

Mediterranean chromosome number reports – 21

edited by G. Kamari, C. Blanché & S. Siljak-Yakovlev

Abstract

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This is the twenty first of a series of reports of chromosome numbers from Mediterranean area, peri-Alpine communities and the Atlantic Islands, in English or French language. It comprises contributions on 16 taxa: *Alyssum* from Iran, by S. Bolourian, A. Tavassoli & M. Pakravan (Nos 1737-1743); *Genista* from Italy, Sardinia and Corse by T. Cusma Velari, L. Feoli Chiapella & G. Bacchetta (Nos 1744-1748); *Genista* from Greece, Cyprus and Israel, by T. Cusma Velari & L. Feoli Chiapella (Nos 1749-1750); *Isoëtes* from Sicily, by A. Troia, P. Marino & A. M. Orlando (No 1751), *Pilosella* from Italy, by E. Di Gristina, A. Geraci & P. Marino (No 1752).

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Reports (1737-1743) by S. Bolourian, A. Tavassoli & M. Pakravan

1737. *Alyssum contemptum* Schott & Kotschy — $2n = 16$ (Fig. 1).

Ir: Kan, Tehran, 35° 56' 02" N, 50° 57' 03" E, gravelly slope, 2116 m, 2008, *Keshavarzi 5045* (ALUH = Alzahra University Herbarium).

Our cytological results confirm the previous count of this species taken from Turkey (Contandriopoulos & Afzal-Rafii 1973).

1738. *Alyssum dasycarpum* Stephan ex Willd. — $2n = 32$ (Fig. 2).

Ir: Mahdasht to Eshtehard road, 26 km before Eshtehard, Tehran, steppe, 1090 m, 18 Apr 2008, *Falaturi 5049* (ALUH).

Chromosome number in the studied specimens was $2n = 32$, while a previous report showed a diploid count of $2n = 16$ (Podlech 1986).

1739. *Alyssum desertorum* Stapf — $2n = 24$ (Figs 3-5).

Ir: Shahre jadide Pardis, Tehran, manmade grove, 1600 m, 11 April 2008, *Bolourian 5009* (ALUH).

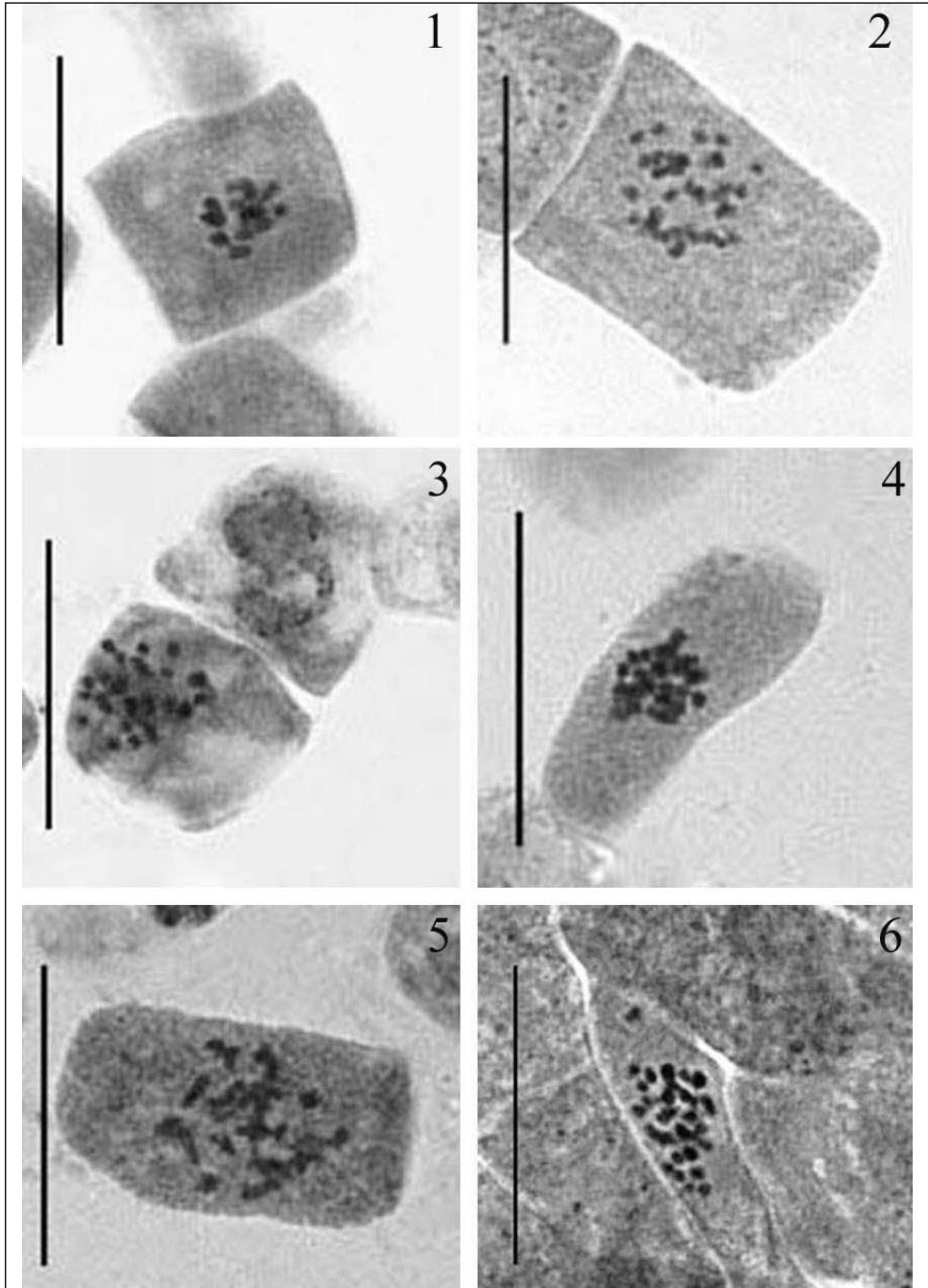
— Qom road to Arak, After Imamzadeh Jafar, Qom, steppe, 1740 m, 22 April 2008, *Bolourian 5016* (ALUH).

In *Alyssum desertorum* the chromosome number $2n = 24$ was counted, while one plate had $2n = 32$ chromosomes. Maasoumi (1980) reported $2n \approx 29-32$ from Iran. Other reports, including Iljinskaya (1986) and Murin & al. (1999), published $2n = 32$. Although only one plate had a different number of chromosomes in this study, a similar observation has been reported in *A. contemptum* with $2n = 18$ from Turkey (Contandriopoulos & Afzal-Rafii 1973).

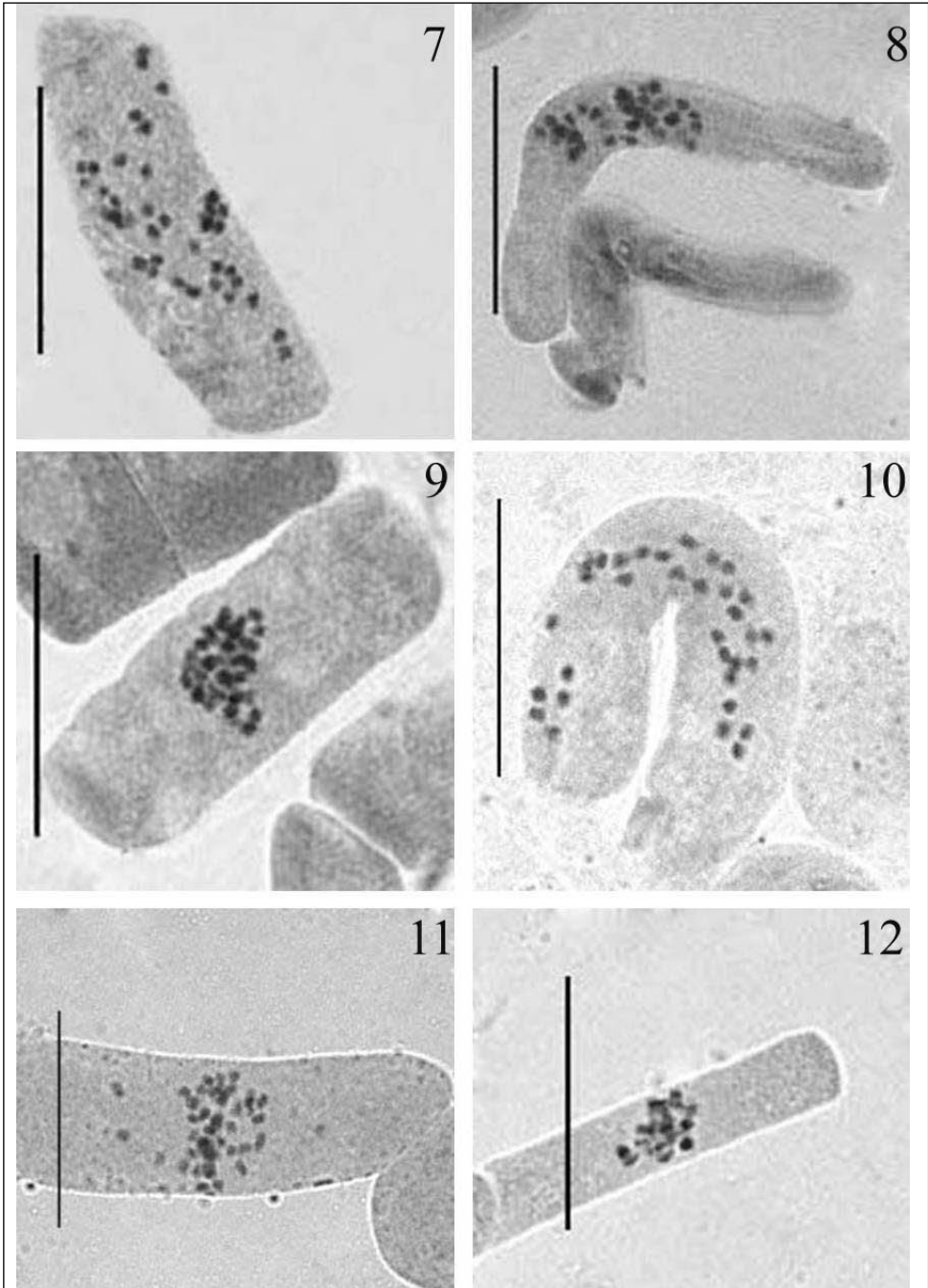
1740. *Alyssum linifolium* Stephan ex Willd. — $2n = 24 / 2n \approx 32$ (Figs 6-9).

Ir: Shahre jadide Pardis, Tehran, manmade grove, 1600 m, 11 April 2008, *Bolourian 5010* (ALUH).

In this species, most cells showed $2n = 24$ chromosomes, but some specimens had $2n \approx 32$ chromosomes per cell and the number of chromosomes counted in one specimen was $2n \approx 40$. Although all specimens were gathered from one area, there is a possibility of the plant originally coming from other sites unknown to the authors because of being collected from a manmade grove. Previous chromosome counts for *A. linifolium* are $2n = 14$ (Iljinskaya 1986; Ilyinska 1972) and $2n = 16$ (Ilyinskaya 1989).



Figs 1-6. Microphotographs of root tip mitosis of: 1, *Alyssum contemptum*, $2n = 16$; 2, *A. dasy-carpum*, $2n = 32$; 3-4, *A. desertorum*, $2n = 24$; 5, *A. desertorum*, $2n = 32$; 6, *A. linifolium*, $2n = 24$. — Scale bars = 20 μm .



Figs 7-12. Microphotographs of root tip mitosis of: 7, *Alyssum linifolium*, $2n \approx 40$; 8- 9, *A. linifolium*, $2n \approx 32$; 10, *A. marginatum*, $2n = 32$; 11, *A. minus* var. *micranthum*, $2n = 32$; 12, *A. szovitsianum*, $2n = 14$. — Scale bars = 20 μm .

1741. *Alyssum marginatum* Steud. ex Boiss. — $2n = 32$ (Fig. 10).

Ir: Tehran to Qom motorway, 80 km before Qom, steppe, 1160 m, 22 April 2008, *Bolourian 5013* (ALUH).

Chromosome counts showed $2n = 32$ chromosomes in *Alyssum marginatum* which was a tetraploid compared to a previous counting of $2n = 16$ (Aryavand 1996) mentioned from his earlier work, which was not accessible by the current authors.

1742. *Alyssum minus* var. *micranthum* (C. A. Mey.) T. R. Dudley — $2n = 32 / 2n \approx 36$ (Fig. 11).

Ir: Lavasan, Naran road, Tehran, along the road, 1780 m, 11 May 2008, *Bolourian 5028* (ALUH).

— Lavasan, Tehran, gravelly slope, 1800 m, 11 May 2008, *Bolourian 5031* (ALUH).

— Lavasan to Afjeh, Tehran, stony slope, 1800 m, 11 May 2008, *Bolourian 5032* (ALUH).

In the population 5031 ALUH were counted $2n \approx 36$, while in the other two 5028 and 5032 ALUH were observed $2n = 32$ chromosomes. Previous studies have reported $2n = 16$ for *Alyssum minus* (L.) Rothm. (including Maasoumi 1980 and Persson 1971). Aryavand (1996) has used a previous counting of $2n = 16$ for *A. minus* var. *micranthum* in a numerical taxonomic study.

1743. *Alyssum szovitsianum* Fisch. & C. A. Mey. — $2n = 14$ (Fig 12).

Ir: Tehran to Qom road, before Hassan abad village, steppe, 1260 m, 22 April 2008, *Bolourian 5012* (ALUH).

Aryavand (1996) reported a count of $2n = 16$ which shows difference in comparison with the present number of $2n = 14$, but we also counted $2n = 16$ chromosomes in one cell. Lack of more evidence made it impossible to have a better evaluation. However, Contandriopoulos & Afzal-Rafii (1973) noted a similar difference in chromosome numbers in *A. contemptum*.

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Reports (1744-1748) by T. Cusma Velari, L. Feoli Chiapella & G. Bacchetta

1744. *Genista desoleana* Vals. — $2n = 18+0-4B$ (Fig. 1a, b, c).

- Sa:** Oristano, Santu Lussurgiu, Punta Badde Urbara, plio-pleistocenic volcanites, 40° 09' N, 8° 37' E, 960 m a.s.l., 5 Aug 2002, *G. Bacchetta* (CAG).
- Nuoro, Bolotana, Badde Salighes, plio-pleistocenic volcanites, 40° 20' N, 8° 54' E, 1500 m a.s.l., 22 Aug 2004, *G. Bacchetta* & *M. Manconi* (CAG).
- Sassari, Bono, Mt. Rasu, palaeozoic metamorphites, 40° 25' N, 9° 00' E, 1000 m a.s.l., 22 Aug 2004, *G. Bacchetta* & *M. Manconi* (CAG).
- It:** Genova, Val d'Aveto, Loc. Caselle, 44° 53' N, 9° 41' E, 1100 m a.s.l., 24 Aug 1989, *S. Gentile* (s.n., s.exsicc.).

The species is distributed in the Northern Apennines (Liguria, Toscana), Elba, Corse and Central Western Sardinia (particularly in the mountains of Montiferru and Marghine) (Valsecchi 1986a).

The chromosome number $2n = 18+0-4B$ was counted on the basis of 20 metaphase plates. Chromosome size ranges from 1.39 to 3.98 μm and from 0.40 to 0.52 μm for B chromosomes. Our counting confirms the only reference reported by Villa (1988) for a population from Cuglieri, Badde Urbara.

The species grows on different siliceous substrata (basalts, granites and metaquartzites) at altitudes between 600 and 1200 m; its bioclimate is mainly temperate submediterranean pluvisesional-oceanic; the thermotype ranges between upper mesosub-mediterranean and lower suprasubmediterranean, the ombrotype between lower subhumid

and lower humid (after Rivas-Martínez & al. 2002). *Genista desoleana* is characteristic of scrub and garrigue, in coenoses of classes *Cisto-Lavanduletea* Br.-Bl. in Br.-Bl., Molinier & Wagner 1940 and *Carici-Genistetea lobelii* Klein 1972.

1745. *Genista toluensis* Vals. — $2n = 18+0-2B$ (Fig. 1d).

Sa: Nuoro, Lula, Monte Albo, Punta su Mutrucone, mesozoic limestone, 40° 31' N, 9° 34' E, 915 m a.s.l., 6 Jun 2004, C. Angiolini, G. Bacchetta & U. Gamper (CAG, TSB).

Genista toluensis is endemic to Central Eastern Sardinia (Mt. Tolui, Mt. Albo and Mt. Tuttavista) (Valsecchi 1984).

The chromosome number $2n = 18+0-2B$ was counted on the basis of 5 metaphase plates. Our counts confirm the only reference reported by Villa (1988) for a population from Mt. Tolui, Dorgali.

The species grows on different limestone substrata at altitudes between 600 and 1000 m; its bioclimate is mainly mediterranean pluviseasonal-oceanic; the thermotype ranges between upper mesomediterranean and lower supramediterranean, the ombrotype between lower subhumid and upper subhumid (after Rivas-Martínez & al. 2002). *Genista toluensis* is characteristic of scrub and garrigue, in coenoses of class *Cisto-Lavanduletea* Br.-Bl. in Br.-Bl., Molinier & Wagner 1940.

1746. *Genista salzmannii* DC. var. *salzmannii* — $2n = 18+0-2B$ (Fig. 2a).

Sa: Sassari, Tempio Pausania, Mt. Limbara, hercynian granites, 40° 51' N, 9° 08' E, 1100-1200 m a.s.l., 16 Jul 2003, L. Feoli Chiapella & L. Feoli (TSB).

Genista salzmannii var. *salzmannii* is endemic to Corse and Northern Eastern Sardinia (Mt. Limbara) (Valsecchi 1993).

The chromosome number $2n = 18+0-2B$ was counted on the basis of 11 metaphase plates. Chromosome size ranges from 1.76 to 5.23 μm (0.20 μm for B chromosomes). Villa (1988) reported $2n = 36$ and $2n = 18$ respectively for populations from Mt. Limbara and Valle della Restonica, Corte (Corse); Cusma Velari & Feoli Chiapella (1982) observed $2n = 18$ on material from Calvi (Corse).

The species grows on granite and metamorphite substrata at altitudes between 300 and 1200 m; its bioclimate is mainly mediterranean pluviseasonal-oceanic; the thermotype ranges between lower mesomediterranean and lower supramediterranean, the ombrotype between lower subhumid and lower humid (after Rivas-Martínez & al. 2002). *Genista salzmannii* var. *salzmannii* is characteristic of scrub and garrigue, in coenoses of class *Cisto-Lavanduletea* Br.-Bl. in Br.-Bl., Molinier & Wagner 1940.

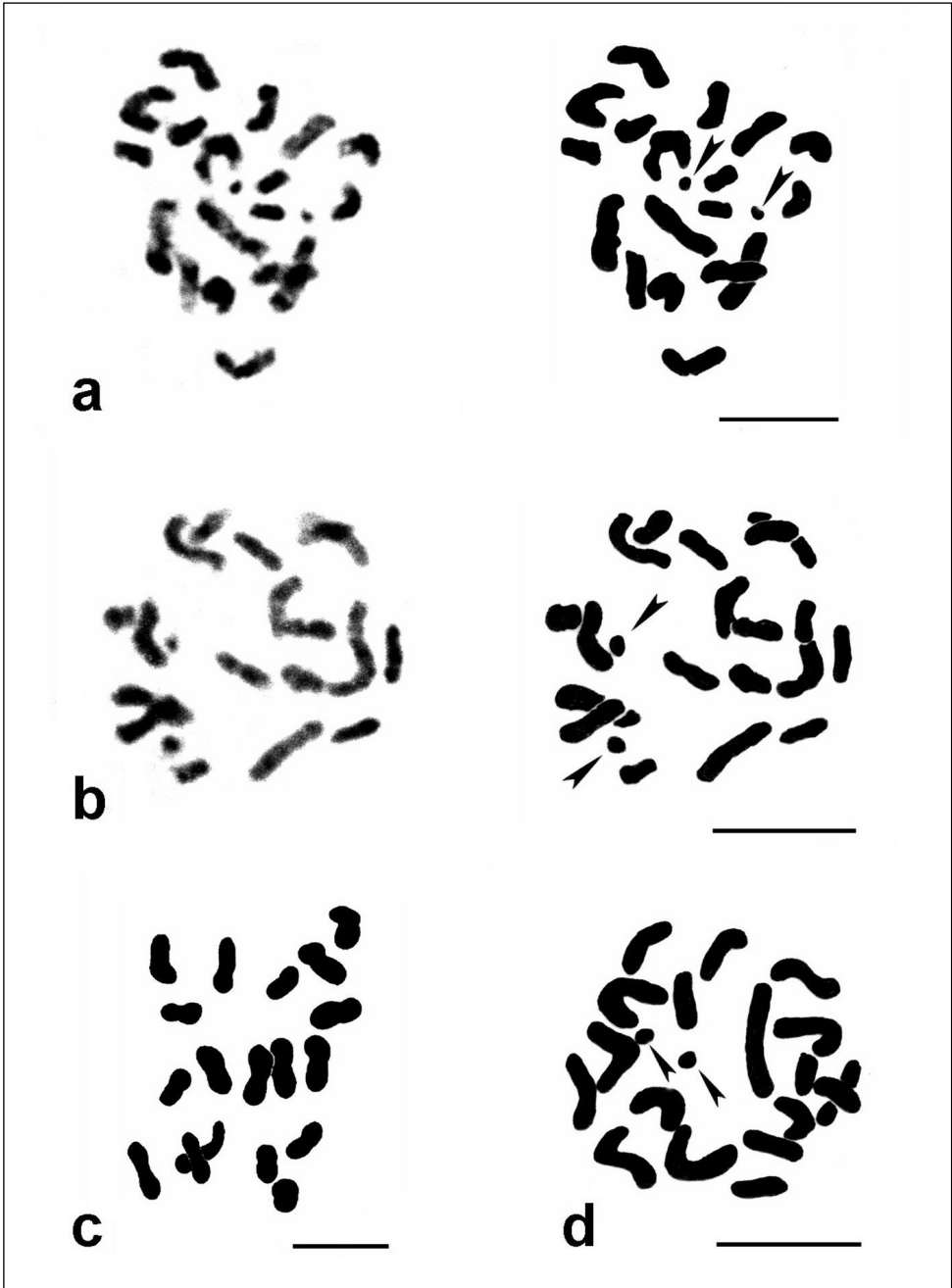


Fig. 1. Photomicrographs and relative drawings of somatic metaphase plates of: **a**, *Genista desoleana* (Badde Salighes), $2n = 18+2B$; **b**, *Genista desoleana* (Badde Urbara), $2n = 18+2B$; drawings of somatic metaphase plates of **c**, *Genista desoleana* (Val d'Aveto), $2n = 18$; **d**, *Genista toluensis* (Mt. Albo), $2n = 18+2B$. – Arrows indicate B-chromosomes. Scale bars = 5 μ m.

1747. *Genista salzmannii* DC. var. *lobelioides* (Gamisans) Gamisans & Jeanmonod (= *G. lobelii* DC. var. *lobelioides* Gamisans) — $2n = 18$ (Fig. 2b).

Co: Bastia, Asco, Haute Asco, porphyrites, 42° 22' N, 8° 54' E, 1825 m a.s.l., 22 Jul 2004 C. Adamo, G. Bacchetta, T. Carai, G. Iriti, C. Pontecorvo (CAG, TSB).

Genista salzmannii var. *lobelioides* (Gamisans) Gamisans & Jeanmonod is endemic to Corse (Gamisans & Jeanmonod 1993).

The chromosome number $2n = 18$ was counted on the basis of 5 metaphase plates. Chromosome size ranges from 1.70 to 3.70 μm . No previous karyological data are known for this taxon.

The species grows on different siliceous substrata at altitudes between 1400 and 1900 m; its bioclimate is mainly temperate submediterranean pluviseasonal-oceanic; the thermotype ranges between upper suprasubmediterranean and lower orosubmediterranean, the ombrotype between lower subhumid and lower humid (after Rivas-Martínez & al. 2002). *Genista salzmannii* var. *lobelioides* is characteristic of dwarf-scrub, in coenoses of class *Carici-Genistetea lobelii* Klein 1972.

1748. *Genista pichisermolliana* Vals. — $2n = 18+0-2B$ (Fig. 2c).

Sa: Nuoro, Fonni, Bruncu Spina, palaeozoic granites, metamorphytes, 40° 02' N, 9° 18' E, 1310 m a.s.l., 23 Aug 2002, G. Bacchetta (CAG).

Genista pichisermolliana is endemic to Central and Eastern Sardinia (Mountains of Gennargentu, Barbagia di Belvi) (Valsecchi 1993).

The chromosome number $2n = 18+0-2B$ was counted on the basis of 16 metaphase plates. Chromosome size ranges from 1.65 to 4.88 μm (0.18-0.22 μm for B-chromosomes). Villa (1988) reported $2n = 18$ for a population from Mt. Scova, Aritzo (sub *G. salzmannii*).

The species grows on different siliceous substrata at altitudes between 1200 and 1700 m; its bioclimate is mainly temperate submediterranean pluviseasonal-oceanic; the thermotype ranges between lower suprasubmediterranean and upper suprasubmediterranean, the ombrotype between lower subhumid and lower humid (after Rivas-Martínez & al. 2002). *Genista pichisermolliana* is characteristic of dwarf-scrub, in coenoses of class *Carici-Genistetea lobelii* Klein 1972.

Genista desoleana, *G. toluensis*, *G. pichisermolliana*, *G. salzmannii* var. *salzmannii* and var. *lobelioides* belong to sect. *Erinacoides* Spach (Valsecchi 1993). In the Sardinian-Corsican district other two species of the section are present: *G. sulcitana* Vals. (endemic to the mountains of Iglesias and mining dump of Montevecchio) and *G. arbusensis* Vals. (psammophilous species, endemic to a restricted area on the coast of Arbus in Southwestern Sardinia) (Valsecchi 1984, 1986b). For both species Villa (1988) counted the number $2n = 18$, while Cusma Velari & al. (2001) reported $2n = 18+(0-2B)$ and, more rarely, $2n = 27+(0-2B)$. All these taxa present the basic chromosome number $x = 9$, by far the most frequent in sect. *Erinacoides* (Sañudo 1971; Talavera 1999; Cusma Velari & al.

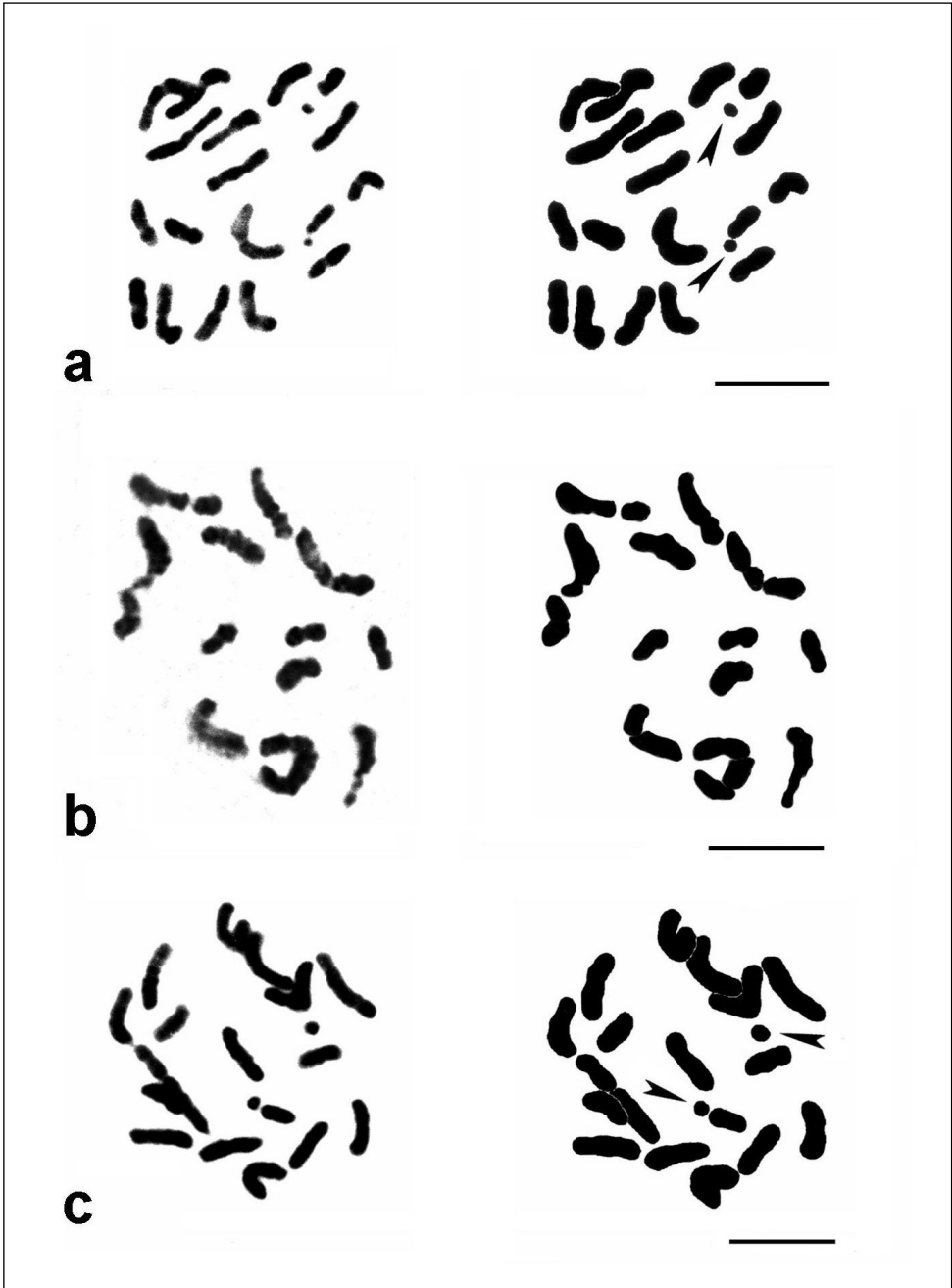


Fig. 2. Photomicrographs and relative drawings of somatic metaphase plates of: **a**, *Genista salzmannii* var. *salzmannii* (Mt. Limbara), $2n = 18+2B$; **b**, *Genista salzmannii* var. *lobelioides* (Haute Asco), $2n = 18$; **c**, *Genista pichisermolliana* (Bruncu Spina), $2n = 18+2B$. – Arrows indicate B-chromosomes. Scale bars = 5 μ m.

1998, 2001, 2010). All Sardinian endemic taxa are diploids, as well as *G. salzmannii* var. *lobelioides*, of Corse, and *G. desoleana*, the only species that reaches the Italian Peninsula. *G. salzmannii* var. *salzmannii* has diploid populations in Corse, diploid and tetraploid in Sardinia.

The same basic number is found also in a series of species of the section endemic to Southern and Eastern Spain (Gibbs 1966, Greuter & al. 1989, Talavera 1999), as *G. longipes* Pau [= *G. lobelii* DC. subsp. *longipes* (Pau) Heywood] with $n = 9, 18$; *G. pumila* (Debeaux & É. Rev. ex Hervier) Vierh. (= *G. mugronensis* Vierh.) with $n = 9, 18$ and $2n = 36, (37, 38)$; *G. versicolor* Boiss. (= *G. baetica* Spach) with $n = 18$ and $2n = 36, (38, 39, 40)$ (Sañudo 1971, 1973, 1974; Sañudo & Ruiz Rejon 1975; Cusma Velari & al. 2010). *G. lobelii* subsp. *lobelii*, from Southeastern France, presents $2n = 18$ (Verlaque 1988) as well.

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Reports (1749-1750) by Tiziana Cusma Velari & Laura Feoli Chiapella

1749. *Genista fasselata* Decne. subsp. *fasselata* — $2n = 48+0-6B$ (Fig. 1a, b, c, d).

- Cr:** Dodekánissa, Kárpáthos, Piles, 35° 53' N, 27° 13' E, 360 m a.s.l., 10 Aug 1997, *L. Feoli Chiapella* (TSB).
- Dodekánissa, Kárpáthos, Profitis Ilías, 35° 51' N, 27° 21' E, 600 m a.s.l., 8 Aug 1997, *L. Feoli Chiapella* (TSB).
- Dodekánissa, Kárpáthos, Agios Nicolaos, 35° 58' N, 27° 15' E, 200 m a.s.l., 6 Aug 1997, *L. Feoli Chiapella* (TSB).
- IJ:** Israel, Mt. Carmel, 32° 59' N, 35° 04' E, 420 m a.s.l., 10 Sept 2000, *M. Livneh* (s.n., s.exsicc.).

Genista fasselata (= *G. sphacelata* Spach) occurs in isolated localities of the Eastern Mediterranean region: Southern Aegean region (Kárpáthos, Kasos), Cyprus, Israel (Mt. Carmel) (Gibbs 1966, Zohary 1972, Chrtek & Slavik 1981, Greuter & al. 1989). The subsp. *fasselata* occurs in all the range of the species. The species grows mainly in maquis and pine forests.

The chromosome number $2n = 48$ was constantly counted in the populations from Kárpáthos on the basis of 17 metaphase plates. Moreover, the numbers $2n = 48+0-6B$ and, more rarely, $2n = 96$ were found in the population of Mt. Carmel on the basis of 15 metaphase plates. Chromosome size ranges from 0.57 to 2.97 μm (0.25-0.40 μm for B-chromosomes). No previous karyological data are known for this taxon.

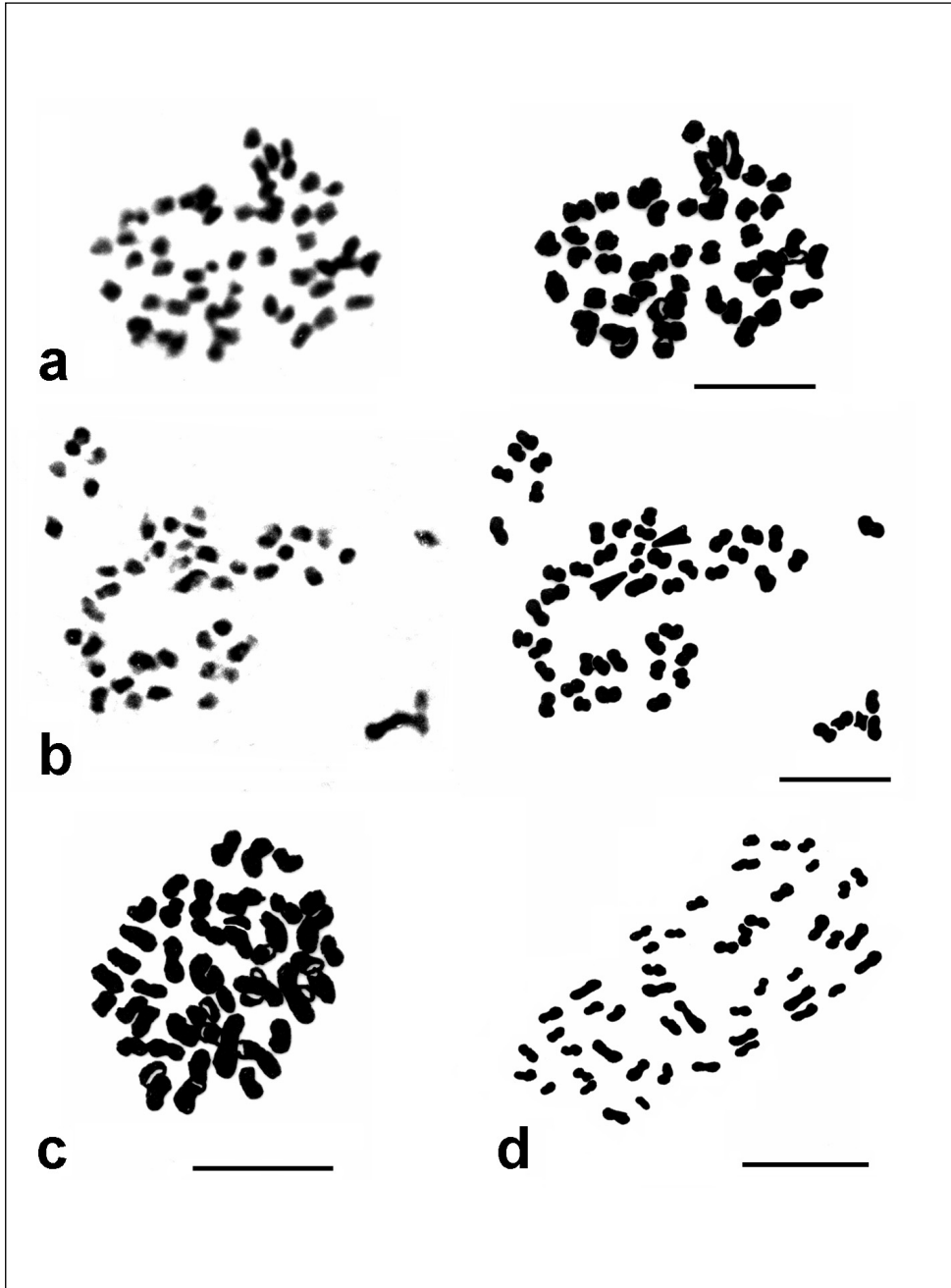


Fig. 1. Photomicrographs and relative drawings of somatic metaphase plates of *Genista fasselata* subsp. *fasselata* from: **a**, Profitis Ilias, $2n = 48$; **b**, Mt. Carmel, $2n = 48+2B$; drawings of somatic metaphase plates from: **c**, Agios Nicolaos, $2n = 48$; **d**, Piles, $2n = 48$. — Arrows indicate B-chromosomes. Scale bars = 5 μ m.

1750. *Genista fasselata* Decne. subsp. *crudelis* (Meikle) Chrtek & B. Slavik — $2n = 48+0-6B$ (Fig. 2a).

Cy: Paphos District, Mt. Troodos, Platres, 34° 59' N, 32° 58' E, seeds obtained from Botanical Garden, Berlin-Dahlem (s.n., s.coll., s.exsicc.).

The subsp. *crudelis* (= *G. fasselata* var. *crudelis* Meikle) is apparently endemic to Cyprus; it was described for Mt. Troodos (Chrtek & Slavik 1981, Greuter & al. 1989).

The chromosome number $2n = 48+0-6B$ was constantly counted on the basis of 16 metaphase plates. Chromosome size ranges from 0.88 to 2.42 μm (0.30-0.45 μm for B-chromosomes). No previous karyological data are known for this taxon.

Spach (1844) included *Genista fasselata* in sect. *Acanthospartum* Spach; furthermore, Gibbs (1966) preferred to include the species in a distinct monospecific section, *Fasselospartum* P.E. Gibbs, because of a series of differential characters between *G. fasselata* and *G. acanthoclada*, as the branching (alternate instead of opposite), the spines recurved, axillary and flower-bearing (instead of branches terminated by a spine), a clearly different shape of the pulvinules (black, scale-like instead of swollen and prominent) and the standard (glabrous instead of sericeous). The type of spines observed in *G. fasselata* is rather rare in *Genista*, being absent in all the other taxa of subgen. *Spartocarpus*, which includes the sections *Spartocarpus*, *Acanthospartum*, *Fasselospartum* and *Cephalospartum* Spach emend. P.E. Gibbs. *G. fasselata* results clearly distinguishable from all the taxa of *G. acanthoclada* aggr. also for several pollen characters (Rizzi Longo & Feoli Chiapella 2007).

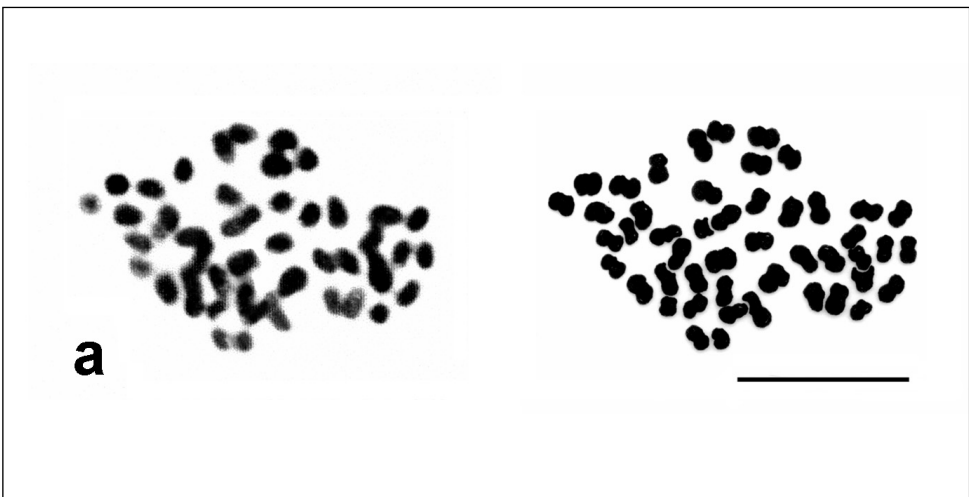


Fig. 2. Photomicrograph and relative drawing of somatic metaphase plate of: **a**, *Genista fasselata* subsp. *crudelis* (Mt. Troodos), $2n = 48$. — Scale bars = 5 μm .

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Report (1751) by A. Troia, P. Marino & A. M. Orlando

1751. *Isoëtes todaroana* Troia & Raimondo — $2n = 22$ (Fig. 1).

Si: Mazara del Vallo (province of Trapani), contrada “Critazzo”, 37°41’07”N, 12°37’05”E, ca. 60 m a.s.l., May 2010, *Angelo Troia* (PAL).

Isoëtes todaroana is a terrestrial/amphibian species recently described from one single site in Sicily (Troia & Raimondo 2010a), and its chromosome number is reported here for the first time.

The genus *Isoëtes* includes both diploids ($2n = 22$) and polyploids (3x, 4x, 5x, 6x, 8x, 10x, 12x) (Troia 2001). Particularly worthy of mention is the high proportion of polyploids with respect to diploids: according to Troia & Raimondo (2010b), the percentage of polyploid species in the genus is between 56 and 59%.

Our observations show that the species is diploid. In the Mediterranean area, diploid species (usually terrestrial or amphibian) are relatively more common than polyploid ones, but aneuploidy also occurs (e.g. *I. histris* Bory with $2n = 20$, cf. Cesca & Peruzzi 2001). According to Taylor & Hickey (1992), *I. todaroana* should be another of the diploid terrestrial species resulting from gradual speciation via isolation and genetic divergence, in contrast to aquatic species in which interspecific hybridization and chromosome doubling processes prevail.

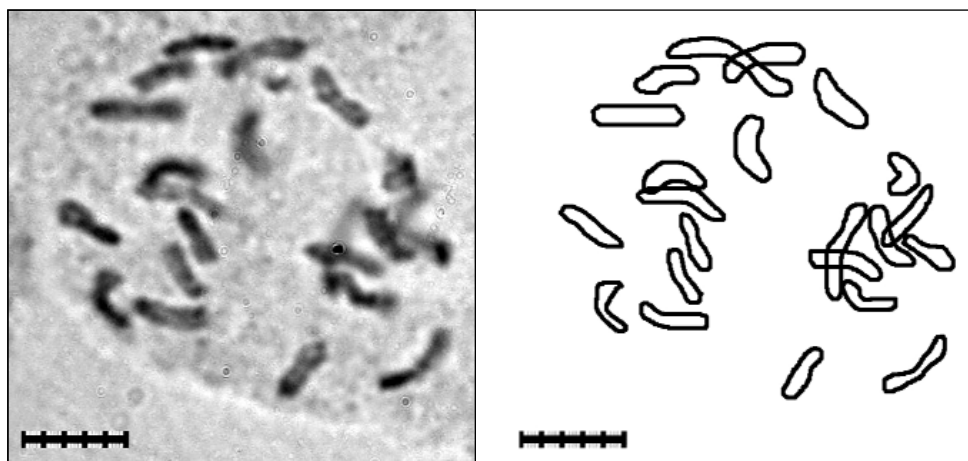


Fig. 1. Mitotic metaphase plate (microphotograph and explanatory drawing) of *Isoetes todaroana* with $2n = 22$. – Scale bars = 5 μ m.

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Reports (1752) by E. Di Gristina, A. Geraci & P. Marino

1752. *Pilosella sphaerocephala* (Rchb.) F. W. Schultz & Sch. Bip. — $2n = 27$ (Fig. 1).

It: Trento, Moena, Passo San Pellegrino, moorlands on acid soil, 1910 m a.s.l., 46° 22' N, 11° 46' E, 08 Aug 2011, E. Di Gristina (PAL).

Pilosella Vaill. is a large genus constituted of at least 3000 perennial herbaceous plants (Pignatti 1982) occurring in Europe, temperate Asia, North Western Africa (Zahn 1923; Sell & West 1975; Pignatti 1982), North America, Patagonia and New Zealand (Mráz & al. 2008).

Pilosella sphaerocephala (Rchb.) F. W. Schultz & Sch. Bip. (*Hieracium sphaerocephalum* Rchb.) is an hemicryptophyte rosulate flowering in Summer between July and August and its distribution is restricted to Eastern and Central Eastern Alps (Sell & West 1976). This taxon is considered by Zahn (1923) as “Zwischenarten” (*species intermediae collectivae*) between *P. glacialis* (Reyn.) F. W. Schultz & Schp. Bip. and *P. hoppeana* (Schult.) F. W. Schultz & Schp. Bip., including 18 subspecies. On the other hand, according to Sell & West (1976), *P. sphaerocephala* should be treated as good species because it often occurs in fairly uniform populations where hypothetical parents are absent.

The chromosome number $2n = 3x = 27$ reported here, obtained by the observation of 30 metaphase plates of 15 individuals, represents the first record for *P. sphaerocephala* from Italy. This datum is conform to the report of Schuhwerk & Lippert (2002, sub *H. sphaerocephalum* subsp. *furcatum* (Hoppe) Zahn) for a population of Austrian Tyrolean Alps but it doesn't agree with the number $2n=36$ reported by the same authors (Schuhwerk & Lippert 1997, sub *H. sphaerocephalum* Froel.) for *P. sphaerocephala* from the Bavarian Alps (Germany).



Fig. 1. Microphotograph of mitotic metaphase plate of *Pilosella sphaerocephala*, $2n = 27$. – Scale bar = 5 μ m.

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