Mediterranean chromosome number reports — 14

edited by G. Kamari, C. Blanché & F. Garbari

Abstract

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This is the fourteenth of a series of reports of chromosomes numbers from Mediterranean area, peri-Alpine communities and the Atlantic Islands, in English or French language. It comprises contributions on 39 taxa: *Genista, Stauracanthus, Adenocarpus* and *Teline* from Morocco, by H. Tahiri, P. Cubas & C. Pardo (Nos 1376-1381); *Petrorhagia, Silene* and *Lathyrus* from Bulgaria, by D. Pavlova & A. Tocheva (Nos 1382-1386); *Bunium, Chaetosciadium, Ferula* and *Tordylium* from Syria, by J. V. Shner & T. A. Ostroumova (Nos 1387-1390); *Bunium, Bupleurum, Chaerophyllum, Daucus, Echinophora, Ferulago, Grammosciadium, Johrenia, Leiotulus, Lisaea, Pimpinella, Prangos, Trigonosciadium* and *Trinia* from Turkey, by J. V. Shner, M. G. Pimenov & E. V. Kljuykov (Nos 1391-1409); *Genista* from Portugal, Sicily and Spain, by T. Cusma Velari, L. Feoli Chiapella & V. Kosovel (Nos 1410 - 1412); *Genista* from Sardinia and Morocco, by T. Cusma Velari, L. Feoli Chiapella & G. Bacchetta (Nos 1413 - 1414).

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Reports (1376-1381) by H. Tahiri, P. Cubas & C. Pardo

1376. *Genista ancistrocarpa* Spach — $n = 22$ & $2n = 44$ (Figs 1, 7).

Ma: Maroc atlantique nord, forêt de Sahel, 35° 16' N, 6° 04' W, 14 Mar 2003 & 22 Jun 2003, *Tahiri* 65678 (RAB).

This species is restricted from west of the Iberian Peninsula to the north-west of Morocco.

Our result is the first data obtained from a Moroccan population. A previous record from Spain indicates $2n = 48$ (Talavera & Arista 1995). Thus, $2n = 44$ constitutes a second chromosome number recorded for this taxon.

1377. *Genista tricuspidata* Desf. — $2n = 50$ (Figs 2, 8).

Ma: Monts du Maroc oriental, Beni Snassen, pied jbel Taforalt, 330 m, 34° 73' N, 2° 29' W, 7 Jun 2003, *Tahiri* 65680 (RAB).

This species is distributed in the Mediterranean area, from the southeast of Spain, Balearic Islands, Morocco, Algeria to Tunisia.

Previous reports indicate $2n = 48 + 0\text{-}4$ B (Cusma & al. 2000) in a sample from the Balearic Islands, and $2n = 48$ (Cusma & al. 1999) in material from Morocco. Our result ($2n = 50$ chromosomes) shows variation in the chromosome number of *G. tricuspidata*, and adds a second chromosome number to the Moroccan populations.

1378. *Genista hirsuta* Vahl subsp. ***erioclada*** (Spach) Raynaud — $2n = 50$ (Figs 3, 9).

Ma: Monts du Maroc oriental, Beni Snassen, pied jbel Taforalt, 330 m, 34° 73'N, 2° 29' W, 7 Jun 2003, *Tahiri* 65677 (RAB).

Genista hirsuta is distributed in the western Mediterranean area, and three subspecies are currently recognised: subsp. *hirsuta*, widespread in the central and western part of the Iberian Peninsula; subsp. *lanuginosa* (Spach) S. Rivas-Martínez, restricted to southern Spain, although its presence has been indicated in the Central Rif (from Morocco by Talavera & Cabezudo 1995); and subsp. *erioclada*, the most common taxon in Morocco and Algeria.

Our report with $2n = 50$ chromosomes in root mitosis is the first count for *G. hirsuta* subsp. *erioclada*, and the highest number reported for the species. Previous reports obtained on Iberian material of the subspecies *hirsuta* and *lanuginosa* indicated $2n = 32$ (Fernandes & Queiros 1978) and $2n = 48$ (Sañudo 1972; Gallego Martin & al. 1986).

1379. *Stauracanthus spectabilis* Webb — $n = 24$ (Figs 4, 10) & $2n = 48$.

Ma: Maroc atlantique nord, forêt de Mamora, 34° 02' N, 6° 50' W, 12 Mar & 30 Apr 2003, *Tahiri* 65676 (RAB).

Stauracanthus spectabilis is a taxon with a disjunct area, restricted to the southwest of Portugal and west of Morocco.

We have found $n = 24$ bivalents at meiotic metaphase and $2n = 48$ chromosome in mitosis from root meristems. This is the first record obtained from Moroccan plants, which confirms those found by Castro (1943) and Cubas (1987) on material from Portugal.

This taxon is closely related to *S. genistoides* Webb that has the same chromosome number (Castro 1943; Cubas 1987), but can be differentiated by the shape and size of the bracteoles (larger in *S. spectabilis* than in *S. genistoides*). Many authors prefer to give it subspecific rank (*S. genistoides* subsp. *spectabilis* (Webb) Rothm.) taking into account that plants with intermediate morphology have been found, and adscribed to a varietal or subspecific rank (e.g. *S. genistoides* subp. *vicentinus* (Daveau) Rothm., Rothmaler 1941).

1380. ***Adenocarpus telonensis*** (Loisel.) DC. — $2n = 52$ (Figs 5, 11).

Ma: Maroc atlantique nord, forêt de Sahel, 35° 16' N, 6° 04' W, 22 Jun 2003, *Tahiri* 65679 (RAB).

The distribution range of this species covers the south of France, the north-east and south-west part of the Iberian Peninsula and the north of Morocco.

The chromosome number $2n = 52$ is the first count on Moroccan material. Our result agrees with those reported on material from the Iberian Peninsula ($2n = 52$, Horjales 1972 and $n = 26$, Sañudo 1973a).

1381. ***Teline linifolia*** (L.) Webb — $n = 24$ (Figs 6, 12).

Ma: Rif, région de Tanger, Cap Spartel, 35°47'N, 5°55'W, 29 Mar 1998, *Tahiri* 62183 (RAB).

Teline linifolia is native to the western Mediterranean area and Atlantic coast of Morocco, and has been introduced in many countries (e.g. North America and Australia).

We counted $n = 24$ bivalents at meiotic metaphase. This chromosome number confirms the only previous count from Morocco (Mamora; Bastida & Talavera 1993) and other reports, $n = 24$ and $2n = 48$, in material from Spain (Sañudo 1973b; Löve & Kjellqvist 1974; Luque 1984), and France, Porquerolles Island (Aboucaya & Verlaque 1990). Same results have also been reported from cultivated material of the Canary Islands (Bramwell & al. 1976), and from Quarteira, South Portugal (Fernandes & al. 1977) although the native presence of this taxon in these areas is doubtful.

Acknowledgements

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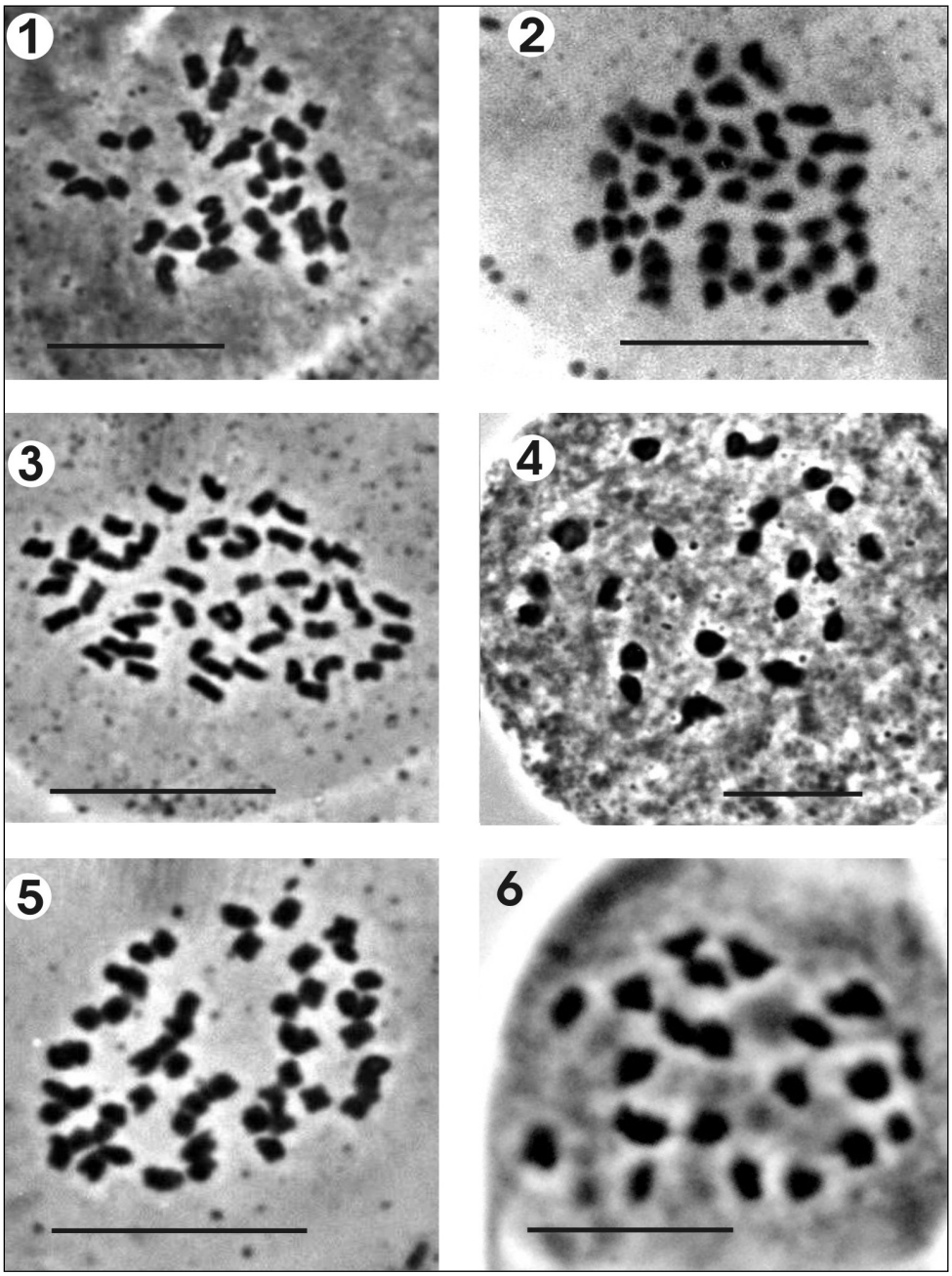
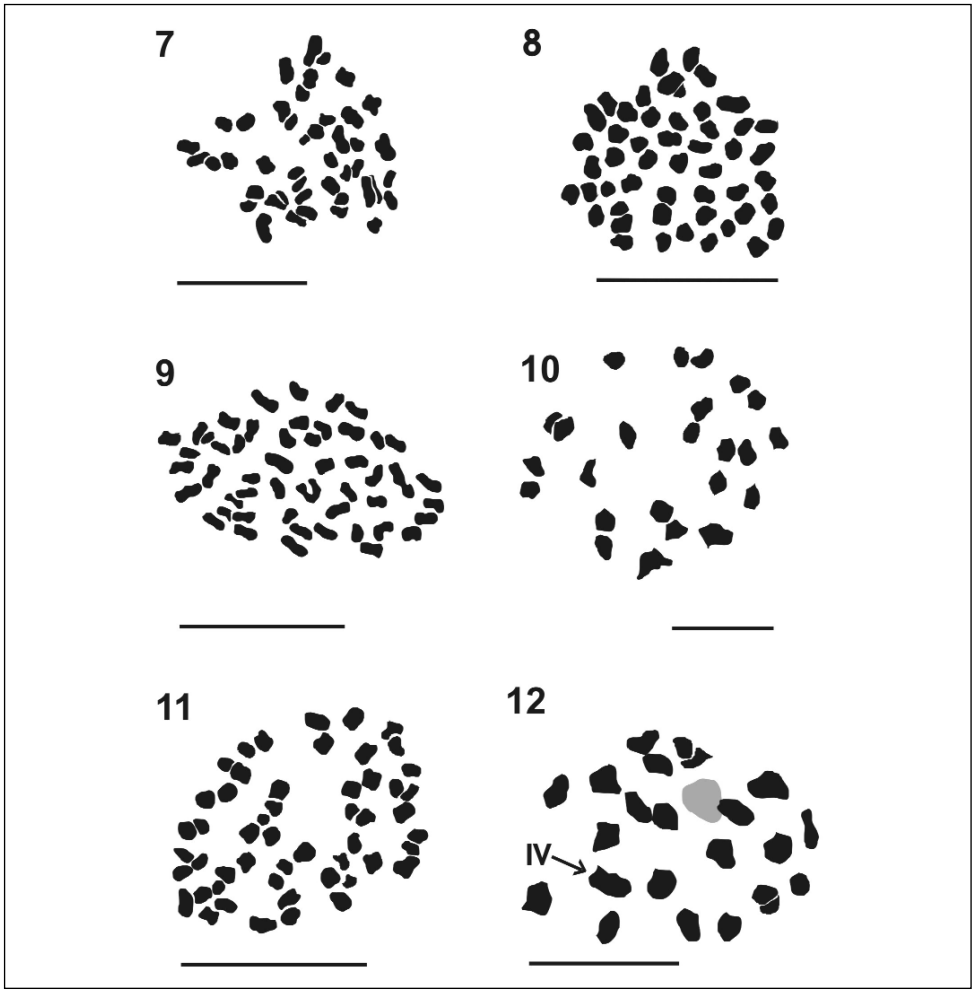


Figs 1-6. Microphotographs of: **1,** *Genista ancistrocarpa,* 2*n* = 44; **2,** *G. tricuspidata,* 2*n* = 50; **3,** *G. hirsuta* subsp. *erioclada*, 2*n* = 50; **4,** *Stauracanthus spectabilis*, metaphase I, *n* = 24 bivalents; **5,** *Adenocarpus telonensis*, 2*n* = 52; **6,** *Teline linifolia*, diakinesis, *n* = 22 bivalents + 1 tetravalent, the nucleole is shaded in grey colour. — Scale bars = 10 µm.



Figs 7-12. Drawings of the figures 1-6: **7,** *Genista ancistrocarpa,* 2*n* = 44; **8,** *G. tricuspidata*, 2*n* = 50; **9,** *G. hirsuta* subsp. *erioclada*, 2*n* = 50; **10,** *Stauracanthus spectabilis*, metaphase I, *n* = 24 bivalents; **11,** *Adenocarpus telonensis*, 2*n* = 52; **12,** *Teline linifolia*, diakinesis, *n* = 22 bivalents + 1 tetravalent, the nucleole is shaded in grey colour. — Scale bars = 10 µm.

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Reports (1382-1386) by Dolja Pavlova & Anita Tosheva

1382. *Petrorhagia velutina* (Guss.) P.W. Ball et Heywood — 2*n* = 30 (Fig. 1).

Bu: East Rhodopes Mt., on serpentine rocky places south-westward from Dobromirtzi village, 41º 23' N, 25º 13' E, with fruits, 2 Jul 2003, *D. Pavlova* 102677 (SO).

The distribution range of this species covers the Mediterranean, the Caucasus Mts and SW Asia. This species is distributed in Bulgaria up to 1000 m a.s.l. in the floristic regions Black Sea coast, Eastern Stara planina Mts, Struma valley, Thracian plain, Tundza hilly region and Strandza Mts (Petrova 1992). The locality of the investigated population is new for the floristic region Eastern Rhodopes Mts. This species occupies terrains with rather thin serpentine ground. The surrounding vegetation is composed mainly of *Teucrium chamaedrys* L., *Plantago subulata* L., *Agropyron cristatum* (L.) Gaertn., *Silene flavescens* Waldst. & Kit., *Dianthus pinifolius* Sibth. & Sm., *Cistus incanus* L. etc.

The chromosome number 2*n* = 30 confirms previous counts (Goldblatt & Johnson 1991: 83, 1994: 75, 1998: 64, 2000: 53 for references).

Populations of this taxon from Bulgaria (Struma valley and Slavjanka Mts) were previously investigated by Petrova (1995) who also reported the chromosome number 2*n* = 30. However, the composition of that karyotype, 2*n* = 2x = 12m + 16sm + 2sm-SAT = 30, is different from the one presented by us.

The centromere index, Ic = S/L+S (Grif & Agapova 1986) gives reasons to consider the chromosomes being of metacentric and submetacentric types. The karyotype is symmetrical. It consists of 2*n* = 2x = 20m + 8sm + 2sm-SAT = 30 chromosomes. The ratio X^{max} : X^{min} is 2.3 : 1.

The karyotype morphology of the species is reported for the first time for populations growing on serpentine substrate.

1383. *Silene supina* Bieb. — 2*n* = 48 (Fig. 2).

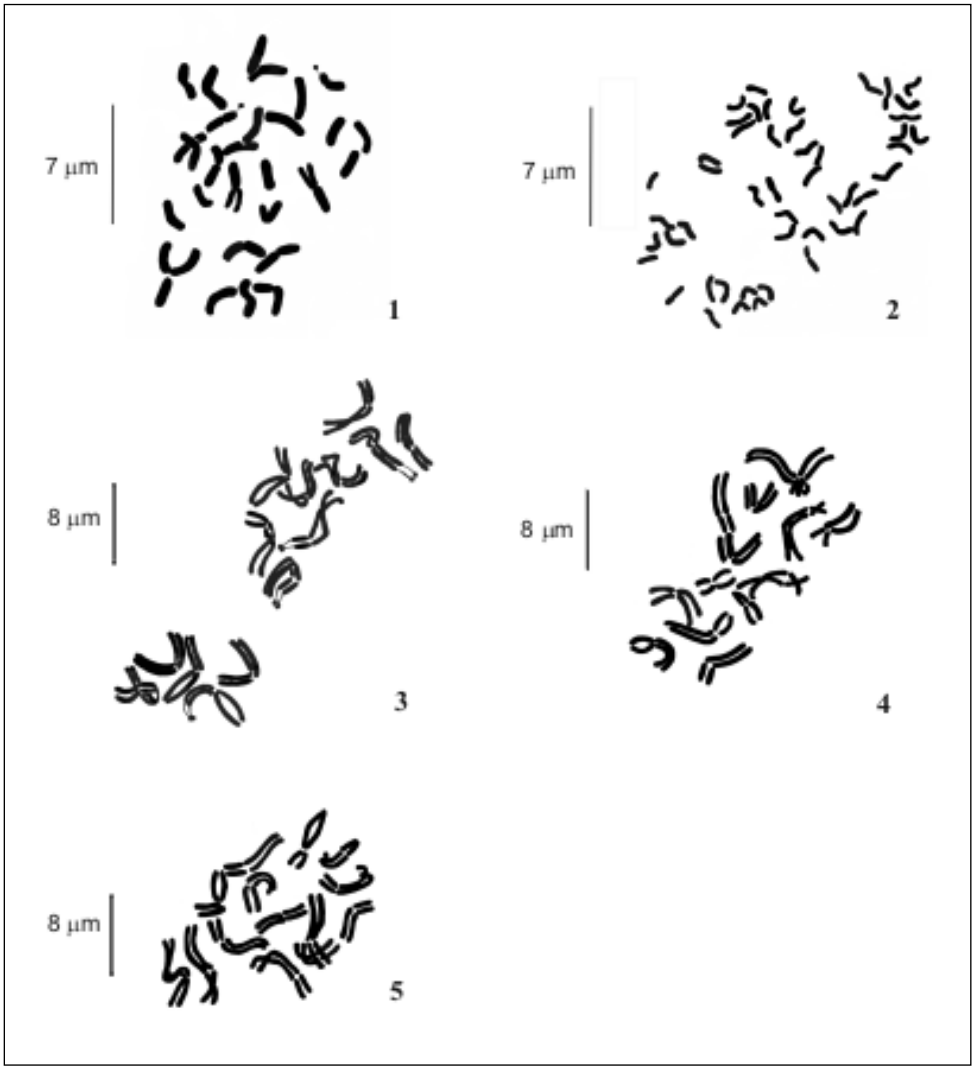
Bu: Black Sea coast, on sandy places in the locality Pobiti Kamani near the city of Varna, 43º 14' N, 27º 40' E, with flowering blossoms, 19 Jun 2003, *D. Pavlova* 102678 (SO).

The distribution range of this species covers SW Europe, the Caucasus Mts and SW Asia (Jordanov & Panov 1966).

This species is distributed in the following floristic regions in Bulgaria: Black Sea coast, Eastern Stara planina Mts, Sofia region and Znepole region, up to 1200 m a.s.l. (Petrova 1992).

The chromosome number 2*n* = 48 confirms previous reports by Petrova (1975) for populations from the Tundza hilly region. Our data are different from the data of Strid (1987) and Yildiz & Cirpici (1996) who give for *Silene supina* Bieb. subsp. *pruinosa* (Boiss.) Chowdh. the chromosome number 2*n* = 24.

The karyotype is symmetrical with prevalence of metacentric and submetacentric chro-



Figs 1-5. Karyotypes of: **1,** *Petrorhagia velutina,* 2*n* = 30; **2,** *Silene supina,* 2*n* = 48; **3,** *Lathyrus. digitatus,* 2*n* = 14; **4,** *Lathyrus vernus*, 2*n* = 14; **5,** *Lathyrus alpestris* ssp. *fridrichstalii*, 2*n* = 14.

mosomes. The longest chromosomes are 3.2 µm and the shortest chromosomes - 1.6 µm. The ratio X^{max} : X^{min} is 2 : 1.

1384. ***Lathyrus digitatus*** (Bieb.) Fiori — 2*n* = 14 (Fig. 3).

Bu: Tundza hilly region, Kenana park the town of Haskovo, 41° 56' N, 25° 33' E, 30 Jun 2003, *A. Tosheva & D. Pavlova* 102679 (SO).

The distribution range of this species covers south Europe, the Mediterranean, and southwest Asia. This species is rarely distributed in Bulgaria up to 800 m a.s.l. (Kozuharov 1976, 1992).

The chromosome number $2n = 14$ is reported for the first time for a population from Bulgaria. This chromosome number confirms previous counts (see Ünal 2001).

The centromere index shows the presence of metacentric, submetacentric and intercentric chromosomes. The shortest and the longest chromosomes are metacentric. One of the metacentric pairs (the second in length) and the intercentric one bears small ball-shaped satellites. The chromosome size ranges between 9.2 and 7.6 µm, and the ratio $X^{max} : X^{min} = 1.2 : 1$. The total length of the karyotype is Σs+l = 121.1 µm. The karyotype is slightly asymmetrical and consists of $2n = 2x = 6m + 4sm + 2m\text{-}SAT + 2I\text{-}SAT = 14$ chromosomes.

1385. *Lathyrus vernus* (L.) Bernh. — $2n = 14$ (Fig. 4).

Bu: Western Sredna Gora Mts, Lozenska Mts, close to a forest of *Fagus sylvatica* L. 42º 36' N, 23º 29' E, 2 Jun 2002, *A. Tosheva* 102669 (SO).

The distribution range of the species covers the whole of Europe without its northern and southern parts, and also the Caucasus Mts, southwestern Asia and Siberia. This species is widely distributed in Bulgaria up to 1200 m a.s.l. (Kozuharov 1976, 1992).

The chromosome number $2n = 14$ confirms previous data from Bulgaria (Kozuharov & al. 1973, 1975) and from other European countries (see in Fedorov 1969: 303; Goldblatt & Johnson 1990: 89, 1991: 104, 2000: 71).

The centromere index gives reasons to consider the chromosomes being of metacentric, submetacentric and acrocentric types. The karyotype is slightly asymmetrical. The karyotype consists of $2n = 2x = 6m + 6sm + 2A = 14$ chromosomes. The chromosome size varies between 8.8 and 2.0 µm. The ratio $X^{max} : X^{min}$ is 2.4 : 1. The shortest chromosome pair is metacentric while the longest one is acrocentric. The total length of the karyotype is Σs+l = 84.0 µm. This karyotype differs from the count $2n = 2m + 6sm + 6a = 14$ of Kozuharov & al. (1975), by the higher number of metacentric chromosomes and lower number of acrocentric chromosomes.

1386. *Lathyrus alpestris* (W. et K.) Celak. subsp. ***fridrichstalii*** (Griseb.) K. Maly — $2n = 14$ (Fig. 5).

Bu: Vitosha Mts, near the touristic hut Aleko, among stands of *Juniperus sibirica* Burgsd., 42º 34' N, 23º 17' E, 14 Sep 2002, *A. Tosheva* 102671 (SO).

The species is endemic for the Balkan Peninsula, distributed in Bulgaria, Albania, Greece and Serbia. The species is represented in Bulgaria by the subsp. *friedrichstalii* (Griseb.) K. Maly, rarely distributed between 1500 and 2500 m a.s.l. in the floristic regions Vitosha Mts, Rila Mts, Stara Planina Mts and western and central Rhodopes Mts (Kozuharov 1976, 1992).

The chromosome number $2n = 14$ here established confirms previous investigations (see Krusheva 1975).

The centromere index shows chromosomes of metacentric, submetacentric and intercentric types. The karyotype is asymmetrical. It consists of $2n = 2x = 4m + 4sm + 4I + 2A = 14$ chromosomes. The chromosome size ranges between 4.8 and 3.2 µm. The ratio $X^{max} : X^{min}$ is 2 : 1. The shortest chromosomes are of metacentric type but the longest are of acrocentric type. The total length of the karyotype is $\Sigma s+l = 54.4$ µm.

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Reports (1387-1390) by Julia V. Shner & Tatiana A. Ostroumova

1387. *Bunium ferulaceum* Sm. — $n = 10$ (Fig. 1a).

Sy: Barada Canyon near Damascus, Ayn al Fijah village (Damascus Province), stony slopes, 33º 36' N, 36º 10' E, 18 Apr 1999, *T. Ostroumova* 51 (MW).

Bunium ferulaceum is distributed in W Asia (Turkey, Lebanon, Syria, Israel, Cyprus) and SE Europe (Greece, former Yugoslavia, Bulgaria, Ukraine).

The chromosome number $2n = 20$ was already recorded in material from Greece (Engstrand 1973).

1388. *Chaetosciadium trichospermum* (Jacq.) Poir. — $n = 6$ (Fig. 1b).

Sy: 31 km from Damascus to As Suwayda' (Der'a Province), basalt stony plain, 33º 17' N 36º 33' E, 11 Apr 1999, *T. Ostroumova* 1 (MW).

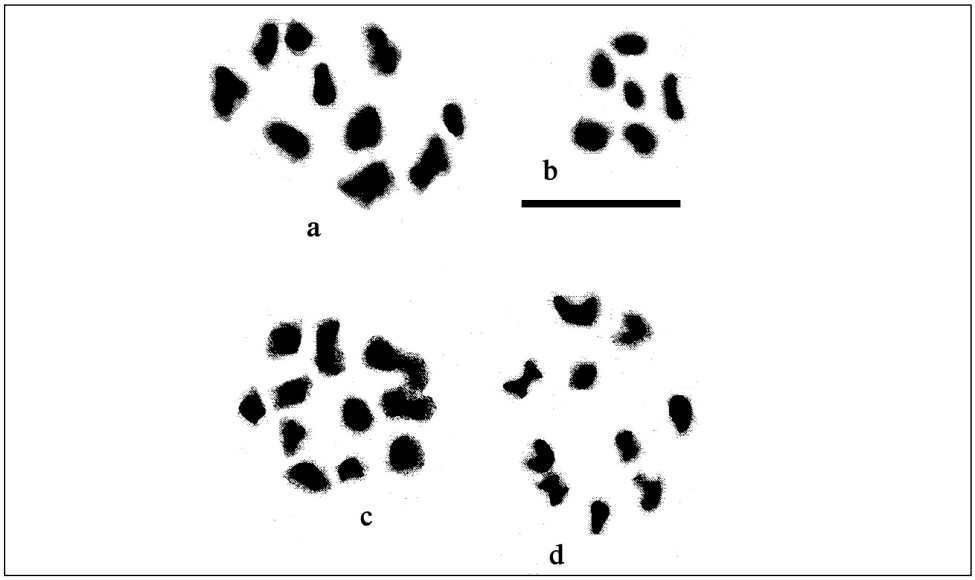

Fig. 1. Micrographs of the meiotic metaphases II of: **a,** *Bunium ferulaceum, n* = 10; **b,** *Chaetosciadium trichospermum, n* = 6; **c,** *Ferula hermonis, n* = 11; **d,** *Tordylium cordatum, n* = 10. — Scale bar = 10 μm.

Chaetosciadium trichospermum is native to W Asia (Lebanon, Syria, Israel, Jordan) and N Africa.

This chromosome number agrees with previous records from Israel (Kliphuis 1977; Kliphuis & Barkoudag 1977), Jordan (Al-Eisawi 1989) and cultivated plants (Constance & al. 1971; Cauwet-Marc & Jury 1978).

1389. *Ferula hermonis* Boiss. — $n = 11$ (Fig. 1c).

Sy: Barada Canyon near Damascus, Ain al Fijah village (Damascus Province), stony slopes, 33º 36' N, 36º 10' E, 18 Apr 1999, *T. Ostroumova* 57 (MW).

This species is an Asiatic Mediterranean element (Turkey, Lebanon, Suria).

The chromosome number is reported here for the first time.

1390. *Tordylium cordatum* (Jacq.) Poir. — $n = 10$ (Fig. 1d).

Sy: Mahardah, the castle Kalat-Sheizar (Hamah Province), stony slopes, 35º 15' N, 35° 34' E, 17 Apr 1999, *T. Ostroumova* 21 (MW).

Tordylium cordatum is also an Asiatic Mediterranean endemic unit (Lebanon, Syria, Israel).

The chromosome numbers $n = 10$ or $2n = 20$ were reported in material from Israel by Constance & al. (1976) and from botanical gardens by Gardé & Malheiros-Gardé (1954).

Acknowledgements

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Reports (1391-1409) by J. V. Shner [Daushkevich], M. G. Pimenov & E V. Kljuykov

1391. *Bunium caroides* (Boiss.) Hausskn. ex Bornm. — $n = 11$ (Fig. 1a).

Tu: B9, Van, SE part, Güzeldere, 38° 10' N, 43° 54' E, 2710 m, 12 Jun 2002, *Pimenov & Kljuykov* 28 (MW).

The species is distributed in Iran (W, C and S) and SE Turkey (Hakkâri, Van) and for the first time it was found in Van vilayet. *B. caroides* was described from Hamadan vicinity under the name of *Elwendia caroides* Boiss., i.e. it was treated initially as belonging to a separate genus.

Chromosome number is determined for the first time.

Bunium is a genus with unusually wide diversity of chromosome numbers and evident dysploid transformation of karyotypes from $2n = 22$ to $2n = 12$ (Vasil'eva & al. 1985). Previously the chromosome numbers were determined for 29 species out of 45-50. Seven of them have $2n = 22$, which is regarded as the most probable ancestral count, known in all the parts of Mediterranean (s.l.) area of the genus.

B. caroides belongs to the section *Elwendia* (Boiss.) H. Wolff and to the monotypic subsection *Vallata* Kljuykov (Kljuykov 1988). Other species of the section, *B. afghanicum* Beauverd and *B. latilobum* Korovin, have $2n = 12, 13$, but they are treated as members of another subsection, *Aliformia* Kljuykov.

1392. *Bunium cylindricum* (Boiss. & Hohen. ex Boiss.) Freyn — $n = 10$ (Fig. 1b).

Tu: B9, Van, Kurubaş Geçidi, 38° 22' N, 43° 23' E, 2230 m, 12 Jun 2002, *Pimenov & Kljuykov* 16 (MW).

This species is distributed mainly in SW Asia (Pakistan, Afghanistan, Iran, Azerbaidzhan, Armenia, Turkey, and Iraq). In Turkey it is now known only from the vilayet of Van.

Chromosome numbers were determined twice: firstly, on material cultivated in the botanical garden (Vasil'eva & al. 1985) and, secondly, from Iran (Sheidai & al. 1996). In both cases, $2n = 20$ was counted. Sheidai & al. (1996) reported also the karyotype of *B. cylindricum*, consisting of metacentric, submetacentric and subacrocentric chromosomes in slightly different proportions ($2n =$ 2m + 16sm + 2sa = 20 and $2n =$ 4m + 12sm + 4sa

= 20); two submetacentrics have satellites. Our new determination confirms the previously known chromosome number.

1393. *Bupleurum croceum* Fenzl — $n = 8$ (Fig. 1c).

Tu: B9, Van, SE of Van, Sumer, 38° 28' N, 43° 21' E, 1700-1800 m, 17 Jun 2002, *Pimenov & Kljuykov* 52 (MW).

The species is widely distributed in SW Asia, often as a weed. Its area includes W & S Iran, Turkey (many vilayets in different parts of the country), Iraq and Syria.

The chromosome number of $2n = 16$, usual for the annual *Bupleurum* species, was determined twice: firstly from Turkey (Cauwet 1969; Cauwet-Marc 1979a) and secondly on the basis of plants with unspecified origin (Cauwet 1973).

1394. *Bupleurum gerardii* All. — $n = 8$ (Fig. 1d).

Tu: B5, Kayseri, near Kayseri, northern slope of Erciyes Dağı, 38° 35' N, 35° 30' E, 2080-2200 m, 18 Jun 2002, *Pimenov & Kljuykov* 57 (MW).

This species is widely distributed in Mediterranean s.l. (S Europe, N Africa) and W Asia from Russia, N Caucasus, Turkmenistan, Iran, Azerbaijan, Georgia, Armenia southwards to Turkey, Iraq, Saudi Arabia, Lebanon, Syria, Israel, Jordan and Cyprus.

Chromosome numbers were determined at least 15 times - from Turkey (Cauwet 1971; Cauwet-Marc 1979b), Portugal (Queiros 1972, 1974, 1978; Cauwet-Marc 1976), Spain

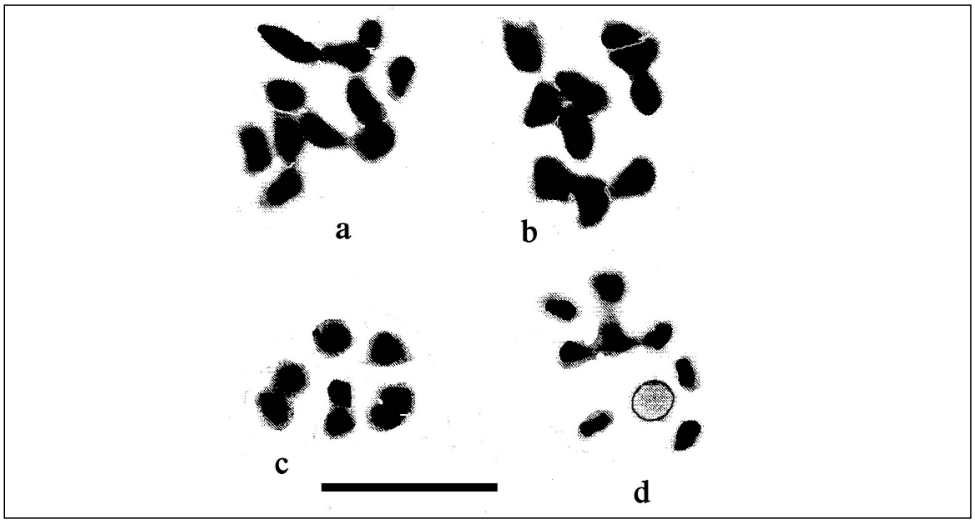

Fig.1. Microphotograph of meiotic chromosomes of: **a,** *Bunium caroides*, $n = 11$; **b,** *B. cylindricum*, $n = 10$; **c,** *Bupleurum croceum*, $n = 8$; **d,** *B. gerardii*, $n = 8$. — Scale bar = 10 µm.

(Silvestre 1976), Jordan (Al-Eisawi 1989), and Georgia (Daushkevich & al. 1993). All counts showed $2n = 16$ (or $n = 8$). Cauwet (1973) also published some chromosome parameters for *B. gerardii* karyotypes. Our determination confirms the previously known chromosome number.

1395. *Chaerophyllum crinitum* Boiss. — $n = 11$ (Fig. 2a).

Tu: B9, Van, N part, Sogursu, 39° 16' N, 44° 02' E, 2250 m, 13 Jun 2002, *Pimenov & Kljuykov* 37 (MW).

It is distributed in SW Asia: W & C Iran, Azerbaidzhan, Armenia, SW & E Turkey and Iraq.

The chromosome number of *C. crinitum*, determined for the first time here, corresponds to those previously known for the majority of *Chaerophyllum* species. For instance, other tuberous *Chaerophyllum* (*C. bulbosum* L., *C. prescottii* DC.) have $2n = 22$, with an exception ($n = 12$ by Rostovtzeva 1976), probably due the miscalculation of a B-chromosome as a basic one of the complement.

1396. *Daucus guttatus* Sm. ex Sibth. & Sm. — $n = 10$ (Fig. 2b).

Tu: B5, Nevşehir, near Avanos, 38° 44' N, 34° 53' E, 1300 m, 19 Jun 2002, *Pimenov & Kljuykov* 65 (MW).

A Mediterranean species, distributed in S Europe, N Africa and SW Asia. In Asia, it is known in Iran, Turkey, Iraq, Lebanon, Syria, Israel, Egypt (Sinai), and Cyprus.

Chromosome counts of plants from Greece (Engstrand 1970; Constance & al. 1976; Strid & Franzen 1981) showed $2n = 22$ (or $n = 11$), while in material from Bulgaria (Ceschmedjiev 1983) and Cyprus (Vogt & Aparicio 1999) the chromosome number $2n = 20$ (or $n = 10$) was counted. Our determination from central Turkey coincides with the last series. One cannot maintain for sure that two chromosome races exist in the species, as there are only six determinations, all from the eastern distribution of the species. It should be noted that the synonymy of *D. guttatus* is not quite clear, and some satellite taxa are sometimes considered as separate species.

1397. *Echinophora sibthorpiana* Guss. — $n = 11$ (Fig. 2c).

Tu: B9, Van, SE of Van, 38° 28' N, 43° 21' E, 1760-1900 m, 09 Jun 2002, *Pimenov & Kljuykov* 9 (MW).

E. sibthorpiana is one of widely distributed species of the genus - SE Europe, SW Asia from Cyprus, Lebanon and Syria up to South Kazakhstan, Tadzhikistan, Uzbekistan, Turkmenistan and Afghanistan; it is known in many Turkish vilayets. Its area is not quite natural to a certain extent and in some localities the species seems to be adventive.

So far, the species has been karyologically studied only once (Pimenov & al. 1998), also

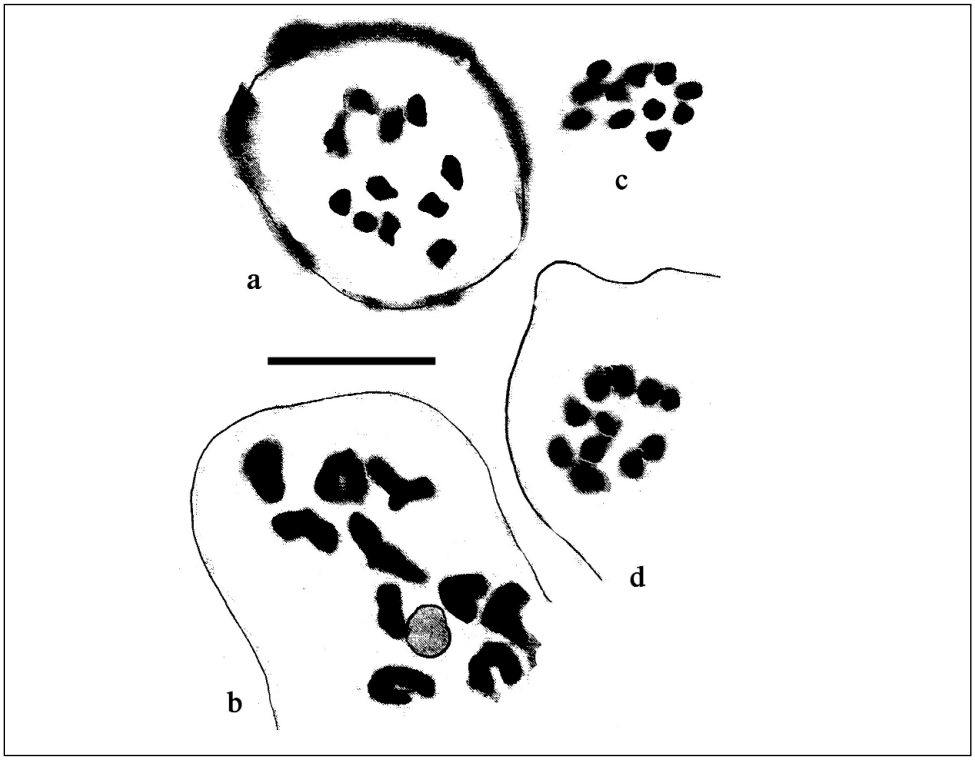

Fig. 2. Microphotograph of meiotic chromosomes of: **a,** *Chaerophyllum crinitum, n* = 11; **b,** *Daucus guttatus*, *n* = 10; **c,** *Echinophora sibthorpiana*, *n* = 11; **d,** *Ferulago platycarpa*, *n* = 11. — Scale bar = 10 μm.

from Turkey. The chromosome number *n* = 11 was determined, and it was confirmed now on material from a remote part of Turkey.

E. sibthorpiana is regarded as a species closely related to *E. tenuifolia* L., distributed westernmore. Some scientists treat *E. sibthorpiana* as a subspecies of *E. tenuifolia* - subsp. *sibthorpiana* (Guss.) Tutin (e.g. Hedge & Lamond 1972; Meikle 1977) or even as varieties. *E. tenuifolia* s.str. has 2*n* = 22 (material from Italy by Brullo & al. 1991). The third *Echinophora* species, which was studied, *E. spinosa* L., has, however, very different chromosome number, most probably *n* = 32 (Rashid 1974) and cf. 2*n* ≈ 64 (Wancher 1933), although *n* = 30 has also been reported as listed in CROMOCAT. So, karyosystematics in *Echinophora* and probably in related genera require further investigation.

1398. *Ferulago platycarpa* Boiss. — *n* = 11 (Fig. 2d).

Tu: B5, Kayseri, near Kayseri, northern slope of Erciyes Dağı, 38° 35’ N, 35° 30’ E, 2080-2200 m, 18 Jun 2002, *Pimenov & Kljuykov* 61 (MW).

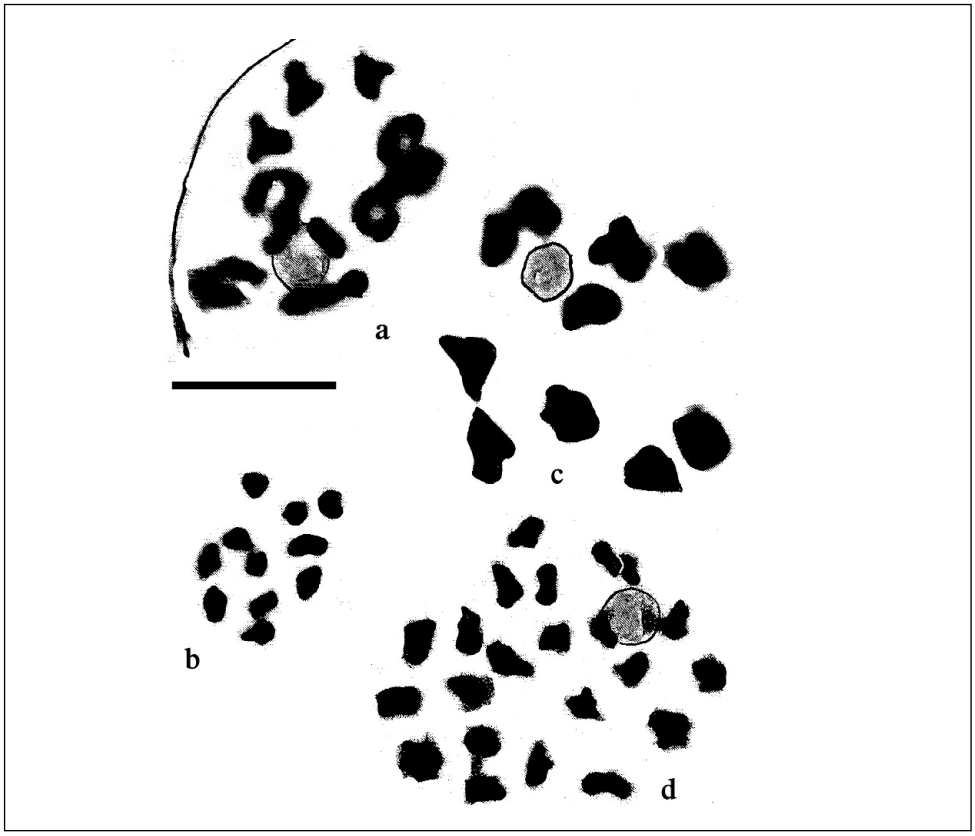

Fig. 3. Microphotograph of meiotic chromosomes of: **a,** *Grammosciadium pterocarpum*, *n* = 10; **b,** *Johrenia aromatica*, *n* = 11; **c,** *Leiotulus pastinacifolius*, *n* = 10; **d,** *L. secacul*, *n* = 22. — Scale bar = 10 μm.

This species is a Turkish endemic, distributed all over the country.

This is the second count of the chromosome number for the species, confirming the previous one (Pimenov & al. 1996). The number 2*n* = 22 is the most frequent in the genus.

1399. *Grammosciadium pterocarpum* Boiss. — *n* = 10 (Fig. 3a).

Tu: B9, Bitlis, Nemrut Dağ, 38° 38' N, 42° 14' E, 2340 m, 16 Jun 2002, *Pimenov & Kljuykov* 46 (MW).

G. pterocarpum is distributed mainly in Turkey (Sivas, Konya, Niğde, Kirşehir, Kayseri, Adana, Gaziantep, Gümüşhane, Erzincan, Erzerum, Ardahan, Kars, Ağri, Malatya, Tunceli, Elaziğ, Bitlis, Van) and also in Iranian ostans of W Azerbayjan and Zanjan.

The chromosome number *n* = 10 is determined for the first time and is in accordance to

those known for two other species of the genus, *G. daucoides* DC. and *G. platycarpum* Boiss. & Hausskn. ex Boiss. (Vinogradova 1970). Vinogradova also provides the karyotype morphology of the last two species, having a similar karyotype formula ($2n$ = 6m + 6sm + 8a = 20).

1400. *Johrenia aromatica* Rech. f. — n = 11 (Fig. 3b).

Tu: B9, Van, SE of Van, 38° 28' N, 43° 21' E, 1760-1900 m, 09 Jun 2002, *Pimenov & Kljuykov* 7 (MW).

This species, recently described from the Iranian Kurdistan (Rechinger 1987), was treated up to now as a west-Iranian-Iraqi endemic. It was firstly found in Turkey, being a floristic novelty for the country.

The chromosome number n = 11, examined for the first time here, is the same as in five other *Johrenia* species, three of which are studied Turkish species, *J. dichotoma* DC., *J. selinoides* Boiss. & Balansa ex Boiss., and *J. tortuosa* (Fisch. & C. A. Mey.) D.F.Chamb. (Pimenov & al. 1998).

1401. *Leiotulus pastinacifolius* (Boiss. & Balansa ex Boiss.) Pimenov & Ostroumova — n = 10 (Fig. 3c).

Tu : B5, Kayseri, near Kayseri, northern slope of Erciyes Dağ i, 38°35'N, 35°30'E, 2080-2200 m, 18.06.2002, *Pimenov & Kljuykov 54* (MW).

This rare Turkish endemic is better known under the name of *Malabaila pastinacifolia* Boiss. & Bal. It is distributed mainly in central Anatolia (Tokat, Sivas, Isparta, Nevşehir, Yozgat, Kayseri), as well as in Kastomanu and Kahramanmaraş, outside central Anatolia.

The chromosome number has been determined for the first time. It corresponds to the numbers, revealed for four other species of the same genus (Pimenov & al. 2002). All these four species, excepting *L. aureus* (Sm.) Pimenov & Ostroumova, seems to be stable diploids with n = 11. In *L. aureus* $2n$ = 22 is also determined, but in some publications (Baltisberger 1991, Constantinidis & al. 1997) $2n$ = 20 has also been reported.

In general, the same number $2n$ = 22 is characteristic of the closely related genus *Pastinaca* L., although polyploids were also found.

1402. *Leiotulus secacul* (Mill.) Pimenov & Ostroumova — n = 22 (Fig. 3d).

Tu: B9, Van, Donemeç Vy, Cavuştepe 38° 21' N, 43° 27' E, 1850 m, 12 Jun 2002, *Pimenov & Kljuykov* 17 (MW).

This species within the genus has a comparatively large distribution area (Iran, Turkey, Iraq, Lebanon, Syria, Israel, Jordan), being not known out of Asia. Its thickened roots are known to be edible.

There are three chromosome number determinations (Constance & al. 1976; Strid 1987

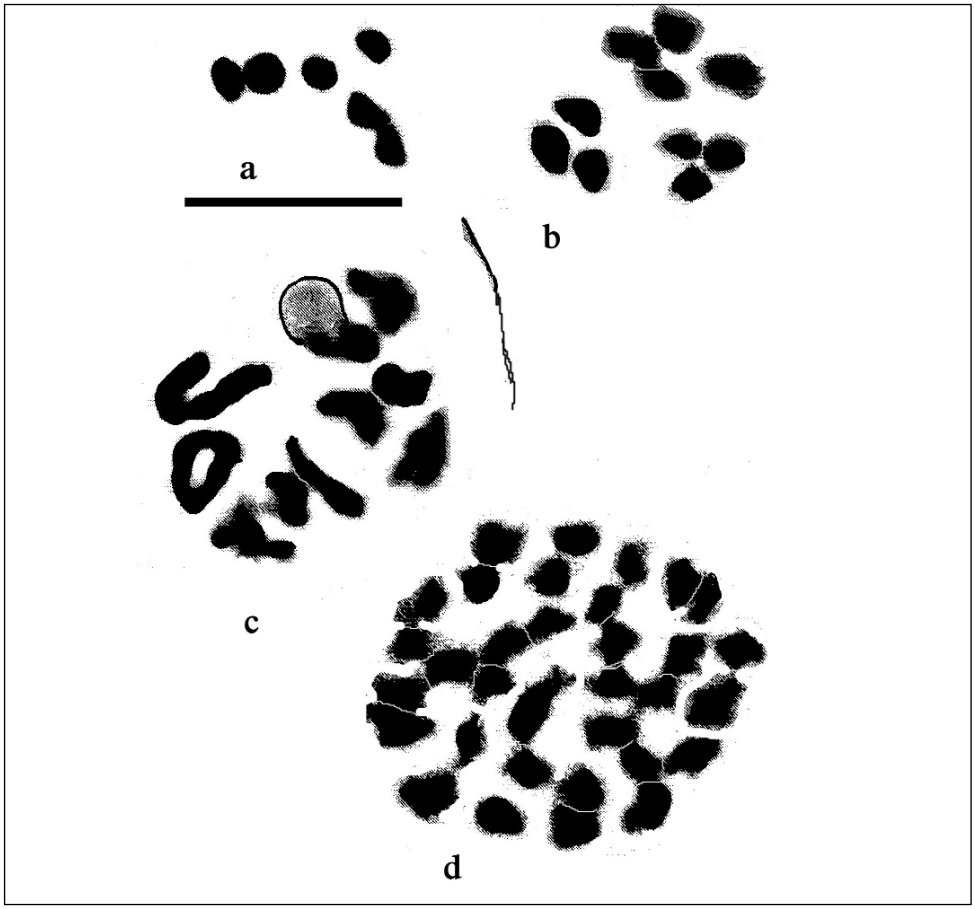

Fig. 4. Microphotograph of meiotic chromosomes of : **a,** *Lisaea papyracea*, *n* = 6; **b,** *Pimpinella kotschyana*, *n* = 10; **c,** *P. peucedanifolia*, *n* = 10; **d,** *Prangos longistylis*, *n* = 33. — Scale bar = 10 µm.

& Al-Eisawi 1989), showing the existence of diploid (*n* = 11) and tetraploid (*n* = 22) infraspecific differentiation. Our sample appeared to be tetraploid, like the plants from Israel, studied by Constance & al. (1976).

1403. *Lisaea papyracea* Boiss. — *n* = 6 (Fig. 4a).

Tu: B9, Van, SE of Van, Sumer, 38° 28' N, 43° 21' E, 1700-1800 m, 17 Jun 2002, *Pimenov & Kljuykov* 53 (MW).

L. papyracea is a representative of a small (3 spp.) genus of SW Asia. The species is distributed mainly in Turkey, where it is currently registered in 23 vilayets; outside Turkey it is known only in Armenia.

Chromosome counts for *L. papyracea* and for the whole genus *Lisaea* have never been determined. So, our determination of $n = 6$ adds a genus to the set of 347 karyologically examined genera of the World *Umbelliferae*.

Lisaea belongs to the tribe of *Caucalideae*; related genera are *Orlaya, Caucalis, Pseudorlaya, Turgenia* and some others, but *Lisaea* differs from them in flat endosperm on the commissural side. In chromosome number it differs from *Orlaya* (x = 7, 8, 9, 19, never 6), *Caucalis* (x = 10), *Pseudorlaya* (x = 7, 8, 10) and *Turgenia*. As to the latter, predominant $2n$ in this genus is 32, which could be interpreted as diploid with x = 16, or as tetraploid with x = 8. The number x = 6 presumably dominates in the monotypic genera *Ammoides* and *Chaetosciadium*, being found in four species of *Torilis*, but all these genera are comparatively distant from *Lisaea* in their morphology. The taxonomic value of chromosome number in this *Lisaea*'s group requires further investigation.

1404. *Pimpinella kotschyana* Boiss. — $n = 10$ (Fig. 4b).

Tu: B9, Van, SE of Van, Sumer, 38° 28' N, 43° 21' E, 1700-1800 m, 17 Jun 2002, *Pimenov & Kljuykov* 50 (MW).

This species is distributed in W & C Iran, Turkey (Bursa, Kahramanmaraş, Gaziantep, Hatay, Erzincan, Malatya, Tunceli, Elaziğ, Bitlis, Van, Diyarbakir, Mardin, Siirt, Hakkâri), Iraq and Syria.

Chromosome number was never determined. Our count $n = 10$ corresponds to data on closely related species, *P. corymbosa* Boiss. (Al-Eisawi 1989; Pimenov & al. 1996). The same number is frequent in the genus, being found for 28 species of different position within it.

1405. *Pimpinella peucedanifolia* Fisch. ex Ledeb. — $n = 10$ (Fig. 4c).

Tu: B9, Van, N part, Muradiye waterfall, 39° 03' N, 43° 45' E, 1860 m, 13 Jun 2002, *Pimenov & Kljuykov* 32 (MW).

In comparison with previous species, *P. peucedanifolia* is a rarer one, although in general, its distribution is slightly more restricted, especially on the western border from Iran (only E Azarbayjan) to Azerbaidzhan, Armenia and Turkey (Erzincan, Erzurum, Kars, Ağri, Tunceli, Bingöl, Muş, Bitlis, Van, Hakkâri).

The chromosome number was determined here for the first time. Resulted number ($n = 10$) is usual within *Pimpinella* (see: *P. kotschyana* paragraph).

1406. *Prangos longistylis* (Boiss.) Pimenov & Kljuykov — $n = 33$ (Fig. 4d).

Tu: B9, Van, SE part, Güzeldere, 38° 10' N, 43° 54' E, 2710 m, 12 Jun 2002, *Pimenov & Kljuykov* 24 (MW).

According to the regional Floras and *Prangos* monograph (Herrnstadt & Heyn 1977) this species is known under the name of *P. platychlaena* Boiss. ex Tchih. However,

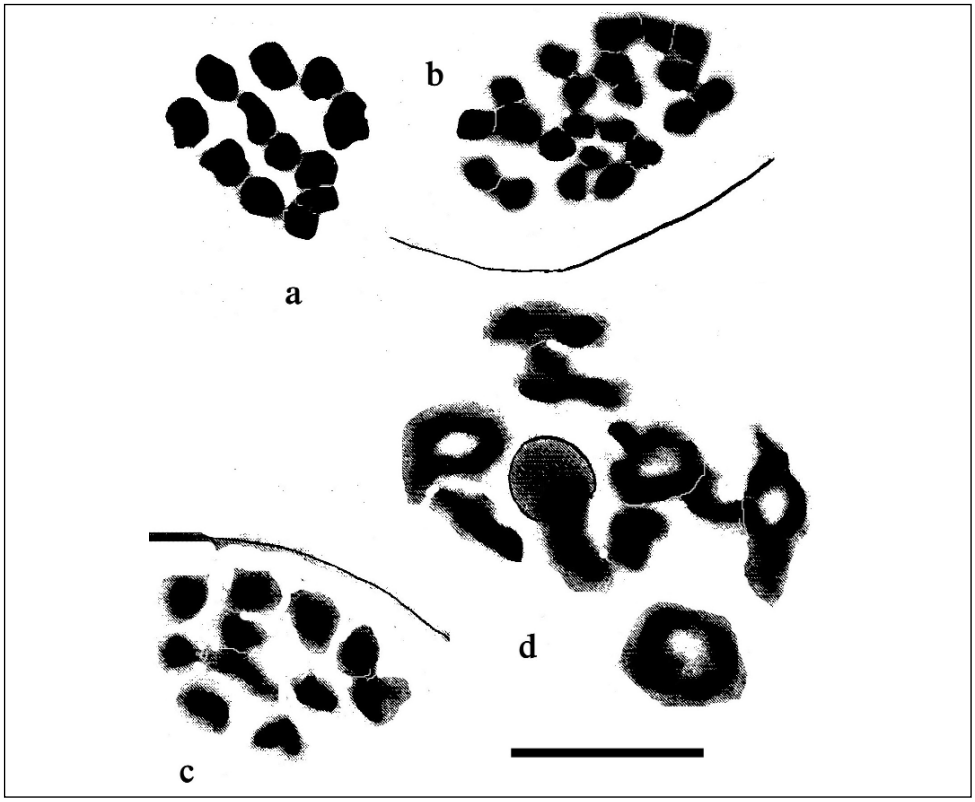

Fig. 5. Microphotograph of meiotic chromosomes of : **a,** *Prangos uloptera*, *n* = 11; **b,** *P. uloptera*, *n* = 22; **c,** *Trigonosciadium viscidulum*, *n* = 11; **d,** *Trinia leiogona, n* = 10. — Scale bar = 10 µm.

Pimenov & Kljuykov (1997) considered that *Ferulago longistylis* Boiss. is the priority name for the species.

P. longistylis has an area of atropatene type from W Iran to Turkey (Giresun, Sivas, Gümüşhane, Erzincan, Erzurum, Kars, Malatya, Tunceli, Muş, Bitlis, Van) and Iraq.

Chromosome number was determined here for the first time. Our result shows the species to be hexaploid (*n* = 33). This is the third case of a hexaploid species within *Prangos*. Two previous ones were *P. asperula* Boiss. subsp. *haussknechtii* (Boiss.) Herrnst. & Heyn and P. *ferulacea* (L.) Lindl. (Herrnstadt & Heyn 1975, 1977), although some populations of *P. ferulacea* can be tetraploid, too (Pimenov & Vasil'eva 1983; Raimondo & al. 1983).

1407. *Prangos uloptera* DC. — *n* = 11, 22 (Fig. 5a-b).

Tu: B9, Van, SE part, Güzeldere, 38° 10' N, 43° 54' E, 2710 m, 12 Jun 2002, *Pimenov & Kljuykov* 23 (MW). - (Fig. 5a).

Tu: B9, Van, SE of Van, 38° 28' N, 43° 21' E, 1760-1900 m, 09 Jun 2002, *Pimenov & Kljuykov* 10 (MW). - (Fig. 5b).

Our treatment of this species is narrower than that in Herrnstadt & Heyn's monograph (1977); for instance, *P. tschimganica* B. Fedtsch., *P. lipskyi* Korovin, *P. isphairamica* B. Fedtsch., *P. ornata* Kuzm. and some other species from the eastern part of *P. uloptera* s.l. area are considered as independent. As a result, *P. uloptera* s.str. appears to be distributed in Afghanistan, Iran, Azerbaidzhan, Armenia, Turkey (only 3 vilayets in south-eastern-most part of the country) and Iraq.

Chromosome number of *P. uloptera* was determined once (Herrnstadt & Heyn 1977), on plants grown from seeds from Moscow Botanical garden, but not from a native population. It can be either *P. uloptera* s.str., or some of its above-mentioned segregate species from Middle Asia.

Our counting has showed two different ploidy level, diploid and tetraploid, although the material was fixed in the limits of a vilayet. Unfortunately, the plants were in the initial stage of blooming, with unripe ovaries, and fruit surface ornamentation was hardly observed. Two voucher plants, nos. 10 and 23, slightly differ in hairness of stems and petioles, but cannot be referred to different species.

1408. *Trigonosciadium viscidulum* Boiss. & Hausskn. ex Boiss. — $n = 11$ (Fig. 5c).

Tu: B9, Van, SE part, Güzeldere, 38° 10' N, 43° 54' E, 2710 m, 12 Jun 2002, *Pimenov & Kljuykov* 25 (MW).

T. viscidulum is a representative of small genus, endemic for atropatene floristic region. It contains 5 species of Iran, E Turkey and Iraq. *T. viscidulum* is distributed in Iranian ostan of W Azarbayjan, Turkish vilayets of Van and Hakkâri, as well as in northern Iraq.

Neither the species nor the whole genus had ever been studied for the chromosome number. The count obtained is the most frequent in *Apioideae*, and, in particular in the tribe of *Tordylieae*, to which *Trigonosciadium* belongs, being the closest relative of *Leiotulus*. Menemen & Jury (2001) consider *Trigonosciadium* as congeneric with *Malabaila*, although they does not proposed new nomenclatural combinations for the *Trigonosciadium* species. Chromosome data do not seem to be of much value for the generic delimitation issue in *Pastinaca-Malabaila-Leiotulus-Trigonosciadium* complex, as $2n = 22$ prevails in all these taxa. Molecular data (unpublished) show close relationships in the complex.

1409. *Trinia leiogona* (C.A.Mey.) B. Fedtsch. — $n = 10$ (Fig. 5d).

Tu: B9, Van, SE part, Güzeldere, 38° 10' N, 43° 54' E, 2710 m, 12 Jun 2002, *Pimenov & Kljuykov* 22 (MW).

According to "Flora of Turkey", the species must be named as *T. scabra* Boiss. & Noe ex Boiss. (Hedge & Lamond 1972). Now it is clear, however, that the name of priority for the species is *Rumia leiogona* C. A. Mey. and the correct name is *T. leiogona* (C. A. Mey.) B. Fedtsch., as the Turkish species is identical with Caucasian one. It is distributed in the Russian north Caucasus, in Georgia, Armenia, Azerbaidzhan and Turkey (C, SW and E Anatolia).

Chromosome number $n = 10$ is the new one for the species. Previously, $2n = 18$ was

reported for it, determined from the northern Caucasus (Vasil'eva & al. 1981). The most usual number within the genus is x = 9, but *2n*=20 is also known. Four counts for populations of *T. kitaibelii* M. Bieb. from different countries (Hungary, Ukraine, Slovakia) showed 2*n* = 20 (Baksay 1958; Vachova & Lhotska 1978, 1980; Fedoronchuk 1979).

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Reports (1410-1412) by T. Cusma Velari, L. Feoli Chiapella & V. Kosovel

1410. ***Genista hirsuta*** Vahl ***subsp. hirsuta*** — 2*n* = 48 (Fig. 1a, b).

Lu: Serra de Monchique, 37°20'N, 8°34'W, seeds obtained from Botanical Garden, Lisboa (s.n., s.coll., s.exsicc.).
— Algarve, Vila do Bispo, Cabo de San Vicente, 37° 1'N, 8°59'W, Jul 1998, seeds obtained from Botanical Garden, Lisboa (s.n., s.coll., s.exsicc.).
— Algarve, Via do Infante, ao Km 298, 37°6'N, 8°47'W, Jul 1999, seeds obtained from Botanical Garden, Lisboa (s.n., s.coll., s.exsicc.).

Genista hirsuta subsp. *hirsuta* is endemic to the central and western Peninsula Iberica (Raynaud 1979; Talavera 1999).

Our count 2*n*= 48 confirms in part the existing references: Gallego Martin & al. (1986) counted *n* = 24 and 2*n* = 48 on Spanish material from Cañaveral, Cáceres, whereas Fernandes & Queirós (1978) reported 2*n* = 32 for a Portuguese population (Colares, Tapada do Cospeto).

Sañudo (1972) found *n* = 24 and 2*n* = 48 both in a population of *Genista hirsuta* from S. Pedro de Alcántara (Málaga) and in a population of *Genista hirsuta* subsp. *lanuginosa* (Spach) Nyman (sub *G. lanuginosa* Spach) from S. Palmitera (Málaga); after Talavera (1999) only subsp. *lanuginosa* is present in the province of Málaga, therefore it is likely that both data obtained by Sañudo (1972) concerning this region have to be referred to subsp. *lanuginosa*.

Chromosome size ranges between 0.66 and 2.42 μm.

1411. ***Genista cupanii*** Guss. — 2*n* = 48 (Fig. 1c).

Si: Palermo, Case Prato, Madonie, 37°49'N, 14°8'E, 1700 m., seeds obtained from Botanical Garden, Palermo (s.n., s.coll., s.exsicc.).

Genista cupanii is endemic to Madonie mountains, Sicily (Raimondo 1999).

The chromosome number 2*n* = 48 confirms the only existing reference reported by Bartolo & al. (1977, for a population from contrada Mandarini, Petralia Sottana, Madonie). Chromosome size ranges from 0.77 to 2.42 μm.

The species grows in the montane part of Madonie on quartzarenitic soils (Raimondo 1999).

Genista hirsuta and *G. cupanii* belong to sect. *Voglera* (Gaertn., Mey. & Schreb.) Spach (Gibbs 1966; Talavera 1999). The chromosome number 2*n* = 48 has been reported for other

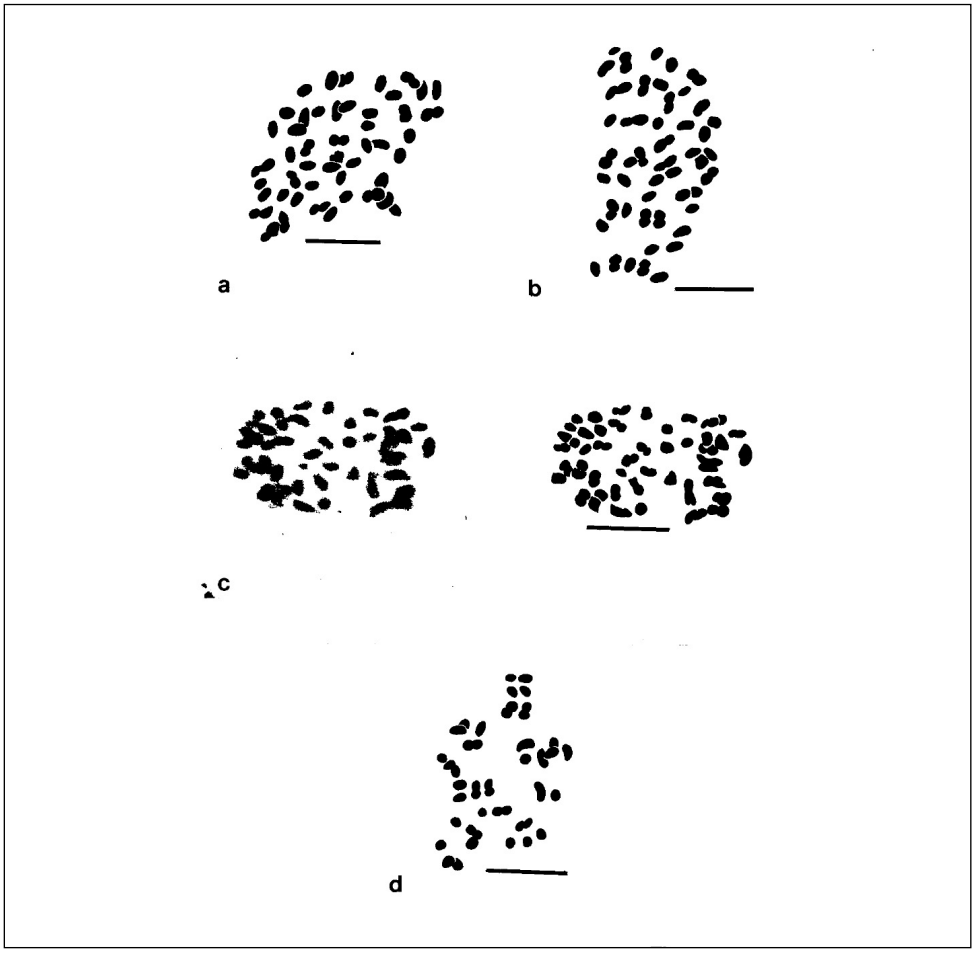

Fig. 1. Drawing of somatic metaphase plate of: **a**, *Genista hirsuta* subsp. *hirsuta* from Algarve, Via do Infante, 2*n* = 48; **b,** Serra de Monchique, 2*n* = 48; **c,** photomicrograph and relative drawing of somatic metaphase plate of *Genista cupanii,* 2*n* = 48; **d,** drawing of somatic metaphase plate of *Genista micrantha,* 2*n* =36. — Scale bars = 5 µm.

species of the section, distributed in the western (*G. tricuspidata* Desf., Boscaiu & al. 1997, sub *G .lucida* Cambess.; Cusma Velari & al. 1999, 2000), central (*G. aristata* C. Presl, Cusma Velari & Feoli Chiapella 1991) and eastern Mediterranean region (*G. anatolica* Boiss., Krusheva 1975). The same number has been sporadically counted also in the eastern Mediterranean species *G. carinalis* Griseb. (Kuzmanov 1975) and in the central European species *G. germanica* L. (Reese 1952; Semerenko & Shvet after Goldblatt & Johnson 1991).

2*n* = 48 may be traced back to the basic number *x* = 12, which is by far the most common number in *Genista* and in other genera of Genisteae (Sañudo 1979).

1412. *Genista micrantha* Gómez Ortega— 2*n* = 36 (Fig. 1d).

Hs: Soria, Santa Inés, 42°2'N, 2°52'W, 1200 m, *A. Segura Zubizarreta* (s.n., s.exsicc.).

Genista micrantha is endemic to the northern Iberian peninsula (Gibbs 1966; Talavera 1999).

The chromosome number 2*n* = 36 confirms the references reported by Sañudo (1972, for a population from Monte Salcedillo, Palencia), by Gallego Martin & al. (1985, on material from S. Martín de Castañeda, Zamora) and by Cubas & al. (1998, for two populations near Zamora: Sierra de la Culebra, Puente de Sanabria). In a preliminary report, Gallego Martin & al. (1984) mentioned also *n* = 12 and 2*n* = 24. Chromosome size ranges between 0.99 and 1.43 μm.

The number 2*n* = 36 may be traced back to the secondary basic number x = 9 (Sañudo 1979; Cusma Velari & al. 1999, 2003). *Genista micrantha* belongs to sect. *Voglera* (Gaertn., Mey. & Schreb.) Spach**;** other western taxa of this section present numbers deriving from x = 9: *G. hispanica* L. subsp. *hispanica* (southeastern France, eastern and central Spain) and subsp. *occidentalis* Rouy (southwestern France, northern and central Spain) have *n* = 18 and 2*n* = 36 (Sañudo 1972; Verlaque & al. 1987), *G. tridens* (Cav.) DC. (Southern Spain, northwestern Morocco) has *n* = 36 and 2*n* = 72 (Sañudo 1972**)**.

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Reports (1413-1414) by T. Cusma Velari, L. Feoli Chiapella & G. Bacchetta

1413. *Genista ferox* Poiret — 2*n* = 48 (Fig. 1b).

Sa: Cagliari, Sarroch, Sa Cruxi e sa Cugurra, on hercynian granites, 39°13’N, 9°06’E, 265 m, 14 April 2003, *G. Bacchetta & M. Orrù* s.n. (CAG).

Genista ferox is distributed in the coastal ranges of northwestern Africa (Algeria and Tunisia, Maire 1987; Greuter & al. 1989) and in Sardinia (Valsecchi 1981). In Sardinia, it grows in the northwestern area (Castelsardo, Sassari) (Valsecchi 1981; Camarda & Valsecchi 1982) and in the southwestern part of Sulcis, where it is diffused in littoral and sublittoral zones between Villa d’ Orri (Sarroch, Cagliari) and Capo Malfatano (Teulada, Cagliari).

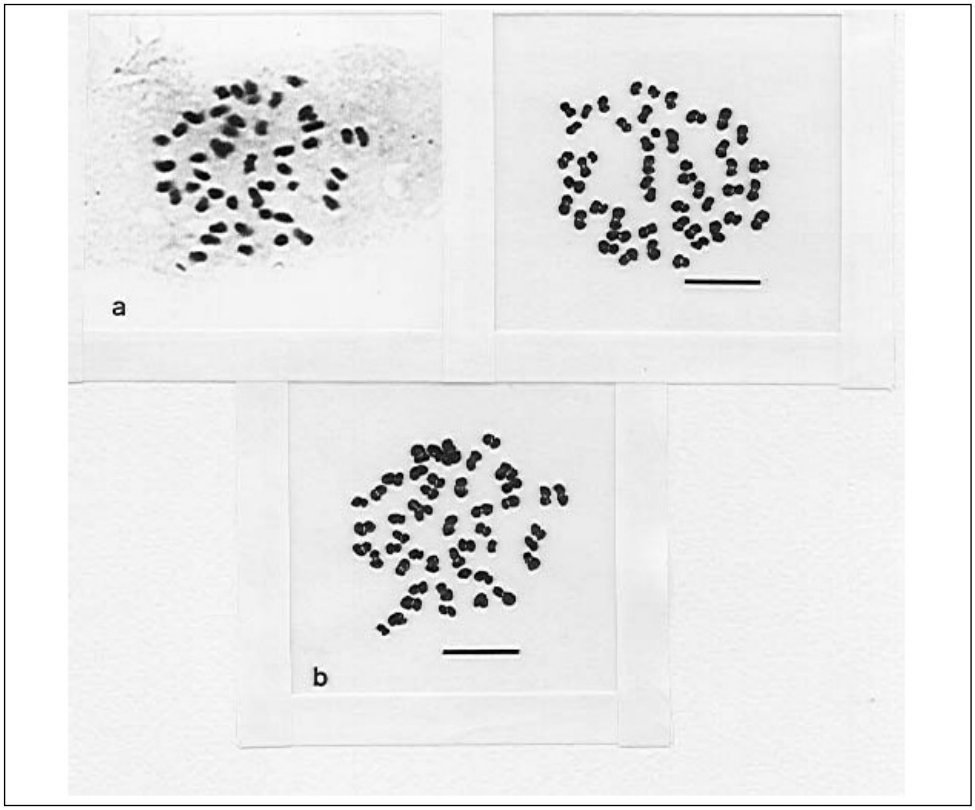

Fig. 1. Photomicrograph and relative drawing of somatic metaphase plate of: **a,** *Genista ifniensis,* 2*n* = 48; **b,** drawing of somatic metaphase plate of *Genista ferox,* 2*n* = 48. — Scale bars = 5 µm.

Our count 2*n* = 48 confirms the existing references: Tschechow (1931) on cultivated material and Villa (1980) for a Sardinian population (Peruledda, Castelsardo). Chromosome size ranges between 0.88 and 1.79 µm.

The species grows on granites and metaquartzites at altitudes between 0 and 600 m; its bioclimate is Mediterranean pluviseasonal-oceanic; the thermotypes range between upper thermomediterranean and lower mesomediterranean, the ombrotypes between upper dry and lower subhumid (after Rivas-Martínez & al. 2002). *Genista ferox* is characteristic of "maquis" and thermophilous garrigue, in coenoses of class *Cisto-Lavanduletea* Br.-Bl. in Br.-Bl., Molinier et Wagner 1940.

1414. *Genista ifniensis* A. Caballero [= *G. ferox* Poiret subsp. *microphylla* (Ball) Font Quer] — 2*n* = 48 (Fig. 1a).

Ma: Sous plain, near Taroudannt, 30°30'N, 8°55'W, 280 m, 23 Jun 1987, *L. Feoli Chiapella* s.n. (TSB).

Genista ifniensis is endemic to southern Morocco (southwestern coast, western Great Atlas, western Anti - Atlas; Raynaud 1979; Maire 1987).

The chromosome number $2n = 48$ confirms the only reference reported by Cusma Velari & al. (1999) for a population from Anti - Atlas, Tiznit - Goulimine, near Tizi – Mighert. Chromosome size ranges between 0.99 and 1.84 m.

Genista ferox and *G. ifniensis* belong to sect. *Scorpioides* Spach (Gibbs 1966; Maire 1987).

The same chromosome number was found in other taxa of the section, such as *Genista corsica* (Loisel.) DC., endemic to Corsica and Sardinia (Valsecchi 1977), on material from both islands (Contandriopoulos 1957, 1962; Villa 1978; Cusma Velari & al. 2000), the close taxon *G. cadasonensis* Valsecchi, endemic to Sardinia, where it is spread through the central-eastern coast (Valsecchi 1984; Villa 1988), and *G. morisii* Colla, endemic to south-western Sardinia (Valsecchi 1976; Villa & Sanna 1983; Cusma Velari & al. 2002).

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