Mediterranean chromosome number reports — 7

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

Abstract

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This is the seventh 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 119 taxa: *Urginea, Hyparrhenia, Bellevalia* and *Colchicum* from Italy, by R. M. Baldini (Nos. 779-782); *Aegilops, Alopecurus, Dactylis, Dianthus, Elymus, Festuca, Minuartia, Phleum, Plantago, Rheum, Sagittaria* and *Silene* from Bulgaria, by A. Petrova & K. Stoyanova (Nos. 783-802); *Bryonia, Malabaila, Centaurea, Astragalus, Pseudosophora, Sphaerophysa, Lens, Cicer, Vicia* and *Lathyrus* from Caucasia, by E. Nazarova (Nos. 803-815); *Silene, Hirschfeldia, Rapistum, Ornithopus, Echium, Cynoglossum, Stachys, Plantago* and *Scabiosa* from Morocco, by B. Valdés, R. Parra, I. García & M. J. Moreno (Nos. 816-826); *Lupinus* from Tunisia, by Z. Ghrabi Gammar, S. Puech, M. Zouaghi & M. Nabli (Nos. 827-830); *Athyrium, Dryopteris, Polystichum, Phyllitis, Asplenium* and *Ceterach* from Bulgaria, by D. Ivanova (Nos. 831-839); *Genista* from Greece, Turkey and Italy and *Laburnum* from Italy, by T. Cusma Velari, L. Feoli Chiapella & L. Mangiavacchi (Nos. 840-842); *Legousia, Lathyrus, Ononis, Papaver, Roemeria, Ranunculus, Galium, Melampyrum* and *Piptatherum* from France, *Hypecoum* and *Linaria* from Corsica, by R. Verlaque, C. Reynaud & A. Aboucaya; *Arabidopsis, Bunias, Cardaminopsis, Clypeola, Erophila, Hesperis, Hornungia, Iberis, Isatis, Lunaria, Myagrum* and *Rorippa* from Bulgaria, by M. Ančev & V. Goranova (Nos. 855-872); *Cardamine* from Bulgaria, by M. Ančev, K. Marhold & V. Goranova (Nos. 873-877); *Dianthus, Opuntia, Wulfenia, Anthemis, Cirsium, Ornithogalum* and *Allium* from Italy, by R. Marcucci & N. Tornadore (Nos. 878-884); *Darniella, Ranunculus, Limonium, Anthemis, Taraxacum, Allium, Caruelia* and *Iris* from Malta, by S. Brullo, A. Guglielmo, P. Pavone & M. C. Terrasi (Nos. 885-898).

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Reports (779-782) by Riccardo Maria Baldini *

779. *Urginea maritima* (L.) Baker — $2n = 4x = 40 + 1$ (Fig. 1).

It: Island of Giannutri (Tuscany), between Vigna vecchia and the old lighthouse, in a xeric garrigue place, 42°15'N 11°06'08"E, 5 m, 1 Jun 1991, *Z. R. Abrahao da Silva & R. M. Baldini* (cult. Hort. Bot. Firenze *BA 4057*).

This species, widespread in the Mediterranean region, has been investigated by various authors such as Martinoli (1949), Battaglia (1957a, 1957b, 1964a), Maugini (1953, 1956, 1960), Giménez Martín & Abián Burgos (1957), Larsen (1960), Löve & Kjellqvist (1973), Borgen (1974), Sañudo & Ruiz Rejón (1975), Ferrarella & al. (1978), Ruiz Rejón (1978), Bartolo & al. (1984) and Oberprieler & Vogt (1994) who reported many ploidy levels: $2n$, $3n$, $4n$, $6n$. In Italy the presence of intrapopulational chromosomal mutations was reported for the first time by Giuffrida (1950), who pointed out the possibility of finding, in the same tetraploid population (from Puglia, in Giuffrida's work), aneuploids with $2n = 4x = 41$. Maugini (1960) reports $2n = 4x = 40$ for material originated from the island of Giannutri. The karyotype formula according to Levan & al. (1964) is: $2n = 4x = 41$: 32st + 4sm-SAT + 5m. In this case, we do not consider the existence of an iso-B-chromosome (cf. Battaglia 1964b). True B-chromosomes were found only in *Urginea fugax* (Moris) Steinh. s.l. (Martinoli 1949, Battaglia 1964c) and never in *Urginea maritima* (cf. Battaglia 1964c).

780. *Hyparrhenia hirta* (L.) Stapf — $2n = 45$ (Fig. 2).

It: Road SP 104 between S. Costantino and Sapri (SA, Campania), dry stony place, 200 m, 40°04'04"N, 15°38'54"E, 16 Jun 1995, G. *Aldobrandi, R. M. Baldini & C. Nepi* (FI, CAM/1).

— Road to Praia a Mare after the crossroad to Maratea (PZ, Basilicata), edge of the road, 150 m, 15°48'23"E, 40°01'42"N, 12 Jun 1995, *Aldobrandi G., Baldini R. M. & Nepi C.* (FI, BA/1).

Hyparrhenia hirta is a paleotropical species (Clayton 1969) widespread in the Mediterranean area and often used as fodder grass in extraeuropean countries (Bogdan 1977).

The chromosome number $2n = 45$ reported here is the first count obtained from Italian material and agrees with previous counts made by De Wet (1954), Fernandes & Queiros (1969) and Queiros (1988) from South Africa, Southern France and Portugal respectively. Assuming as basic chromosome number $x = 5$ [see Celarier (1956); Talavera (1978)], the karyotype formula according to Levan & al. (1964) is: $2n = 9x = 45$: 40m + 5 sm-SAT. Many other caryological data are available for various European or not countries, as following: Portugal: $2n = 40$, 45 + 0, 1B [sub *H. hirta* (L.) Stapf var. *longearistata* (Willk. & Lange) Rothm. & P. Silva, (Fernandes & Queiros 1969)], $2n = 44$ [*Celarier* in sched. ex Clayton (1969)]; Spain: $n = 15$ (Talavera 1978), $2n = 30$ [sub *Hyparrhenia pubescens* (Vis.) Chiov.], $2n = 40$ sub *Hyparrhenia hirta* (L.) Stapf (Llauradó 1983);

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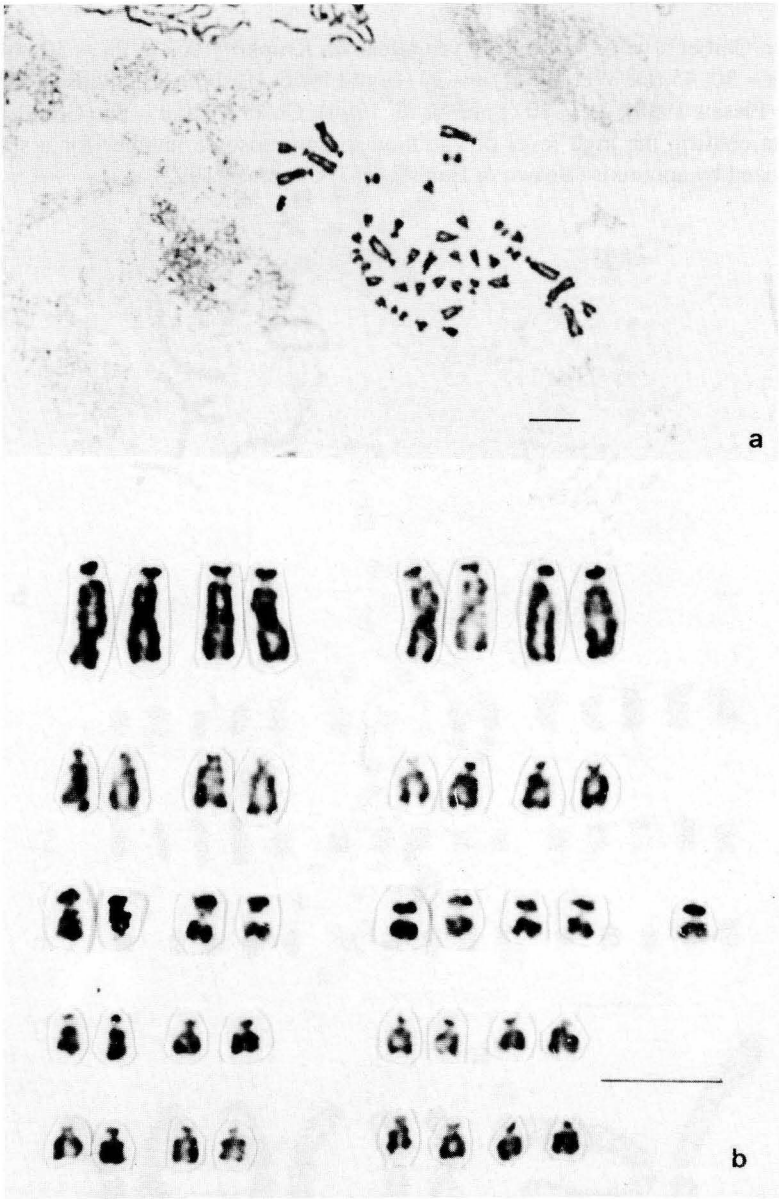

Fig. 1. **a,** Mitotic methaphase plate and **b,** karyotype of *Urginea maritima* (H.B.F., BA 4057), $2n = 4x = 40 + 1$. — Scale bars = 10 µm.

France: $2n = 30$ (Larsen 1954); Cyprus: $2n = 46$ [Celarier in sched. ex Clayton (1969)]; Israel: $2n = 30$ (Celarier 1956), $2n = 40$ [Celarier in sched. ex Clayton (1969)]; Iraq: $n = 30$? (Gould 1956); Pakistan: $n = 20$ (Faruqi & al., 1979); India: $2n = 30$ (Celarier 1956); Tunisia: $2n = 40$, 40 + 1B, ca. 48, 60 (Gould & Soderstrom 1970); Kenya: $2n = 30$ (Krupko 1955); South Africa: $n = 15$ [Garber 1944; the origin of the strains are not

defined in Garber's work, but only 9 years later in Krupko (1953)], $2n = 30, 44$ (Krupko 1953), $2n = 30, 45$ (De Wet 1954), $n = 20$ (Gould 1956, Hoshino & Davidse 1988), $n = 30$ (Spies & Plessis 1988), $2n = 20$ (Spies & al. 1994); Costa Rica, $n = 20$ (Gould 1956). All these data confirm the high level of variation in chromosome number for a species also characterized by apomixis (Brown & Emery 1957, Chapman 1992).

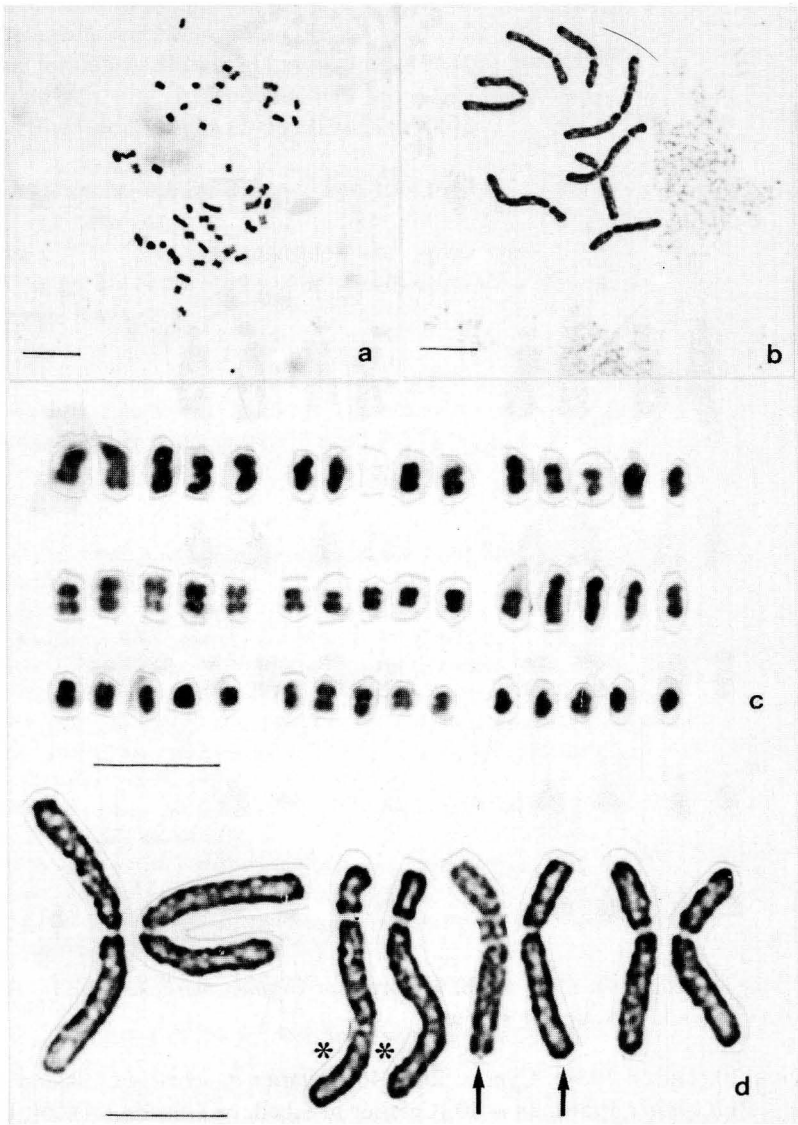

Fig. 2. Mitotic methaphase plates and karyotypes of: **a & c,** *Hyparrhenia hirta* (FI-CAM/1), $2n = 45$; **b & d,** *Bellevalia romana* (BA-4166), $2n = 8$. - Asterisks and arrows indicate secondary constrictions and microsatellites respectively. — Scale bar = 10 µm.

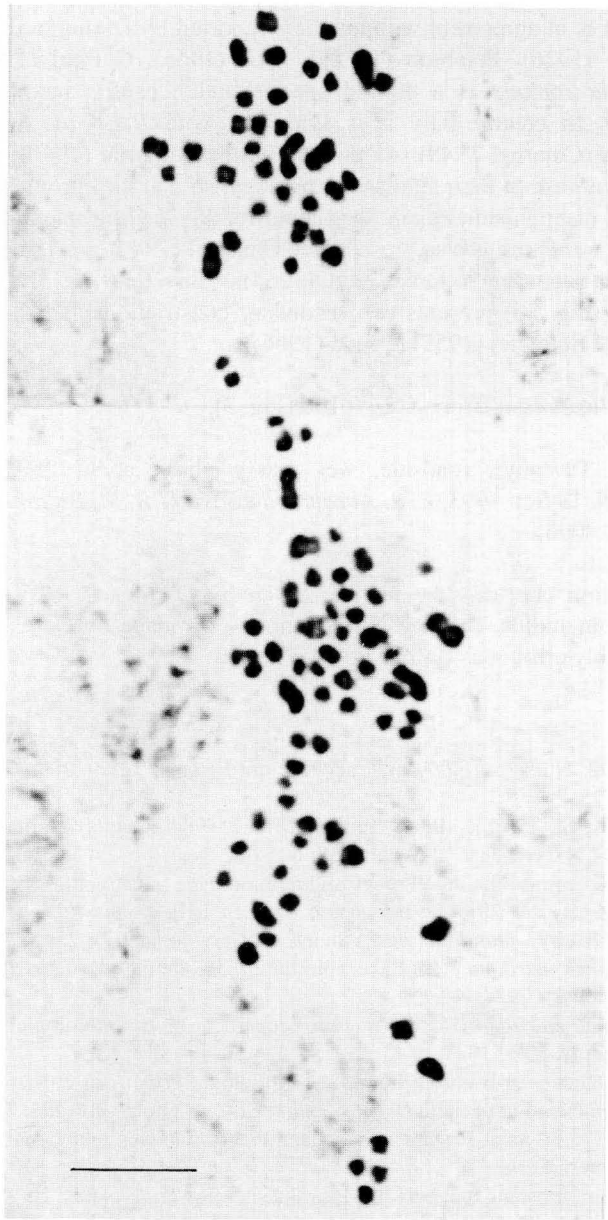

Fig. 3. Mitotic methaphase plate of *Colchicum lusitanum* (H.B.F., BA 4062), $2n = 106$. — Scale bar = 10 μm.

781. *Bellevalia romana* (L.) Rchb. — $2n = 8$ (Fig. 2).

It: Olmo (FI, Tuscany), roadside, about 250 m, 11°20'30"E, 43°51'65"N, 10 May 1995, *R. M. Baldini*, (cult. Hort. Bot. Firenze BA 4166).

Our indication is in agreement with numbers reported by Darlington (1926), Delaunay (1922), De Mol (1926), Feinbrun (1938a), Jona (1966), Garbari (1968) and Baldini (1992). *Bellevalia romana* is a diploid species and a central mediterranean element (Feinbrun 1940). In central Italy it is sympatric with *Bellevalia webbiana* Parl., a tetraploid species (Chiarugi 1949). As pointed out by Feinbrun (1940), these species are often confused, because of their similar morphology, so that the chromosome analysis is a useful method of distinguishing them. Our count for *Bellevalia romana* is from a locality where *Bellevalia webbiana* is also present [see Chiarugi (1949) and Maggini (1972)]. The karyotype formula according to Levan & al. (1964) is: $2n = 2x = 8$: 2M + 2 sm-SAT + 4m. The second pair (Fig. 2d) presents two secondary constrictions and the third pair has a microsatellite [see Battaglia (1955) & Jona (1966)].

782. *Colchicum lusitanum* Brot. — $2n = 106$ (Fig. 3).

It: Olmo (FI, Tuscany), roadside, wet grassy place, about 250 m, 11°20'30"E, 43°51'65"N, 19 Sep 1993, *Z. R. Abrahao da Silva & R. M. Baldini*, (cult. Hort. Bot. Firenze BA 4096).

Our investigation confirms the number given by D'Amato (1955, 1957) for many Italian localities, including Tuscany. The count $n = 51$ made by De Castro (1945) from Portugal is probably erroneous (D'Amato 1957).

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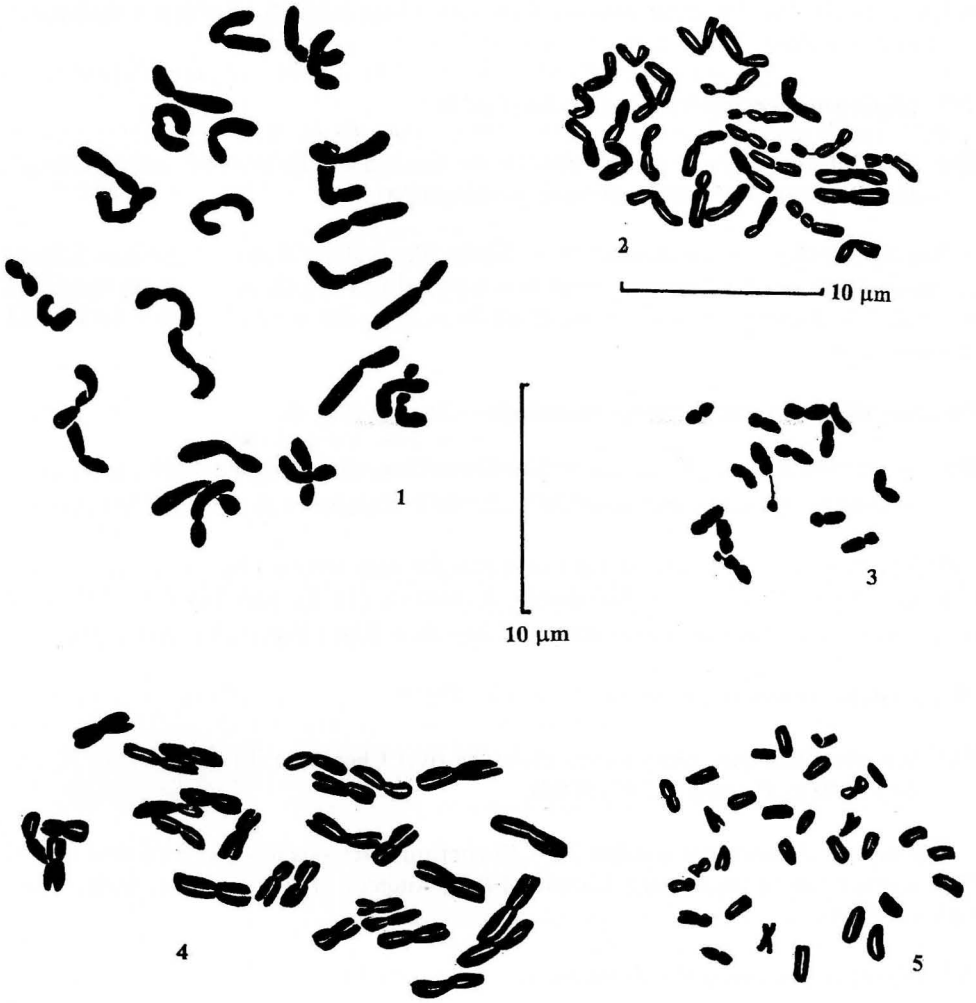
Reports (783-802) by Ana Petrova & Kalina Stoyanova

783. ***Aegilops geniculata*** Roth — $2n = 28$ (Fig. 1).

Bu: Thracian Lowlands, grassy places near the village Mezek, district Svilengrad, 41° 45'N, 26°05'E, 180 m, *Petrova 4051* (SOM).

The tetraploid chromosome number $2n = 4x = 28$ confirms our previous reports (Kožuharov & al. 1983), as well as these of Hindaková (1987) and Baltisberger & Leuchtmann (1991). The karyotype studied consists of $2n = 4x = 6m + 22sm = 28$ chromosomes. The diploid chromosome number for the species was also reported by Devesa & al. (1990) from Spain.



Figs. 1-5. Karyotypes of: **1,** *Aegilops geniculata*, $2n = 28$; **2,** *Alopecurus geniculatus*, $2n = 28$; **3,** *A. gerardii*, $2n = 14$; **4,** *Dactylis glomerata* subsp. *glomerata*, $2n = 28$; **5,** *Dianthus moesiacus*, $2n = 30$. — Scale bars = 10 µm.

784. *Alopecurus geniculatus* L. — $2n = 28 + 1B$ (Fig. 2).

Bu: Sofia region, damp grassy places along the irrigation canals around the village Kazichene, 42°39'N, 23°29'E, 550 m, *Petrova 15294* (SOM).

The tetraploid chromosome number $2n = 4x = 28$ confirms our previous data (Kožuharov & Petrova 1991), but a B-chromosome is registered for this species for the first time in Bulgarian material, although B-chromosomes are common in the karyotypes of the grasses. The same chromosome number with a B-chromosome is also reported by

Sorokin (1991). The karyotype consists of $2n = 4x = 14m + 2m$ - SAT + 8sm + 4sm - SAT = 28 chromosomes.

785. ***Alopecurus gerardii*** Vill. — $2n = 14$ (Fig. 3).

Bu: Pirin Mt, rocky grassy places between the rest houses "Bunderitsa" and "Vichren", 41°48'N, 23°27'E, 1800 m, *Petrova 11994* (SOM).

The diploid chromosome number $2n = 14$ coincides with the results of previous authors (Favarger 1965, Strid & Franzén 1981). It is reported here for the first time on Bulgarian material. The karyotype studied consists of $2n = 2x = 4m + 8sm + 2sm$ - SAT = 14 chromosomes.

786. ***Dactylis glomerata*** L. **subsp.** ***glomerata*** — $2n = 28$ (Fig. 4).

Bu: Western Balkan range, near the village Gorni Lom, along the path to the top Midžur, 1060 m, damp grassy places, 43°28'N, 22°49'E, *Kožuharov & Petrova 3919* (SOM).

The tetraploid chromosome number confirms the data reported by many authors (see Fedorov 1969) as well as of Kožuharov & Petrova (1973), and Nikolov (1991) on Bulgarian material.The karyotype consists of $2n = 4x = 20m + 8sm = 28$ chromosomes.

787. ***Dianthus cruentus*** Griseb. s.l. — $2n = 30$ (Fig. 8).

Bu: Western Rhodopes, rocky places along the river Chepinska (Elidere), 41°52'N, 24° 07'E, 850 m, *Petrova 24289* (SOM).

The diploid chromosome number $2n = 30$ confirms previous reports of Petrova (1995) from another part of the country, Carolin (1957), Andreev (1981) and other authors (see Fedorov 1969).

788. ***Dianthus moesiacus*** Vis. & Pančić s.l. — $2n = 30$ (Fig. 5).

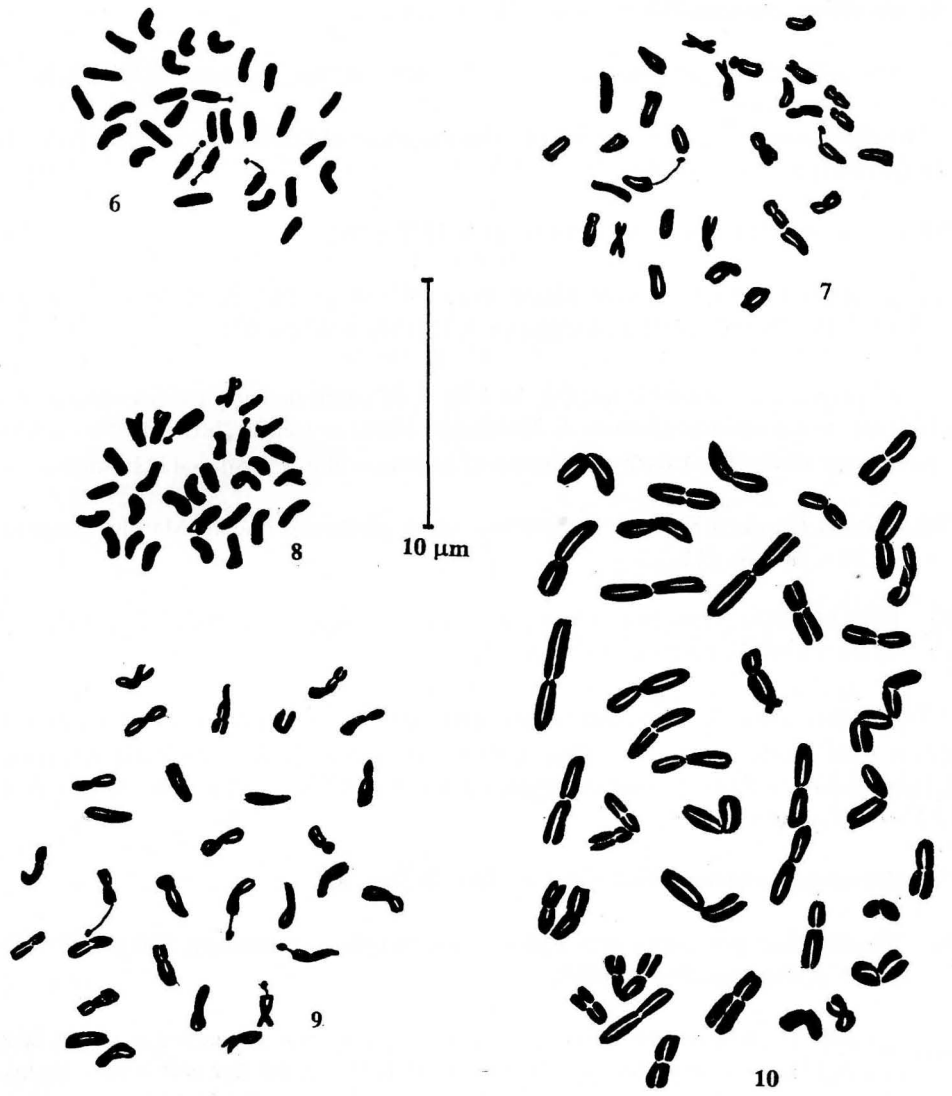
Bu: River Strouma region, the hill "Pchelina", near the villages Levunovo and Pripechene, district Blagoevgrad, 41°29'N, 23°19'E, 280 m, *Petrova 21248* (SOM).

The diplod chromosome number $2n = 30$ coincides with the data of Gentscheff (1937). The species is a Balkan endemic.

789. ***Dianthus pelviformis*** Heuffel — $2n = 30$ (Fig. 6).

Bu: Znepole region, Chepun Mt, near Dragoman, rocky grassy places, 42°59'N, 22° 59'E, 920 m, *Petrova 23517* (SOM).

The diploid chromosome number $2n = 30$ coincides with the results of Rohweder (1934) and Gentscheff (1937). The species is a Balkan endemic.



Figs. 6-10. Karyotypes of: **6,** *Dianthus pelviformis*, $2n = 30$; **7,** *D. pinifolius*, $2n = 30$; **8,** *D. cruentus*, $2n = 30$; **9,** *D. quadrangulus*, $2n = 30$; **10,** *Elymus hispidus*, $2n = 42$.

790. *Dianthus pinifolius* Sm. s.l. — $2n = 30$ (Fig. 7).

Bu: Western Rhodopes, grassy places near the forestry enterprise "Beglika", 41°52'N, 24°07'E, 1510 m, *Petrova 21738* (SOM).

The chromosome number $2n = 30$ confirms previous reports from Bulgaria by Rohweder (1934), Carolin (1957) and Petrova (1975).

791. ***Dianthus quadrangulus*** Velen. — $2n = 30$ (Fig. 9).

Bu: Slavyanka Mt, grassy places, 41°26'N, 23°36'E, 1420 m, *Petrova 23834* (SOM).

The chromosome number $2n = 30$ confirms the result of Carolin (1957) from Bulgaria. The species is a Balkan endemic.

792. ***Elymus hispidus*** (Opiz) Melderis — $2n = 42$ (Fig. 10).

Bu: Thracian Lowlands, grassy places near the village Sladun, Svilengrad district, 41°51'N, 26°28'E, 150 m, *Kožuharov & Petrova 4092* (SOM).

The hexaploid chromosome number $2n = 6x = 42$ confirms our previous reports from other parts of the country (Petrova & Kožuharov 1983) as well as those of other authors (see Fedorov 1969). The karyotype consists of $2n = 6x = 28m + 14sm = 42$ chromosomes.

793. ***Festuca bosniaca*** Kummer & Sendtner subsp. ***pirinensis*** (Acht.) Markgr.-Dannenb. — $2n = 14$ (Fig. 11).

Bu: Pirin Mt, calcareous grassy places near the top "Vichren", 41°46'N, 23°24'E, 2700 m, *Kožuharov & Petrova 31323* (SOM).

The chromosome number confirms the previous report of Kožuharov & Kuzmanov (1970) from another part of Mt Pirin (sub *F. pirinensis*). It is an endemic subspecies distributed only in Pirin Mt. The karyotype studied consists of $2n = 2x = 6m + 6sm + 2sm - SAT = 14$ chromosomes.

794. ***Minuartia caespitosa*** (Ehrh.)Deg. — $2n = 48$ (Fig. 12).

Bu: Middle Rhodopes, rocky grassy places near Bachkovo monastery, 510 m, 41°56'N, 24°51'E, *Petrova 22610* (SOM).

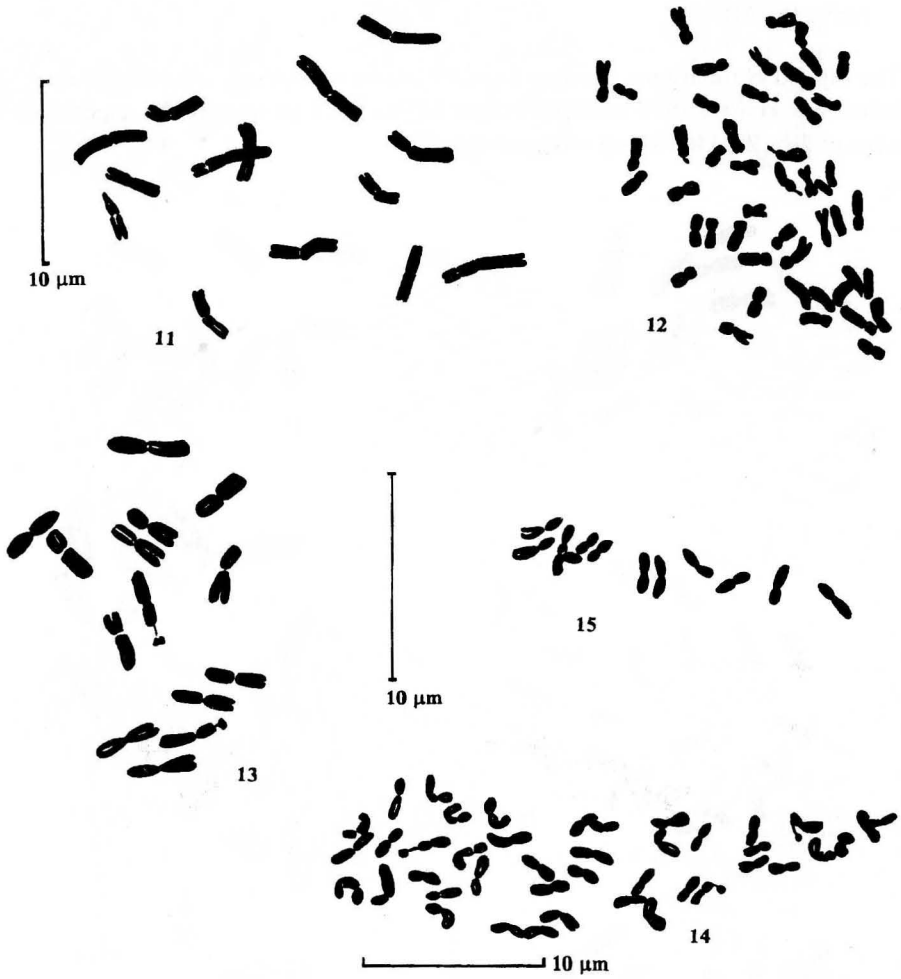
The tetraploid chromosome number $2n = 4x = 48$ confirms our previous results from another part of the country (Petrova 1975). Unfortunately in the last reference a mistake has been made: $2n = 28$ is printed instead of the correct $2n = 48$. The karyotype consists of $2n = 4x = 20m + 28sm - 4SAT = 48$ chromosomes.

795. ***Phleum phleoides*** (L.) Karsten — $2n = 14$ (Fig. 13).

Bu: Western Balkan range, Vrachanska Mt, near the rest house "Purshevitsa", 43°08'N, 23°29'E, 1320 m, *Petrova 494* (SOM).

The diploid chromosome number $2n = 14$ confirms our previous results from other parts of the country (Kožuharov & Petrova 1991) as well as these of other authors (see

Fedorov 1969, Uchriková 1974 and Duckert-Henriod 1991). The karyotype of the material studied consists of $2n = 2x = 8m + 6sm = 14$ chromosomes.



Figs. 11-15. Karyotypes of: **11,** *Festuca bosniaca* subsp. *pirinensis*, $2n = 14$; **12,** *Minuartia caespitosa*, $2n = 48$; **13,** *Phleum phleoides*, $2n = 14$; **14,** *P. pratense*, $2n = 42$; **15,** *Plantago atrata*, $2n = 12$.

796. *Phleum pratense* L. — $2n = 42$ (Fig. 14).

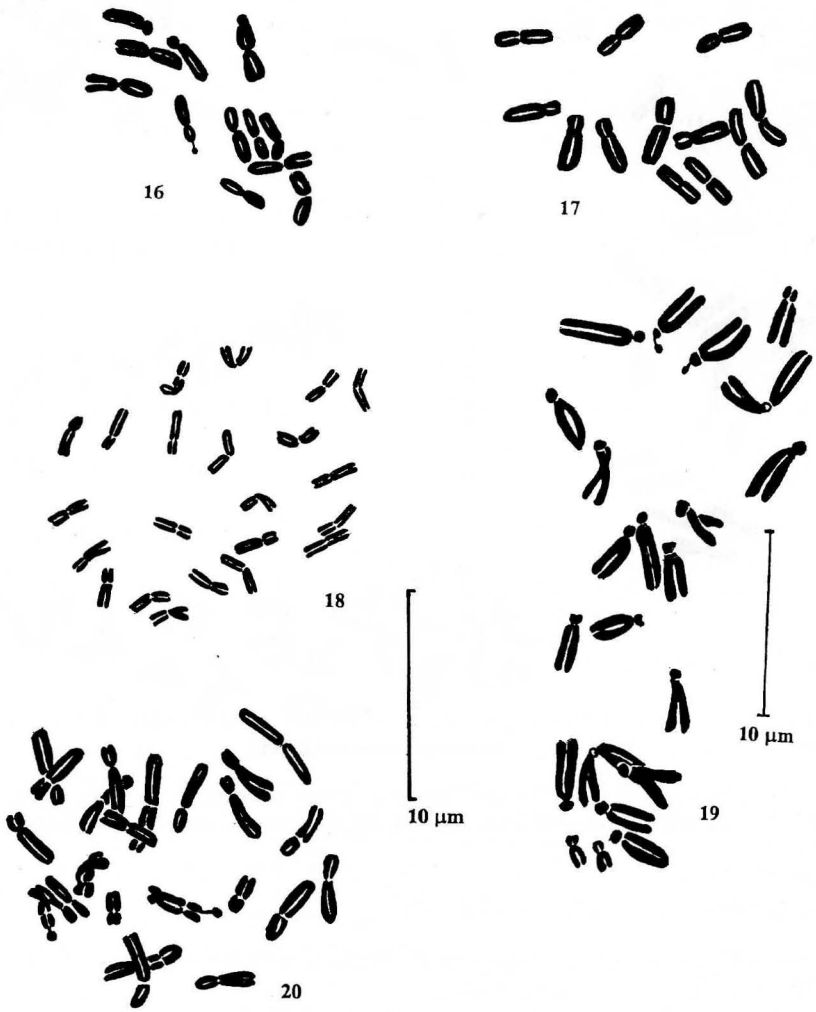
Bu: Western Rhodopes, grassy places near "Beglika" forestry enterprise, 41°52'N, 24° 07'E, 1520 m, *Petrova 24094* (SOM).

This chromosome number confirms our previous report (Kožuharov & Petrova 1991) as well as these of other authors (see Fedorov 1969). The karyotype of the material studied consists of $2n = 6x = 24m + 18sm - 4SAT = 42$ chromosomes.

797. ***Plantago atrata*** Hoppe s.l. — $2n = 12$ (Fig. 15).

Bu: Pirin Mt, near the top "Vichren", grassy places, 41°48'N, 23°27'E, 2700 m, *Petrova 12394* (SOM).

The diploid chromosome number $2n = 12$ confirms previous results (Fedorov 1969, Kožuharov & Petrova 1974 and Baltisberger 1988). The karyotype of the material studied consists of $2n = 2x = 8m + 4sm = 12$ chromosomes.



Figs. 16-20. Karyotypes of: **16,** *Plantago lanceolata*, $2n = 12$; **17,** *P. scabra*, $2n = 12$; **18,** *Rheum rhaponticum*, $2n = 22$; **19,** *Sagittaria latifolia*, $2n = 22$; **20,** *Silene sendtneri*, $2n = 24$ — Scale bars = 10 µm.

798. *Plantago lanceolata* L. — $2n = 12$ (Fig. 16).

Bu: Sofia region, damp places along the irrigation canals near the village Kazichene, 42°39'N, 23°29'E, 550 m, *Petrova 15794* (SOM).

The diploid chromosome number $2n = 12$ confirms our previous reports (Kožuharov & Petrova 1974) and also those of other authors (see Fedorov 1969, Goldblatt & Johnson 1990). The karyotype of the material studied consists of $2n = 2x = 8m + 2\ sm$ - SAT + 2st = 12 chromosomes.

799. *Plantago arenaria* Waldst. & Kit Syn.: *Plantago scabra* Moench — $2n = 12$ (Fig. 17).

Bu: Thracian Lowlands, near village Mandra, Haskovo district, 41°49'N, 25°30'E, 280 m, *Petrova 22182* (SOM).

The diploid chromosome number confirms previous counts (see Fedorov 1969 and Kožuharov & Petrova 1974). The karyotype of the material studied consists of $2n = 2x = 4m + 8sm = 12$ chromosomes.

800. *Rheum rhaponticum* L. — $2n = 22$ (Fig. 18).

Bu: Rila Mt, "Urdinski circus", 42°11'N, 23°29'E, 2100 m, *Andreev 29122* (SOM).

The species is very rare in Bulgaria, restricted to Mt Rila. The same diploid chromosome number $2n = 22$ was reported by Stoeva (1985) who did not mention the karyotype formula and by Harriman (1981). The tetraploid chromosome number $2n = 44$ was also reported by other authors (see Fedorov 1969). The karyotype studied consists of $2n = 2x = 10m + 12sm = 22$ chromosomes.

801. *Sagittaria latifolia* Willd. — $2n = 22$ (Fig. 19).

Bu: Sofia region, in the irrigation canals around the village Kazichene, 550 m, 42°39'N, 23°29'E, *Petrova 20994* (SOM).

This is a very rare alien species of the Bulgarian flora. The diploid chromosome number $2n = 22$ agrees with the reports of Löve & Löve (1980) and Beal & al. (1982) and it is reported here for the first time on Bulgarian material. The karyotype is asymmetrical and consists of $2n = 2x = 2m + 2sm + 18st$ - 2SAT = 22 chromosomes.

802. *Silene sendtneri* Boiss. — $2n = 24$ (Fig. 20).

Bu: Western Balkan range, Vrachanska Mt, around the rest house Purshevitsa, 1350 m, 43°08'N, 23°29'E, *Petrova 694* (SOM).

This chromosome number is reported for the first time on Bulgarian material and confirms the data of Loon van & Kieft (1980) from former Yugoslavia. The species has a very restricted distribution in the western part of Bulgaria. The karyotype consists of $2n = 2x = 4m + 18sm + 2sm - SAT = 24$ chromosomes.

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Reports (803-815) by Estella Nazarova

803. ***Bryonia alba*** L. — $2n = 20$ (Fig. 1).

Cc: Armenia, Sevan, v. Daranak, 40°20'N, 45°38'E, 2100 m, 30 Jul 1996, *Nazarova 2320* (ERE).

This small genus is mainly distributed in the Mediterranean region including the Caucasus and Middle Asia. Our data confirm earlier reports given in literature (see Fedorov 1969, Moore 1974, Goldblatt 1981, 1988, Goldblatt & Johnson 1994). This chromosome number is the first record from Transcaucasian material.

804. ***Malabaila dasyantha*** (C. Koch) Grossh. — $2n = 22$ (Fig. 2).

Cc: Arcach, Lachin, 39°38'N, 46°32'E, 1000 m, 5 Jun 1995, *Gabrielian & Fajvush 2196* (ERE).

This species has a limited distribution in Anatolia, Iran and Transcaucasia. The chromosome number $2n = 22$ confirms a previous count (Vasiljeva & al. 1981) for this species from Nachitchevan.

805. ***Centaurea gulissashvilii*** Dumb. — $2n = 18$ (Fig. 3).

Cc: Armenia, Sevan, v. Tsamakaberd, 40°32'N, 44°56'E, 2100 m, 25 Aug 1994, *Agababjan 2097* (ERE).

This species is an endemic of the Armenian highland. It is distributed in S.W. and S. Transcaucasia. The count is the first record for the species.

806. ***Astragalus asterias*** Stev. ex Ledeb. — $2n = 16$ (Fig. 4).

Cc: Armenia, Goris region, v. Karachen, 39°33'N, 46°24'E, 1540 m, 2 Jun 1995, *Gabrielian & Fajvush 2216* (ERE).

This species is distributed in the Mediterranean area. The chromosome number $2n = 16$ is the first record for this species.

807. ***Astragalus glycyphyllos*** L. — $2n = 16$ (Fig. 5).

Cc: Arcach, Lachin region, v. Vazgenachen, 39°45'N, 46°30'E, 1250 m, 9 Aug 1995, *Oganezova 2263* (ERE).

The species is widely distributed in Europe, W. Siberia, Asia Minor and the Caucasus. Our count, the first on Transcaucasian material, is in agreement with many previous records from different areas (see Fedorov 1969, Moore 1973, Goldblatt 1981, 1984, 1985, Takhtajan 1990 for references).

808. ***Pseudosophora alopecuroides*** (L.) Sweet — $2n = 36$ (Fig. 6).

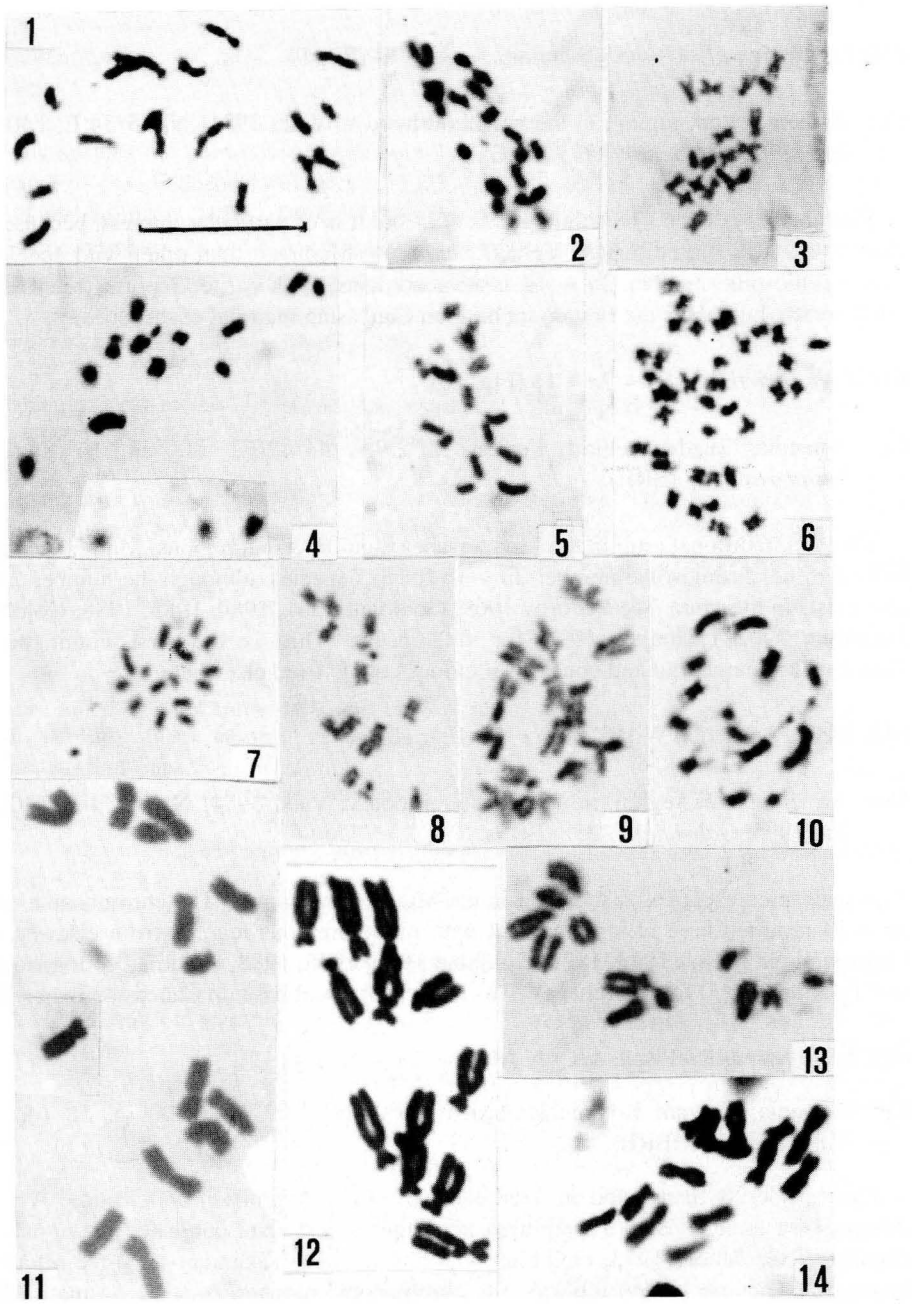
Cc: Armenia, Ararat region, Khosrov reserve, 40°55'N, 44°50'E, 1050 m, 2 Sept 1995, *Oganezova 2283* (ERE).

This species is widely distributed. Our data confirm earlier reports given in literature (see Fedorov 1969, Goldblatt 1984, 1988, Goldblatt & Johnson 1991, 1994 for references). This is the first count on Caucasian material.

809. ***Sphaerophysa salsula*** (Pall.) DC. — $2n = 16$ (Figs. 7 & 8).

Cc: Armenia, Ararat region, swamps, 39°45'N, 44°46'E, 850 m, 5 Aug 1993, *Fajvush 2273* (ERE).

This species is widely spread in Asia. Its southern border goes through N. Mongolia and N. China and its eastern border goes through Dagestan and W Transcaucasia. This species is also reported from Armenia (Ararat region) by Fajvush. The chromosome number ($n = 8$) given by Reveal & Spellenberg (1976) is confirmed by our count.



Figs. 1-14. Mitotic metaphase plates of: **1,** *Bryonia alba*, $2n = 20$; **2,** *Malabaila dasyantha*, $2n = 22$; **3,** *Centaurea gulissashvilii*, $2n = 18$; **4,** *Astragalus asterias*, $2n = 16$; **5,** *Astragalus glycyphyllos*, $2n = 16$; **6,** *Pseudosophora alopecuroides*, $2n = 36$; **7-8,** *Sphaerophysa salsula*, $2n = 16$; **9,** *Lens orientalis*, $2n = 14$; **10,** *Cicer arietinum*, $2n = 16$; **11,** *Vicia ervilia*, $2n = 14$; **12,** *Vicia hyrcanica*, $2n = 12$; **13,** *Vicia sativa*, $2n = 12$; **14,** *Lathyrus cicera*, $2n = 14$. — Scale bar = 10 µm.

810. ***Lens orientalis*** (Boiss.) Schmalh. — $2n = 14$ (Fig. 9).

Cc: Armenia, Vaik region, in the neighbourhood v. Vaik, 39°41'N, 45°34'E, 1400 m, 6 Jun 1995, *Gabrielian 2233* (ERE).

This species is widely distributed in S.W. Asia. It is of particular interest, because it is a close relative of the cultivated lentil (*L. culinaris* Medicus) than other wild species are. The chromosome number $2n = 14$ is in accordance with earlier reports (see Goldblatt 1984, 1988), but this is the first count base on Caucasian material of this species.

811. ***Cicer arietinum*** L. — $2n = 16$ (Fig. 10).

Cc: Armenia, Razdan region, Fontan, 40°23'N, 44°42'E, 1800 m, 14 Aug 1991, *Nazarova 2027* (ERE).

This is a traditional crop in the Mediterranean and E. Asian regions. Many investigators indicated the chromosome number $2n = 16$ for this species, although the number $2n = 14$ also exists in literature (see Fedorov 1969, Goldblatt 1981, 1984, 1985, 1988, Goldblatt & Johnson 1990, Takhtajan 1990 for references). This is the first count base on Transcaucasian material and confirms previous counts from elsewhere.

812. ***Vicia ervilia*** (L.) Willd. — $2n = 14$ (Fig. 11).

Cc: Armenia, Vaik region, in the neighbourhood v. Vaik, 39°41'N, 45°34'E, 1400 m, 6 Jun 1995, *Gabrielian 2257* (ERE).

A widespread species, distributed in the Mediterranean area. The chromosome number $2n = 14$ reported here is in agreement with many previous records from elsewhere (see Fedorov 1969, Moore 1973, 1977, Goldblatt 1981, 1985, 1988, Goldblatt & Johnson 1994 and Takhtajan 1990 for references). This is the first count base on Caucasian material.

813. ***Vicia hyrcanica*** Fisch. & C. A. Mey. — $2n = 12$ (Fig. 12).

Cc: Armenia, Erevan, Botanical Garden, 40°08'N, 44°32'E, 1200 m, 18 Jun 1996, *Nazarova 2410* (ERE).

This species is distributed in Transcaucasia, Iran, Afganistan and Middle Asia. The chromosome number $2n = 12$ reported here agrees with data published previously from elsewhere (see Moore 1973, Goldblatt & Johnson 1994, Takhtajan 1990 for references). Podlech & Dieterle (1969) reported the chromosome number $2n = 14$ on material from Afganistan.

814. ***Vicia sativa*** L. *s.l.* — $2n = 12$ (Fig. 13).

Cc: Armenia, Vaik region, in the neighbourhood v. Vaik, 39°41'N, 45°34'E, 1400 m, 6 Jun 1995, *Gabrielian & Fajvush* 2231 (ERE).

— Arcach, Lachin, 39°38'N, 46°32'E, 1000 m, 5 Jun 1995, *Gabrielian & Fajvush 2209* (ERE).

For this species the chromosome numbers $2n$ = 10, 12 and 14 have been reported by several authors (see Fedorov 1969, Moore 1973, 1977, Goldblatt 1981, 1984, 1985, 1988, Goldblatt & Johnson 1990, 1994, Takhtajan 1990 for references). Especially the chromosome numbers $2n$ = 12 & 14 have also been reported for Caucasian populations. Our counts confirm previous reports from elsewhere.

815. *Lathyrus cicera* L. — $2n$ = 14 (Fig. 14).

Cc: Armenia, Vaik region, in the neighbourhood v. Vaik, 39°41'N, 45°34'E, 1400 m, 6 Jun 1995, *Gabrielian & Fajvush 2232* (ERE).

This species is widely distributed in the Mediterranean area. The chromosome number $2n$ = 14 confirms earlier records (see Fedorov 1969, Moore 1973, Goldblatt 1981, Goldblatt & Johnson 1990, 1991, Takhtajan 1990 for references), but this is the first count base on Caucasian material.

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Reports (816-826) by Benito Valdés, Raquel Parra, Isabel García & María José Moreno

816. ***Silene gallica*** L. — $2n = 24$.

Ma: Between Chefchaouen and Tetouan, 35°20'N, 5°22'W, 25 Jun 1996, *Díez, Rossini, Terrab & Valdés 7466* (SEV 141243).

This report agrees with the diploid number $2n = 24$ found by several authors, and with the haploid $n = 12$ indicated by Talavera & Bocquet (1976: 110-112) for plants from several localities of S.E. Spain.

817. ***Silene inaperta*** L. subsp. ***inaperta*** — $2n = 24$.

Ma: Between Chefchaouen and Tetouan, 35°20'N, 5°22'W, 25 Jun 1996, *Díez, Rossini, Terrab & Valdés 7390* (SEV 141257).

The diploid chromosome number $2n = 24$ agrees with the count made by Luque & Díaz Lifante (1991: 349) based on Spanish plants belonging to this subspecies. Talavera & Bocquet (1976: 105) recorded $n = 12$ and Fernandes & Leitão (1971: 159) and Fernández Casas (1976: 92) $2n = 24$ for plants from the Iberian Peninsula identified as *Silene inaperta* L., which belong, most probably, to this subspecies.

818. ***Hirschfeldia incana*** (L.) Lagrèze-Fossat — $2n = 14$.

Ma: Between Chefchaouen and Tetouan, 35°20'N, 5°22'W, 25 Jun 1996, *Díez, Rossini, Terrab & Valdés 7393* (SEV 141253).

The chromosome number $2n = 14$ confirms the results obtained by various authors. Baez (1933: 84) indicated $n = 7$, $n = 8$, $n = 9$ and $2n = 15$ as well as a variable number of satellites for this species (sub *Erucastrum incanum* (L.) Koch).

819. ***Rapistum rugosum*** (L.) All. — $2n = 16$.

Ma: 5 km from Ouezzane in the road to Mekness, 34°44'N, 5°32'W, 26 Jun 1996, *Díez, Rossini, Terrab & Valdés 7420* (SEV 141247).

This count agrees with the numbers $n = 8$ and $2n = 16$ reported previously by several authors. Baez (1933: 86) recorded $n = 8 + 1B$ and $2n = 16 + 2B$ from plants of this species, without indication of locality.

820. ***Ornithopus compressus*** L. — $2n = 14$.

Ma: Between Chefchaouen and Tetouan: Beni Hassan, 35°22'N, 5°23'W, 400 m, 25 Jun 1996, *Díez, Rossini, Terrab & Valdés 7415* (SEV 141250).

This diploid number $2n = 14$ agrees with previous counts made by Fernandes & Santos (1971: 188, 1975: 182) and Fernandes & al. (1977: 158) from Portuguese plants, and by Pavone & al. (1981: 275) for plants from Sicily.

821. ***Echium creticum*** L. subsp. ***creticum*** — $2n = 16$.

Ma: Oued-Laou: Tamgest, 35°27'N, 5°7'W, 25 Jun 1996, *Díez, Rossini, Terrab & Valdés 7369* (SEV 141247).

The chromosome number found agrees with the number given by Luque (1984: 28) for Spanish plants belonging to this subspecies.

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

Ma: Sidi Cazem, 34°13'N, 5°13'W, 26 Jun 1996, *Díez, Rossini, Terrab & Valdés 7428* (SEV 141242).

Many authors have reported this chromosome number for this species from various countries.

823. ***Stachys ocymastrum*** (L.) Briq. — $2n = 18$.

Ma: Road to Mekness, 8 km from Ouezzane, 34°03'N, 5°33'W, 26 Jun 1996, *Díez, Rossini, Terrab & Valdés 7426* (SEV 141259).

This count agrees with the diploid number $2n = 18$ given by several authors, and with the haploid $n = 9$ indicated by Diosdado & al. (1993: 170). The count does not agree, however, with the diploid $2n = 16$ found by Colombo & al. (1987: 142) in plants from Sicily (Trapani).

824. ***Plantago lagopus*** L. — $2n = 12$.

Ma: Between Chefchaouen and Tetouan, 15 km from Chefchaouen, 35°15'N, 5°20'W, 25 Jun 1996, *Díez, Rossini, Terrab & Valdés 7392* (SEV 141252).

González & Silvestre (1980: 263) counted $n = 6$ and $2n = 12$ in plants from Spain and the same diploid number was reported by Kožuharov & Petrova (1974: 377) for plants from Bulgaria, by Strid & Franzen (1981: 839) and Runemark (1967: 15) for plants from Greece, and by Brullo & al. (1985: 227) for Sicilian plants. Fernandes & Franca (1972: 227) indicated $2n = 12$ and $2n = 12 + 1$ in Portuguese plants of var. *cylindrica*.

825. ***Plantago afra*** L. — $2n = 12$.

Ma: Oued Laou, 35°27'N, 5°6'W, 25 Jun 1996, *Díez, Rossini, Terrab & Valdés 7382* (SEV 141236).

The diploid number found $2n = 12$ agrees with previous records by Fernandes & Franca (1972: 405) for Portuguese plants (sub *P. psyllium* L.), by Luque & Díaz Lifante (1991: 358) for plants from S.E. Spain and by Brullo & al. (1985: 228) for Sicilian plants.

826. ***Scabiosa atropurpurea*** L. — $2n = 16$.

Ma: Between Chefchaouen and Tetouan: Beni Hassan, 35°22'N, 5°23'W, 25 Jun 1996, *Díez, Rossini, Terrab & Valdés 7412* (SEV 141251).

This count on Moroccan plants agrees with the chromosome numbers given by several authors for plants from different countries.

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Rapports (827-830) de Z. Ghrabi Gammar, S. Puech, M. Zouaghi & M. Nabli

827. *Lupinus albus* L. — $2n = 50$ (Fig. 1I).

Tu: El Alia, nord de la Tunisie, près de Bizerte, sol sableux, bioclimat méditerranéen, sub-humide inférieur à hivers doux (Le Floc'h 1995), 12 May 1990, Herbier du Laboratoire de Production Fourragère de l'INAT, Tunis.

L. albus est bien implanté sur le pourtour méditerranéen où il est cultivé, toutefois on ne trouve pas de représentants sauvages de cette espèce en Tunisie. Selon Gladstones (1974), il existe chez *L. albus* la var. *graecus* (Boiss. et Spruner) Gladst. qui correspond à la forme sauvage qu'on rencontre dans les Balkans, et la var. *albus* qui correspond à la forme cultivée et a comme synonyme *L. termis* Forskal. Darlington & Wylie (1955), publient pour cette dernière $2n = 50$ chromosomes.

Les nombres chromosomiques publiés pour *L. albus* sont très variables: $2n = 30$ (Olszewska 1954), $2n = 40$ (Savchenko 1935 in Darlington & Wylie 1955); $2n = 50$ (Senn 1938 in Pazy & al. 1977, Tuschnjakowa 1935 in Gilot 1965, Malheiros 1942 in Darlington & Wylie 1955, Gilot 196,; Gladstones 1974, Pazy & al. 1977). Le nombre le plus répandu est $2n = 50$. Ce nombre correspond aussi à celui que nous avons dénombré pour la première fois pour la flore de Tunisie pour cette espèce et plus précisément pour le cultivar Mekna collecté à El Alia (Fig. 1I).

828. *Lupinus angustifolius* L. — $2n = 38, 42, 44$ (Fig. 1D, E, F).

Tu: Borj H'faïedh, Cap Bon, sol sableux, bioclimat méditerranéen semi aride supérieur à hivers doux (Le Floc'h 1995), 20 May 1991, Herbier du Laboratoire de Production Fourragère de l'INAT.

La population de *L. angustifolius* collectée à Borj H'faïedh présente une grande variation dans l'ornementation des graines ce qui, dans un premier temps, nous a conduit à diviser les récoltes en cinq lots différents (A, B, C, D et E). Les graines des lots A et E se distinguent nettement (Gammar Ghrabi & al. 1996a). Nous avons limité nos comptages chromosomiques à ces deux lots. Les individus du lot A ont montré une variation du

nombre chromosomique comprise entre $2n = 38$ et $2n = 42$ avec des chromosomes très petits. Par contre ceux du lot E, avec $2n = 44$, se sont révélés stables (Fig. 1D, E, F).

L. angustifolius présente $2n = 38$, 40, 42 et 44. Le nombre $2n = 42$ est le plus fréquent et est nouveau pour cette espèce. La variation du nombre chromosomique explique l'instabilité génétique au sein des populations de *L. luteus* et *L. angustifolius* et pourrait être mise en relation avec sa variation morphologique, son adaptation à l'aridité et surtout à l'impact humain.

Les comptages chromosomiques cités dans la littérature (Winge 1925 in Gilot 1965, Kawakami 1930, Malheiros 1942 in Darlington & Wylie 1955, Gilot 1965, Gladstones 1974) rapportent tous $2n = 40$ ou $n = 20$ pour cette espèce. Les comptages de Pazy & al. (1977), réalisés pour deux variétés se développant en Israël (décrites comme la var. *angustifolius* et la var. *basalticus* Zoh. et Plitmann) citent aussi $2n = 40$.

829. *Lupinus cosentinii* Guss. — $2n = 32$ (Fig. 1A, B, C).

Tu: Borj H'faïedh, Cap Bon, sol sableux, bioclimat méditerranéen semi aride supérieur à hivers doux (Le Floc'h 1995), 20 May 1991, Herbier du Laboratoire de Production Fourragère de l'INAT.

L. cosentinii est une espèce qui se développe à l'état spontané en Afrique du Nord (seulement au Maroc et en Tunisie), dans le Sud Ouest de l'Espagne, le Sud du Portugal, en Sardaigne et en Corse (Gladstones 1974, Greuter & al. 1989). *L. cosentinii* est aussi la seule espèce des Lupins du type graines rugueuses se développant dans le Bassin Méditerranéen et en Afrique qui présente ce nombre. Les plaques métaphasiques de plus de 30 racines de *L. cosentinii* Guss. analysées ne présentent aucune fluctuation du nombre de chromosomes, ni inter ni intra-individuelle. Toutes sont à $2n = 32$ chromosomes (Fig. 1A, B, C). Ce résultat donné pour la première fois pour la flore de Tunisie concorde avec ceux de Malheiros (1942 in Darlington & Wylie 1955) pour l'Egypte; de Gladstones (1958, 1974) et de Pazy & al. (1977) pour du matériel originaire de l'Ouest de la Méditerranée (Maroc et Espagne).

La comparaison de nos résultats avec ceux des espèces qui sont apparentées à *L. cosentinii*, qui présentent le même type de graines et qui se développent en Afrique du Nord, a permis les constatations suivantes.

Aucune autre espèce à graines rugueuses du genre n'a présenté ce nombre de $2n = 32$ chromosomes, pas même *L. tassilicus* Maire qui a souvent été assimilé à *L. cosentinii* Guss. *L. tassilicus* Maire, endémique du Tassili (Quézel & Santa 1962) est la seule espèce à graines rugueuses qui se développe en Algérie. Les comptages publiés pour cette espèce indiquent $2n = 36$ (Eichorn 1949, Gladstones 1974, Plitmann & Pazy 1984, Castairs & al. 1991).

L. digitatus Forsk. est aussi considéré comme synonyme de *L. cosentinii* Guss. et de *L. tassilicus* Maire (Gladstones 1974). Il est originaire d'Egypte et présente $2n = 36$ chromosomes (Castairs & al. 1991) comme *L. tassilicus* Maire. Le nombre de chromosomes $2n = 36$ est en accord avec le nombre de base $x = 12$ suggéré par Gilot (1965) pour le genre *Lupinus*.

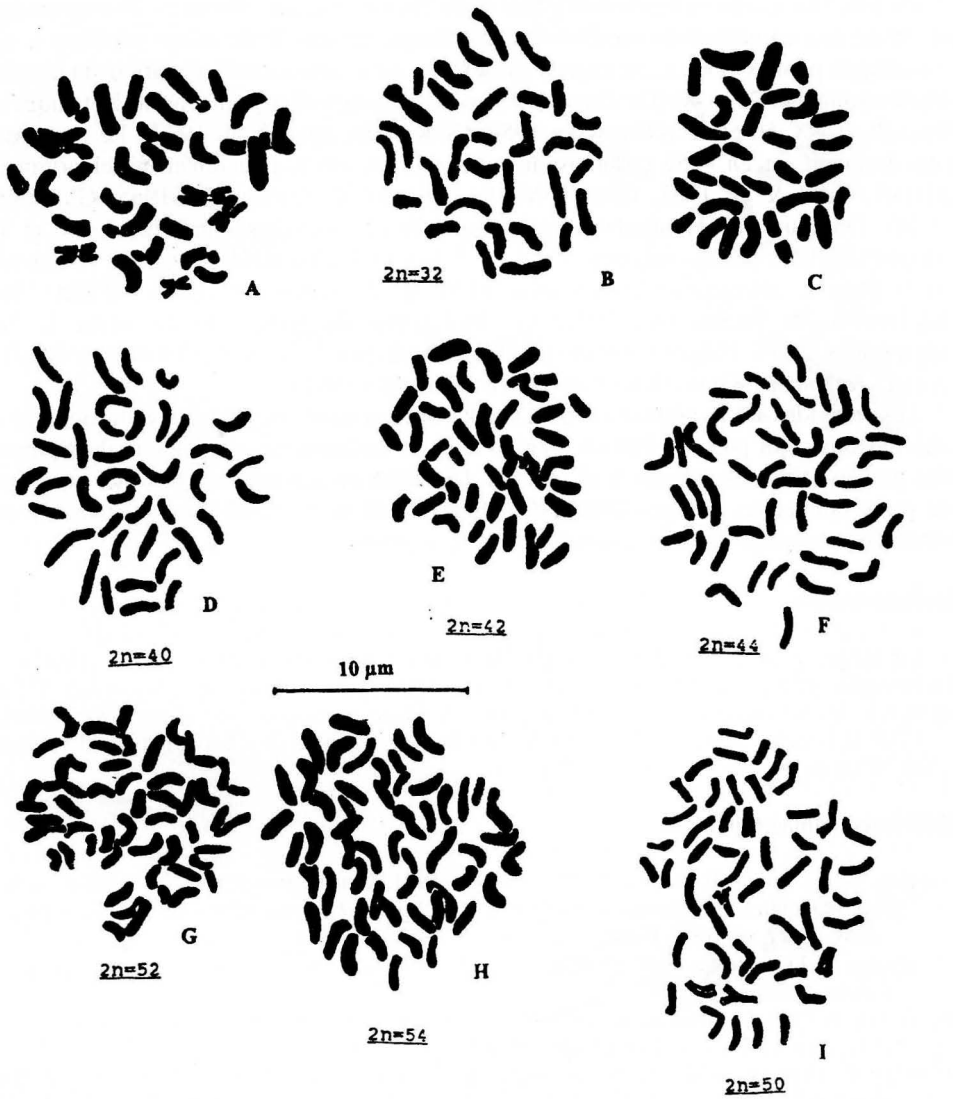

Fig. 1. Plaques métaphasiques de méristèmes de *Lupinus*: **A**, **B**, **C**, *L. cosentinii*, $2n = 32$; **D**, **E**, **F**, *L. angustifolius*, $2n = 40$ (D), $2n = 42$ (E), $2n = 44$ (F); **G**; **H**, *L. luteus*, $2n = 52$ (G), $2n = 54$ (H); **I**, *L. albus*, $2n = 50$.

830. *Lupinus luteus* L. — $2n = 52, 54, 56$ (Fig. 1G, H).

Tu: Tabarka, nord ouest de la Tunisie, sol sableux, bioclimat méditerranéen humide inférieur à hivers doux (Le Floc'h 1995), 20 May 1991, Herbier du Laboratoire de Production Fourragère de l'INAT, Tunis.

L. luteus se reconnaît facilement grâce à ses fleurs jaunes et odorantes. Nos comptages montrent une variabilité du nombre chromosomique au sein d'une même population. Les comptages publiés pour cette espèce présentent aussi une grande variation du nombre chromosomique: $2n = 46$ (De Zeeuw 1936 pour un matériel reçu du Jardin Botanique de Bruxelles), 48, 50 et 52 (Olszewska 1954, Gilot 1965, Pazy & al. 1977). Le nombre le plus fréquent est $2n = 52$ chromosomes (Pazy & al. 1977, pour un matériel originaire d'Israël, Troll & al. 1963, Gilot 1965, Kazimierski & Kazimierska 1965, Gladstones 1974). On retrouve six nombres haploides différents compris entre 16 et 26, et les nombres de base publiés suivants: $x = 5, 6, 7, 8, 9$ et 13. Le nombre $2n = 52$ se retrouve aussi chez *L. hispanicus* (Gladstones 1974) et *L. rothmaleri* Klink. (Gilot 1965, Kazimierski & Kazimierska 1981) qui font partie du groupe de *L. luteus* L. Des tétraploïdes à $2n = 104$ sont obtenus artificiellement chez *L. luteus* L. (Troll & al. 1963) et chez *L. rothmaleri* Klink. (Kazimierski & Kazimierska 1981).

Les individus de la population de Tabarka ont présenté une instabilité du nombre de chromosomes qui pourrait être en relation avec la variation morphologique du tégument des graines (Gammar Ghrabi & al. 1996a). L'analyse de descendance des individus issus de semis comme les dosages d'ADN (Gammar Ghrabi & al. 1996b) devraient fournir des informations complémentaires concernant cette hypothèse.

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Reports (831-839) by Daniella Ivanova

831. ***Athyrium filix-femina*** (L.) Roth — $2n = 2x = 80$ (Fig. 1A, A').

Bu: Western Balkan Range, above Gorni Lom, along road to Midzur peak, along river Barza Reka, 43°26'N, 22°43'E, beech forest, 850 m, 02 May 1995, *Vladimirov DI-5.95* to *8.95* (SOM).
— Vitosha Mt, "Kumata" hut, 42°36'N, 23°15'E, among moraines, 1725 m, 26 Sep 1994, *Ivanova DI-219.94* to *221.94* (SOM).
— Western Sredna Gora, between Vakarel and Bogdanovtzi, 42°34'N, 23°43'E, gully in beech forest, c. 900 m, 18 Jul 1995, *Ivanova DI-205.95* (SOM).
— Rila Mt, along river Beli Iskar, above Beli Iskar, 42°14'N, 23°33'E, in *Pinus silvestris-Picea abies* forest, 1300 m, 01 Jun 1995, *Ivanova DI-29.95, DI-30.95, DI-32.95, DI-35.95* (SOM).
— Rila Mt, between Rila Monastery and "Kirilova Poljana", 42°09'N, 23°24'E, mixed forest, 1200-1250 m, 08 Aug 1995, *Ivanova DI-268.95, DI-269.95* (SOM).
— Northern Pirin Mt, near "Demjanitza" hut, along river Demjanitza, 41°44'N, 23° 27'E, in *Pinus peuce*-forest, c. 1900 m, 18 Jul 1994, *Kachaunova DI-39.94* (SOM).
— Southern Pirin Mt, foothill of Sveshtnik peak, 41°32'N, 23°39'E, in forest, 1700-1800 m, 12 Aug 1995, *Petkova DI-291.95* (SOM).

— Slavjanka Mt, river-banks at the entrance of frontier post, above village Paril, 41° 26'N, 23°40'E, in fissures of calcareous rocks, 750-800 m, 12 Jun 1995, *Ivanova DI-65.95, DI-66.95, DI-68.95* (SOM).
— Western Rhodopes, "Beglika", 41°52'N, 24°06'E, spruce forest, 1600 m, 16 Sep 1994, *Ivanova DI-181.94* (SOM).
— Western Rhodopes, westward of Sarnitza, 41°45'N, 23°59'E, mixed forest above the village, 1200-1300 m, 16 Sep 1994, *Ivanova DI-188.94, DI-199.94* (SOM).
— Middle Rhodopes, "Tchairite" in "Shabanitza" Reserve, 41°35'N, 24°28'E, spruce forest at the first lake, 1700 m, 15 Aug 1991, *Ivanova DI-10.91* (SOM).
— Middle Rhodopes, between Smoljan and Stoikite, 41°38'N, 24°39'E, spruce forest, c. 1500 m, 15 Aug 1991, *Ivanova DI-8.91* (SOM).
— Strandza Mt, near Slivarovo, 41°59'N, 27°36'E, dark, damp gully, in *Fagus orientalis* forest, c. 200 m, 21 Jun 1995, *Ivanova DI-122.95, DI-123.95* (SOM).

This fern species is one of the most widely distributed in Europe (Jalas & Suominen 1972, map 105). Its area of distribution extends throughout Europe, North Africa, Asia, North America and parts of South America. *A. filix-femina* is common in Bulgaria, where it may be found in almost all mountains, in damp shady places, rarely in open places above the timberline.

All plant material, collected from 13 populations in the Bulgarian mountains, proved to be diploid with $2n = 80$. The approximate haploid chromosome number $n = 38$-40 was counted by Farmer & Digby (1907), but the exact number $n = 40$ was first determined by Manton (1950). The same number was found by many authors in plants from different parts of Europe and elsewhere (Britton 1953, Sorsa 1961, 1962, Fabbri 1963, Reeves 1978, Schneller 1979, Manton & al. 1986, Queirós & Ormonde 1987, Queirós & al. 1988). Schneller (1979) also reported 40 bivalents on material from Bulgaria (Middle Balkan Range).

The diploid sporophytic number, $2n = 80$, was also counted by Brögger 1960, Löve & Löve 1961, 1976, Brullo & al. 1982, Kato & al. 1992. Thus, our counts agree with these previous results.

832. ***Athyrium distentifolium*** Opiz — $2n = 2x = 80$ (Fig. 1B, B').

Bu: Vitosha Mt, above "Aleko" hut, along path to Cherni Vrch peak, 42°33'N, 23°17'E, among moraines, 2050 m, 26 Sep 1994, *Ivanova DI-211.94* (SOM).
— Vitosha Mt, along path between "Aleko" hut and "Torfeno Branishte" Reserve, 42° 34'N, 23°17'E, among big rocks, 1950 m, 29 Jul 1994, *Ivanova DI-55.94* (SOM).
— Rila Mt, near "Maljovitza" hut, 42°12'N, 23°24'E, open places among rocks and stones, 1950 m, 21 Jul 1994, *Valjovska DI-47.94* (SOM).

This species occurs in Northern and Central Europe, in the mountains of Southern Europe, in Northern Turkey, Caucasus, Korea, Kamchatka, Japan, the mountains of South Siberia, in western and eastern North America and Greenland. It is rare in Bulgaria and occurs in damp screes and rocky places in the high mountains (1700-2400 m).

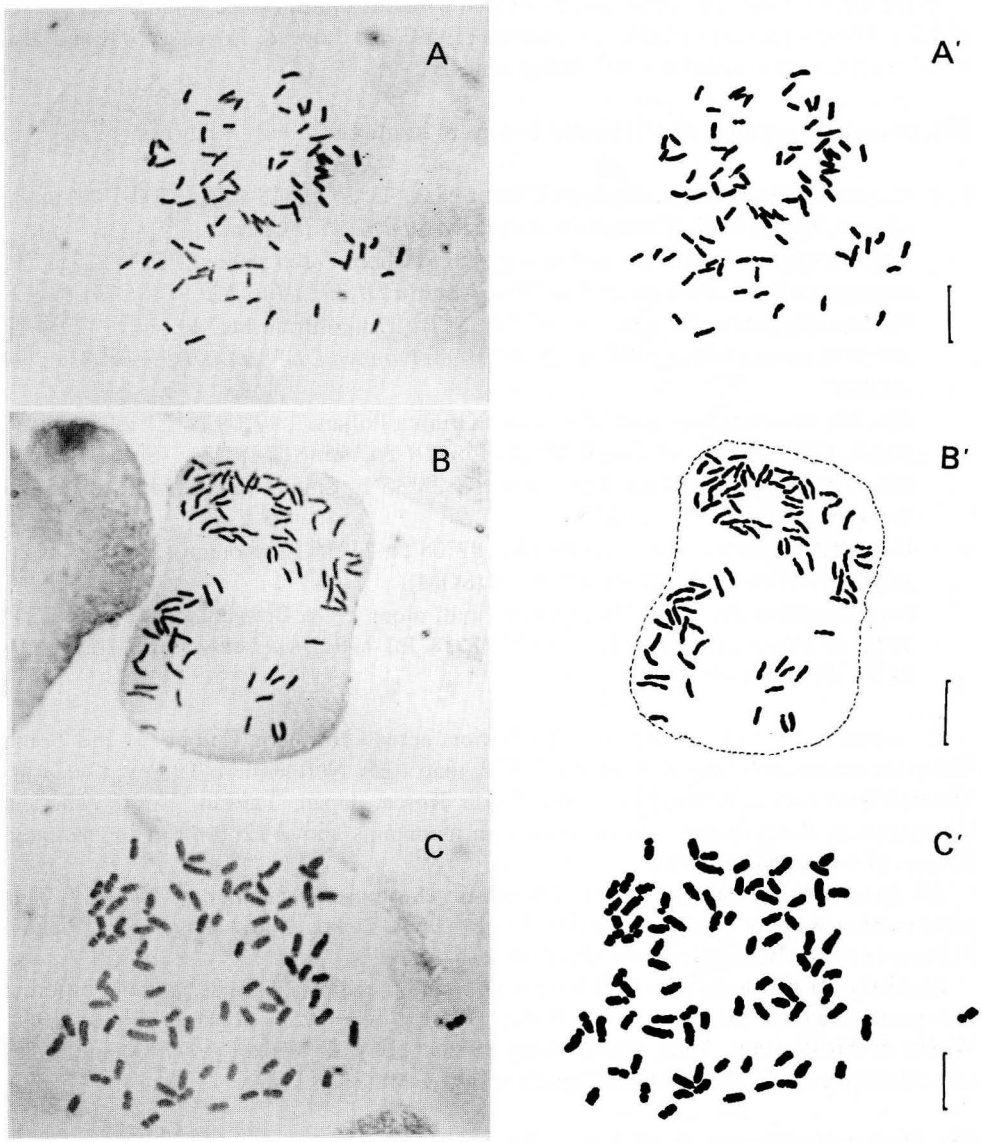

Fig. 1. Photographs and drawing of mitotic metaphase plate: **A, A'**, *Athyrium filix-femina*, $2n = 80$; **B, B'**, *A. distentifolium*, $2n = 80$; **C, C'**, *Dryopteris expansa*, $2n = 82$. — Scale bar = 10 µm.

Between 1930-1960 the species had been found in three localities on Rila Mt and in one locality on Pirin Mt. Recently it has been discovered by the author in two localities on Vitosha Mt, in a new locality on Pirin Mt and in two localities on Middle Balkan Range. Specimens from Vitosha Mt and Rila Mt were studied cytologically.

In the three populations cited, counts yielded a mitotic chromosome number of $2n = 80$, which confirms previous reports by Manton (1950) and Löve & Löve (1961), and also Mitui (1976), who counted $n = 40^{II}$ during meiosis.

833. ***Dryopteris expansa*** (Presl) Fraser-Jenkins & Jermy — $2n = 2x = 82$ (Fig. 1C, C').

Bu: Western Balkan Range, slopes of Midzur peak, 43°25'N, 22°44'E, 1700-1900 m, on silicate, 29 Jun 1995, *Vladimirov & Petkova DI-152.95* (SOM).
— Vitosha Mt, above "Aleko" hut, along path to Cherni Vrch peak, 42°33'N, 23°17'E, among moraines, 2050 m, 26 Sep 1994, *Ivanova DI-207.94* to *209.94* (SOM).
— Vitosha Mt, near path from "Aleko" hut to "Bistrishko Branishte" Reserve, 42°34'N, 23°19'E, spruce forest, 1800 m, 29 Jul 1994, *Ivanova DI-58.94, DI-59.94, DI-62.94* (SOM).
— Rila Mt, between Rila Monastery and "Kirilova Poljana", 42°09'N, 23°24'E, mixed forest, 1200-1250 m, 08 Aug 1995, *Ivanova DI-267.95* (SOM).
— Rila Mt, above "Mussala" hut, 42°12'N, 23°35'E, among rocks, 2400 m, 25 Jul 1993, *Ivanova DI-1.93* (SOM).
— Rila Mt, "Grantchar" hut, near the lake, 42°08'N, 23°35'E, among rocks, 2185 m, 13 Aug 1994, *Ivanova DI-81.94, DI-88.94* (SOM).
— Northern Pirin Mt, near "Demjanitza" hut, along river Demjanitza, 41°44'N, 23° 27'E, in *Pinus peuce*-forest, c. 1900 m, 18 Jul 1994, *Kachaunova DI-18.94, DI-24.94, DI-25.94* (SOM).

D. expansa has a circumboreal distribution across Northern Europe to the South European mountains (Jalas & Suominen 1972, map 132), Northeastern Turkey, Caucasus, Siberia, Kamchatka, North Manchuria, North Korea, Japan, Taiwan, North America, Greenland. In Bulgaria this species occurs on mountains above 1200 m, in forests or in fissures of rocks and in screes.

All specimens investigated showed a mitotic chromosome number of $2n = 82$. This same number was previously counted by Döpp (1958), Piekos & Passakas (1973), Piekos-Mirkowa (1979), Benl & Eschelmüller (1983).

Similarly, 41 bivalents ($n = 41^{II}$) have been found in meiosis on material from different European countries (Manton 1950, Walker 1955, Sorsa 1958, Sorsa & Widén 1968, Widén & Sorsa 1969, Vida 1963, Nardi 1976, Gibby & Walker 1977, Viane 1985, Hovenkamp & al. 1990), and from Canada (Cody & Mulligan 1982).

834. ***Dryopteris filix-mas*** (L.) Schott — $2n = 4x = 164$ (Fig. 2A, A').

Bu: Rila Mt, above Mala Tzarkva, along river Levi Iskar, 42°15'N, 23°31'E, spruce forest, 1200 m, on silicate, 28 May 1994, *Petkova DI-1.94* (SOM).
— Rila Mt, along river Beli Iskar, above Beli Iskar, 42°14'N, 23°33'E, in *Pinus silvestris-Picea abies* forest, 1300 m, 01 Jun 1995, *Ivanova DI-33.95* (SOM).

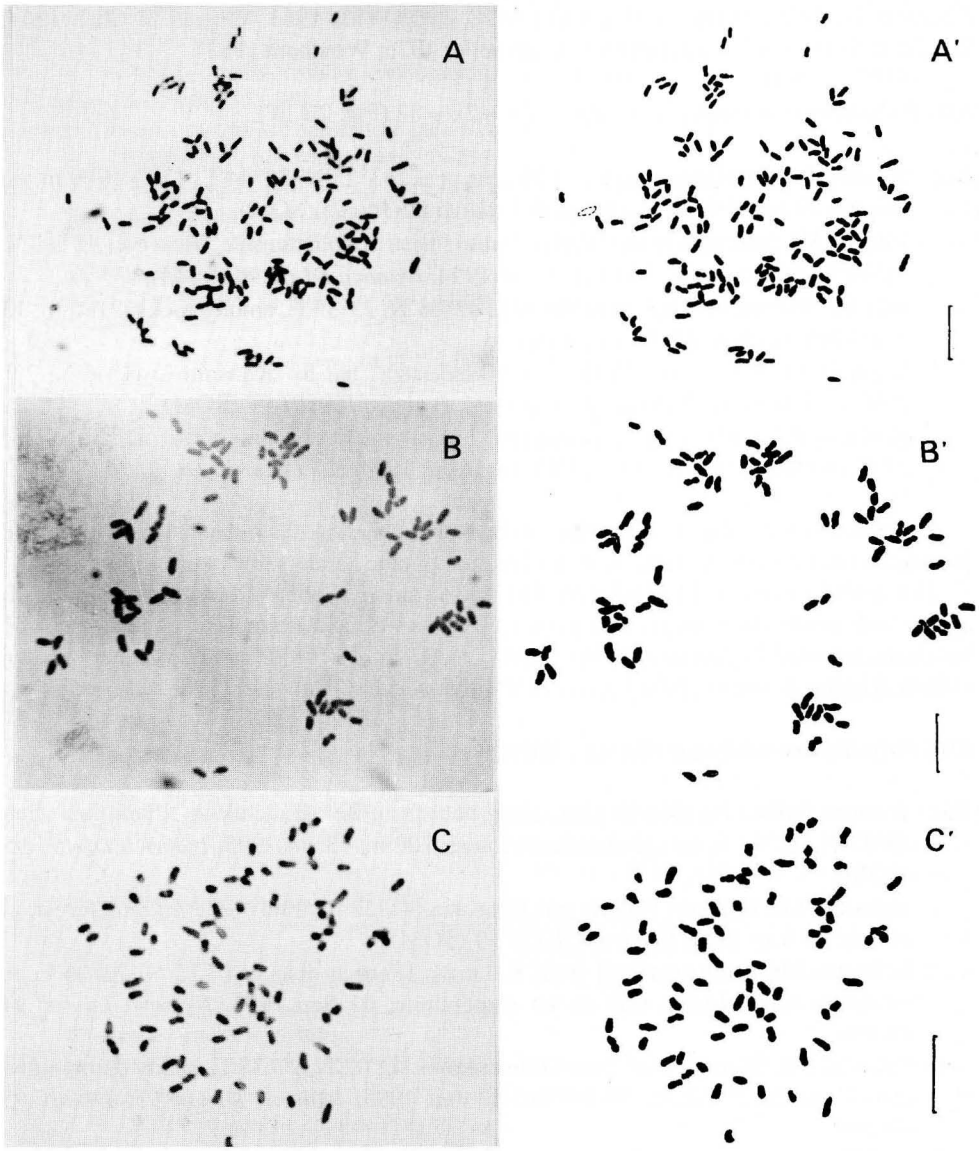

Fig. 2. Photographs and drawing of mitotic metaphase plate: **A, A'**, *Dryopteris filix-mas*, $2n = 164$; **B, B'**, *Polystichum lonchitis*, $2n = 82$; **C, C'**, *P. setiferum*, $2n = 82$. — Scale bars = 10 µm.

This is a very common fern in Bulgaria - almost everywhere in damp shady places in forests and among bushes. Its area of distribution extends from Europe, North and South America, and North Africa to Asia.

Our counts from two populations confirm earlier reports of $2n = 164$ by Schneller (1975) and Al-Bermani & al. (1993). Many authors found $n = 82$ bivalents in meiosis

(Döpp 1939, 1955, Manton 1950, Sorsa 1958, 1962, Vida 1963, Wagner & Chen 1964, Britton & Soper 1966, Reisender 1974, Schneller 1975, Windham 1983).

835. *Polystichum lonchitis* (L.) Roth — $2n = 2x = 82$ (Fig. 2B, B').

Bu: Western Balkan Range, slopes of Midzur peak, 43°25'N, 22°44'E, 1700-1900 m, on silicate, 29 Jun 1995, *Vladimirov & Petkova DI-160.95* (SOM).
— Vitosha Mt, near path from "Aleko" hut to "Bistrishko Branishte" Reserve, 42°34'N, 23°19'E, spruce forest, 1800 m, 29 Jul 1994, *Ivanova DI-61.94* (SOM).
— Rila Mt, "Grantchar" hut, near the lake, 42°08'N, 23°35'E, among rocks, 2185 m, 13 Aug 1994, *Ivanova DI-86.94* (SOM).
— Northern Pirin Mt, along path from "Banderitza" hut to "Kazanite", 41°46'N, 23° 25'E, rock fissures, 2300 m, 16 Aug 1994, *Ivanova DI-101.94* (SOM).
— Northern Pirin Mt, near "Demjanitza" hut, along river Demjanitza, 41°44'N, 23° 27'E, in *Pinus peuce*-forest, c. 1900 m, 18 Jul 1994, *Kachaunova DI-40.94* (SOM).

P. lonchitis is distributed in Europe, Asia, North America, Greenland. It is widespread in Bulgaria and occurs in open, rocky and often montane habitats, in fissures of rocks.

The somatic number $2n = 82$ was observed in all five populations from Bulgaria. It agrees with observations of Löve & Löve (1976), as well as with meiotic counts of $n = 41$ bivalents, reported by Manton (1950), Vida (1963, 1966), Britton (1964), Wagner & Chen (1964), Khullar & Gupta (1978), Cody & Mulligan (1982), Dalgaard (1988).

836. *Polystichum setiferum* (Forssk.) Woynar — $2n = 2x = 82$ (Fig. 2C, C').

Bu: Western Balkan Foothill Region, along path from Belogradchik to "Planinitza" hut, 43°37'N, 22°42'E, mixed deciduous forest, 700 m, 13 Jul 1995, *Ivanova DI-191.95* (SOM).
— Belasitza Mt, between Petrich and Belasitza, 41°22'N, 23°10'E, *Platanus* forest, c. 600 m, 29 Aug 1994, *Ivanova DI-115.94* (SOM).
— Belasitza Mt, southwestward from Kolarovo (Petrich distr.), 41°22'N, 23°06'E, in *Castanea sativa*-forest, 600 m, on serpentinite, 01 Sep 1994, *Ivanova DI-163.94* (SOM).
— Strandza Mt, "Kachul Dol" near Gramatikovo, 42°02'N, 27°38'E, shady damp gully, mixed deciduous forest, 50-100 m, 20 Jun 1995, *Ivanova DI-109.95, DI-117.95* (SOM).
— Strandza Mt, along gravel road from "Kachul Dol" to Kosti, along river Veleka, 42° 01'N, 27°39'E, in *Fagus orientalis*-forest, 50-100 m, 22 Jun 1995, *Ivanova DI-127.95* (SOM).

This fern is distributed in Western and Central Europe, throughtout the Mediterranean region, in North Africa and Asia - Caucasus, North Anatolia and perhaps Iraq. In Bulgaria it can be found in shady, moderately damp, stony places in forests.

Our mitotic counts from five populations confirm previous reports of the diploid number of $2n = 82$ made by Brullo & al. (1982).

Other populations of *P. setiferum* from different countries have also proved to be diploid showing $n = 41$ bivalents during meiosis (Manton 1950, Fabbri 1963, Vida 1963, 1966, Daigobo 1973, 1974, Khullar & Gupta 1978, Manton & al. 1986, Queirós & Nogueira 1989, Queirós 1991).

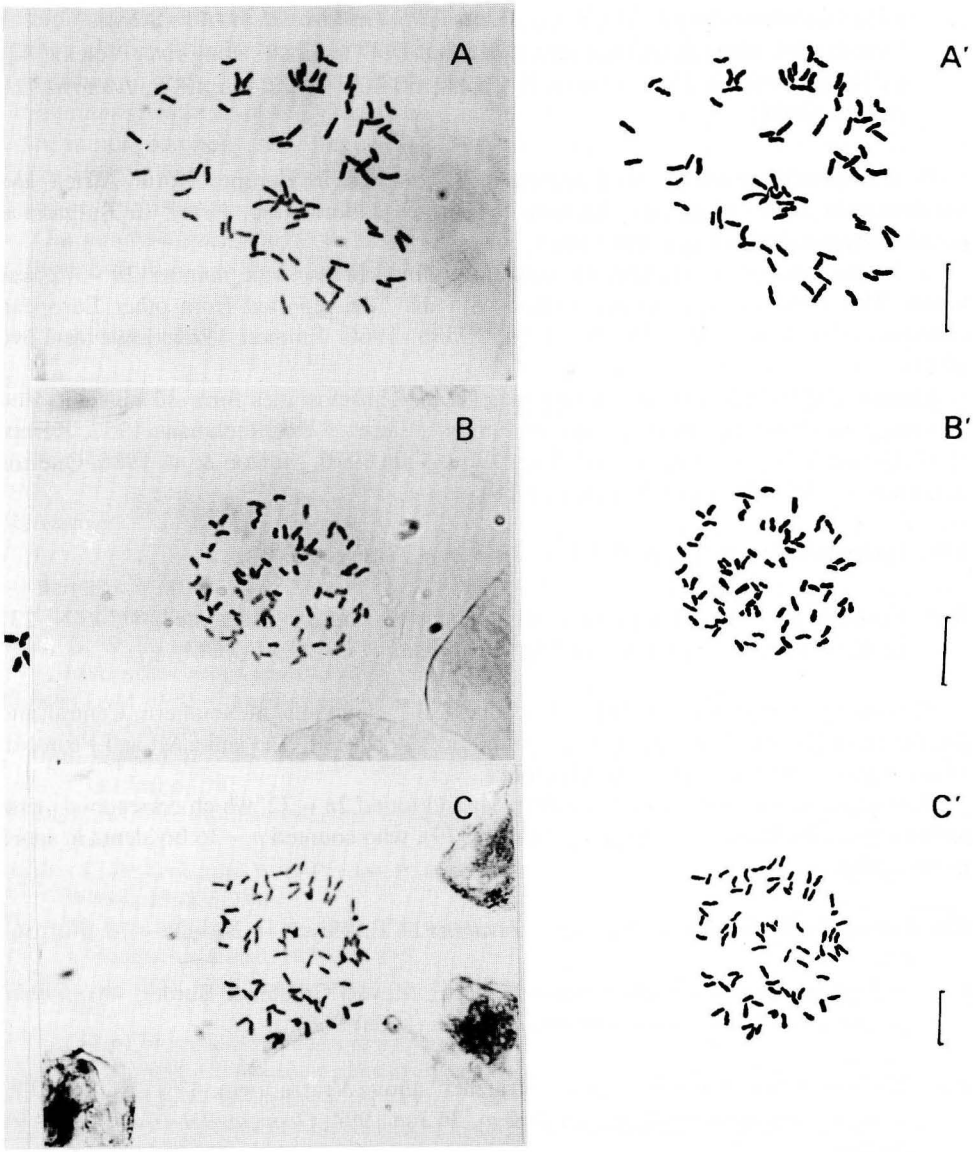

Fig. 3. Photographs and drawing of mitotic metaphase plate: **A, A'**, *Phyllitis scolopendrium* subsp. *scolopendrium*, $2n = 72$; **B, B'**, *Asplenium fissum*, $2n = 72$; **C, C'**, *Ceterach officinarum* subsp. *bivalens*, $2n = 72$. — Scale bar = 10 µm.

837. *Phyllitis scolopendrium* (L.) Newm. subsp. ***scolopendrium*** — $2n = 2x = 72$ (Fig. 3A, A').
(syn.: =*Asplenium scolopendrium* L.)

Bu: Strandza Mt, "Kachul Dol" near Gramatikovo, 42°02'N, 27°38'E, shady damp gully, mixed deciduous forest, 50-100 m, 20 Jun 1995, *Ivanova DI-111.95* (SOM).
— Strandza Mt, along gravel road from "Kachul Dol" to Kosti, along river Veleka, 42° 01'N, 27°39'E, in *Fagus orientalis* forest, 50-100 m, 22 Jun 1995, *Ivanova DI-132.95* (SOM).

P. scolopendrium subsp. *scolopendrium* is common in Europe, North Africa and Southwestern Asia - Caucasus, Anatolia in Turkey, Elburz, Iraq, Israel. In Bulgaria it occurs in damp shady places, more often in forests.

In the two specimens studied, the somatic diploid chromosome number $2n = 72$ was found. This observation is in accordance with the data reported from other European countries (Reekmans 1957, Meyer 1958a, 1958b, 1960, Emmott 1964, Löve & Löve 1973).

Manton (1950) indicates that during meiosis the chromosomes form 36 bivalents and this result has been confirmed by many authors (Vazart 1956, Reekmans 1957, Kempf 1967, Girard & Lovis 1968, Lovis & Vida 1969, Vida 1970, Manton & al. 1986, Queirós & Ormonde 1987, Queirós & Nogueira 1989).

838. *Asplenium fissum* Kit. ex Willd. — $2n = 2x = 72$ (Fig. 3B, B').

Bu: Northern Pirin Mt, along path from "Banderitza" hut to "Kazanite", 41°46'N, 23° 25'E, rock fissures, 2300 m, 16 Aug 1994, *Ivanova DI-99.94* (SOM).

This fern is a European endemic. It occurs in the mountains of Southern, Central and Southeastern Europe. In Bulgaria it was found on Vitosha Mt, Slavjanka Mt and Pirin Mt, where it grows in fissures of calcareous rocks.

We examined one population from Pirin Mt and found $2n = 72$, which corresponds with earlier reports by Meyer (1958a), and Nardi (1979), who counted $n = 36$ bivalents in spore mother cells.

839. *Ceterach officinarum* Willd. subsp. ***bivalens*** D. E. Meyer — $2n = 2x = 72$ (Fig. 3C, C').
(syn.: = *Asplenium ceterach* subsp. *bivalens* (D. E. Meyer) Greuter & Burdet; =*Asplenium javorkeanum* Vida; = *Ceterach javorkeanum* (Vida) Soó).

Bu: Western Balkan Foothill Region, "Vratzata" above Vratza town, 43°11'N, 23°30'E, on rocks of a southern slope, 700-800 m, 26 Jun 1994, *Georgiev DI-10.94, DI-11.94* (SOM).

C. officinarum subsp. *bivalens* is distributed mostly in Europe and is closely related to *C. officinarum* Willd. subsp. *officinarum*, which is distributed from Western Europe,

Mediterranean region, North Africa, Western Asia to the Himalayas. The two subspecies occur in fissures of dry, mainly calcareous rocks, or old walls.

Vida (1963) published the results from his studies on different representatives of the genus *Asplenium* (including the genus *Ceterach*). He discovered that most Hungarian populations of *C. officinarum* consist of diploid individuals, while in very few localities tetraploids were found. The diploids and tetraploids are similar morphologically, and the author claims that the diploid may be looked upon as the ancestor of the tetraploid. According to Vida (l.c.) the diploid cytotype deserves the rank of species and he calls it *Asplenium javorkeanum*. It differs from *C. officinarum* by its chromosome number and by some minor morphological features. Its distribution includes Hungary, Romania, Bulgaria, Jugoslavia, Albania and Italy (Vida 1963). Later Greuter & Rechinger (1967) added localities from Greece, and Anatolia (Greuter 1980). It may also be found in other areas.

Our counts agree with the diploid chromosome number, $2n = 72$, mentioned by Meyer (1964), Sušnik & Lovka (1970, 1973) and Pintér & Vida (1993).

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Reports (840-842) by Tiziana Cusma Velari, Laura Feoli Chiapella & Laura Mangiavacchi

840. ***Genista acanthoclada*** DC. subsp. ***acanthoclada*** — $2n = 48 + 0\text{-}2B$ (Fig. 1a, b).

Gr: Taýgetos Óros, gravel of the road side from Kalamata to Sparte, 10 km E. of Kalamata, 37°03'N, 22°10'E, 100 m, 24 Jul 1985, *L. Feoli Chiapella* (TSB) s.n.

Tu: Cesme (Izmir), garigue near the town, 38°20'N, 26°19'E, 30 m, 1 Aug 1996, *L. Feoli Chiapella* (TSB) s.n.

The chromosome number $2n = 48 + 0\text{-}2B$, based on 10 metaphase plates, was counted for populations both from Cesme and from Taýgetos Óros. Our counts differ from the only available reference. Contandriopoulos & Cardona (1984) report for "*Genista acanthoclada ssp. acanthoclada* de Grèce, Crète et région égéenne $2n$ = env. 36". Chromosome size ranges between 0.54 and 2.60 µm.

G. acanthoclada DC., eastern Mediterranean species (Vierhapper 1919, Gibbs 1966), belongs to the *G. acanthoclada* aggr. (Greuter & al. 1989), that also includes *G. sardoa* Valsecchi [= *G. acanthoclada* subsp. *sardoa* (Bèg. et Landi ex Landi) Valsecchi], a Sardinian endemic (Valsecchi 1975, 1984), and *G. balearica* Porta et Rigo [= *G. acanthoclada* subsp. *fasciculata* (Knoche) O. Bolòs et J. Vigo], endemic to Balearic Islands - Mallorca (Knoche 1922, Colom 1957).

The chromosome number $2n = 72$ was counted in *G. balearica* for material from Es Mal Pas- Mallorca (Cardona & Contandriopoulos 1983). *G. sardoa* instead has $2n = 52$ (Villa 1988, on populations from Alghero, Sardinia).

841. ***Genista aetnensis*** (Biv.) DC. — $2n = 52$ (Fig. 2).

It: Cesarò (ME, Sicily), 37°50'N, 14°43'E, 1200 m, Sep 1987, seeds obtained from Botanical Garden, Palermo (s.n., s. coll., s. exsicc.).

The chromosome number $2n = 52$, based on 12 metaphase plates, confirms the existing references. In fact Forissier (1973a) and Villa (1988) report $n = 26$ and $2n = 52$ for plants from the Etna (Sicily) and from Preda Rubbia (Villagrande Strisaili, Sardinia) respectively. Chromosome size ranges between 0.56 and 1.32 µm.

Genista aetnensis is spread in natural habitats in Sardinia and on the Etna Volcano in Sicily (Arrigoni & Vannelli 1967, Valsecchi 1993); it has been introduced for reforestation on the Vesuvius - Campania (Pignatti 1982); it is doubtfully native in Corse (Greuter & al. 1989).

The somatic chromosome number $2n = 52$ is uncommon in *Genista*; in sect. *Spartocarpus* Spach it has been found only in *G. aetnensis*, that differs from the other species of the section also morphologically. In fact Spach (1844) excluded this species from *Genista*, establishing the genus *Dendrospartum* Spach. More recently Valsecchi (1993) maintained the species in *Genista*, but referred it to the new monospecific section *Aureospartum* Valsecchi.

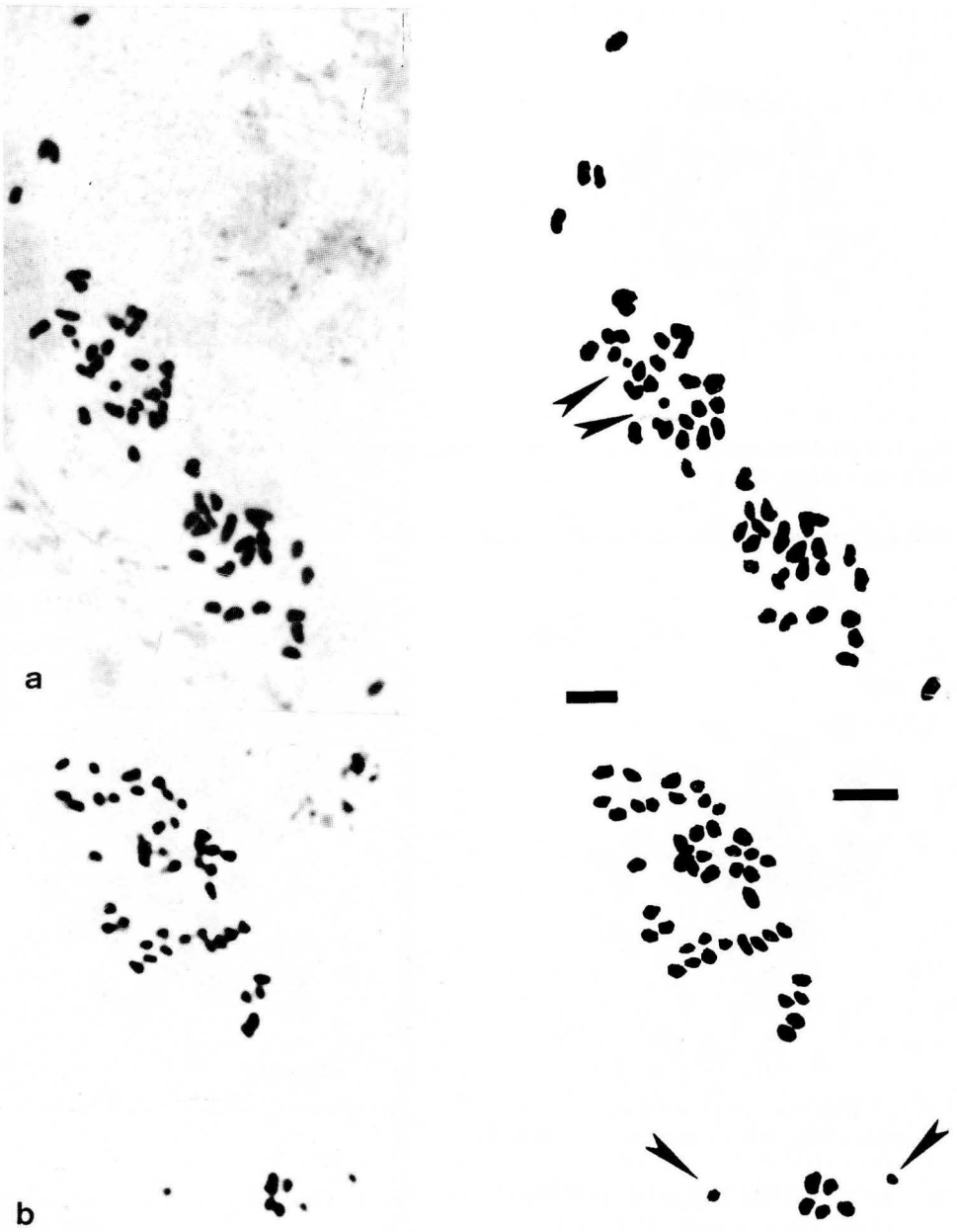

Fig. 1. A photomicrograph and a drawing somatic metaphase plate of: **a,** *Genista acanthoclada* - Cesme and **b,** *G. acanthoclada* - Taýgetos Óros, $2n = 48 + 2B$. Arrows indicate B-chromosomes. — Scale bars = 5 µm.

Fig. 2. A photomicrograph and a drawing somatic metaphase plate of *Genista aetnensis*, $2n = 52$. — Scale bar = 5 µm.

842. *Laburnum alpinum* (Miller) Berchtold & J. Presl — $2n = 48 + 2B$ (Fig. 3).

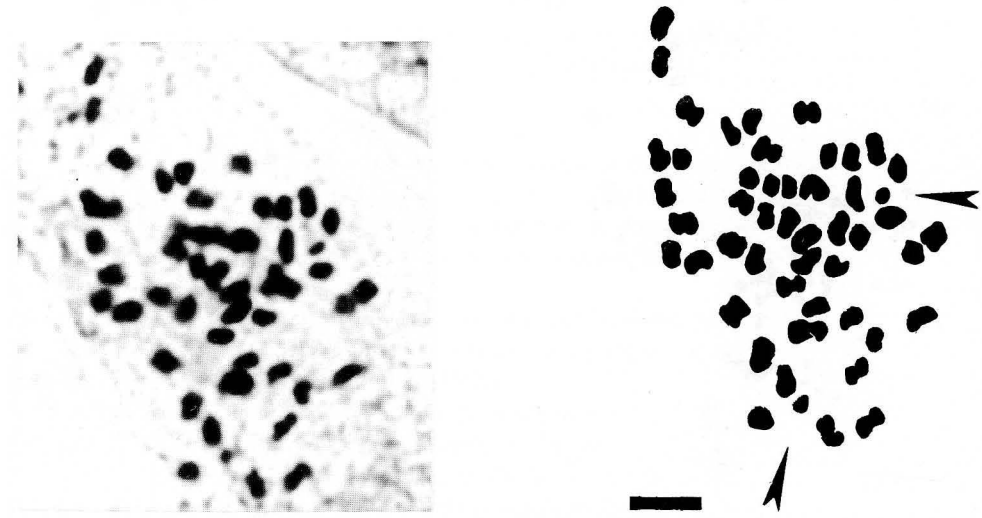

Fig. 3. A photomicrograph and a drawing somatic metaphase plate of *Laburnum alpinum*, $2n = 48 + 2B$. Arrows indicate B-chromosomes. — Scale bar = 5 µm.

It: M. Ceppo (IM - Liguria), 43°55'N, 07°45'E, seeds obtained from Botanical Garden, Genova (s.n., s. coll., s. exsicc.).

Our counts, based on 20 metaphase plates, have shown the chromosome number $2n = 48 + 2B$. The following numbers have been reported for this species: $n = 25$ (Forissier 1973b) for plants from Pontarlier (Doubs - Ga), $2n = 48$ (Uríková 1976) for populations from Podunajská nízina (Slovenská Republika), $2n = 48$ with a satellited pair (Gilot 1965)

and $2n$ = 48-50 (Tschechow 1931), both on cultivated material. Chromosome size ranges between 0.80 and 1.90 µm; B-chromosomes size is about 0.32 µm.

The genus *Laburnum* Fabr. includes two species: *L. alpinum*, a S-European orophyte, and *L. anagyroides* Medicus, a central-southern European species (Frodin & Heywood 1968, Pignatti 1982). The only karyological reference obtained on natural populations for the latter species is n = 25 (Fort de l'Ecluse - Ga, Forissier 1973b). Cultivated populations instead have been studied by several authors; $2n$ = 48 with a satellited pair and $2n$ = 50 with two satellited pairs were counted by Gilot (1965) and by Fernandes & Queirós (1978) respectively. Finally Strasburger (1905, 1907) and Ishikawa (1916, after Löve & Löve 1961) found $2n$ = 48.

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Rapports (843-854) de Régine Verlaque, Claude Reynaud & Annie Aboucaya

843. ***Legousia speculum-veneris*** (L.) Chaix — $2n = 20$ (Fig. 1).

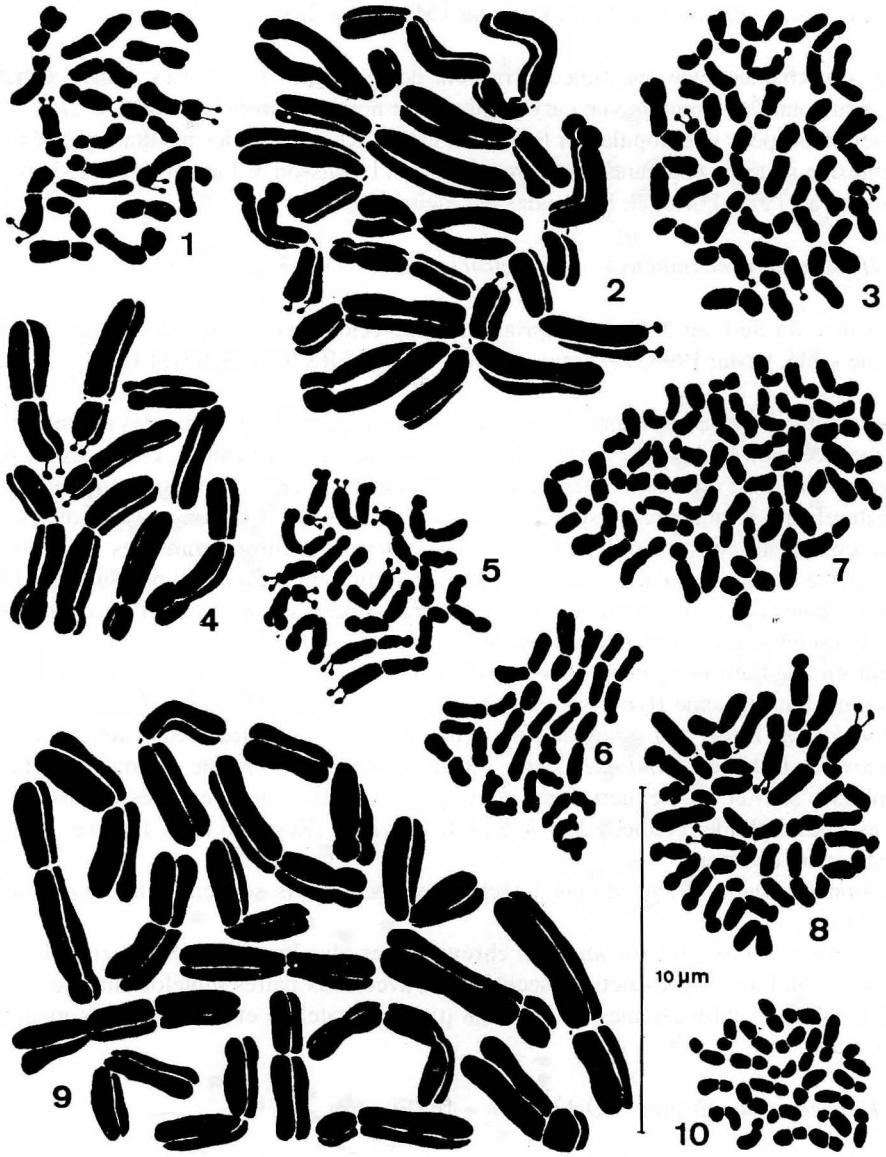
Ga: Bouches-du-Rhône, Jouques à Bèdes, 43°39'N, 5°40'E, lisière d'un champ de céréales, c. 390 m, Mai 1994, *Filosa* (MARS 94-3, 94-12).

Cette annuelle nord-méditerranéenne représente l'une des très rares messicoles qui ne soit pas vraiment menacée en France. Sur cette population de Provence, nous confirmons le nombre diploïde de $2n = 20$ établi précédemment sur des plantes du Nord de la France (Loon & Jong 1978), de Grèce (Contandriopoulos 1966), de Yougoslavie (Loon & Kieft 1980) et de Bulgarie (Ančev 1975). Soulignons d'ailleurs que ce nombre chromosomique caractérise l'ensemble du genre *Legousia*.

844. ***Lathyrus hirsutus*** L. — $2n = 14$ (Fig. 2).

Ga: Hautes-Alpes, St-Marcellin près de Veynes, 44°32'N, 5°49'E, bord de champ, c. 650 m, Juin 1994, *Filosa* (MARS 95-1).

Cette espèce euryméditerranéenne se range dans la longue liste des messicoles menacées en Provence. Ce premier comptage sur une population de France montre la grande stabilité caryologique de ce taxon diploïde, à $2n = 14$ à travers toute son aire, conformément aux résultats antérieurs (par exemple ceux de Fernandes & Queiros (1978) au Portugal, Luque & Diaz Lifante (1991) en Espagne, Colombo & Trapani (1990) en Sicile, Loon & Kieft (1980) en Grèce, Kožuharov & al. (1972) en Bulgarie et Magulaev (1980) au N.-Caucase).



Figs. 1-10. Métaphases somatiques de l'ovaire (Figs. 1 & 5 à 9), méristèmes racinaires (Figs. 2, 3, 10) et mitose pollinique (Fig. 4) de: **1**, *Legousia speculum-veneris*, $2n = 20$; **2**, *Lathyrus hirsutus*, $2n = 14$; **3**, *Ononis minutissima*, $2n = 30$; **4**, *Ranunculus monspeliacus*, $n = 8$; **5**, *Hypecoum procumbens*, $2n = 16$; **6**, *Hypecoum torulosum*, $2n = 16$; **7**, *Galium tricornutum*, $2n = 44$; **8**, *Linaria pelisseriana*, $2n = 24$; **9**, *Melampyrum arvense*, $2n = 18$; **10**, *Piptatherum miliaceum*, $2n = 24$.

845. *Ononis minutissima* L. — $2n = 30$ (Fig. 3).

Ga: Alpes-de-Haute-Provence, Lure, vallée du Jabron, 44°09'N, 5°57'E, coteau sec

caryotype (voir ci-dessus) semble assez distinct de celui de l'espèce voisine *H. procumbens* et très différent de celui de *H. pendulum* (Reynaud & al. 1992).

848. *Papaver argemone* L. subsp. ***argemone*** — $2n = 40$.

Ga: Indre-et-Loire, Noizay, 47°25'N, 0°53'E, bord de champ de céréales, c. 60 m, Juin 1995, *Filosa* (MARS 95-2).

Avec ce nouveau comptage d'individus provenant du Centre-Ouest de la France, nous confirmons le seul nombre chromosomique hypohexaploïde de $2n = 40$, déjà trouvé par nous sur plusieurs populations de Provence (Reynaud & al. 1992) de ce taxon messicole. La distribution du second cytotype euhexaploïde à $2n = 42$, en apparence plus fréquent d'après la bibliographie, reste à préciser; mais il semble plutôt être situé sur les marges Nord et Ouest de l'aire de cette sous-espèce européenne.

849. *Roemeria hybrida* (L.) DC. subsp. ***hybrida*** — $2n = 22$.

Ga: Bouches-du-Rhône, Bèdes près de Jouques, 43°39'N, 5°40'E, lisière de champ de céréales, c. 390 m, Mai 1994, *Filosa* (MARS 94-2).

Nous retrouvons, sur ces individus des Bouches-du-Rhône, le nombre chromosomique hypotétraploïde déjà établi par nous sur plusieurs populations du Vaucluse (Reynaud & al. 1992). Rappelons que si ce nombre paraît dominant dans le Sud de l'Europe, cette sous-espèce *hybrida* présente aussi d'autres cytotypes: un hexaploïde à $2n = 36$ en Provence (accidentel et jamais revu), un eutétraploïde à $2n = 24$ en Turquie et peut-être un diploïde à $2n = 12$ (plantes de Jardin botanique d'origine inconnue). Par contre, le subsp. *dodecandra* (Forsk.) Maire oriental est caractérisé par la seule valence tétraploïde ($2n = 24$). Des études complémentaires semblent donc nécessaires pour préciser la distribution approximative des différentes races chromosomiques de cette espèce messicole à $x = 6$ et ses relations phylogénétiques avec le reste du genre (deux autres espèces orientales et diploïdes à $2n = 14$, $x = 7$: Baytop 1983).

850. *Ranunculus monspeliacus* L. — $n = 8$ (Fig. 4).

Ga: Bouches-du-Rhône, près de Jouques à Bèdes, 43°39'N, 5°40'E, pelouses, c. 390 m, Mai 1994, *Filosa* (MARS 94-4, 94-5, 94-6).

Ce taxon vivace, des pelouses et pentes herbeuses de basse et moyenne altitude, s'étend sur une aire assez restreinte et morcelée au Nord-Ouest de la Méditerranée: Catalogne, S-France, Corse, Sardaigne, Sicile, Centre et Sud Italie. Les travaux antérieurs ont révélé l'existence de deux cytotypes chez cette espèce très polymorphe. Nos premiers comptages pour des populations françaises confirment le nombre chromosomique diploïde de $2n = 16$, trouvé en Catalogne vers 850 m (Diosdado & Pastor Diaz 1990) et dans le Centre de l'Italie à basse altitude (Province de L'Aquila: Marchi 1971). Par contre, les tétraploïdes ont été décelés dans la nature seulement en Italie (Province de Rome: Marchi & Visona

1982) en montagne vers 1350 m et dans plusieurs jardins botaniques. De nouvelles investigations paraissent indispensables pour préciser la distribution biogéographique de ces deux races et la validité des taxons infraspécifiques décrits (notamment les subsp. *monspeliacus* et *saxatilis* (Balbis) Nyman).

851. *Galium tricornutum* Dandy — $n = 22$; $2n = 44$ (Fig. 7).

Ga: Alpes-de-Haute-Provence, Hautes-Plaines près de Manosque, 43°30'N, 5°47'E, lisière de champ, c. 500 m, Mai 1994, *Filosa* (MARS 94-8).
— Bouches-du-Rhône, Bèdes près de Jouques, 43°39'N, 5°40'E, bord de champ de céréales, c. 390 m, Mai 1994, *Filosa* (MARS 94-1).

Pour cette messicole annuelle largement répandue dans l'Hémisphère Nord tempéré, nous confirmons le nombre tétraploïde de $2n = 44$ déjà établi par plusieurs auteurs, dans différents pays d'Europe (Kliphuis 1974, Ehrendorfer 1982), aux Canaries (Loon 1974) et en Syrie (Kliphuis & Barkoudah 1977). Ce résultat diffère de celui d'Ančev (1982), qui décrit un cytotype diploïde en Bulgarie.

852. *Linaria pelisseriana* (L.) Miller — $2n = 24$ (Fig. 8).

Co: Corse du Sud, Golfe de Roccapina, 41°30'N, 8°55'E, c. 50 m, friche en bord de champ, 9 Mai 1995, *Verlaque & Aboucaya* (MARS 95-115).

Cette annuelle (Nord) méditerranéo-atlantique, à aire disjointe et morcelée, présente deux cytotypes distincts. Notre premier comptage pour cette espèce en France corrobore le nombre chromosomique tétraploïde de $2n = 24$ mis en évidence précédemment aux Baléares (Dahlgren & al. 1971) et en Grèce (Strid & Franzén 1981). Compte tenu du manque de données caryologiques sur ce taxon, pour l'instant, seule la Sicile semble avoir conservé des populations diploïdes à $2n = 12$ (Larsen & Lagaard 1971). Soulignons, en outre, que la polyploïdie s'avère très rare dans ce genre (à 95 % diploïde); en Méditerranée et en Europe, seules 4 à 5 espèces de distribution essentiellement balkanique sont tétraploïdes.

853. *Melampyrum arvense* L. — $2n = 18$ (Fig. 9).

Ga: Alpes-de-Haute-Provence, Hautes-Plaines près de Manosque, 43°50'N, 5°47'E, champs de céréales, c. 500 m, Mai 1994, *Filosa* (MARS 94-7, 94-9).

Cette annuelle essentiellement (médio) européenne se range parmi les messicoles rares et menacées en France. Ce premier dénombrement d'une population française est en accord avec le nombre diploïde de $2n = 18$, déjà connu pour des stations plus nordiques (Tischler 1934: Schleswig-Holsteins; Greilhuber 1973: Autriche; Arohonka 1982: S-O. Finlande). En fait, jusqu'à présent aucune variation chromosomique n'a pu être décelée dans ce genre eurasiatique.

854. ***Piptatherum miliaceum*** (L.) Cosson — $2n = 24$ (Fig. 10).

Ga: Bouches-du-Rhône, Carry-le-Rouet, 43°18'N, 5°09'E, bord de chemin, c. 10 m, Juin 1992, *Verlaque* (MARS 92-26).
— Gironde, près de Bordeaux, 44°50'N, 0°34'E, talus rocailleux, c. 60 m, Juillet 1992, *Reynaud* (MARS 92-6).

Cette rudérale méditerranéo-touranienne, pourtant très répandue, a fait l'objet de peu d'études caryologiques. Notre comptage, le premier pour la flore française, corrobore le nombre tétraploïde de $2n = 24$ établi seulement en Espagne (Devesa & al. 1991, Luque & Diaz Lifante 1991) et en Libye (Faruqui & al. 1987).

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Reports (855-872) by Minčo E. Ančev & Valentina Goranova

855. ***Arabidopsis thaliana*** (L.) Heynh. — $2n = 10$ (Fig. 1A, B).

Bu: Pirin Mt, in fallow fields above Rožen monastery, 41°32' N, 23°26' E, 600 m, *Ančev & Hardalova*, A8831 (SOM).
— The Central Stara planina Mts, waste ground, above the village of Enina, 700 m, 42° 43' N, 25°24' E, *Hardalova & Ančev A88540* (SOM).

The chromosome number $2n = 10$ is the first countbase on Bulgarian material. It agrees with numerous earlier reports from the large Euro-Asiatic distribution of *A. thaliana* (see

Fedorov 1969: 163, Jalas & Suominen 1994: 34 for references). The karyotype is symmetrical, consisting of chromosomes predominantly of m-type. It differs slightly from the C-banded karyotype described by Ambros & Schweizer (1976: 168, fig. 1; p. 170).

856. *Bunias erucago* L. — $2n = 14$ (Fig. 1C).

Bu: Struma valley, Malak Kožuh Mt, on south facing slope in a plant community dominated by *Paliurus spina-christi, Carpinus orientalis* and *Jasminum fruticans*, 41°23' N, 23°20' E, 150 m, *Ančev A8197* (SOM).

The chromosome number $2n = 14$ agrees with the number reported from Italy (Polatschek 1983: 130) and former Czechoslovakia (Hejny & Slavik 1992: 46).

The chromosome set of the studied material consists of $2n = 2x = 12sm + 2sm\text{-}st = 14$.

857. *Cardaminopsis arenosa* (L.) Hayek subsp. ***arenosa*** — $2n = 16$ (Fig. 1D)

Bu: Osogovska Mt, open rocky slopes, 42°14' N, 22°37' E, 900 m, *Ančev A9065* (SOM).

The diploid chromosome number $2n = 2x = 16$ from S.W. Bulgaria confirms an earlier report by v. Loon & v. Setten (1982: 589) from Pirin Mt of Bulgaria.

The tetraploid number of $2n = 32$ and occasionally the number of $2n = 39\text{-}40$ were also reported (see Jalas & Suominen 1994: 179 for references).

The chromosomes in the diploid cytotype are small, with a similar size and without distinct centromeres.

858. *Clypeola jonthlaspi* L. — $2n = 32$ (Fig. 1F).

Bu: Znepole region, Konjavska Mt, open limestone slopes, 42°22' N, 22°55' E, 650 m, *Ančev A864* (SOM).

The tetraploid chromosome number of $2n = 4x = 32$, a first count for the Bulgarian flora, agrees with a record from France (see Jalas & Suominen 1996: 76 for references).

The karyotype consists of small chromosomes, slightly differentiated in length, without visible position of the centromeres.

The wide morphological variation of this South-Europaean annual autogamous species was taxonomically organized by recognizing in rather numerous taxa of various infraspecific status (Breitstroffer 1936, 1946; Jalas & Suominen 1996: 76).

In the process of summarizing karyological data, we prefer to adopt the narrow species concept and accept *C. jonthlaspi* L. and *C. microcarpa* Moris as distinct species.

859. *Clypeola microcarpa* Moris. — $2n = 16$ (Fig. 1E).

Bu: Pirin Mt, open limestone slopes above the village of Ilindentsi, 41°39' N, 23°14' E, 600 m, *Ančev A8850* (SOM).

Fig. 1. Mitotic metaphase plate of: **A, B**, *Arabidopsis thaliana*, A8831 & A88540, $2n = 10$; **C, a** (karyotype) & **b** (karyogram), *Bunias erucago*, A8197, $2n = 14$; **D**, *Cardaminopsis arenosa*, A9065, $2n = 16$; **E**, *Clypeola microcarpa*, A8850, $2n = 16$; **F**, *C. jonthlaspi*, A864, $2n = 32$. — Scale bar = 10 µm.

The diploid chromosome number $2n = 2x = 16$, the first record from Bulgaria, corresponds to the number reported from Spain (Luque & Lifante 1991: 308) and France (see Jalas & Suominen, 1996: 76 for references), under the name of *C. jonthlaspr* subsp. *microcarpa* (Moris) Arcangeli. The tetraploid number $2n = 32$ was counted in material from Iran (Jalas & Suominen, l.c.).

The chromosomes of the studied karyotype were medium sized and short, differentiated in length, as two pairs (n° 1, 2) exceeded in length the rest ones in the karyotype.

860. *Erophila verna* (L.) Cheval. — $2n = 52$ (Fig. 3C).

Bu: Vitoša Mt, open grassy slopes, 42°32' N, 23°22' E, 900 m, *Ančev A9412* (SOM).

This polyploid chromosome number is the first count base on Bulgarian material. *E. verna*, an autogamous annual species, shows a wide karyological variation, our count agrees with some of the numerous cytological reports for the species (see Jalas & Suominen 1996: 109-110 for references). The plants from the studied population morphologically belong to *E. verna* s.str.

The karyotype consists of small, well-differentiated in length chromosomes. Most of them are without any visible primary constriction.

861. *Hesperis dinarica* G. Beck. — $2n = 24$ (Fig. 2Ba,b).

Bu: Vitoša mountain, the nature reserve "Bistriško branište", in open rocky glades, 42° 34' N, 23°20' E, 1800 m, *Ančev A87227* (SOM).

The tetraploid chromosome number $2n = 4x = 24$ reported here for the first time from Bulgaria, confirms an earlier count base on plants of unknown origin (see Jalas & Suominen 1994: 99 for references). The karyotype is asymmetrical, with $2n = 4x = 12m + 6sm + 2st + 2t(?) + 2SAT\text{-}sm\text{-}st = 24$ chromosomes.

862. *Hesperis laciniata* All. subsp. ***laciniata*** — $2n = 12$ (Fig. 2Aa,b).

Bu: Struma valley, Mt Malak Kožuh, on dry south facing slopes, in thickets of *Paliurus spina-christi, Cotinus coggygria, Jasminun fruticans* and *Coronilla emerus*. 41°23' N, 23°20' E, 150 m, *Ančev A8184* (SOM).

The diploid chromosome number $2n = 2x = 12$ was reported earlier for *H. laciniata* All. (Ančev & Peneva-Nikolova 1984). Here we describe the karyotype of the studied plant population which is symmetrical with $2n = 2x = 8m + 4sm = 12$ chromosomes.

863. *Hesperis sylvestris* var. ***velenovskyi*** Fritsch — $2n = 12, 14$ (Fig.3-Aa,b, B).

Bu: Balkan foothill region, Markova mogila, dry bushy places, limestone ground, 43° 18'N, 24°05' E, 300 m, *Ančev A90112* (SOM).

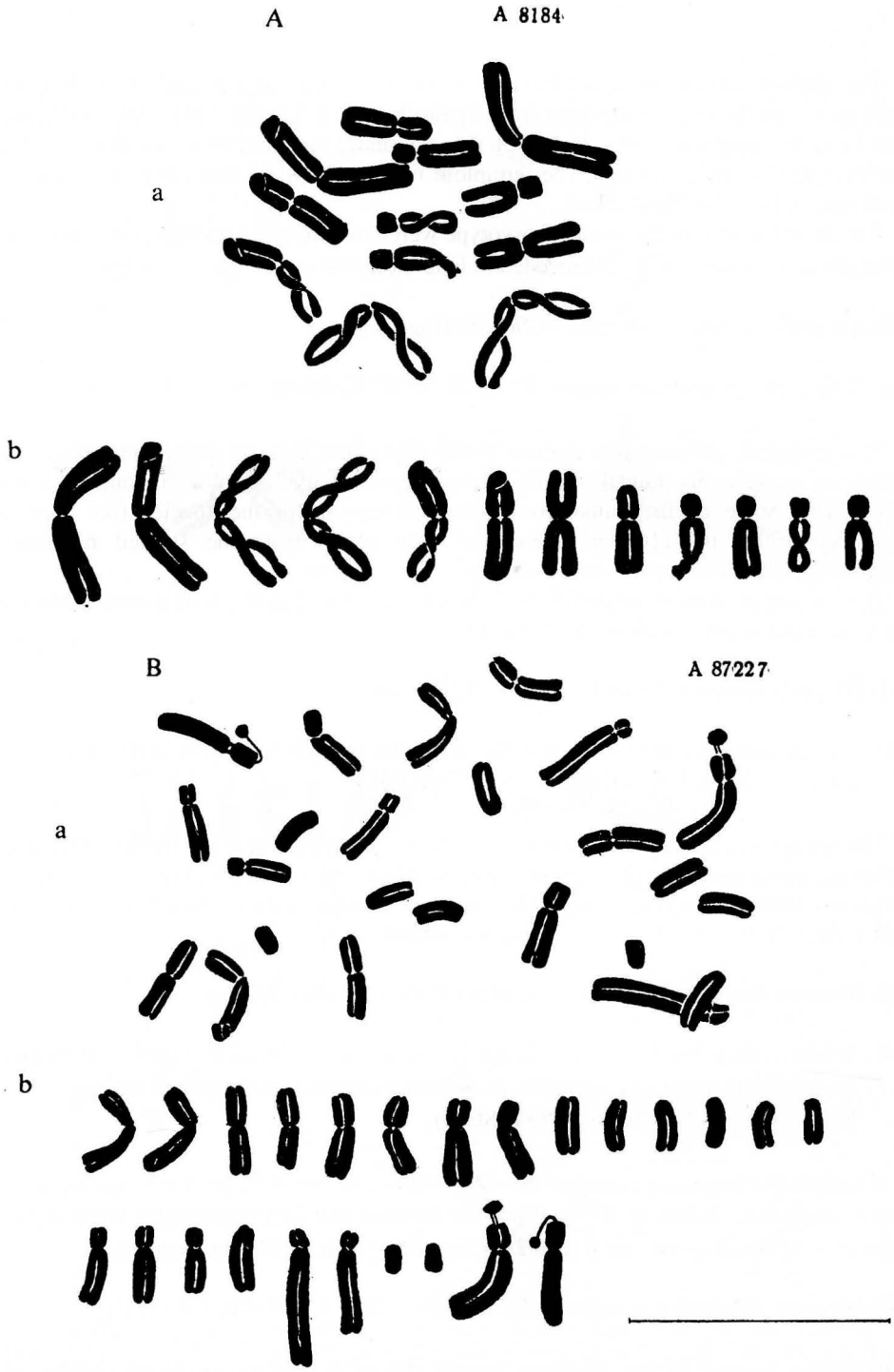

Fig. 2. Karyotypes (**a**) and karyograms (**b**) of: **A,** *Hesperis laciniata* subsp. *laciniata*, A8184, $2n = 12$; **B,** *H. dinarica*, A87227, $2n = 24$. — Scale bar = 10 µm.

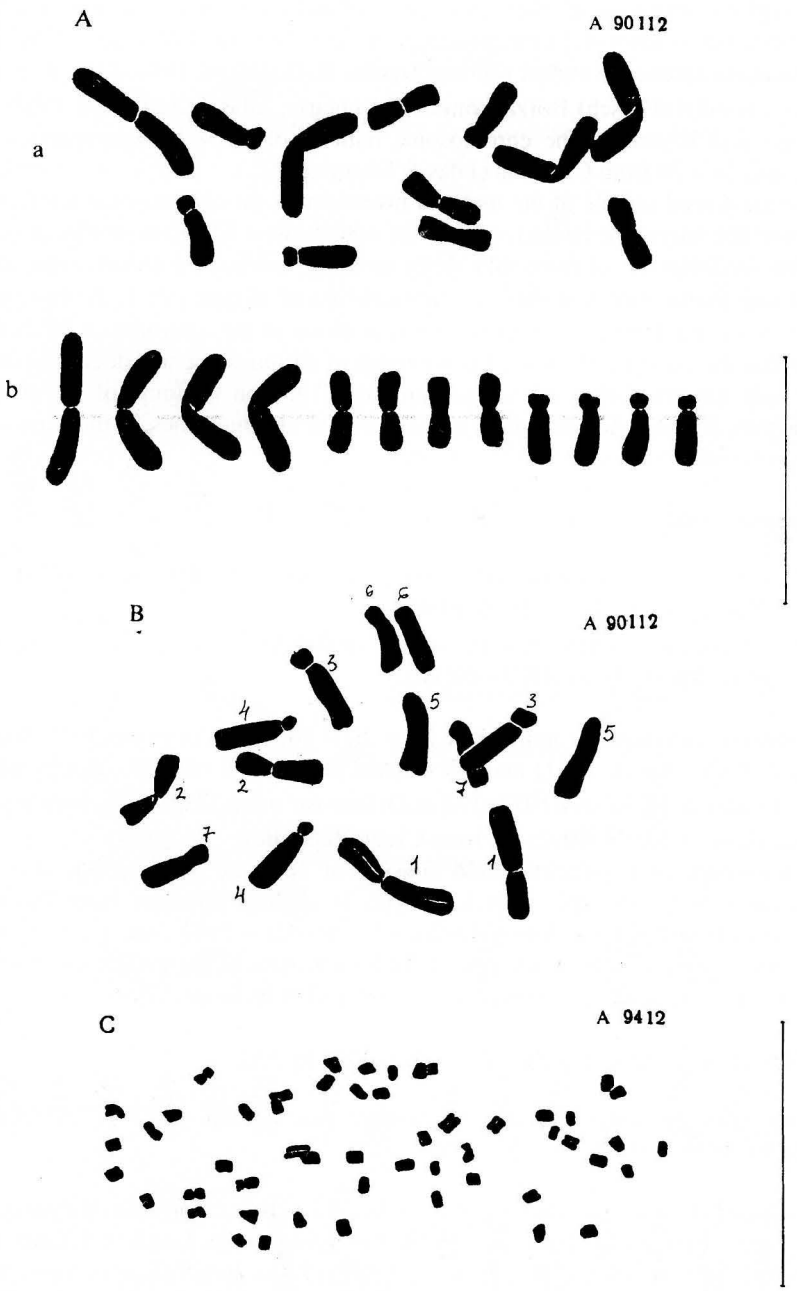

Fig. 3. Karyotypes (**a**) and karyogram (**b**) of: **A,** *Hesperis sylvestris* var. *velenovskyi*, A90112, $2n$ = 12; **B,** *Hesperis sylvestris* var. *velenovskyi*, A90112, $2n$ = 14; **C,** *Erophyla verna*, A9412, $2n$ = 52. — Scale bar = 10 μm.

Two diploid chromosome numbers of $2n = 12$ and $2n = 14$ were found in seedlings of *H. sylvestris* var. *velenovskyi* from a locality in the Balkan foothill region, N.W. Bulgaria. These numbers agree with earlier reports (Dvořák & Dadáková 1974: 128, as *H. sylvestris* subsp. *velenovskyi* (Fritsch) Borza from N.E. Bulgaria; Jalas & Suominen 1994: 97, from C. Europe and Krymea). The chromosome number of $2n = 16$ was reported from C. Europe, and $2n = 28$ from Caucasia (Jalas & Suominen l.c.).

In the mass seed sample of the material investigated, the chromosome number $2n = 12$ dominates. The karyotype consists of $2n = 2x = 8m + 4st = 12$ chromosomes (Fig. 3Aa, b).

In four seedlings out of more than thirty seedlings studied the chromosome number of $2n = 14$ was found, with two pairs of chromosomes of m-type (n°: 1, 2), two pairs of st-type (n°: 3, 4) and three pairs without visible position of the centromeres (n° 5, 6, 7). We suppose that the cytotype of $2n = 14$ is the result of chromosome translocations in $2n = 12$. We exclude the possibility of "squash produced" fission of some of the long m-type chromosomes in the cytotype with $2n = 12$, as the chromosomes in the karyotype with $2n=14$ seem well spiralized and differentiated.

864. ***Hesperis tristis*** L. — $2n = 14$ (Fig. 4A, B).

Bu: Black Sea coast, Arkutino, on sandy places along thickets, near to the seashore, 42°23'N, 27°39' E, *Ančev A926* (SOM).

— West Stara planina Mts, near the village of Gradets, in limestone glades, 44°02' N, 22°45' E, 900 m, *Ančev A9420* (SOM).

The diploid chromosome number of $2n = 2x = 14$, found in plants from South Black Sea coast, *A926* (Ančev 1981) and West Stara planina Mt. *(A9420)*, agrees with earlier reports (Dvořák & Dadáková 1974: 123 as *Deilosoma tristis* (L.) Spach, both reports from Slovakia; Hejny & Slavik 1992: 52, from Czech Republic).

The karyotype of population *A926* consists of $2n = 2x = 6m + 4sm\text{-}st + 4st = 14$ chromosomes (Fig. 4Aa, b). This karyotype is slightly different from the karyotype observed in plants from population *A9420*, with $2n = 2x = 8m + 2sm + 2sm\text{-}st + 2st = 14$ chromosomes (Fig. 4Ba, b) where one of the homologues of the longest chromosome pair (n° 1) has a faint secondary constriction near the end of its longer arm.

865. ***Hornungia petraea*** (L.) Reichb. — $2n = 12$ (Fig. 5A).

Bu: Struma valley, along railroad embankments near Zemen, 42°28' N, 22°45' E, 500 m, *Ančev A9212* (SOM).

The diploid chromosome number of $2n = 2x = 12$, a first report from Bulgaria, confirms earlier counts (Franzén & Gustavsson 1983: 103 from Greece, Luque & Lifante 1991: 103 for material from Spain; see also Fedorov 1969: 173 as *Hutschinsia petraea* (L.) R. Br. and Jalas & Suominen 1996: 138, for references). The haploid chromosome number of $n = 6$ was also reported (see Goldblatt & Johnson 1994: 69 for a reference). The karyotype studied consists of rather small, similar in length chromosomes. A pair of SAT-chromosomes with micro-satellites was observed in most of the studied karyotypes.

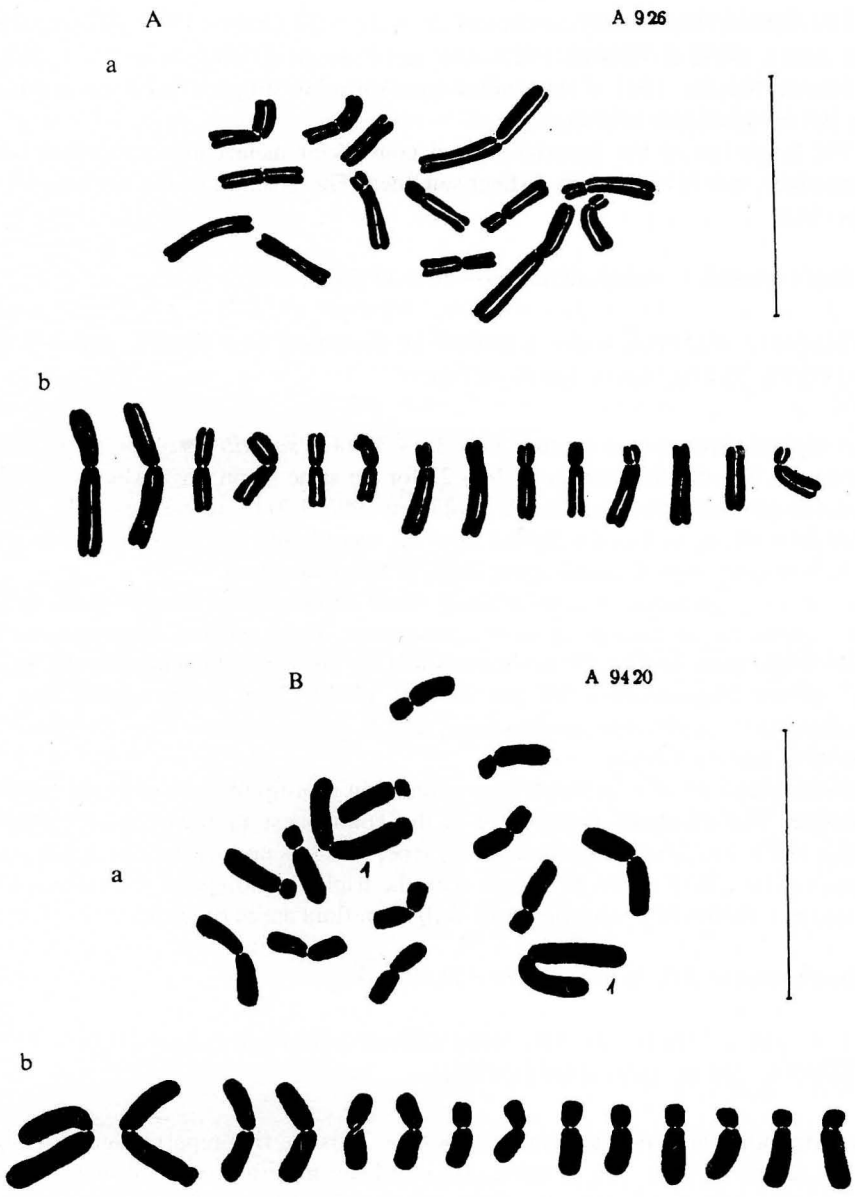

Fig. 4. Karyotypes (**a**) and karyograms (**b**) of *Hesperis tristis*, A926 (**Aa, b**) & A9420 (**Ba, b**), $2n = 14$. — Scale bars = 10 µm.

866. *Iberis sempervirens* L. — $2n = 22$ (Fig. 5C).

Bu: Central Stara planina Mts, the locality Orlovo gnezdo, limestone open rocky glades, 42°43' N, 24°42' E, 1600 m, *Ančev A86308* (SOM).

The diploid chromosome number of $2n = 2x = 22$ (Ančev 1978: 532) agrees with earlier counts (Strid & Franzén 1981: 834, and Franzén & Gustavsson 1983: 104, both from Greece, Nikolov 1991: 70 in material from Pirin Mt, Bulgaria, see Jalas & Suominen 1996: 168 for additional references).

The karyotype of the material studied consists of metacentric and submetacentric chromosomes, two of them with distinct satellites. The position of the centromere is not always clear.

867. ***Iberis saxatilis*** L. subsp. ***saxatilis*** — $2n = 33$ (Fig. 5D).

Bu: Slavjanka Mt, open rocky grassland on limestone near Tsarev vrăh, 41°23' N, 23°37'E, 2100 m, *Ančev A9549* (SOM).

The triploid chromosome number $2n = 3x = 33$ of *I. saxatilis* is reported probably for the first time. The diploid number of $2n = 22$ for the same taxon was earlier reported from France, Greece and Spain (see Jalas & Suominen 1996: 170 for references). The tetraploid number $2n = 44$, as well as the diploid $2n = 22$, were found in *I. saxatilis* subsp. *cinerea* (Poiret) Font Quer in plants from Spain (Jalas & Suominen, l.c.).

The karyotype consists of comparatively small chromosomes most of them similar in length without any distinct position of centromeres. Three pairs of chromosomes of m-type are longer than the rest. What is remarkable for this triploid population of *I. saxatilis*, is the pollen characteristics of the studied plants. The pollen grains are rather heteromorphous, varied from small to large, with E- pollen diameter from 20 μm to 37.5 μ m, tricolpate and tetracolpate.

The chromosomes of *I. saxatilis* were counted in root-tip mitoses of plants grown in a greenhouse. The tricolpate pollen type is the commonest in *Brassicaceae* (Rollins & Banerjee 1979: 34). The tetracolpate pollen type, which is unusual for the family (Rollins & Banerjee, l.c.), here seems to coexist with the triploid cytotype of *I. saxatilis*. Further biosystematic studies of *I. saxatilis* in the Bulgarian flora are in progress.

868. ***Isatis praecox*** Kit. ex Tratt. — $2n = 28$ (Fig. 5E).

Bu: The Central Stara planina Mts, along railroad embankments near Zverino, 43°05' N, 23°33' E, 350 m, *Ančev A9278* (SOM).

The tetraploid chromosome number $2n = 4x = 28$ is the first report based on Bulgarian material. Murin (1974: 12) counted $2n = 14$ in material from former Jugoslavia, Juhoslovensky kras, as "*I. tinctoria* subsp. *praecox* (Kit.) Dom." The chromosomes in all studied chromosome sets were small and similar in length. Two pairs of chromosomes with microsatellites were observed in most of the studied complements. There are different taxonomic treatments for *I. praecox*. Jalas & Suominen (1994: 43) accepted a broader species concept including *I. praecox* under the synonymy of *I. tinctoria* L., known to have diploid ($2n = 14$) and tetraploid ($2n = 28$) chromosome numbers. Here we follow the concept maintained by Assenov (1970) and Ball & Akeroyd (1993), where *I. praecox* and *I. tinctoria* are retained as distinct species.

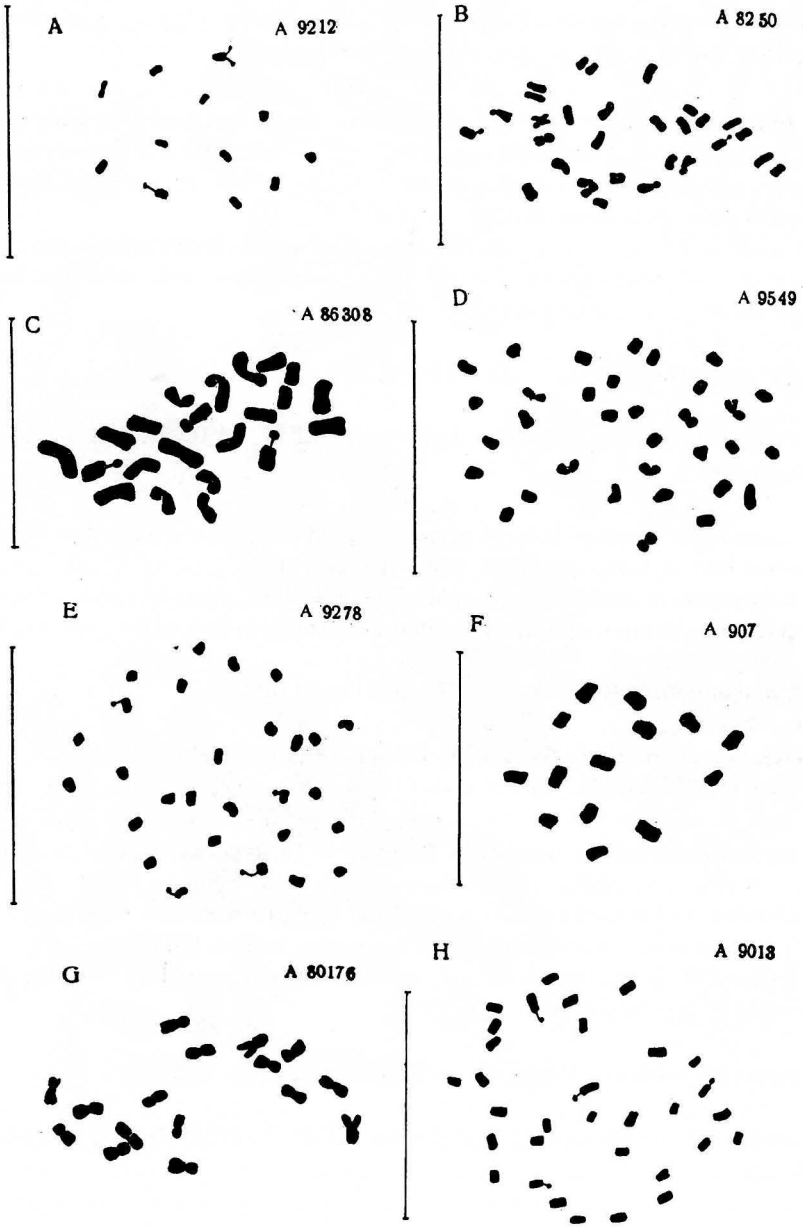

Fig. 5. Mitotic metaphase plates of: **A,** *Hornungia petraea,* A9212, $2n = 12$; **B,** *Lunaria rediviva,* A8250, $2n = 30$; **C,** *Iberis sempervirens,* A86308, $2n = 22$; **D,** *I. saxatilis,* A9549, $2n = 33$; **E,** *Isatis praecox,* A9278, $2n = 28$; **F,** *Myagrum perfoliatum,* A907, $2n = 14$; **G,** *Rorippa amphibia,* A80176, $2n = 16$; **H,** *R. sylvestris,* A9013, $2n = 32$. — Scale bars = 10 μm.

869. *Lunaria rediviva* L. — $2n = 30$ (Fig. 5B).

Bu: Balkan foothill region, Markova mogila, dry bushy places, limestone ground, 43°18'N, 24°05' E, 300 m, *Ančev A8250* (SOM).

The chromosome number $2n = 30$, reported here for the first time from Bulgaria, agrees with earlier counts from Europe (Manton 1932: 520-521; see Jalas & Suominen 1996: 18 for references). The tetraploid number of $2n = 28$ and "in one specimen" of $2n = 60$ were also reported (Jalas & Suominen, l.c.).

The karyotype of the material studied consists of small chromosomes, most of which belong to m- and sm-type. A pair of SAT-chromosomes with microsatellites were observed in most of the seedlings.

870. *Myagrum perfoliatum* L. — $2n = 14$ (Fig. 5F).

Bu: Danube plane, along fields near Lukovit, 43°12' N, 24°09' E, 200 m, *Ančev A907* (SOM).

The chromosome number $2n = 14$ agrees with three previous counts from France, Iran and Iraq (see Jalas & Suominen 1994: 40 for references).

The karyotypes in the seedlings studied consisted of medium-sized, comparatively similar in length, chromosomes, mostly without a visible position of the centromeres.

871. *Rorippa amphibia* (L.) Besser — $2n = 16$ (Fig. 5G).

Bu: Black Sea coast, along the marshy borders of Arkutino blato, 42°23' N, 27°39' E, *Ančev A80176* (SOM).

The diploid chromosome number of $2n = 2x = 16$, reported for the first time from Bulgaria, agrees with earlier counts from Europe (see Fedorov 1969: 176, Jalas & Suominen 1994: 133 for references). A tetraploid cytotype with 2n = 32 was also reported from different countries of the continent (Fedorov, l.c.; Jalas & Suominen, l.c.).

The karyotype is symmetrical and consists of comparatively similar in length chromosomes of m- and sm- type.

872. *Rorippa sylvestris* (L.) Besser — $2n = 32$ (Fig. 5H).

Bu: Danube plane, wet meadows near Popitsa, 43°26' N, 23°51' E, 180 m, *Ančev A9013* (SOM).

The tetraploid chromosome number of $2n = 4x = 32$, reported here for the first time from Bulgaria, corresponds to a count from Portugal. An hexaploid number of $2n = 48$ was reported from Britain (see Jalas & Suominen 1994: 135 for references under the name *R. sylvestris* subsp. *sylvestris*).

The chromosomes in the studied material are short, with two or three pairs of them being very short. Two chromosome pairs with small satellites were observed in most of the studied karyotypes.

Acknowledgements

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Reports (873-877) by Minčo E. Ančev, Karol Marhold & Valentina Goranova

873. *Cardamine acris* Griseb. — $2n = 16$ (Fig. 1A, B).

Bu: Pirin Mts, the Demjanica river valley, in wet glades by streams and springs, 1800 m, 41°44'N, 23°27'E, *Ančev & Marhold A95111* (SOM).

— The Central Stara planina Mts, Zlatiško-Tetevenska planina. On wet places along stream, above the village of Anton, 900 m, 42°44'N, 24°16'E, *Ančev A9611* (SOM).

Distributed in S.E. Europe in the mountains of the Balkan Peninsula, C. Italy and N. Anatolia to Caucasus in the east (Jalas & Suominen 1994, Strid 1986, as *Cardamine raphanifolia* subsp. *acris* (Griseb.) O. E. Schulz). The chromosome number $2n = 2x = 16$ is published here, as far as we know, for the first time. The karyotype is symmetrical, consisting of m- and sm-type chromosomes. A pair of SAT- chromosomes with very small satellites was found in all studied complements. No significant differences in the chromosome morphology were observed between the two populations studied.

The diploid chromosome number $2n = 16$ of *C. acris* deserves additional attention. The treating of *C. acris* as a subspecies of *C. raphanifolia* Pourret seems now more problematic than earlier, as for *C. raphanifolia* subsp. *raphanifolia* two polyploid numbers, $2n = 44$, (unknown origin) and $2n = 46$ (Br), (subspecific identity uncertain) (see Jalas & Suominen 1994: 156, for references) were reported.

874. *Cardamine amara* L. subsp. ***amara*** — $2n = 16$ (Fig. 1C, D).

Bu: The Central Stara planina Mts, Zlatiško-Tetevenska planina. Open wet places along stream, above the village of Anton, 900 m, 42°44'N, 24°16'E, *Ančev A9610* (SOM).

— The Central Stara planina Mts, Kaloferska planina. In floods by stream on the bed of narrow mountain valley, in mixed forests dominated by *Fagus sylvatica*, 1230 m, 42°42'N, 24°54'E, *Ančev A96113* (SOM).

Distributed in most of Europe (Jalas & Suominen 1994, Marhold 1995), extending south-east to the W. & C. Stara planina Mts in Bulgaria. The chromosome number $2n = 2x = 16$ confirms many earlier reports from diverse parts of the species distribution (Marhold 1994a: 27-31, Jalas & Suominen 1994: 154, for references, Marhold & al. 1996: 201). The karyotype (Fig. 1C, D) is published here for first time from Bulgarian material. The chromosomes are small, of m- and sm- type, and one pair (pair n°1) slightly exceeds in length than the other ones (Fig. 1C, D).

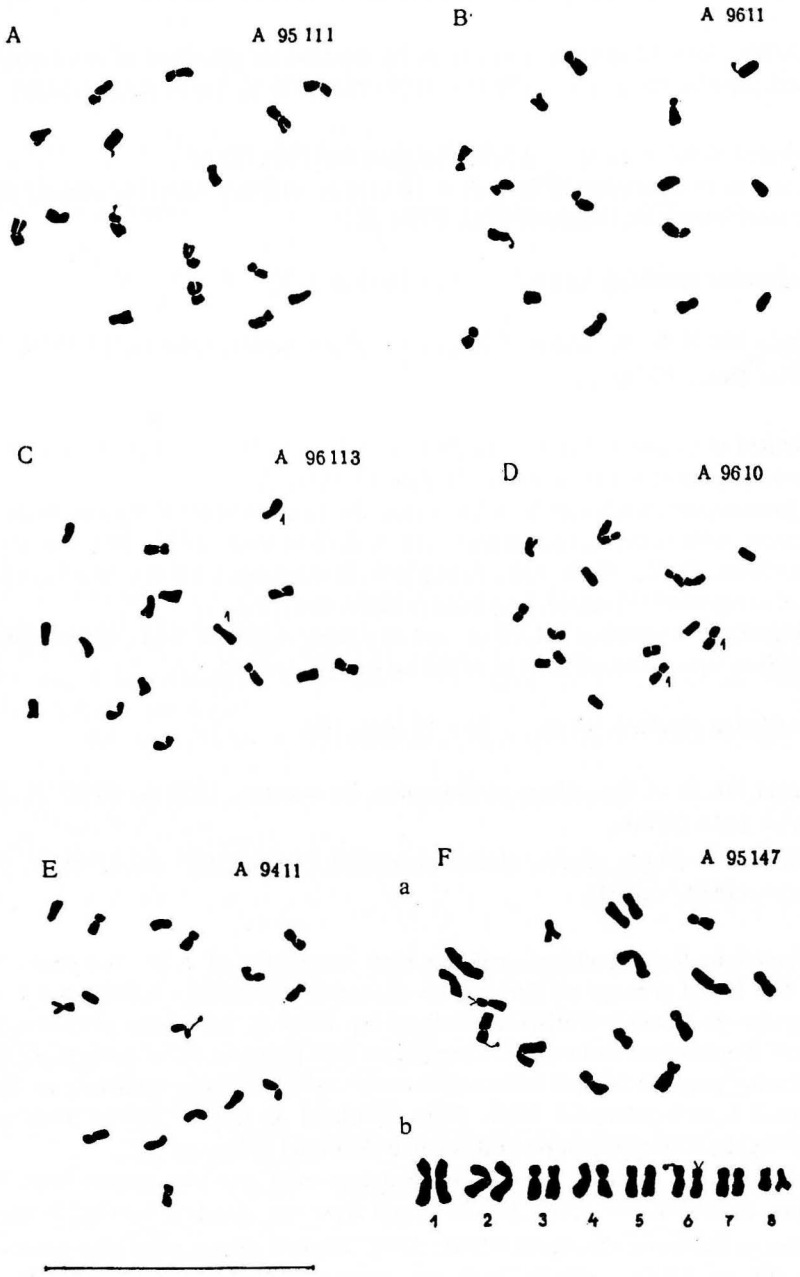

Fig. 1. Mitotic metaphase plates of: **A, B**, *Cardamine acris*, $2n = 16$; **C, D,** *C. amara* subsp. *amara*, $2n = 16$; **E,** *C. matthioli*, $2n = 16$; **F,** karyotype (**a**) and karyogram (**b**) of *C. rivularis*, $2n = 16$. — Scale bar = 10 µm.

875. *Cardamine amara* subsp. ***balcanica*** Marhold, Ančev & Kit Tan — $2n = 16$.

Bu: Rila Mt., Beli Iskar river, wet places by streams, in clearings of coniferous forests dominated by *Picea abies*, 1700 m, 42°14'N, 23°33'E, *Ančev A9520* (SOM).

Distributed in the mountains of S.W. Bulgaria and N.E. Greece.

The chromosome number of $2n = 2x = 16$ is in accordance with data already published from the same mountain (Marhold & al. 1996: 201).

876. *Cardamine matthioli* Moretti. — $2n = 16$ (Fig. 1, E).

Bu: Vitoša Mt, N.W. of village of Železnica, in wet glades, 1200 m, 42°32'N, 23°22'E, *Ančev A9411* (SOM).

Distributed in C. and S. Europe (Marhold 1994b, Jalas & Suominen 1994, map 2356 as "*Cardamine pratensis* subsp. *matthioli*" (Moretti) Nyman).

The chromosome number of $2n = 2x = 16$ is the first count for Bulgarian material. It is in agreement with many earlier reports (Jalas & Suominen 1994: 163, for references, Marhold 1994a: 23-24, 1994b: 353). Aneuploid chromosome numbers $2n = 17, 18, 19, 20, 21$ were also reported (Marhold, l.c.; Jalas & Suominen, l.c.).

The karyotype is symmetrical, of m- and sm- type. A pair of SAT- chromosomes with small satellites was observed in most of the karyotypes studied.

877. *Cardamine rivularis* Schur. — $2n = 16$ (Fig. 1F).

Bu: Vitoša Mt, S. of the village of Železnica, by streams, 1200 m, 42°32'N, 23°22'E, *Ančev A916* (SOM).

— Rila Mt, in boggy glades, above Manastirska reka, 2190 m, 42°06'N, 23°23'E, *Ančev A95147* (SOM).

Distributed in S. Carpathians and the high mountains of S.W. Bulgaria (Marhold 1994b). The broad concept of this species accepted by Lövkvist (1956) and Urbanska-Worytkiewicz & Landolt (1974) as well as by Jalas & Suominen (1994) cannot be maintained. Populations from the S. Carpathians and Bulgaria differ from those from the Alps in having purplish anthers before dehiscence and hairs being appressed on the rachis of the basal leaves (Marhold 1995, 1996, Marhold & Rayner 1994). This was also confirmed by the lectotypification of this name (Marhold & Rayner l.c.).

The chromosome number $2n = 2x = 16$ agrees with previous counts from Bulgaria (Kuzmanov & Kožuharov 1969: 110-111) and from the classical locality in the Muntii Făgărasului in Romania (Marhold 1994b: 336). Triploid plants were also reported from Romania (Marhold l.c.), while the diploid and tetraploid counts reported for this species from Central Europe (see Jalas & Suominen 1994: 164 for references) do not correspond to this taxon in its narrow sense.

The karyotype is symmetrical. The chromosomes are mostly of sm- type. They are well differentiated in length, as follows: two pairs of chromosomes (n° 1 and n° 2) are comparatively long, four pairs (n° 3, 4, 5 and 6) are of medium size, one pair (n° 7) is somewhat shorter, and one pair of chromosomes (n° 8) is short. A pair of SAT-chromosomes (n° 6) with very small sattelites was observed in most of the studied karyotypes. This karyotype is not significantly different from the karyotype published by Kuzmanov & Kožuharov (1969: 113, fig. 3), althought they reported a pair of acrocentric chromosomes (Kuzmanov & Kožuharov, l.c. p. 111), something we did not notice. The difference is probably coming from the nomenclature for centromeric position of chromosomes accepted here (Levan & al. 1965), than from actual differences between the two karyotypes studied.

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Reports (878-884) by Rossella Marcucci & Noemi Tornadore

878. ***Dianthus japigicum*** Bianco et Brullo — $2n = 30$ (Fig. 1A, A_1).

It: Place "Ciolo", rocky sites near the sea (LE-Apulia), 39°50'N, 18°22'E, 25 Nov 1993, *S. Marchiori* (LEC).

Endemic to Apulia. *Dianthus japigicum* was previously assigned to *D. rupicola* Biv. but then it was identified as a specific unit by Brullo (1988); see also Tornadore & al. (1995).

This count is the first report for the species; it confirms the number given for the genus by other authors (see Petrova 1995).

879. ***Opuntia compressa*** (Salisb.)Mcbride — $2n = 44$ (Fig.1B, B_1).

It: Mt. Ceva, Euganean Hills (PD-Veneto), 45°19'N, 11°41'E, 22 Apr 1995, *C. Tietto* (*cult.* Hort. Bot. Padova)

Opuntia compressa, native of North America, is locally naturalized on the siliceous rocks of the Euganean district (Béguinot 1910, Mazzetti 1987). The chromosome number $2n = 44$ confirms the count of Katagiri (in Darlington & Wylie 1955) in material from America.

The chromosomes are small, c. 1 to 1.8 µm in size, and appear to be mostly metacentric (m).

880. ***Wulfenia carinthiaca*** Jacq. — $2n = 18$ (Fig.1C, C_1).

It: Mt. Bondone (TN-Trentino Alto Adige), 45°44'N, 10°32'E, 20 Jun 1996, *M. E. Cappelletti* (*cult.* Hort.Bot.Padova).

This rare species grows on calcifuge soils of S. E. Alps. Our count is in accordance with the diploid chromosome number given by Favarger (in Moore 1982) for the Austrian territory.

Most of the chromosomes of the complement appear to be metacentric.

881. ***Anthemis hydruntina*** Groves — $2n = 18$ (Fig.2A, A_1).

It: Near Cannole, dry meadows (LE-Apulia), 40°11'N, 18°19'E, 26 Nov 1993, *S. Marchiori* (LEC).

The species is distributed in Apulia, Basilicata and Calabria (Pignatti 1982), preferably on calcareous dry meadows. The present count is in agreement with a previous report given by Capineri & al. (1978) for Otranto (Apulia). Our karyotype consists of $2n = 2x = 18$: 6m+2sm+6m+2sm+2sm^s (Fig. $2A_1$) but differs from the previous one for the presence of two pairs of acrocentric chromosomes.

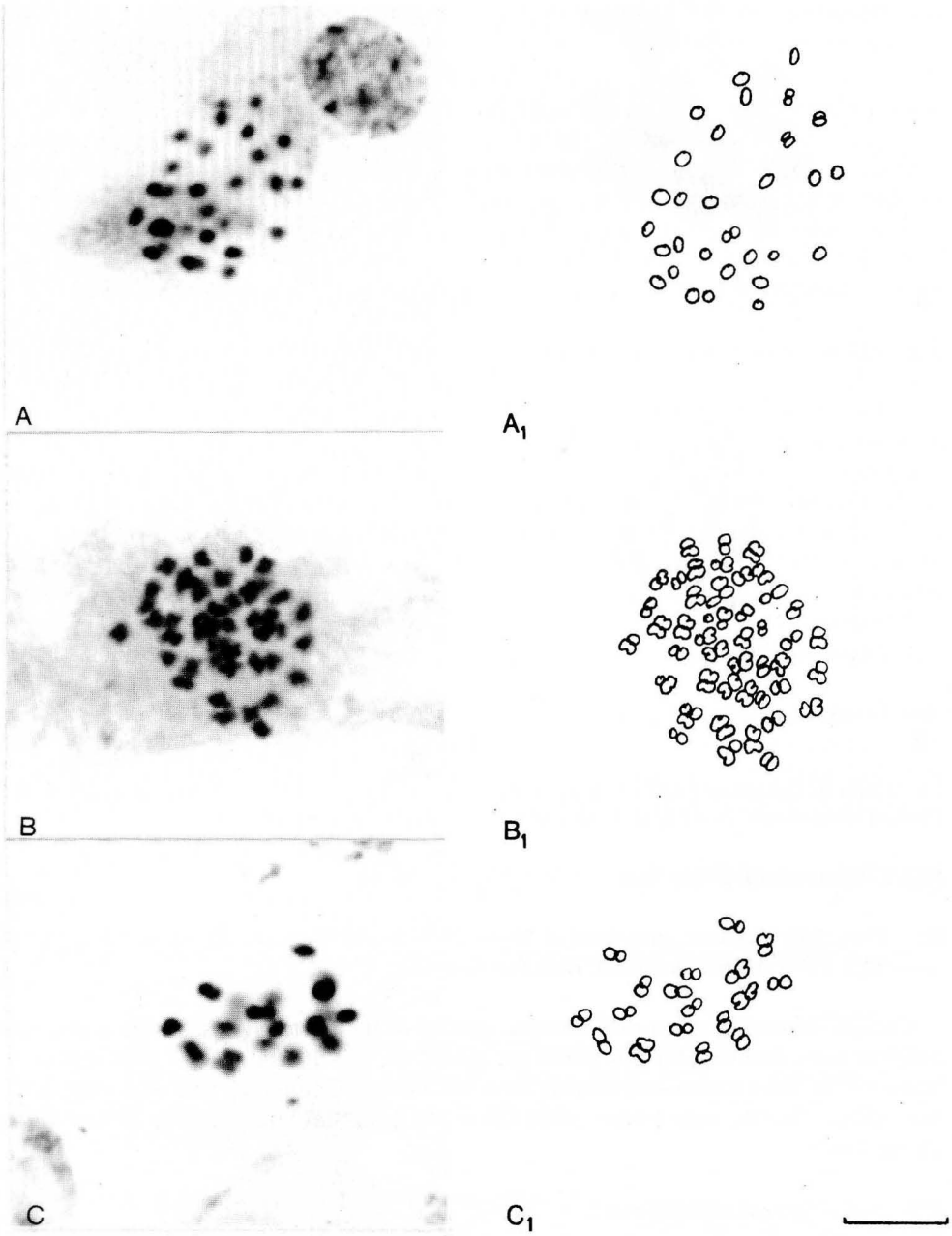

Fig. 1. Mitotic metaphase plates, photos and drawings, of: **A-A$_1$,** *Dianthus japigicum*, $2n = 30$; **B-B$_1$,** *Opuntia compressa*, $2n = 44$; **C-C$_1$,** *Wulfenia carinthiaca*, $2n = 18$. — Scale bar = 10µm.

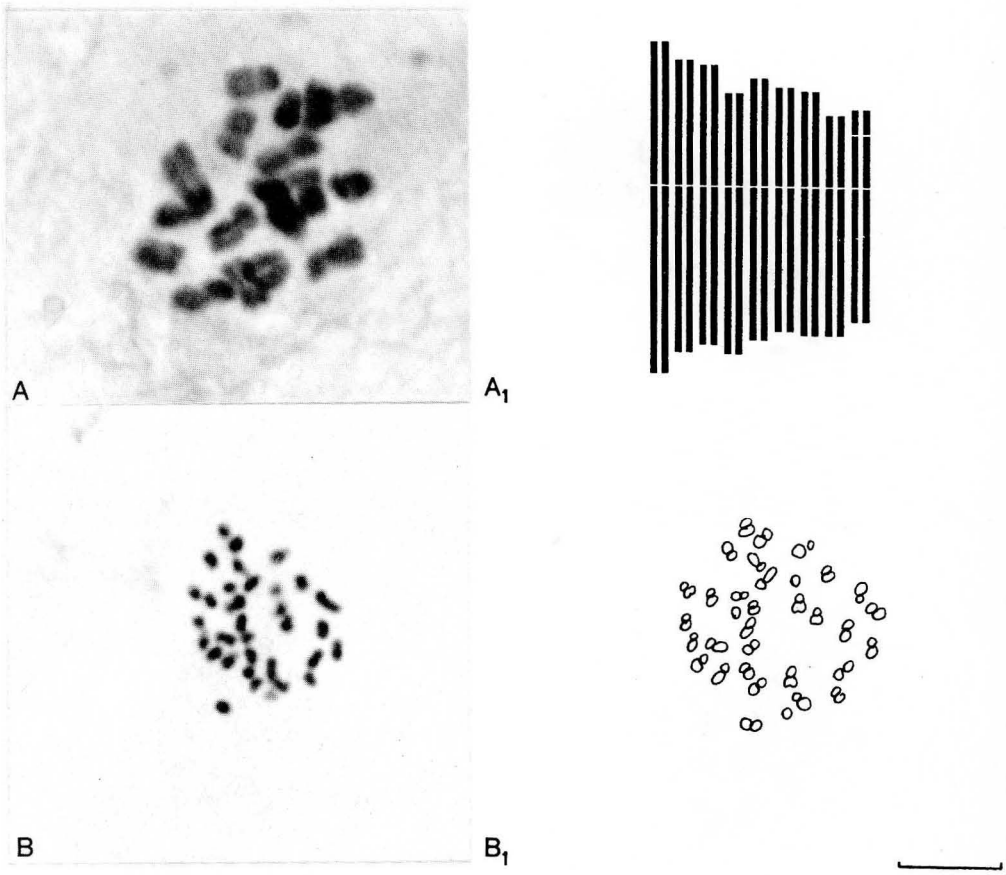

Fig. 2. Mitotic metaphase plates of: **A-A$_1$,** *Anthemis hydruntina*, $2n = 18$, photo and idiogram; **B-B$_1$,** *Cirsium carniolicum*, $2n = 34$, photo and drawing. — Scale bar = 10μm.

882. *Cirsium carniolicum* Scop. — $2n = 34$ (Fig. 2B, B$_1$).

It: Pian delle Fugazze, grassland at about 1100 m (VI-Veneto), 45°48'N, 11°12'E, 15 May 1996, *M. Brentan* (*cult.* Hort.Bot.Padova).

Cirsium carniolicum is a rare endemic species of the Eastern Alps. In literature, two different basic numbers for this genus are given, i.e. $x = 10$ and $x = 17$ (Darlington & Wylie 1955). The chromosome number $2n = 34$, reported here for the first time from Italy, does not confirm the only former count ($2n = 16$) from Slovenia of Lovka & Susnik (in Moore 1982).

883. *Ornithogalum umbellatum* L. — $2n = 27$ (Fig. 3A).

It: Tricase, under *Quercus macrolepis* Kotschy (LE-Apulia), 39°55'N, 18°21'E, 22 Nov 1990, *N. Tornadore* (PAD).

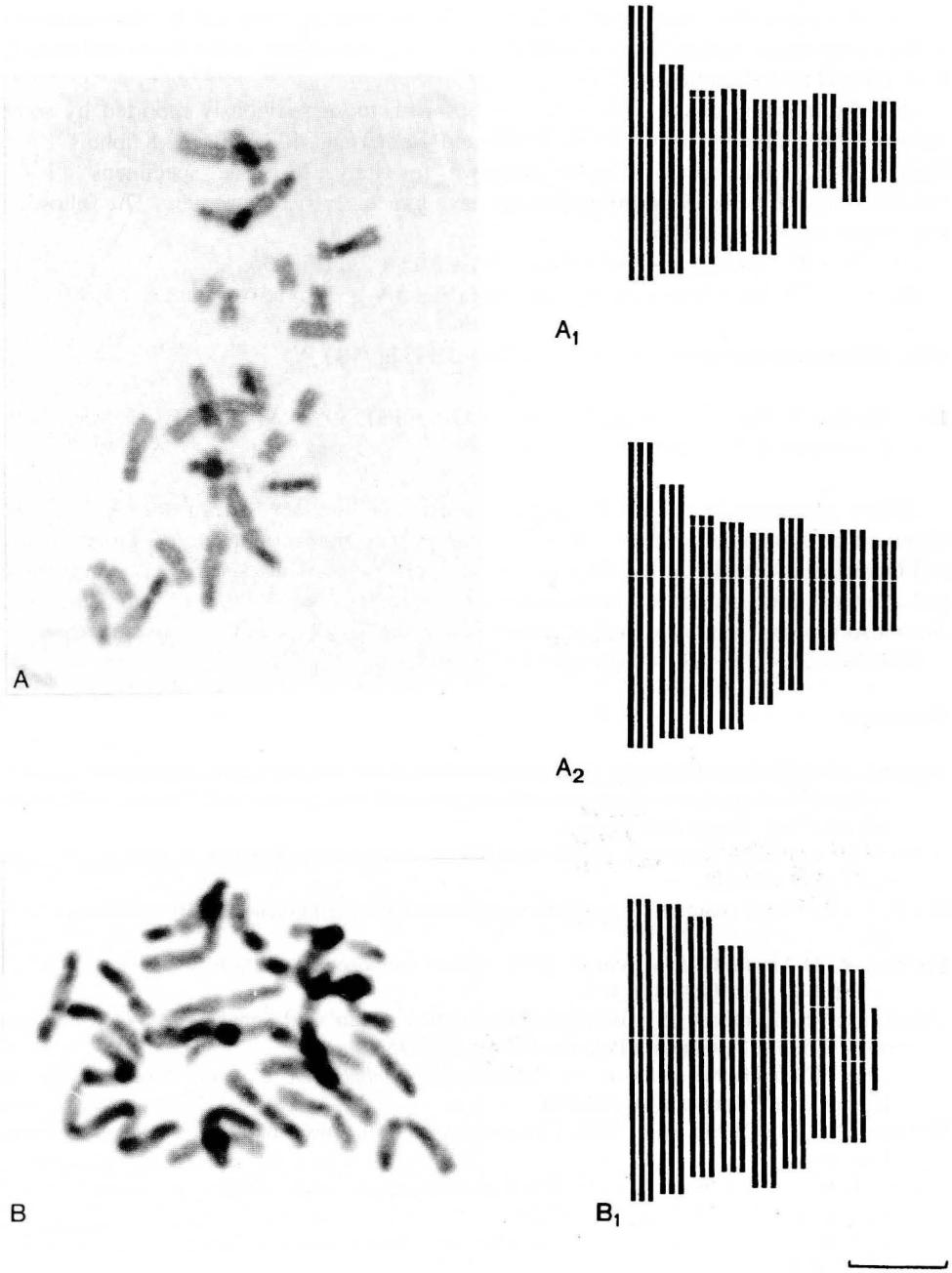

Fig. 3. Mitotic metaphase plates of: **A-A_1-A_2**, *Ornithogalum umbellatum*, $2n$ = 27, photo and idiograms; **B- B_1,** *Allium commutatum*, $2n$ = 24 + 1B, photo and idiogram. — Scale bar = 10µm.

This plant is widely distributed both in the Mediterranean basin and in other countries of the European continent. Many ploidy levels are reported for *O. umbellatum* and namely from diploid to dodecaploid.

Our chromosome count - $2n = 27$ - agrees with those previously reported by some authors from Poland (Czapik 1967, 1968) and Netherlands (Gadella & Kliphuis 1963, Gadella 1972) but appears to be unknown for Italy. In some specimens all the chromosomes of the smallest group but one have a metacentric centromere. The following karyotypes have been obtained:

$2n = 2x = 27$: 3m + 3sm + 3st^s + 9sm + 3m + 3sm + 3m (Fig. $3A_1$).

$2n = 2x = 27$: 3m + 3sm + 3st^s + 9sm + 9m (Fig. $3A_2$).

884. *Allium commutatum* Guss. — $2n = 24 + 1B$ (Fig. 3B).

It: Marina di Novaglie, along the coast (LE-Apulia), 39°53'N, 18°15'E, 17 May 1991, *L. Ghirelli & N. Tornadore* (PAD).

Allium commutatum is not a common species in the Mediterranean regions. The observed chromosome number - $2n = 24$ - agrees with that reported by Bothmer (1982) and Guern & al. (1991) for the Aegean area and for France. The karyotype is symmetrical and contains four groups of metacentric chromosomes, two groups of submetacentric chromosomes, two groups of marker chromosomes and finally, one B-chromosome.

$2n = 3x = 24 + 1B$: 12m + 6sm + 3sm^s + 3m^s + 1B(m) (Fig. $3B_1$).

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Reports (885-898) by S. Brullo, A. Guglielmo, P. Pavone & M. C. Terrasi

885. *Darniella melitensis* (Botsch.) Brullo — $2n = 18$ (Fig. 1A).

Me: Malta, Mtahleb Wied Migra Fecha, 35°52'N, 14°21'E, on the calcareous sea cliffs, 14 Nov 1986, *Brullo & Pavone* (CAT).

This chasmophyte, endemic to the Maltese Islands, was described by Botschantzev (1964) as *Salsola melitensis*; according to Brullo (1984), it belongs for some ancestral characters to the genus *Darniella*, an old taxon of the Mediterranean Tertiary flora, well differentiated from *Salsola*.

The somatic chromosome count, $2n = 18$, of this very rare species is reported here for the first time.

886. *Ranunculus bullatus* L. — $2n = 16$ (Fig. 1B).

Me: Malta, Salina Bay, 35°57'N, 14°25'E, ephemeral meadows on limestone, 22 Nov 1985, *Brullo* (CAT).

The somatic number $2n = 16$ agrees with that reported by various authors from Sicily (Ottonello 1985), Sardinia (Scrugli & Mossa 1972) and Spain (Valdes-Bermejo 1980).

887. *Limonium virgatum* (Willd.) Fourr. — $2n = 27$ (Fig. 1C).

Me: Malta, Dragunara, 35°56'N, 14°29'E, rocky coast near the sea, 23 Sep 1985, *Brullo* (CAT).

This species, widespread in the Mediterranean area, shows a triploid chromosome number ($2n = 27$) which agrees with the number given by Artelari (1992) from Greece, Erben (1978) from Spain and France, Brullo & Pavone (1981) from Sicily, Chicchiricò & Tammaro (1980) from Italy, Brullo & Erben (1989) from Tunisia.

Fig. 1. Karyotypes of: **A,** *Darniella melitensis*, $2n = 18$; **B,** *Ranunculus bullatus*, $2n = 16$; **C,** *Limonium virgatum*, $2n = 27$; **D,** *L. zeraphae*, $2n = 18$; **E,** *Anthemis urvilleana*, $2n = 18$. — Scale bars = 10 μm.

888. ***Limonium zeraphae*** Brullo — $2n = 18$ (Fig. 1D).

Me: Malta, Zonqok Point (Marsaskala), 35°52'N, 14°34'E, on the calcareous rocky coast, 26 Sep 1985, *Brullo* (CAT).

This species, endemic of the Maltese Islands, where it is very frequent, belongs to the *L. cancellatum* (Bertol.) O. Kuntze group. Its diploid chromosome number, $2n = 18$, unknown up to now, is very common in most species of this group as *L. cancellatum* (Bertol.) O. Kuntze, *L. vestitum* (Salmon) Salmon, *L. diomedeum* Brullo (Brullo 1988), *L. arcuatum* Artel. (Artelari & Kamari 1986), *L. apulum* Brullo (Brullo & al. 1990).

889. ***Anthemis urvilleana*** (DC.) Sommier & Caruana Gatto — $2n = 18$ (Fig. 1E).

Me: Malta, Mtahleb, 35°52'N, 14°21'E, ephemeral sub-alophilous meadows on the rocks near the sea, 12 Apr 1984, *Brullo & Ronsisvalle* (CAT).

This chromosome count $2n = 18$ is the first one reported for this Maltese endemic species and it is in accordance with the reports of the allied species, belonging to the *A. secundiramea* Biv. group, such as *A. secundiramea* s. str., *A. intermedia* Guss., *A. lopadusana* Lojac. (Capineri & al. 1976, Brullo & al. 1977, Bartolo & al. 1979).

890. ***Taraxacum minimum*** (Brig. ex Guss.) N. Terracc. — $2n = 32$ (Fig. 2A).

Me: Malta, Sliema, 35°55'N, 14°30'E, ruderal urban areas, 29 Sep 1985, *Brullo* (CAT).

This taxon, belonging to the group of *T. megalorhizon* (Forskal) Hand.-Mazz., shows a tetraploid chromosome number $2n = 32$, which is the same as that given by Nordenstam (1972) from Egyptian material, while it differs from the diploid one ($2n=16$) reported by Richards (1969) from Yugoslavia. As it is a very complex taxonomic group, probably this last count must be referred to a mistaken identification.

891. ***Allium arvense*** Guss. — $2n = 16$ (Fig. 2B).

Me: Gozo, 36°05'N, 14°11'E, dwarf shrubs vegetation on limestone, Jun 1985, cultivated material, *Brullo* (CAT).

Our count $2n = 16$ is in accordance with other former contributions given by Bartolo & al. (1978) from Sicily and Tzanoudakis (1985) from Greece. Diploid populations with or without accessory chromosomes in Sicily and Italy have been recently recorded by Marcucci & Tornadore (1977).

892. ***Allium chamaemoly*** L. subsp. ***chamaemoly*** — $2n = 22$ (Fig. 2C).

Me: Malta, 35°54'N, 14°30'E, ephemeral meadows on limestone, Apr 1984, *Brullo & Ronsisvalle* (CAT).

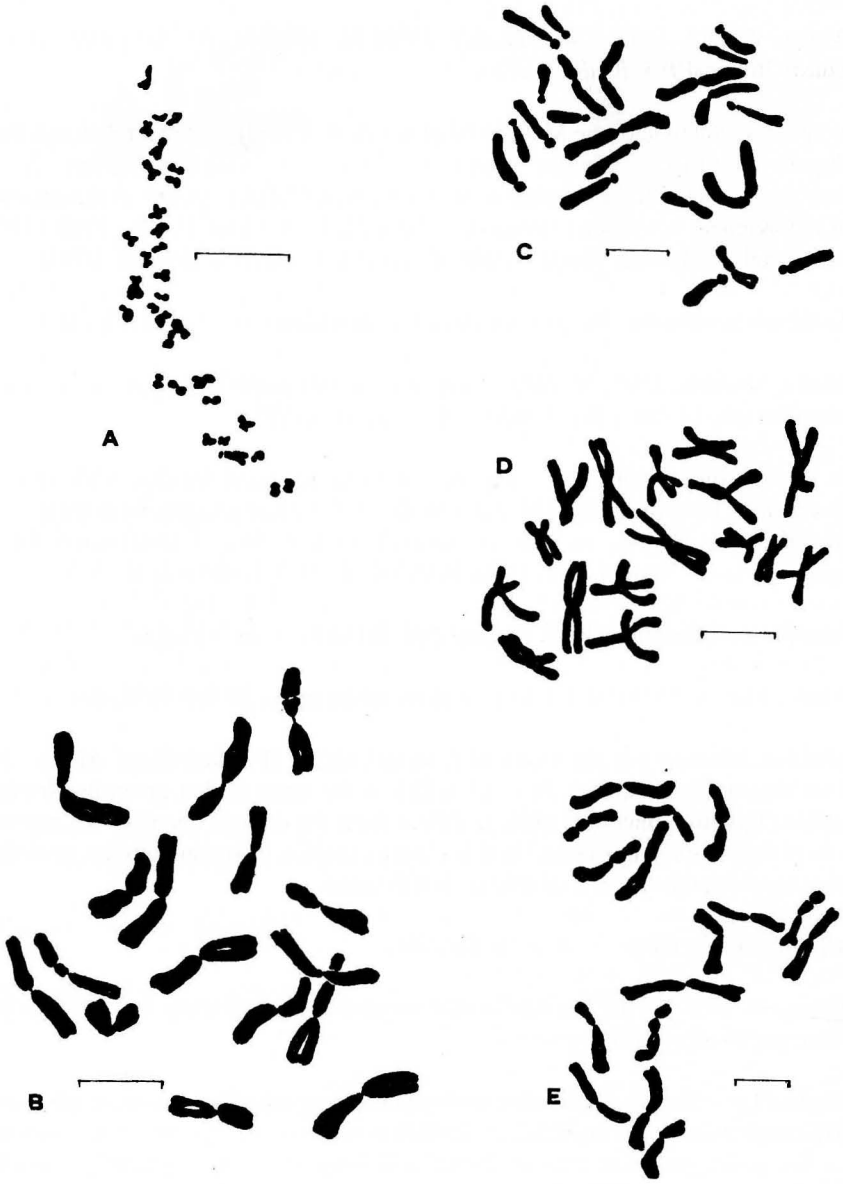

Fig. 2. Karyotypes of: **A,** *Taraxacum minimum*, $2n = 32$; **B,** *Allium arvense*, $2n = 16$; **C,** *A. chamaemoly* L. subsp. *chamaemoly*, $2n = 22$; **D,** *A. commutatum*, $2n = 16$; **E,** *A. sphaerocephaon*, $2n = 16$. — Scale bars = 10 µm.

The chromosome count of the Maltese population, $2n = 22$, is in accordance with the former records of this species on material coming from Sardinia (Mossa & Scrugli 1970),

Italy (Marchi & al. 1974, Garbari 1975), Spain (Pastor & Valdes 1988) and Greece (Tzanoudakis & Vosa 1988, Phitos & al. 1979).

893. ***Allium commutatum*** Guss. — $2n = 16$ (Fig. 2D).

Me: Malta, Dragunara, 35°56'N, 14°29'E, on the rocky coast, 24 Jun 1973, *Brullo* (CAT).

The Maltese populations should be referred to the var. *melitensis* described as a provisional name by Sommier & Caruana Gatto (1915).

The examined material is diploid with $2n = 16$, count previously mentioned for populations coming from other Mediterranean localities by Garbari & Cela Renzoni (1975), von Bothmer (1982), Johnson (1982), Guern & al. (1991). Triploid ($2n = 24$) and tetraploid ($2n = 32$) populations are known too (von Bothmer 1975, 1982, Karavokyrou & Tzanoudakis 1991, Guern & al. 1991).

894. ***Allium sphaerocephalon*** L. — $2n = 16$ (Fig. 2E).

Me: Gozo, 36°05'N, 14°11'E, perennial meadows, Jun 1985, cultivated specimen, *Brullo* (CAT).

This count on Maltese material agrees with previous reports from other Mediterranean territories (Nilsson & Lassen 1971, Barros Neves 1973, Scrugli & Bocchieri 1977, Pastor 1982, Tzanoudakis 1985, Ozhatay 1990). See also Johnson & Ozhatay (1996) for other references.

895. ***Allium subhirsutum*** L. — $2n = 14$ (Fig. 3A).

Me: Malta, St. Paul Bay, 35°58'N, 14°24'E, subnitrophilous shadow places, 11 Apr 1987, *Brullo, Pavone & Ronsisvalle* (CAT).

The Maltese population has the same chromosome number, $2n = 14$, previously reported by several authors from many localities of the Mediterranean area (Bartolo & al. 1981, Karavokirou & Tzanoudakis 1981).

896. ***Allium trifoliatum*** Cyr. — $2n = 21$ (Fig. 3B).

Me: Malta, Barryia Valley, 35°55'N, 14°20'E, cultivated fields, 11 Apr 1987, *Brullo, Pavone & Ronsisvalle* (CAT).

This species, quite related to *A. subhirsutum* L., differs from the latter in some peculiar features as well as in the ecology and chromosome number. In fact *A. trifoliatum* is a triploid species with $2n = 21$ and this count agrees with the citations of numerous authors (Miceli & al. 1981, 1984, Bartolo & al. 1981, Tzanoudakis 1986, Karavokyrou & Tzanoudakis 1991).

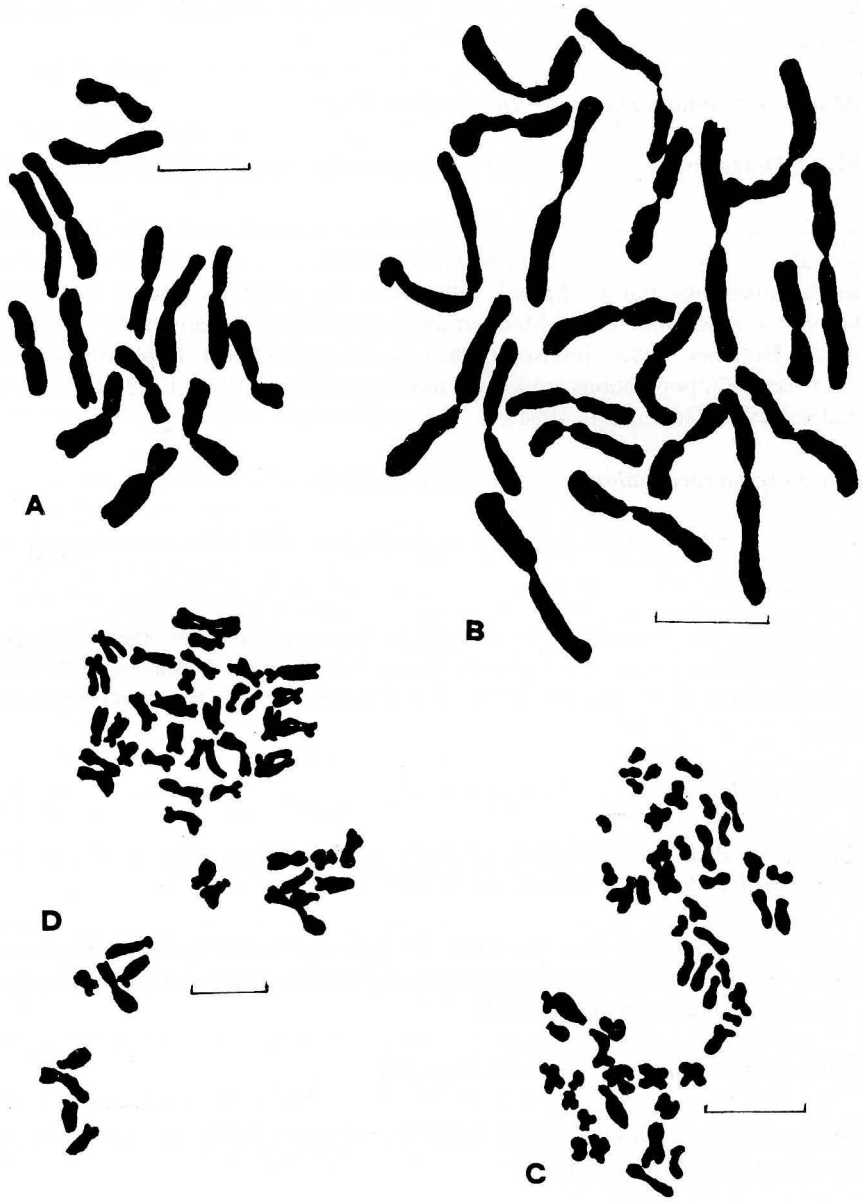

Fig. 3. Karyograms of: **A,** *Allium subhirsutum*, $2n = 14$; **B,** *A. trifoliatum*, $2n = 21$; **C,** *Caruelia arabica*, $2n = 50$; **D,** *Iris sicula*, $2n = 48$. — Scale bars = 10 μm.

897. *Caruelia arabica* Parl. — $2n = 50$ (Fig. 3C).

Me: Comino, 36°01'N, 14°20'E, ruderal habitats, 15 Apr 1987, *Brullo, Pavone & Ronsisvalle* (CAT).

Our count, $2n = 50$, is in accordance with those cited by Nakajima (1936), Sato (1942) and Gallego Martin (1984).

For this species other chromosome numbers as $2n = 36, 38, 46, 51$ (Heitz 1926, Gallego Martin, l.c., Neves 1952, Pastor 1979) are known.

898. *Iris sicula* Tod. — $2n = 48$ (Fig. 3D).

Me: Gozo, Xlendi Valley, 36°02'N 14°13'E, rocky places, 14 Apr 1987, *Brullo* (CAT).

This species, quite related to *Iris germanica* L., is endemic of Sicily and Maltese Islands.

The chromosome number $2n = 48$ of Maltese plants, here reported for the first time, occurs also in tetraploid populations of *I. germanica* (Simonet 1934, Koul & Gohil 1973, Mehra & Pandita 1978).

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