Bulgarian localities and of van Loon (1987), Goldblatt (1984, 1988), Goldblatt & Johnson (1990, 1996) from elsewhere.

The karyotype of this taxon consists of two long and two considerably shorter submetacentric pairs, one submetacentric SAT-pair of intermediate size, and two metacentric pairs which are the shortest in the complement. No B-chromosomes were detected. The high morphological variability of *S. cana* presupposes some karyotype diversity that is worth studying and is in progress for Bulgarian accessions.

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Reports (1058-1063) by Daniella Ivanova

1058. ***Dryopteris carthusiana*** (Vill.) H. P. Fuchs — $2n = 4x = 164$ (Fig. 1A, B).

Bu: Rila Mts, Gyolechitsa locality, along Cherni Iskur river, 42°14'N, 23°24'E, coniferous forest, c. 1300 m, 09 Aug 1998, *Ivanova DI-86.98* (SOM).



Fig. 1. **A,** microphotograph and **B**, drawing of root tip mitosis of *Dryopteris carthusiana*, 2*n* = 164. — Scale bar = 10 µm.

— Rila Mts, between Rila Monastery and "Kirilova Polyana", along Rilska river, 42°08'N, 23°23'E, mixed forest dominated by *Fagus sylvatica*, 1250 m, 01 Sep 1998, *Ivanova DI-150.98, DI-153.98* (SOM).

— Rila Mts, above Borovets, near the Royal Palace, 42°15'N, 23°36'E, in a mixed forest of *Picea abies*, *Abies alba* and *Pinus nigra*, 1310 m, 02 Sep 1998, *Ivanova DI-158.98, DI-159.98* (SOM).
— Western Rhodope Mts, Malka Syutkya peak, 41°51'N, 24°01'E, spruce forest, c. 1950 m, 03 Aug 1998, *Ivanova DI-57.98* (SOM).
— Western Rhodope Mts, Dospat dam, by a feeder along the southern road from Dospat to Surnitsa, 41°42'N, 24°02'E, spruce forest, 1200 m, 04 Aug 1998, *Ivanova DI-60.98, DI-61.98* (SOM).

The *Dryopteris carthusiana*-complex is represented in Bulgaria by three species: two tetraploids (*D. carthusiana* (Vill.) H. P. Fuchs and *D. dilatata* (Hoffm.) A. Gray) and one diploid (*D. expansa* (C. Presl) Fraser-Jenkins & Jermy). These species show similarities in respect to their gross morphology and exibit a considerable variation making their identification sometimes difficult. Some herbarium specimens cannot be classified with reasonable certainty as one or other species and have often been confused with the other members of the complex. In that way most of the earlier data on the range of these three species in Bulgaria are rather confusing and misleading.

The area of distribution of *D. carthusiana* extends from North America; N. & C. Europe from Scandinavia to the mountains of N. Mediterranean region, N. Spain, Pyrenees, Corsica, Alps, Balkans; across W. & C. Siberia to Lake Baikal; in Anatolia, Caucasus, Transcaucasia and the Tien Shan.

This fern species has been indicated as widely distributed in all mountains in Bulgaria (Andreev 1992, Jalas & Suominen 1972: map 129), but in our opinion the taxon is more restricted, while *D. expansa* is of wider distribution.

This is the first report of the cytology of *D. carthusiana* from Bulgaria. It has been reported widely from other countries as a sexual tetraploid (see Löve & al. 1977: 305 for references, and Sorsa & Widén 1968, Gibby & Walker 1977, Piekos-Mirkowa 1979, Cody & Mulligan 1982, Benl & Eschelmüller 1983, Werth 1986).

1059. *Dryopteris expansa* (C. Presl) Fraser-Jenkins & Jermy — $2n = 2x = 82$ (Fig. 2A, B, C, D, E, F).

Bu: Vitosha Mts, Bistrishko Branishte reserve, along the path from Aleko hut to Bistritsa, 42°34'N, 23°18'E, among moraines in a spruce forest, c. 1600-1650 m, *Ivanova DI-256.95* (SOM).
— Northern Pirin Mts, between Ravnako locality above Vihren hut and Mouratovo lake, 41°44'N, 23°24'E, open stony places, c. 2150 m, 28 Aug 1998, *Ivanova DI-109.98* (SOM).
— Northern Pirin Mts, Popovo ezero circus, the eastern shore of Popovo lake, 41°42'N, 23°30'E, among big rocks and stones, 2234 m, 29 Aug 1998, *Ivanova DI-117.98* (SOM).
— Northern Pirin Mts, between Gotse Delchev hut and Bezbog hut, 41°45'N, 23°32'E, in a *Pinus peuce - Pinus silvestris - Picea abies* forest, c. 1800 m, 29 Aug 1998, *Ivanova DI-119.98* (SOM).
— Southern Pirin Mts, the foothills of Sveshtnik peak, 41°32'N, 23°39'E, in a mixed forest, 1700-1800 m, 12 Aug 1995, *Dimitrova DI-284.95, DI-285.95* (SOM).

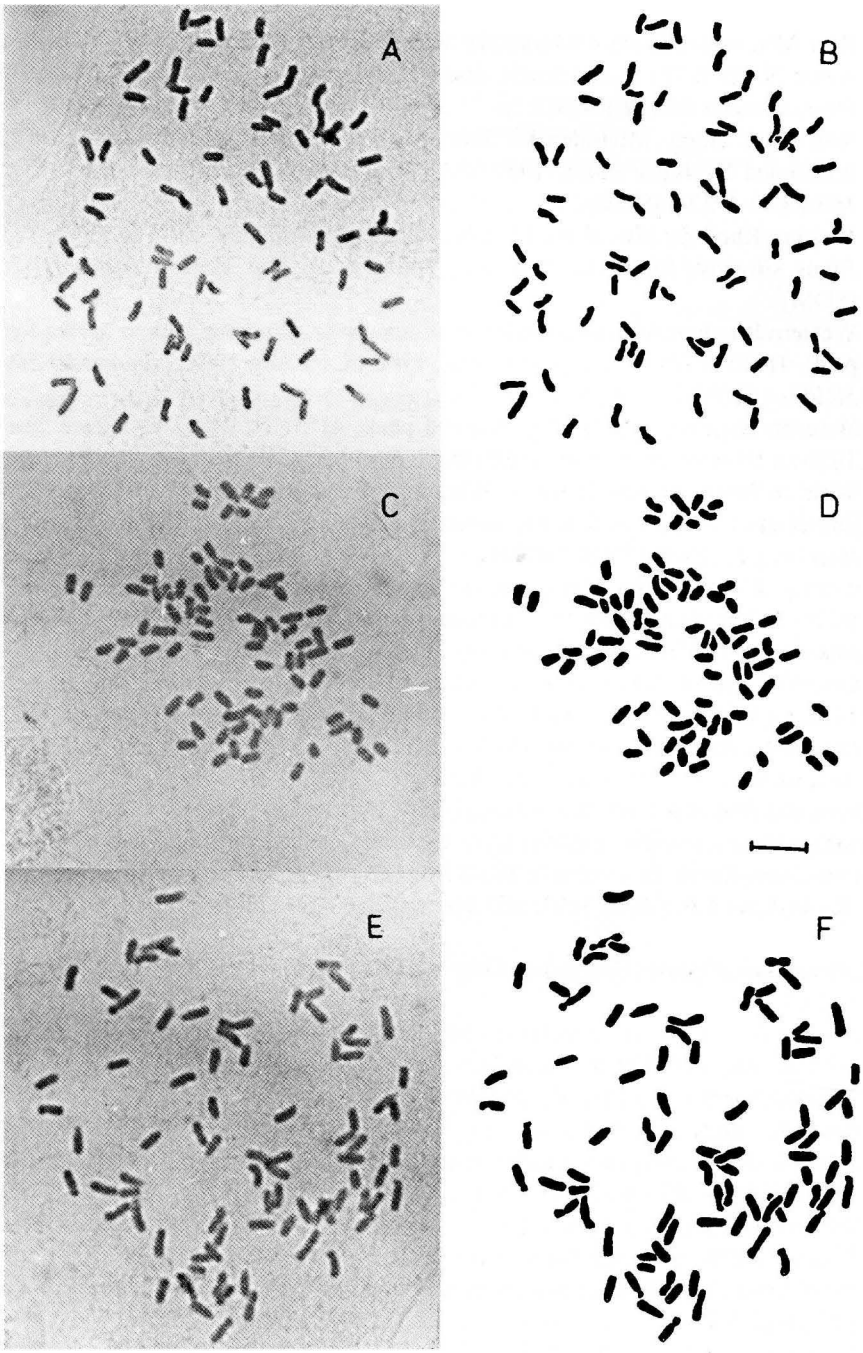


Fig. 2. Microphotographs and drawings of root tip mitosis of *Dryopteris expansa*, $2n = 82$: **A, B**, *DI-164.98*; **C, D**, *DI-22.98*; **E, F**, *DI-109.98*. — Scale bar = 10 µm.

— Rila Mts, between Rila Monastery and "Kirilova Polyana", along Rilska river, 42°08'N, 23°23'E, mixed forest dominated by *Fagus sylvatica*, 1250 m, 01 Sep 1998, *Ivanova DI-151.98* (SOM).
— Rila Mts, along Mousalenska Bistritsa river, 42°14'N, 23°36'E, in a forest dominated by *Picea abies*, 1430-1700 m, 02 Sep 1998, *Ivanova DI-164.98, DI-165.98, D-171.98* (SOM).
— Western Rhodope Mts, above Surnitsa village, 41°43'N, 24°00'E, in a *Picea abies - Pinus silvestris* forest, by a stream, 1400 m, 16 Sep 1994, *Ivanova DI-203.94* (SOM)*.
— Western Rhodope Mts, by a feeder of Semiza river, along the path to Malka Syutkya peak, 41°52'N, 24°02'E, spruce forest, 1700 m, 03 Aug 1998, *Ivanova DI-50.98* to *56.98(a)* (SOM)*.
— Western Rhodope Mts, Malka Syutkya peak, 41°51'N, 24°01'E, spruce forest, c. 1950 m, 03 Aug 1998, *Ivanova DI-58.98, DI-59.98* (SOM)*.
— Western Rhodope Mts, between Teheran hut and Rovno partisan camp, 41°53'N, 24°12'E, in a coniferous forest dominated by *Picea abies*, 1750 m, 05 Aug 1998, *Ivanova DI-75.98* to *77.98* (SOM)*.
— Central Rhodope Mts, along the Panorama road near Lednitsata hut, 41°38'N, 24°31'E, spruce forest, by a mountain stream, 1750 m, 23 Jul 1998, *Dimitrova & Vladimirov DI-20.98* to *22.98* (SOM)*.
— Central Rhodope Mts, at the beginning of the path to Momchil summit between Manastir and Davidkovo, 41°43'N, 24°54'E, spruce forest, c. 1700 m, 25 Jul 1998, *Dimitrova & Vladimirov DI-34.98* (SOM)*.

The general distribution of this fern is already indicated in Ivanova (1997).

Cytological examination of plants from 13 localities has confirmed that the Bulgarian plants are diploid with $2n = 82$, like those from elsewhere in Europe and North America (for references see Löve & al. 1977: 303 and Ivanova 1997: 228).

1060. *Dryopteris dilatata* (Hoffm.) A. Gray — $2n = 4x = 164$ (Fig. 3A, B).

Bu: Central Balkan Range, Kaloferska Mt, near the locality Smesite along the road to Triglav peak, 42°43'N, 25°02'E, in a *Fagus sylvatica - Picea abies* forest, 1500 m, 30 Jul 1996, *Ivanova DI-64.96* (SOM).
— Rila Mts, above Borovets, near the Royal Palace, 42°15'N, 23°36'E, in a mixed forest of *Picea abies*, *Abies alba* and *Pinus nigra*, 1310 m, 02 Sep 1998, *Ivanova DI-160.98, DI-161.98* (SOM).
— Western Rhodope Mts, above Surnitsa village, 41°43'N, 24°00'E, spruce forest, by a stream, 1250 m, 16 Sep 1994, *Ivanova DI-187.94* (SOM)**.
— Western Rhodope Mts, above Surnitsa village, 41°43'N, 24°00'E, spruce forest, by a stream, 1250 m, 04 Aug 1998, *Ivanova DI-66.98* to *68.98* (SOM)**.

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* The distribution is a new record for Western and Central Rhodope Mts.
** The distribution is a new record for Western Rhodope Mts.

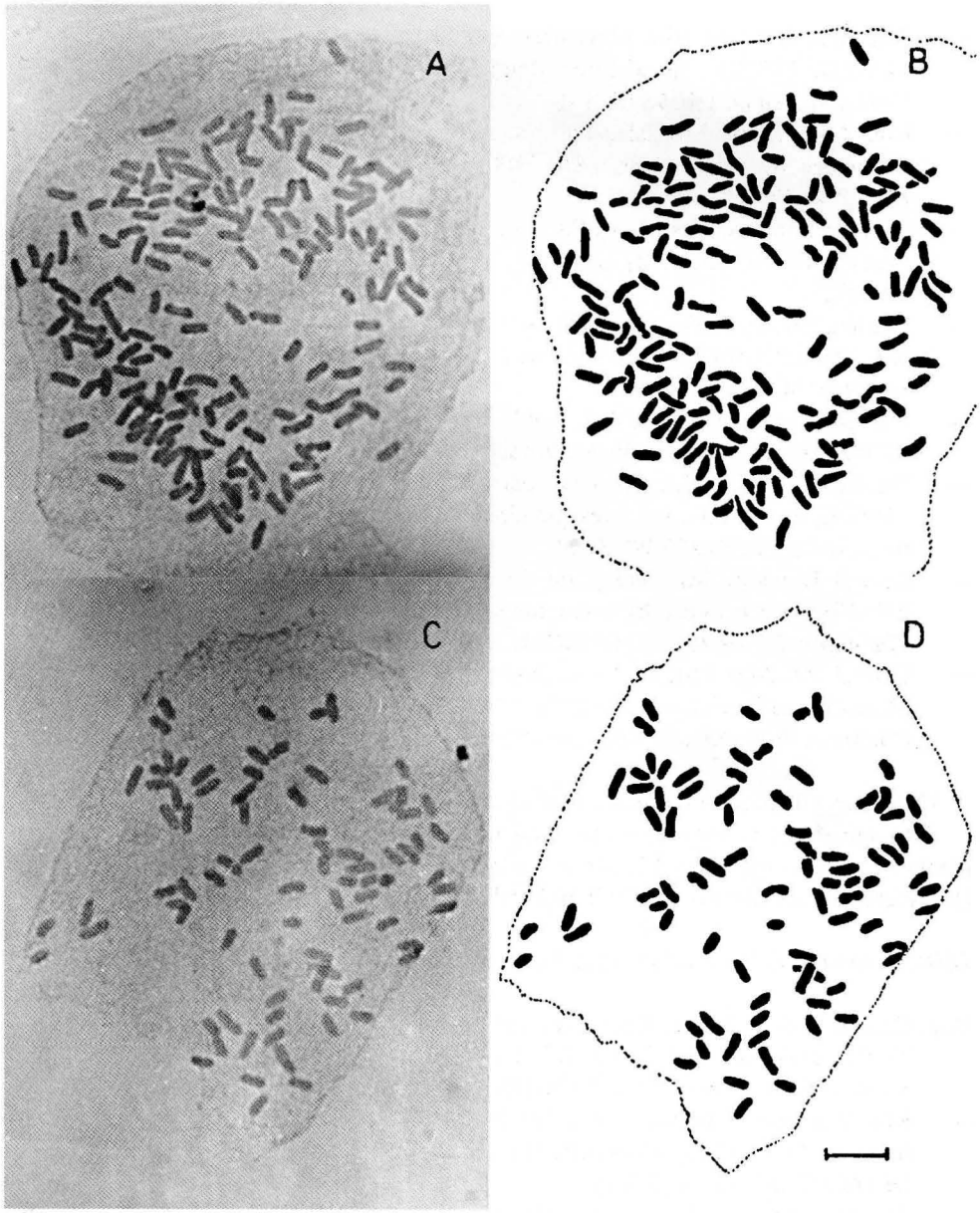


Fig. 3. Microphotographs and drawings of root tip mitosis: **A, B**, *Dryopteris dilatata*, $2n = 164$; **C, D**, *D. villarii*, $2n = 82$. — Scale bar = 10 µm.

This fern species has a subatlantic character. It is distributed in most of Europe, but is rare in the Mediterranean region and south-east. It extends eastwards to North Anatolia, Crimea, Caucasus and Caspian coast of Iran (rare). This is the first cytological count on Bulgarian material.

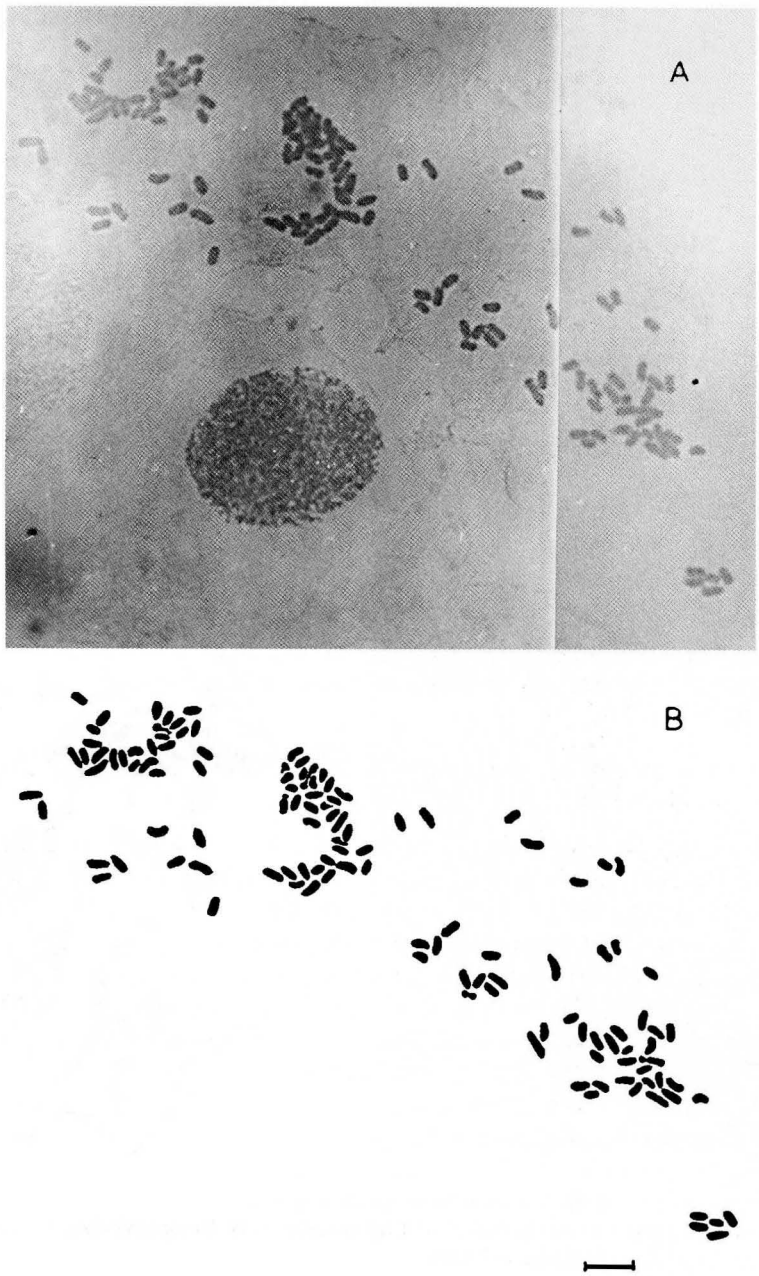


Fig. 4. **A,** microphotograph and **B**, drawing of root tip mitosis of *Polystichum* x *illyricum*, $2n = 123$. — Scale bar = 10 µm.

Our specimens have the same tetraploid chromosome number $2n = 164$, as previously reported from various regions (see Löve & al. 1977: 304 for references, as well as Sorsa

& Widén 1968, Löve & Löve 1976, Nardi 1976, Gibby & Walker 1977, Piekos-Mirkowa 1979, Benl & Eschelmüller 1983, Gibby 1985).

1061. ***Dryopteris villarii*** (Bell.) Woynar ex Schinz & Thell. subsp. ***villarii*** — $2n = 2x = 82$ (Fig. 3C, D).

Bu: Northern Pirin Mts, Golyam Kazan circus, below Vihren peak, 41°46'N, 23°24'E, in fissures of rocks and among big stones, limestone, 2400 m, 28 Aug 1998, *Ivanova DI-104.98, DI-106.98* to *108.98* (SOM).

This fern species occurs on open high alpine limestone rocks and screes in France, Switzerland, W. Germany, Austria, Italy, Jugoslavia, Albania, Bulgaria and Greece, as well as in Caucasus. In Bulgaria *D. villarii* has been found on Pirin Mts and Slavyanka Mt. Andreev (1992) indicates it erraneously as *D. pallida* (Bory) Maire & Petitm.

This is the first cytologically confirmed record of *D. villarii* from Bulgaria. Previous reports of this taxon from different countries by Manton (1950), Panigrahi (1965), Widén & al. (1971), Nardi (1979) and Rasbach & al. (1982) have described it as a diploid sexual species with $n = 41$ bivalents or $2n = 82$ chromosomes.

1062. ***Polystichum* × *illyricum*** (Borbás) Hahne (= ***P. aculeatum* × *lonchitis***) $2n = 3x = 123$ (Fig. 4A, B).

Bu: Slavyanka Mt, between Livadata locality and Gotsev peak, near the timberline, 41°23'N, 23°36'E, shady gully in a coniferous forest, 16 Aug 1995, *Ivanova DI-299.95* (SOM)***.

— Northern Pirin Mts, by Demyanitsa river, 41°46'N, 23°27'E, in a spruce forest, 1700 m, 01 Jul 1995, *Anchev DI-299.95* (SOM)***.

The combination between the two sexual species *P. aculeatum* (L.) Roth and *P. lonchitis* (L.) Roth is the hybrid *P.* × *illyricum*. This taxon is reported from British Isles, Spain, Germany, Switzerland, Austria, Italy, Slovakia, FYROM etc., but it could be found everywhere where the parent species grow together in quantity. This is the first cytological report from Bulgaria. The established chromosome number from Bulgarian material corresponds to the triploid level, $2n = 123$, as it was expected (since *P. aculeatum* is tetraploid, and *P. lonchitis* diploid). This number confirms previous reports of $2n = 123$ in mitosis or $n =$ c. $41^{II} + 41^{I}$ in meiosis from other countries (Manton 1950 from Switzerland, Vida 1966 from Hungary, Sleep & Reichstein 1967 from Switzerland, Vida & Reichstein 1975 from Switzerland and Poland).

1063. ***Asplenium ruta-muraria*** L. subsp. ***dolomiticum*** Lovis & Reichstein — $2n = 2x = 72$ (Fig. 5A, B).

Bu: Western Balkan Foothill Region, "Vratsata" above Vratsa town, 43°11'N, 23°30'E, on limestone rocks of a southern slope, 700-800 m, 26 Jun 1994, *Georgiev DI-7.94* (SOM).

*** The distribution is a new record for the floristic region.

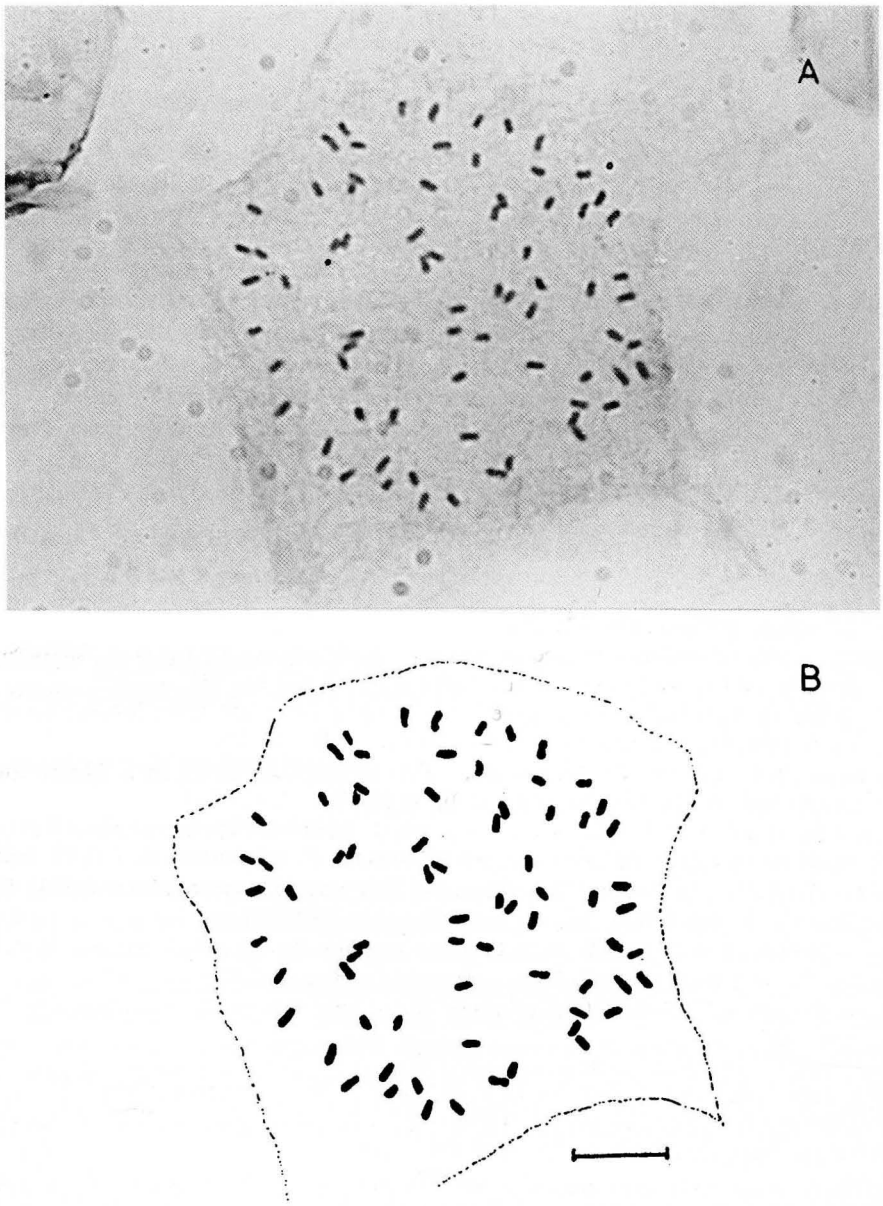


Fig. 5. **A,** microphotograph and **B**, drawing of root tip mitosis of *Asplenium ruta-muraria* subsp. *dolomiticum*, $2n = 72$. — Scale bar = 10 µm.

Asplenium ruta-muraria is represented by two subspecies, which are very similar morphologically and differ only by some minor features. The typical subsp. *ruta-muraria* is common in Europe, while subsp. *dolomiticum* is geographically restricted in S. and S. C. Europe (S. France, Germany, N. Italy, Jugoslavia). However, these two subspecies

have different ploidy levels, the former is tetraploid with $n = 72$, and the latter is diploid with $n = 36$.

Our count yielded a mitotic chromosome number of $2n = 72$, which agrees with the meiotic counts of $n = 36$ bivalents, reported from Italy (Lovis 1964, Lovis & Reichstein 1964, Vida 1970, Bouharmont 1972) and France (Bouharmont 1972). This is the first record on Bulgarian material.

Acknowledgements

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Reports (1064-1065) by Dolja Pavlova

1064. *Hieracium hoppeanum* Schult. — $2n = 18$ (Figs. 1-7).

Bu: Struma valley, the hill Malak Kozhuh, on south-eastern slope, 41°23''N, 23°20''E, 150 m, 1997, *D. Pavlova*, (SO 99 667).

— Stara planina Mts, Ribaritza village, on a grassy slope north-eastern from the school, 42°50''N, 24°25''E, 1996, *D. Pavlova*, (SO 99 669).

— Pirin Mts, Popovi livadi, on calcareous rocky places, 1350 m, 41°32''N, 23°38''E, 1997, *M. Anchev*, (SO 99798).

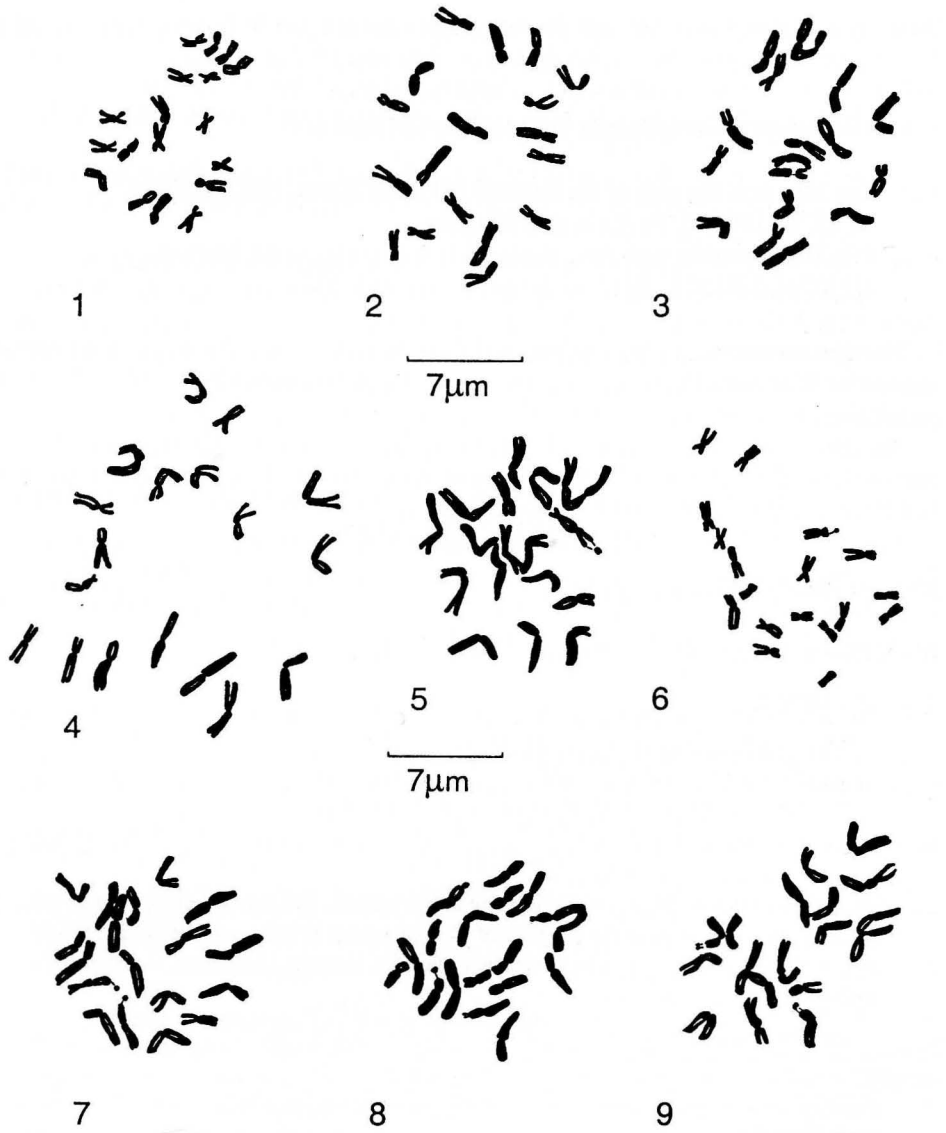
— Eastern Rhodopes Mts, Meden buk village, on dry sandy eastern slopes along the road to Zhulti chal village, 41°25''N, 26°10''E, 1996, *D. Pavlova*, (SO 99 665).

— Rila Mts, near the touristic hut Ovnarsko, clearing at the end of a pine forest, 42°15''N, 23°30''E, 1998, *D. Pavlova*, (SO 99 666).

— Lozenska planina Mts, on dry terrains near the path to the monastery "St. Spass", 42°32''N, 23°40''E, 1998, *D. Pavlova* (SO 99 670).

— Vitosha Mts, near the touristic hut Aleko, 42°32''N, 23°20''E, 1998, *D. Pavlova*, (SO 99 668).

Hieracium hoppeanum is widespread in the Bulgarian flora up to 2500 m (Peev 1992). The oldest cytological publications on *H. hoppeanum* are those of Christoff & Popoff (1938), Christoff & Christoff (1948), Gentscheff (1937) on materials from Bulgaria. The authors reported the chromosome numbers $2n = 45, 90$. These numbers are not confirmed by now (see Darlington & Wylie 1955, Fedorov 1969, Loon 1987, Goldblatt 1984, 1988, Goldblatt & Johnson 1990, 1994, 1996 for references). On the contrary, all the reports from the investigated European populations as well as from Bulgaria (Gadella 1984) are diploid ($2n = 18$), a number which is also confirmed by the present study.



Figs. 1-9. Karyotypes of *Hieracium* species from Bulgaria: **1-7,** *H. hoppeanum.*, $2n = 18$; **8-9,** *H. pseudopilosella*. $2n = 18$. — Scale bars = 7µm.

The karyotypes examined here exhibit variability in the chromosomal morphology. The karyotypes of the populations from Malak Kozhuh, Ribaritza and Pirin Mts are similar consisting of $2n = 2x = 10m + 8sm = 18$ chromosomes (Figs. 1-3). The karyotype of the population from the Eastern Rhodopes Mts differs from the above three by two more pairs of metacentric chromosomes, consisting of $2n = 2x = 14m + 4sm = 18$ chromosomes (Fig. 4). The karyotypes from the Rila Mts and the Lozenska Mts consist of

$2n$ = 2x = 14m + 3sm + 1sm-SAT = 18 (Figs. 5-6) and that of the population from the Vitosha Mts consists of $2n = 2x$ = 14m + 2sm + 2sm-SAT = 18 chromosomes (Fig. 7).

1065. *Hieracium pseudopilosella* Ten. — 2n = 18 (Figs. 8-9).

Bu: Rila Mts, near the path of the touristic hut Ribni Ezera, 1900 m, 42°10''N, 23°35''E, 1998, *D. Pavlova*, (SO 99 663).
— Rila Mts, along the path from the locality Nektenitza to the Martvoto ezero, 42°10''N, 23°15''E, 1998, *D. Pavlova*, (SO 99 664).

The species occurs in the Bulgarian mountain flora above 2000 m in the floristic regions of Rila Mts, Pirin Mts, Stara Planina Mts and Rhodope Mts (Peev 1992). The populations from Bulgaria are investigated for the first time karyologically.

The chromosome number $2n$ = 18 confirms previous study by Merxmuller (1975). The chromosome number $2n$ = 36 is also reported for *H. pseudopilosella* s.l. (see Loon 1987, Goldblatt & Johnson 1994, 1996 for references).

The investigated two populations are different in their morphology, consisting of $2n = 2x$ = 12m + 2sm + 4m-SAT and $2n = 2x$ = 14m + 2sm + 2m-SAT chromosomes, respectively. The karyotypes are symmetrical with two or four m-SAT chromosomes and the satellites are ball-shaped.

Acknowledgements

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Reports (1066-1070) by Ilaria Amore, Gianni Bedini & Fabio Garbari

1066. ***Centaurea aplolepa*** Moretti subsp. ***subciliata*** (DC.) Arcang. — $2n = 18$ (3 populations - Fig. 1A).

It: Marina di Vecchiano (Pisa, Tuscany), on sandy shore, about 200 m from the shoreline, 43°48'N, 10°16'E, 16 Sep 1998, *Amore* (PI; 1998-0815 H.B.P.).
— Viareggio (Lucca, Tuscany), on sandy shore, about 200 m from the shoreline, 43°50'N, 10°15'E, 15 Aug 1998, *Amore* (PI; 1998-0809, 1998-0812 H.B.P.).

The somatic number $2n = 18$ has been found in all populations investigated. These are the first counts for this subspecific unit, endemic of the Central-Northern Tuscan seashores (Pignatti 1982).

1067. ***Helichrysum stoechas*** (L.) Moench — $2n = 28$ (1 population - Fig. 1B).

It: Marina di Vecchiano (Pisa, Tuscany), on sandy shore, about 70 m from the shoreline, 43°48'N, 10°16'E, 29 Jun 1998, *Amore* (PI; 1998-0445 H.B.P.).

The somatic number $2n = 28$ found agrees with previous counts performed on plants from Latium (D'Amato 1971).

These are the first counts for Tuscan plants of this species.

1068. ***Otanthus maritimus*** Hoffmgg. et Link — $2n = 18$ (3 populations - Fig. 1C).

It: Marina di Vecchiano (Pisa, Tuscany), on sandy shore, about 40 m from the shoreline, 43°48'N, 10°16'E, 30 Jul 1998, *Amore* (1998-0495 H.B.P.).
— Viareggio (Lucca, Tuscany), on sandy shore, about 40 m from the shoreline, 43°50'N, 10°15'E, 27-29 Jul 1998, *Amore* (PI; 1998-0493, 1998-0494 H.B.P.).

The somatic number $2n = 18$ has been found in all populations investigated. It agrees with previous counts performed on plants from Sicily (Colombo 1978), from Latium (Del Caldo 1971) and on plants grown in Botanic Garden of Pisa (Martinoli 1937, 1939).

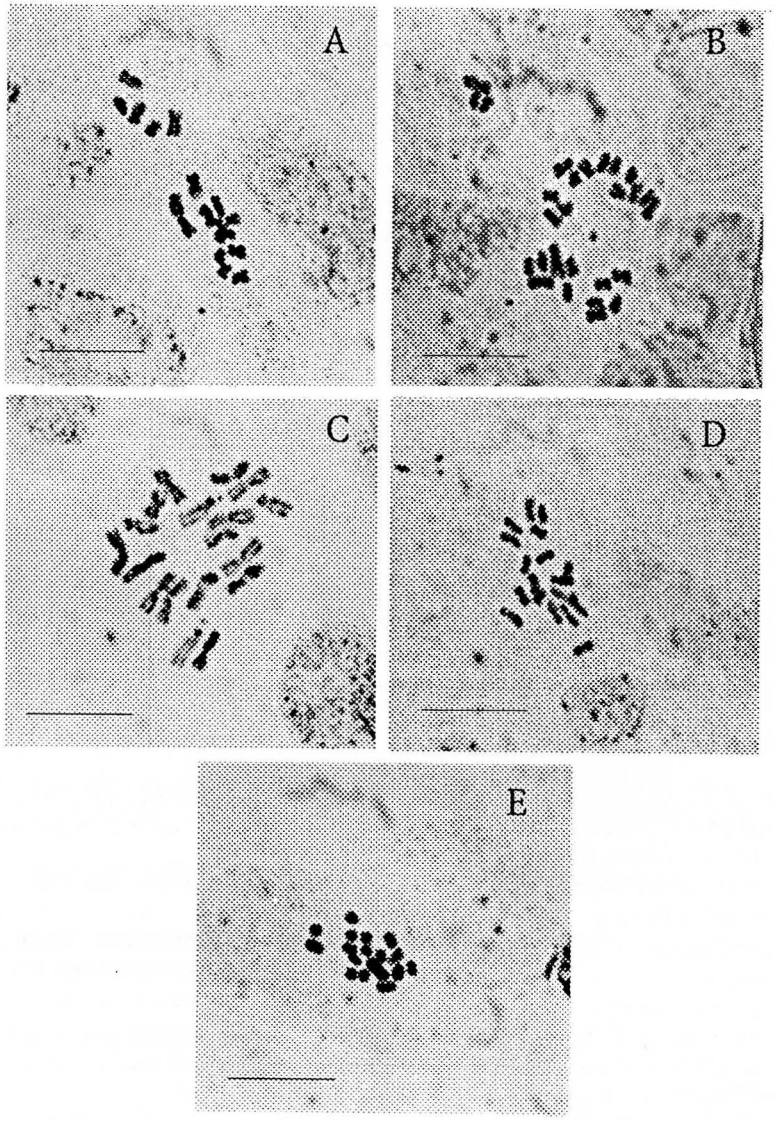


Fig. 1. Microphotographs of mitotic metaphase plates : **A,** *Centaurea aplolepa* subsp. *subciliata*, $2n = 18$; **B,** *Helichrysum stoechas*, $2n = 28$; **C,** *Otanthus maritimus*, $2n = 18$; **D,** *Solidago litoralis*, $2n = 18$; **E,** *Pycnocomon rutifolium*, $2n = 18$. — Scale bars = 10 µm.

1069. *Pycnocomon rutifolium* Hoffmgg. et Link — $2n = 18$ (3 populations - Fig. 1E).

It: Marina di Vecchiano (Pisa, Tuscany), on sandy shore, about 200 m from the shoreline, 43°48'N, 10°16'E, 18 Aug 1998, *Amore* (PI; 1998-0813 H.B.P.).

— Viareggio (Lucca, Tuscany), on sandy shore, about 200 m from the shoreline, 43°50'N, 10°15'E, 13 Aug 1998, *Amore* (PI; 1998-0807, 1998-0810 H.B.P.).

The somatic number $2n = 18$ has been found in all populations investigated. It agrees with previous counts performed on plants from Corse (Contandriopoulos 1957). To our knowledge, these are the first counts for Italian plants of this species.

1070. ***Solidago litoralis*** Savi — $2n = 18$ (5 populations - Fig. 1D).

It: Marina di Vecchiano (Pisa, Tuscany), on sandy shore, about 200 m from the shoreline, 43°48'N, 10°16'E, 9 Nov 1998, *Amore* (PI; 1999-0001, 1999-0002 H.B.P.).

— Viareggio (Lucca, Tuscany), on sandy shore, about 200 m from the shoreline, 43°50'N, 10°15'E, 8 Nov 1998, *Amore* (PI; 1999-0003, 1999-0004, 1999-0005 H.B.P.).

The somatic number $2n = 18$ has been found in all populations investigated. It agrees with previous counts performed on plants from Viareggio (Garbari & Tornadore 1972, Garbari 1979). This plant is considered as an endemic unit of the N.W. Tyrrhenian shores from the Magra to the Arno Rivers (Garbari 1979).

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Reports (1071-1072) by T. Cusma Velari, L. Feoli Chiapella, G. Bacchetta & V. Kosovel

1071. ***Cytisus villosus*** Pourret — $2n = 48$ (Fig. 1a).

Sa: Burgos (Nuoro), 2 km far from the town, granite, 40°24'N, 09°00'E, 700 m, 2 Jul 1998, *G. Bacchetta* (CAG), s.n.

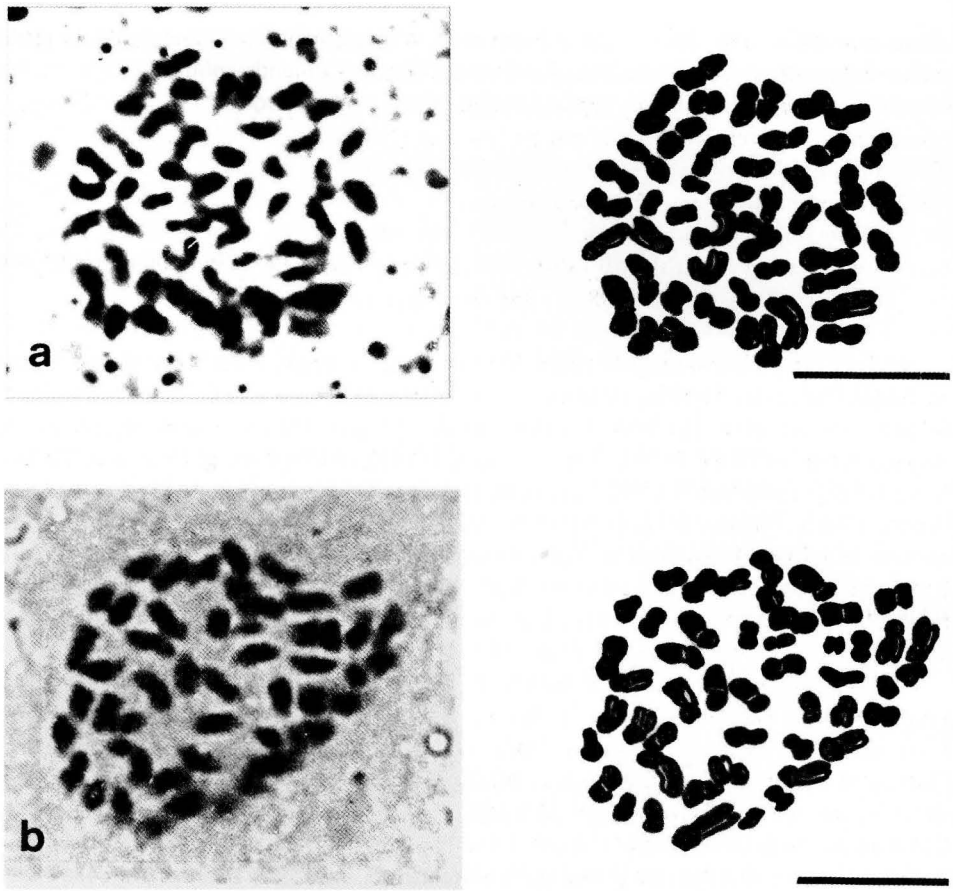


Fig. 1. A photomicrograph and a drawing of somatic metaphase plate of: **a,** *Cytisus villosus*, $2n = 48$ and **b,** *Lupinus luteus*, $2n = 48$. — Scale bars = 5 µm.

Cytisus villosus is most frequent in the central Western part of the Mediterranean region, less frequent in the Eastern part, in the "maquis" and *Quercus ilex* woods, being somewhat calcifuge (Frodin & Heywood 1968, Pignatti 1982, Greuter & al. 1989).

The chromosome number $2n = 48$ confirms the reference reported by Sañudo (1973): $2n = 48$ in a population from Los Barrios (Cádiz, Spain), and by Troìa & al. (1997): around $2n = 48$ in plants from S. Martino (Palermo, Sicily) and from Salina (Isole Eolie, Messina, Sicily).On the other hand, Forissier (1975) counted $n = 25$ in a population from Bosco di Ficuzza (Palermo, Sicily). Chromosome size ranges between 0.6 and 1.8 µm.

Cytisus villosus belongs to sect. *Trianthocytisus* Griseb., together with *C. aeolicus* Lindley, endemic to the Isole Eolie (Sicily), and *C. emeriflorus* Reichenb. [= *Lembotropis emeriflora* (Reichenb.) Skalická], Insubrian endemite (from the lake of Lugano to the Pre-Alps of Brescia, Val Camonica) with a disjunction in the Carnic Pre-Alps (Frodin & Heywood 1968, Poldini 1977, Pignatti 1982, Crescini & al. 1983).

Concerning *C. aeolicus*, Bartolo & al. (1977) reported $2n = 52$ in specimens from Vulcano; Conte & al. (1998) found $2n = 52$ in plants from Vulcano, $2n = 50, 51, 52$ in

those from Stromboli, $2n$ = c. 52 in those from Alicudi, whereas Frahm-Leliveld (1957) counted $2n = 48$ in specimens from the Botanical Garden of Antibes.

For *C. emeriflorus*, the only reported number is $n = 25$ in populations from "La Grigna meridionale" (Lombardia, Italy) both by Favarger (1969) and Forissier (1973).

1072. *Lupinus luteus* L. — $2n = 48$ (Fig. 1b).

Sa: Fluminimaggiore, Su Giogadroxiu (Cagliari), siliceous "palaeodunes", 39°26'N, 08°28'E, 80 m, 11 Jun 1998, *G. Bacchetta et S. Brullo* (CAG), s.n.

Lupinus luteus is a mostly Western Mediterranean species; it certainly is spontaneous in Spain, Portugal, Tunisia, Algeria and Morocco (Maire 1987, Greuter & al. 1989); recently its presence has been recorded in the Eastern Mediterranean region in East Aegean Islands (Ikaría) by Kit Tan & Sorger (1986). While Amaral Franco & Pinto da Silva (1968) and Pignatti (1982) also consider it native of Corsica, Sardinia, Sicily and Southern Italy, Greuter & al. (1989) have doubts about its being native of these regions, as well as of Israel and Jordan. The species is widely cultivated elsewhere for fodder, becoming in some cases adventitious, both in Eastern and Central Europe and in some areas of the Mediterranean: France, Lebanon, Syria and perhaps Greece (Amaral Franco & Pinto da Silva 1968, Greuter & Raus 1986, Greuter & al. 1989).

Our counts have shown the chromosome number to be $2n = 48$; chromosome size ranges between 0.6 and 2.4 µm. To our knowledge, the only two sets of data deriving from certainly native populations, both showing $2n = 52$, are those presented by Fernandes & al. (1977, two Portuguese populations from Alpedrinha and Algarve, Ribeira de Odeleite) and by Fernandes & Queirós (1978), again from Portuguese populations (Escamarão, on the left bank of Douro; Belmonte; Coimbra, Estação Velha; Azeitão).

Other data for this species ($n = 24$, $2n = 46$, $2n = 48$, $2n = 50$, $2n = 52$, $2n = 104$) are referred by Löve & Löve 1961, Gilot 1965, Fedorov 1969, Goldblatt 1981, Goldblatt & Johnson 1991, 1994.

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Reports (1073-1074) by T. Cusma Velari, L. Feoli Chiapella & C. Cristin

1073. ***Genista tournefortii*** Spach var. ***jahandiezii*** (Batt.) Maire — $2n = 32 + 2B$ (Fig. 1a).

Ma: Middle Atlas, Azrou, clearing in a Mediterranean oak wood, 33°25'N, 05°10'W, c. 1400 m, 2 Jul 1987, *L. Feoli Chiapella et E. Feoli* (TSB), s.n.

Genista tournefortii var. *jahandiezii*, which is endemic to Morocco, grows on the Middle Atlas and the Rif Mountains (Jahandiez & Maire 1932, Maire 1987).

The chromosome number has been found to be $2n = 32 + 2B$; chromosome size ranges between 0.5 and 2.9 µm.

No previous karyological data are known for this taxon. There are, instead, chromosome counts for different European populations of *Genista tournefortii* (= *G. decipiens* Spach), a Western Mediterranean species (Central Southern Spain, Portugal and Morocco) belonging to sect. *Voglera* (Gaertn., Mey. & Schreb.) Spach (Willkomm 1880, Gibbs 1966, Greuter & al. 1989). In particular, $n = 15$ and $2n = 30$ were reported for Spanish populations of *Genista tournefortii* s.l. by Sañudo (1972, S.ta Elena, Jaén) and Gallego Martín & al. (1984, 1985 from San Martín del Castañar, Salamanca) respectively; $2n = 32$ was instead counted for a Portuguese population (Caneças) by Fernandes & al. (1977). For *G. tournefortii* Spach subsp. *tournefortii*, $n = 32$ was reported by Cubas & al. (1998) for a Spanish population (Navalperal de Tormes-La Angostura, Avila), while $2n = 32$ was reported for two Portuguese populations (Figueira da Foz, Serra da Boa Viagem) by Fernandes & Santos (1971).

The number $2n = 32$ is unusual for the genus *Genista*; it has been sporadically found in *G. hirsuta* Vahl by Fernandes & Queirós (1978) in a population from Colares, Tapada do Cospeto (Portugal). This number has instead frequently been reported for *G. triacanthos* Brot.; in particular, Sañudo (1972) counted $n = 16$, $2n = 32$ in the Spanish populations from Los Barrios, Cádiz (sub *G. scorpioides* Spach) and S. Roque, Cádiz. Forissier (1973a) reported $n = 16$ for specimens coming from the Botanical Garden of Coimbra; Fernandes & Santos (1975) reported $2n = 32$ for a Portuguese population from Azeitão; finally Horjales (1974) found both $2n = 32$ and 36 in a population from S. Sebastiào, Coimbra.

1074. ***Cytisus purpureus*** Scop. — $2n = 48 + 2B$ (Fig. 1b).

It: Cividale (Udine, Friuli-Venezia Giulia), arid grasslands, conglomerate rocks on the banks of the river Natisone, 46°06'N, 13°26'E, 135 m, Jul 1990, *L. Feoli Chiapella* (TSB), s.n.

Cytisus purpureus [= *Chamaecytisus purpureus* (Scop.) Link] is the only species belonging to sect. *Tubocytisus* DC., series *Purpureae* (A. Klásková) Cristof., distinguishable for the purple corolla and by the glabrescent stem and calyx. The species is spread through the Northern Adriatic and Illyric region: Northeastern Italy (with the Western limit at the Como lake), Slovenia, Croatia, Hungary, Southern Austria (Cristofolini 1976, 1991); Heywood & Frodin (1968) report it also for Albania.

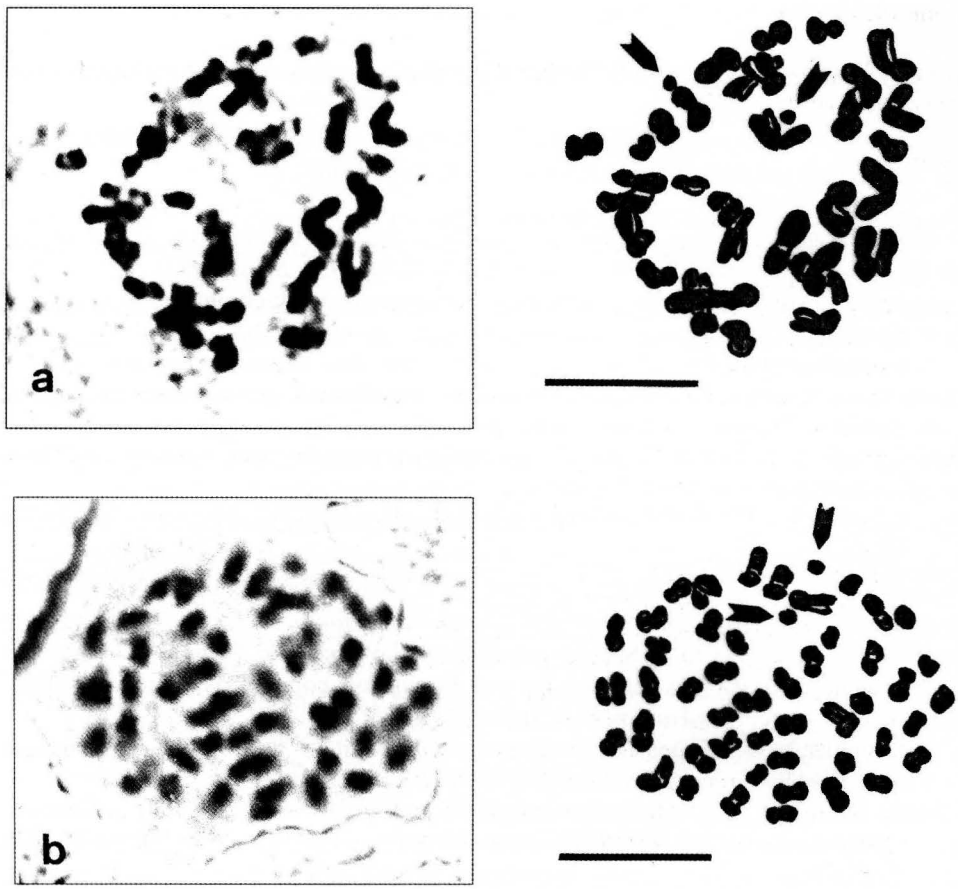


Fig. 1. A photomicrograph and a drawing of somatic metaphase plate of: **a,** *Genista tournefortii* var. *jahandiezii*, $2n = 32 + 2B$ and **b,** *Cytisus purpureus*, $2n = 48 + 2B$. Arrows indicate B-chromosomes. — Scale bars = 5 µm.

The species grows on calcareous substrates, in woodlands dominated by *Pinus nigra,* in rocky habitats or consolidated alluvions ("grave"); it is considered characteristic of the alliance *Fraxino orni-Ostryion carpinifoliae*, order *Erico-Pinetalia*; it can be found in some types of natural grasslands as well, where it is considered differential of the Southeastern alpine suballiance *Centaurenion dichroanthae* (order *Scorzoneretalia villosae*) (Feoli Chiapella & Fontana 1990, Feoli Chiapella & Poldini 1993, Wallnöfer 1993).

Our chromosome count was $2n = 48 + 2B$. Chromosome size ranges between 0.5 and 1.5 µm. Forissier (1973b) reported $n = 25$ in plants from Mount Baldo (Veneto, Italy), whereas Strasburger (1905, 1907), Gilot (1965), Hruby (1932, in Löve & Löve 1974) counted $2n = 48$. The chromosome number $2n = 48$ is by far the most common in the various sections of *Cytisus* s.l. (Cusma Velari & Feoli Chiapella 1994).

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Reports (1075-1082) by R. Parra, B. Valdés, I. Gordillo & R. Venanzi

1075. ***Adenocarpus anagyrifolius*** Cosson & Balansa. — $2n = 52$.

Ma: High Atlas, between Taroudannt and the coll of Tizi-n-Test, 30°49'N, 8°23'W, 19 Jun 1998, *Rossini & Valdés 60* (SEV 157736).

This seems to be the first chromosome number account for this Moroccan endemic.

1076. ***Cynoglossum creticum*** Miller — $2n = 24$.

Ma: High Atlas, between Tizi-n-Test and Azni, 31°11'N, 8°10'W, 19 Jun 1998, *Rossini & Valdés* (no voucher was collected).

Many authors had been indicated $n = 12$ or $2n = 24$ for plants of this species from different origins.

1077. ***Ebenus pinnata*** Aiton — $2n = 18$.

Ma: High Atlas, between Tizi-n-Test and Azni, 31°11'N, 8°10'W, 19 Jun 1998, *Rossini & Valdés 17* (SEV 157737).

Apparently, this is the first chromosome number account for this species endemic of N. Africa (Morocco, Algeria, Tunisia and Lybia; Greuter & al. 1989: 90).

1078. ***Lathyrus tingitanus*** L. — $2n = 14$.

Ma: Central Rif, between Taounate and Ketama, 34°47'N, 4°39'W, 21 Jun 1998, *Rossini & Valdés 50* (SEV 157739).

The diploid chromosome number $2n = 14$ confirms previous reports by several authors from elsewhere.

1079. *Ononis natrix* L. — $2n = 32$.

Ma: 15 Km N from Agadir, 30°27'N, 9°22'W, 18 Jun 1998, *Rossini & Valdés* (no voucher was collected).

This chromosome number agrees with the haploid $n = 16$ and the diploid $2n = 32$ found by several authors for plants of this species from different procedences. It differs, however, from the somatic $2n = 28, 30$ indicated by Elena-Roselló & al. (1985: 111) for plants from Cañizal (province of Zamora) and by Björkquist & al. (1969: 273), for plants from Marbella (province of Málaga).

1080. *Rumex intermedius* DC. — $2n = 14$.

Ma: Bad-Berred, 34°59'N, 4°54'W, 22 Jun 1998, *Rossini & Valdés 57* (SEV 157735).

This is a dioecious species from S.W. Europe and N.W. Africa for which the chromosome numbers $2n = 14$ for female plants and $2n = 15$ for male plants were given by several authors, such as Queiros (1982: 598, sub *Acetosa intermedia* (DC.) Foun.) for Portuguese plants, and also by Löve [(1986: 612, sub *Acetosa thyrsiflora* (Fingerh.) A. Löve subsp. *intermedia* (DC.) A. Löve], Fernández Casas (1977: 337) and García & al. (1989: 132) for Spanish plants. This account on Moroccan female plants confirm the already known number.

1081. *Silene colorata* Poiret — $2n = 24$.

Ma: Midde Atlas, Ifrane, 33°30'N, 5°9'W, 19 Jun 1998, *Rossini & Valdés 40* (SEV 157738).

The diploid number $2n = 24$ on Moroccan plants confirms previous reports by several authors for plants of different origins.

1082. *Trifolium gemellum* Pournet ex Willd. — $2n = 14$.

Ma: Central Rif, between Taounate and Ketama, 34°47'N, 4°39'W, 21 Jun 1998, *Rossini & Valdés 48* (SEV 157740).

The cromosome number $2n = 14$ confirms previous reports for material from Madrid (Navarredonda) by Angulo & al. (1969: 103, 1972: 305).

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Reports (1083-1088) by B. Valdés, R. Parra, F. J. Pina, R. Álvarez, M. I. López & A. E. Rubio

1083. ***Cistus monspeliensis*** L. — $2n = 18$.

Ma: Tanger, el Mausla, 35°31'N, 5°44'W, 29 Jun 1996, *Díez, Rossini, Terrab & Valdés 7464* (SE 157711).

The diploid number $2n = 18$ agrees with observations by several authors on material from different origins.

1084. ***Lavandula dentata*** L. — $2n = 44$.

Ma: Chefchaouen, track to Talembote, 35°18'N, 5°11'W, 25 Jun 1996, *Díez, Rossini, Terrab & Valdés 7387* (SEV 157716).

The chromosome number found agrees with the tetraploid $2n = 4x = 44$ given by Nilsson & Lassen (1971: 274) for plants from Mallorca (Balearic Islands). It does not agree, however, with the number given by Suárez-Cervera (1986: 393) for Spanish material from Alicante (Peñón de Ifach).

1085. ***Marrubium supinum*** L. — $2n = 34$.

Ma: Lamtiwa, 18 km from Ketama on the road to Al-Hoceima, 34°58'N, 4°32'W, 24 Sep 1997, *Díez, García, Terrab & Valdés 205* (SEV 157744).

The same chromosome number was given by Löve & Kjellqvist (1974: 179) on Spanish plants from Jaén (Sierra de Cazorla) and Serranía de Cuenca, while Luque & Díaz Lifante (1991: 356) counted $2n = 30$ for plants from Granada (Huescar). This account on Moroccan plants confirms the diploid number $2n = 34$.

1086. ***Marrubium vulgare*** L. — $2n = 34$.

Ma: El Jebha, on the road to Ketama, 35°10'N, 4°40'W, 23 Sep 1997, *Díez, García, Terrab & Valdés 203* (SEV 157745).

The chromosome number found, $2n = 34$, agrees with most accounts for this species by several authors.

1087. ***Silene inaperta*** L. — $2n = 24$.

Ma: 11 km from Tleta Ketama towards Taounate, 34°47'N, 4°39'W, 26 Sep 1997, *Díez, García, Terrab & Valdés 212* (SEV 157743).

The somatic number $2n = 24$ agrees with the count found by Luque & Díaz Lifante (1991: 349), Fernandes & Leitâo (1971: 159) and Fernández Casas (1976: 92) for plants from the Iberian Peninsula, and with the haploid $n = 12$ recorded by Talavera & Bocquet (1976: 105) for Spanish plants. This is the second account for Moroccan plants, as Valdés & al. (1997) reported $2n = 24$ for plants of *S. inaperta* subsp. *inaperta* collected between Chefchaouen and Tetuan.

1088. ***Thymus zygis*** Loefl. ex L. — $2n = 28$.

Ma: Chefchaouen, track to Talembote, 35°18'N, 5°11'W, 25 Jun 1996, *Díez, Rossini, Terrab & Valdés 206* (SEV 157719).

The somatic number found, $2n = 28$ agrees with the previously indicated by Elena-Roselló (1980: 115) for *T. zygis* and for Spanish material of *T. zygis* subsp. *gracilis* (Boiss.) R. Morales by Morales (1986a: 103) from Minateda (province of Albacete), Serón (province of Almería) and Albadalejo (province of Jaén). *T. zygis* subsp. *gracilis* was not indicated by Greuter & al. (1986: 394) for Morocco, but its occurence in this country was given by Morales (1986a: 244; 1993: 218).

However, the plants from Chefchaouen studied do not agree clearly with *T. zygis* subsp. *gracilis*, and could belong to *T. afer* (Pau & Font Quer) Huguet del Villar, (Huguet del Villar 1934), which was considered by Morales (1993: 218) as a synonyme of *T. willdenowii* Boiss., a species which, however, has $2n = 30$ chromosomes (Morales 1986b: 36).

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Reports (1089-1098) by R. Marcucci & N. Tornadore

1089. ***Allium ericetorum*** Thore — $2n = 16 + 1B$ (Figs. 1l, 2b).

It: Mt Cavallo, Tambre (Belluno), dry meadow, 46°09'N, 12°22'E, 4 Oct 1981, *Dal Coll.* (cult. Hort. Bot. Padova).

Distributed from S. W. France to the Carpathians (Stearn 1980), this species is often considered as synonym of *A. ochroleucum* Waldst. & Kit. (Pignatti 1982). The chromosome numbers $2n = 8m + 2sm\text{-}SAT + 6m = 16$ and $2n = 4m + 2sm + 6m + 2m + 2sm\text{-}SAT + 1B = 16 + 1B$ have been previously determined (Miceli & Garbari 1980) from C. Italy. The karyotype of our population consists of $2n = 8m + 2sm + 2m + 2sm\text{-}SAT + 2m + 1B = 16 + 1B$; the position of SAT-chromosomes differs from that given by Miceli & Garbari (l.c.).

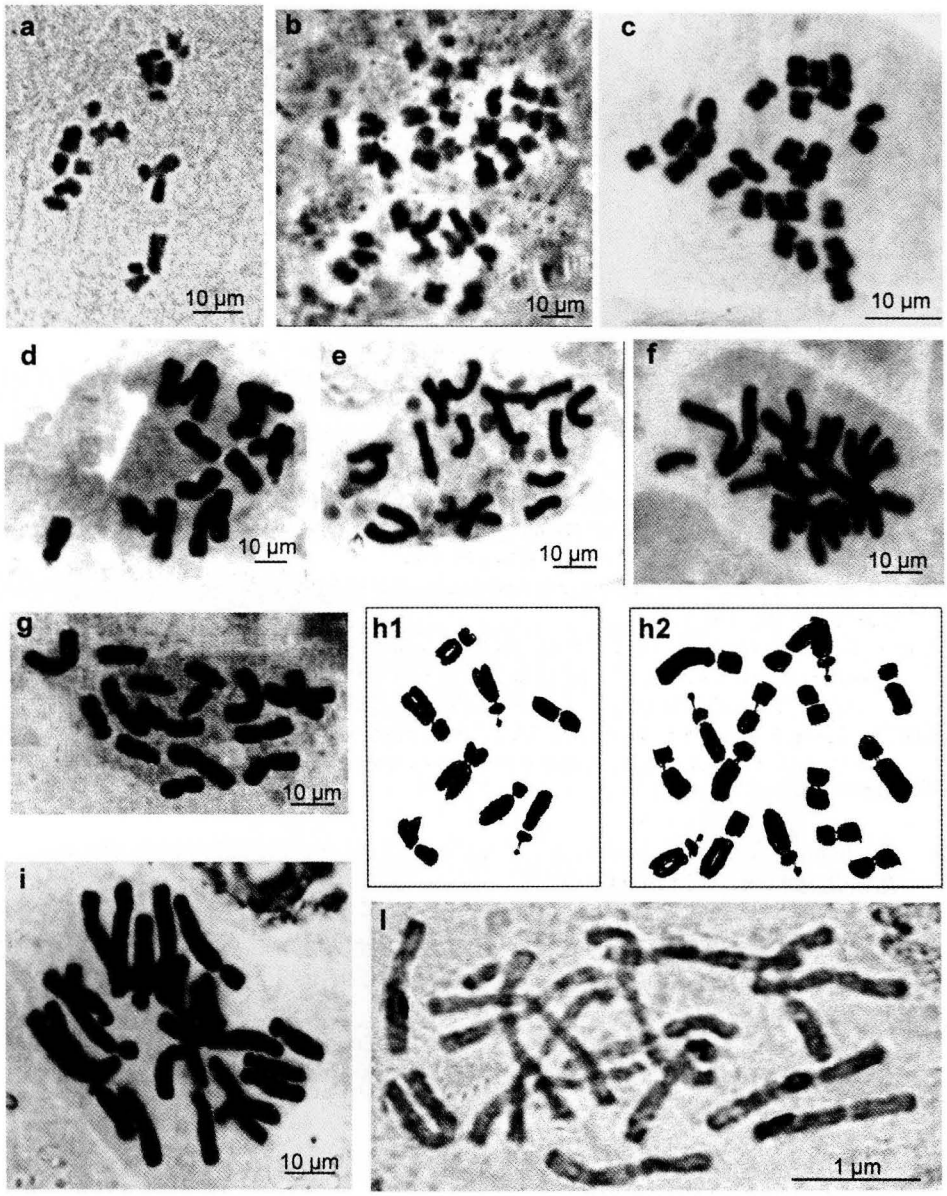


Fig. 1. Mitotic metaphase plates and drawings of: **a,** *Tulipa australis*, $2n = 24$; **b,** *Rumex induratus*, $2n = 40$; **c,** *Gentiana pneumonanthe*, $2n = 26$; **d,** *Allium suaveolens*, $2n = 16$; **e,** *Hieracium porrifolium*, $2n = 18$; **f,** *Allium moschatum*, $2n = 16$; **g,** *Pulsatilla montana*, $2n = 16$; **h_1,** *Scilla obtusifolia*, $2n = 8$; **h_2,** *Scilla obtusifolia*, $2n = 16$; **i,** *Leucojum aestivum*, $2n = 22$; **l,** *Allium ericetorum*, $2n = 16 + 1B$.

1090. *Allium moschatum* L. — $2n = 16$ (Figs. 1f, 2e).

It: Mt Calvi near Castagneto Carducci (Livorno), dry meadow, 43°07'N, 10°42'E, 5 Sep 1997, *Marchiori* (PAD).

This species is distributed in Southern Europe and extends northwards to Hungary (Stearn 1980). Its karyology is described previously by several authors (Strid & Franzen 1981, Tornadore 1982, Özhatay 1983, Tzanoudakis 1983, Tzanoudakis & Vosa 1988, Özhatay 1990, Pògosian 1991, etc.), who reported the same chromosome number with or without B-chromosomes.

In our specimens we have recorded the following karyotype formula: $2n = 2x$ = 10m + 2m-SAT + 2m + 2st-SAT =16. This datum partially confirms that from Tuscany (Tornadore l.c.) with $2n = 2x$ = 6m + 2m-SAT + 2m + 2m-SAT + 2m + 2st-SAT = 16.

1091. ***Allium suaveolens*** Jacq. — $2n = 16$ (Figs. 1d, 2c).

It: Val Grande di Bibione (Venice), damp meadows, 45°37'N, 13°04'E, 20 Sep 1997, *Marcucci* (PAD).

The species is distributed in the S.-W. parts of C. Europe, N. Italy and Albania. The same chromosome number $2n = 16$ is also reported by Rusconi-Camerini (1959) and Löve & Löve (1961).

A similar symmetrical karyotype is also reported by Miceli (1985) for plants from Monfalcone (Trieste) but the authors found a cytotype with one B-chromosome and an other with the satellitate pair in the last position. In our plants the karyotype is symmetrical with $2n = 2x$ = 8m + 2sm-SAT +6m = 16; the SAT-chromosomes are in 5th position.

1092. ***Gentiana pneumonanthe*** L. — $2n = 26$ (Fig. 1c).

It: Trichiana (Belluno), flat-moss, 46°08'N, 12°13'E, 15 Jul 1994, *Brentan & Rebellato* (cult. Hort. Bot. Padova).

The diploid chromosome number $2n = 26$ confirms previous results (Loon & Jong 1978, Polya 1950 in Moore 1982, Amadei & al. 1982, Fernandez & al. 1985, Dmitrieva 1986, Pogan & al. 1987).

Two symmetrical karyotypes are found: $2n = 2x$ = 2m + 2sm-SAT + 22m = 26 and $2n = 2x$ = 10m + 2sm-SAT + 14m = 26. The SAT-pairs are of sm-type in second and in sixteenth position respectively.

1093. ***Hieracium porrifolium*** L. — $2n = 18$ (Figs. 1e, 2a).

It: Cison di Valmarino (Treviso), calcareous rocks, 45°57'N, 12°16'E, 20 Jun 1997, *Brentan & Rebellato* (cult. Hort. Bot. Padova).

This species is endemic of the Eastern Alps (Pignatti 1982).

The chromosome number of this *taxon* was hitherto unknown but it agrees with the number given for the genus by Darlington & Wylie (1955). The karyotype is symmetrical with m and sm chromosome types. A pair of SAT-chromosomes with small satellites was observed in 7th position.

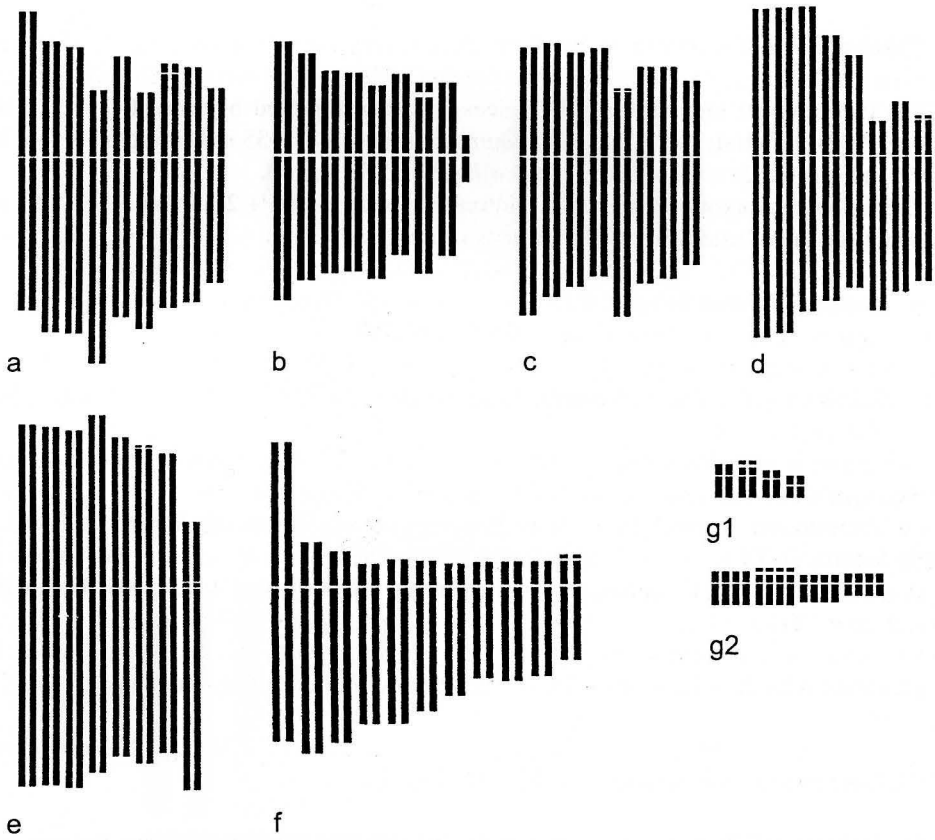


Fig. 2. Idiograms of: **a,** *Hieracium porrifolium,* $2n = 18$; **b,** *Allium ericetorum,* $2n = 16 + 1B$; **c,** *Allium suaveolens,* $2n = 16$; **d,** *Pulsatilla montana,* $2n = 16$; **e,** *Allium moschatum,* $2n = 16$; **f,** *Leucojum aestivum,* $2n = 22$; $\mathbf{g_1}$ and $\mathbf{g_2}$, *Scilla obtusifolia,* $2n = 8$ and $2n = 16$, respectively.

1094. *Leucojum aestivum* L. — $2n = 22$ (Figs. 1i, 2f).

It: Polesine Mossano (Vicenza), near a small stream, 45°24'N, 11°36'E, 22 Apr 1995, *Brentan & Rebellato* (cult. Hort. Bot. Padova).

L. aestivum is widespread in Europe where it lives in marshes and wet meadows (Webb 1980). The somatic number $2n = 22$ agrees with previous counts (see Bareka & al. 1998 for references, as well as by Uhrikova 1976, Svesnikova & Krichfalnshij 1985, Magulaev 1986, Sveshnikova & Zemskova 1988) on plants from Italy and E. S. Europe. The karyotype studied consists of $2n = 2m + 18st + 2st\text{-}SAT = 22$ chromosomes, instead that given by Bareka & al. (l.c.) from Greece, which is $2n = 2m + 10st + 6st\text{-}SAT + 4t = 22$ with 2 SAT-chromosome pairs.

1095. *Pulsatilla montana* (Hoppe) Rchb. — $2n = 16$ (Figs. 1g, 2d).

It: Col San Martino (Treviso), meadow, 45°54'N, 12°16'E, 20 Jun 1997, *Brentan &*

Rebellato (PAD).

The chromosome number $2n = 16$ agrees with that reported by Rosenthal (1936 in Moore 1982) from Italy but differs from Guinochet, $2n = 24$ (1935 in Darlington & Wylie 1955) and Moffet, $2n = 32, 48$ (1932 in Darlington & Wylie l.c.).

The following karyotype formula is observed: $2n = 2x = 10m + 2st + 2sm + 2st\text{-}SAT = 16$; there is a micro-satellited pair in the last position.

1096. *Rumex induratus* Boiss. & Reuter — $2n = 4x = 40$ (Fig. 1b).

Hs: Near Cartagena, Capo Palos, dry meadow, 37°38'N, 1°18'E, 5 Mar 1978, *Tornadore* (cult. Hort. Bot. Padova).

This *taxon* is probably a distinct species (Rechinger 1964); it grows in dry habitats of Portugal and C. S. Spain.

The chromosome number $2n = 40$ confirms the previous count, sub *Rumex scutatus* L. subsp. *induratus*, by Luque & Diaz Lifante (1991). The species *R. scutatus* has always a diploid cytotype $2n = 20$ (Lessani & Chariat-Panahi 1979, Pavone & al. 1981, Huber & Baltisberger 1989).

1097. *Scilla obtusifolia* Poiret — $2n = 2x = 8$; $2n = 4x = 16$ (Figs. $1h_1$, $1h_2$, $2g_1$, $2g_2$).

Hs: Tarragona, Marina di Cambrils, scrub, 41°02'N, 1°05'E, 2 Mar 1978, *Tornadore* (PAD).

This species is distributed in dry grassland and scrub of North-East Spain and islands of West Mediterranean region.

Previous counts are confirmed by the chromosome diploid number $2n = 8$ (Ruiz Rejon 1978, Pastor 1985), but the tetraploid cytotype $2n = 4x = 16$ is the first count on Spanish material.

1098. *Tulipa australis* Link — $2n = 24$ (Fig. 1a).

Ga: Provence, St. Maximin, on the summit of S. Bäume, 43°17'N, 5°50'E, 30 Apr 1986, *Tornadore* (PAD).

This species is widespread in mountain meadows and stony places of S. and S. E. Europe. It was picked up in a meadow together with other bulbous herbs as *Lilium martagon* L., *Aphyllanthes monspeliensis* L., *Ornithogalum pyrenaicum* L., *O. monticolum* J. et F., *Allium sphaerocephalon* L.

The observed chromosome number is in agreement with counts from other areas (Natarajan 1979a, 1979b, Blakey & Vosa 1981, Pajarón Sotomayor 1982). A tetraploid cytotype, $2n = 4x = 48$, for this species is also reported by Papanicolaou & Kokkini (1983) and a triploid one, $2n = 3x = 36$, for plants from Greece (Athanasiou 1988). The haploid number $n = 12$ is reported by Ruiz Rejon (1978)

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Reports (1099-1105) by Antonio Borzatti von Löwenstern & Fabio Garbari

1099. *Allium macrochaetum* Boiss. & Hausskn. — $2n = 16$ (Figs. 1, 1a).

IJ: Jebel el Guzlan (Hisma Basin), 29°38'N, 35°40'E, 23 Apr 1998, *G. Barsotti* (*cult.* Hort. Bot. Pisa 438/1998-1, 438/1998, *exsicc.* PI, *s.n.*).

Allium macrochaetum is distributed in N.W. Iran, N. Iraq, Syria, S.E. Turkey (Mathew 1996). It is an Irano-Turanic element, new for Jordan (Al-Eisawi & al., *submitted*), which has its southern distribution limit at the Hisma Basin. The chromosome number $2n = 16$ is already known from Turkey (Özathay & Siraneci 1990/92), but it was not possible to obtain data about the karyotype formula of the specimens investigated in earlier studies. The specimens collected in Jordan and grown in H.B.P. have the following karyotype formula: $2n = 2x = 2M + 8m + 4sm\text{-}SAT + 2st\text{-}SAT = 16$. The karyotype is symmetrical with 5 metacentric chromosome pairs; 3 pairs show satellites of *scorodoprasum* type (Ved Brat 1965). Chromosome size ranges between 12.6 and 9 µm.

1100. *Allium dictyoprasum* C. A. Mey. — $2n = 16$ (Figs. 2, 2a).

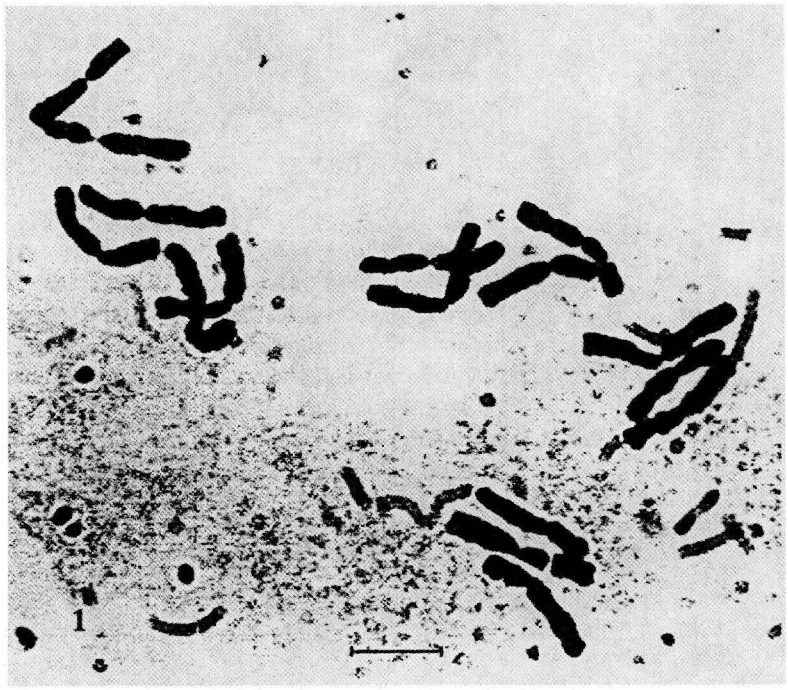
IJ: Manatt el Beden (Hisma Basin), 29°28'N, 35°24'E, 15 Nov 1997, *E. Borzatti von Löwenstern* (*cult.* Hort. Bot. Pisa 251/1997, *exsicc.* PI, *s.n.*).

Allium dictyoprasum is distributed in Transcaucasia, N. & W. Iran, E. & S.E. Turkey, N. Iraq, W. Syria, Israel, Jordan (Mathew 1996). Although Mathew (l.c.) regards *Allium dictyoprasum* and *A. viride* Grossh. as synonyms, the karyotypes of these entities differ (Garbari & Crisman 1998) as regards symmetry, number and position of satellited pairs. Specimens collected in Jordan show the following karyotype formula: $2n = 2x = 6m + 2sm + 4m + 2m\text{-}SAT + 2sm\text{-}SAT = 16$; no idiograms were found in literature to allow a comparison. The first three chromosome pairs are metacentric; they are followed by a heterobrachial pair, two smaller metacentric pairs, and two satellited pairs of *sativum* type (Ved Brat 1965). Chromosome size ranges between 11.5 and 7.4 µm.

1101. *Bellevalia mosheowii* Feinbr. — $2n = 8$ (Figs. 3, 3a).

IJ: Jebel Gill (Hisma Basin), 29°53'N, 35°24'E, 1 Apr 1997, *A. Borzatti von Löwenstern, G. Barsotti* (*cult.* Hort. Bot. Pisa 159/1997, *exsicc.* PI, *s.n.*).

Bellevalia mosheowii is distributed in Palestine, Syrian desert and Iraq (Zohary & Feinbrun 1986). The Jordan site of Jebel Gill, at the foot of Ras en Naqb highland, is the southern distribution border of this Irano-Turanic taxon (Feinbrun 1938, 1939, 1940). The chromosome number $2n = 8$ agrees with Garbari and Crisman (1988); the karyotype consists of $2n = 2x = 2m + 2st + 2sm + 2sm\text{-}SAT = 8$. The first pair is constituted by large metacentric chromosomes (14.4 µm), the second one by markedly heterobrachial chromosomes, the third one by smaller submetacentric chromosomes, while the fourth one (7.3 µm) shows terminal satellites on the long arm.



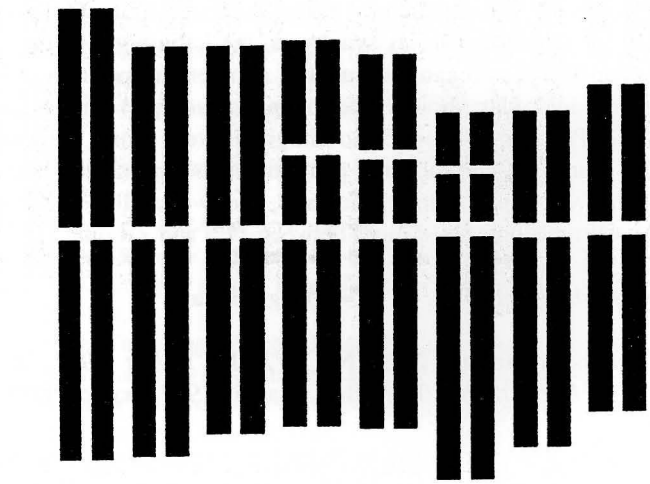
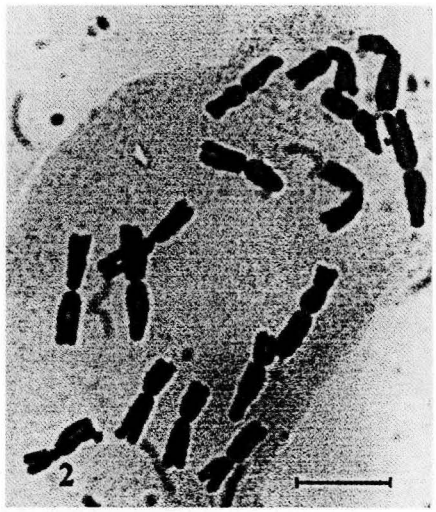
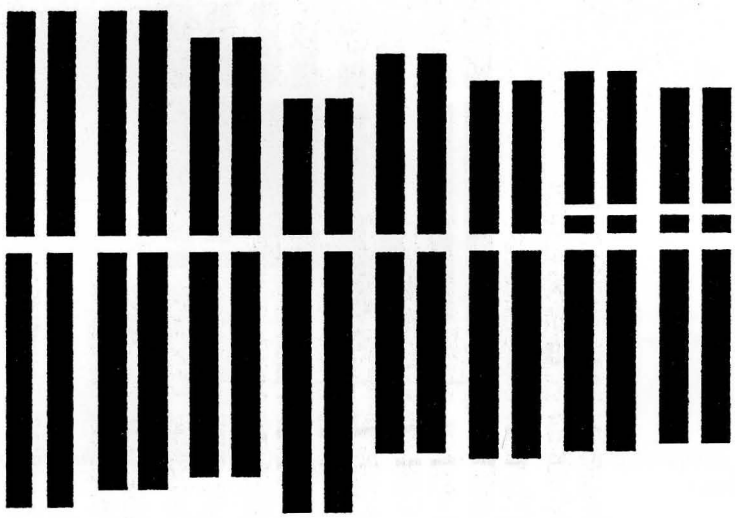


Fig. 1. **1,** metaphase plate and **1a,** correspondent idiogram of *Allium macrochaetum,* $2n = 16$. — Scale bar = 10 µm.





2a

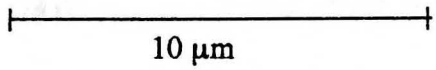
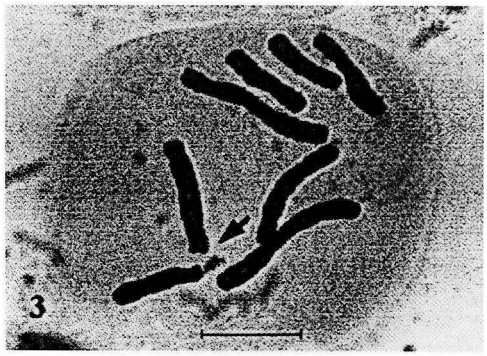


Fig. 2. **2,** metaphase plate and **2a,** correspondent idiogram of *Allium dictyoprasum*, $2n = 16$. — Scale bar = 10 µm.

In all metaphasic plates observed, the satellited pair is pronouncedly asymmetrical, one of the homologues being provided with a long nucleolar organizer, not visible in the other one. This suggests a heterozygotic condition.



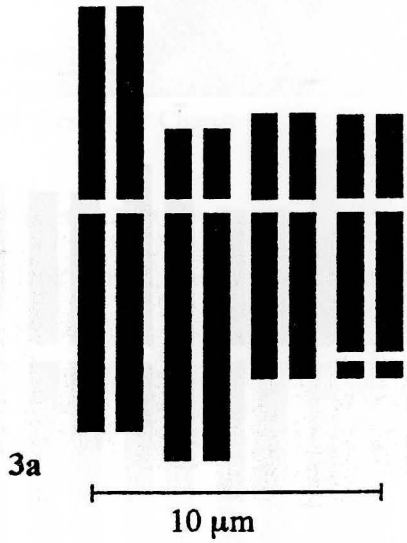
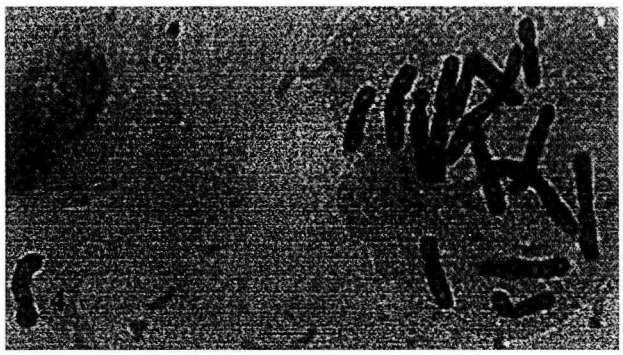


Fig. 3. **3,** metaphase plate and **3a,** correspondent idiogram of *Bellevalia mosheowii*, $2n = 8$. — Scale bar = 10 µm.

1102. *Bellevalia stepporum* Feinbr. — $2n = 16$ (Figs. 4, 4a).

IJ: Jebel Gill (Hisma Basin), 29°53'N, 35°24'E, 1 Apr 1997, *A. Borzatti von Löwenstern, G. Barsotti* (*cult.* Hort. Bot. Pisa 158/1997).

Bellevalia stepporum, an Irano-Turanic element, is distributed in the same area with *B. mosheowii* (Zohary & Feinbrun 1986) and is often associated with it. The site of Jebel Gill is the southern distribution border of this taxon. The karyotype $2n = 2x = 2m + 2M + 4st + 2sm + 2st + 2sm\text{-}SAT + 2m\text{-}SAT = 16$, agrees with Feinbrun (1938, 1939, 1940); it is constituted by two large metacentric pairs (the first one 16.8 µm in length), four markedly heterobrachial pairs and two chromosome pairs with terminal satellite on the long arm. In both satellited pairs, the nucleolar organizer is asymmetrically placed on the homologues.



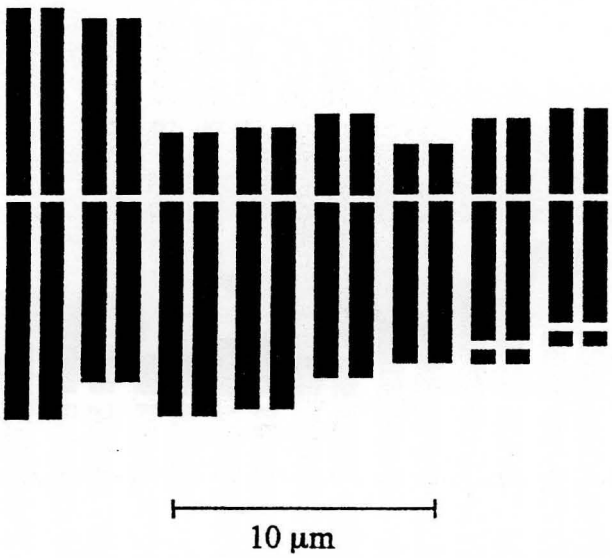


Fig. 4. **4,** metaphase plate and **4a,** correspondent idiogram of *Bellevalia stepporum,* $2n = 16$. — Scale bar = 10 µm.

1103. *Tulipa polychroma* Stapf — $2n = 24$ (Figs. 5, 5a).

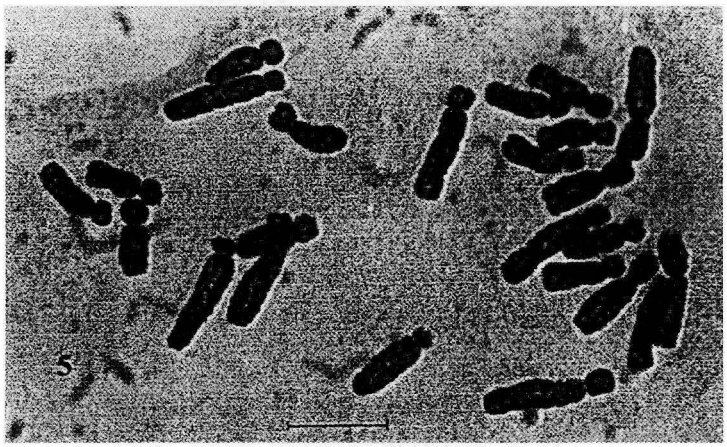
IJ: Ras en Naqb (Hisma Basin), 29°57'N, 35°30'E, 26 Mar 1994, *A. Borzatti von Löwenstern* (*cult.* Hort. Bot. Pisa 534/1994); 1 Apr 1997, *A. Borzatti von Löwenstern, G. Barsotti* (*cult.* Hort. Bot. Pisa 165/1997, *exsicc.* PI, *s.n.*).

Tulipa polychroma is an Irano-Turanic element, distributed in Palestine, E. Syria, Iran, E. Caucasus (Zohary & Feinbrun 1986).

Tetraploid and hexaploid levels of ploidy were reported for plants collected in Afghanistan (Raamsdonk & De Vries 1992).

Jordan plants lack the black tip on the anthers and are diploid with the following karyotype: $2n = 2x = 6st + 2m + 2sm + 2st + 2sm + 6st + 4sm = 24$, in agreement with Raamsdonk & De Vries (1992).

No satellited pairs were observed, in agreement with Blakey & Vosa (1981). Chromosome size ranges between 12 and 7 µm.



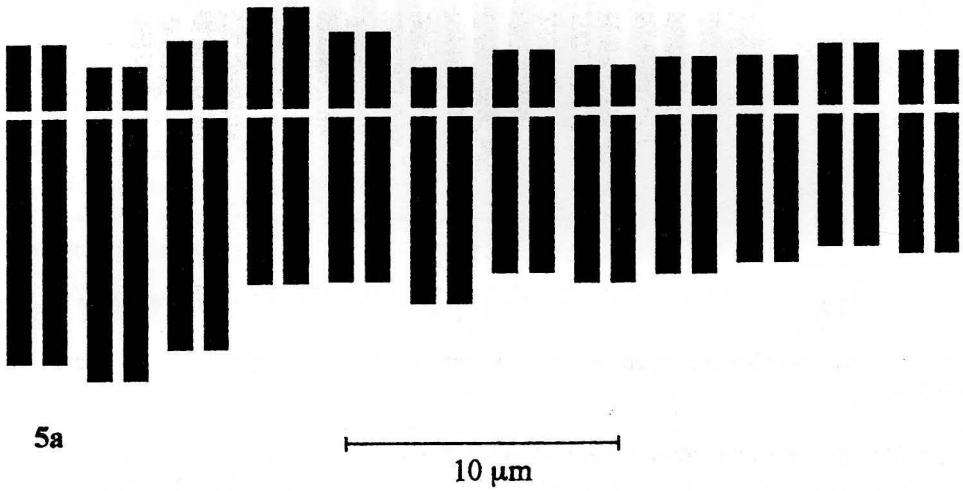
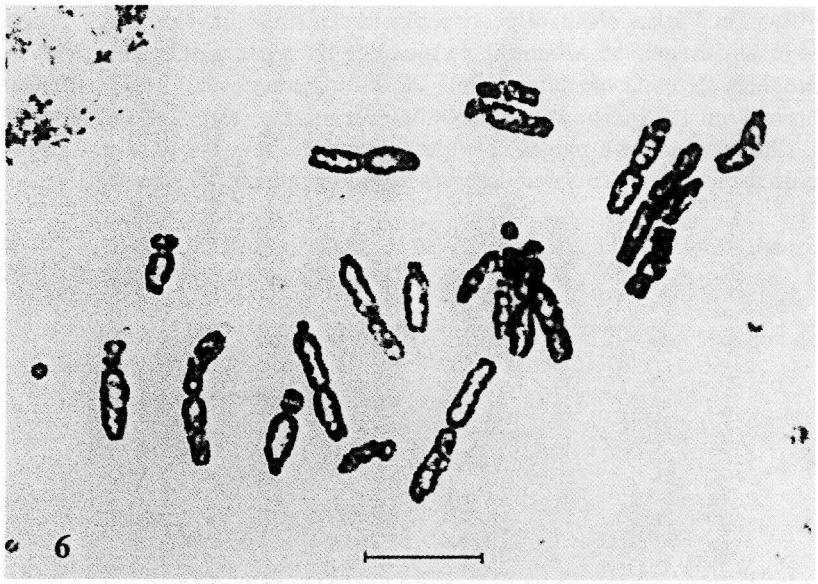
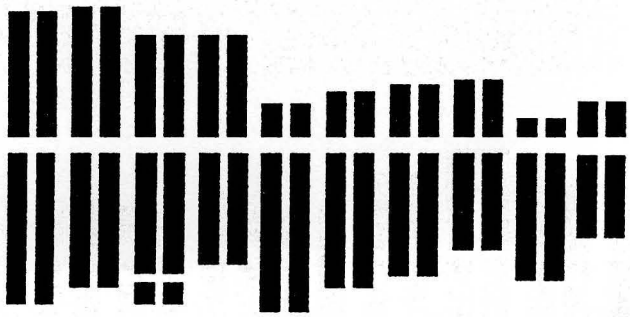


Fig. 5. **5,** metaphase plate and **5a,** correspondent idiogram of *Tulipa polychroma*, $2n = 24$. — Scale bar = 10 µm.





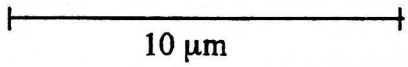


Fig. 6. **6,** metaphase plate and **6a,** correspondent idiogram of *Iris regis-uzziae*, $2n = 20$. — Scale bar = 10 µm.

1104. *Iris regis-uzziae* Feinbr. — $2n = 20$ (Figs. 6, 6a).

IJ: Ras en Naqb (Hisma Basin), 29°57'N, 35°30'E, 1 Apr 1997, *A. Borzatti von Löwenstern, G. Barsotti* (*cult.* Hort. Bot. Pisa 162/1997, *exsicc.* PI, *s.n.*).

Iris regis-uzziae is endemic to the deserts of Negev in Israel (Feinbrun 1978) and of

Ras en Naqb in Jordan. With respect to plants described for the Negev desert, those collected in Jordan lack the white ring surrounding the tepal crest and have much shorter falls. Also their chromosome number $2n = 20$ differs from that of Israeli specimens with $2n = 22$ (Feinbrun 1978). The karyotype is $2n = 2x = 2m + 4m + 2m\text{-SAT} + 6sm + 4st + 2t = 20$. Chromosome size ranges between 9.6 and 3.8 µm, the third pair has terminal satellites on the long arm. This unit deserves further systematic consideration.

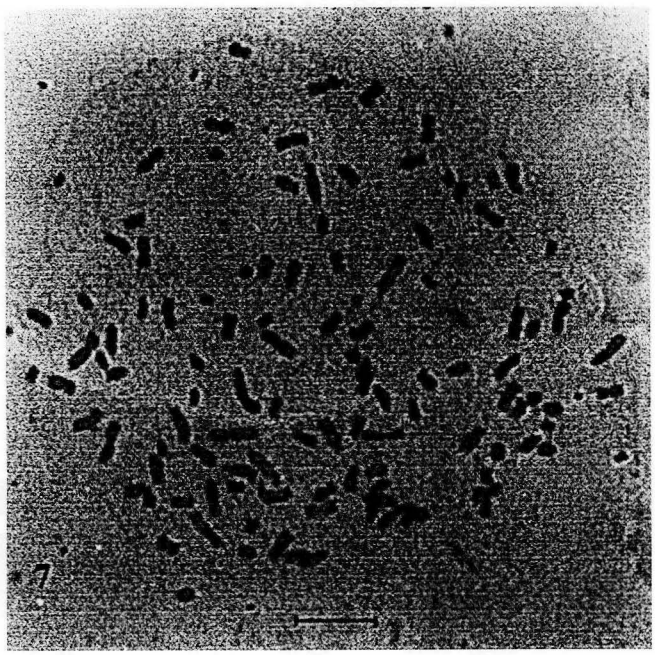


Fig. 7. Metaphase plate of *Biarum pyrami*, $2n = 108$. — Scale bar = 10 µm.

1105. *Biarum pyrami* (Schott) Engler — $2n = 108$ (Fig. 7).

IJ: Jebel Gill (Hisma Basin), 29°53'N, 35°24'E, 26 Mar 1994, *A. Borzatti von Löwenstern, G. Barsotti* (*cult.* Hort. Bot. Pisa 546/1994, 547/1994), 1 Apr 1997, *A. Borzatti von Löwenstern, G. Barsotti* (*cult.* Hort. Bot. Pisa 157/1997).

The chromosome number $2n = 108$ is reported here for the first time. The high number did not allow the idiogram to be prepared. The species is evidently polyploid, but the ploidy level must be verified. Further observations are in progress.

Acknowledgements

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