Mediterranean chromosome number reports – 19

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

Abstract

Kamari, G., Blanché, C. & Siljak-Yakovlev, S. (eds): Mediterranean chromosome number reports – 19. — Fl. Medit. 19: 313-336. 2009. — ISSN 1120-4052.

This is the nineteen 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 21 taxa: *Allium*, *Ammi*, *Andryala*, *Daucus*, *Diplotaxis*, *Emex*, *Mercurialis*, *Torilis*, *Urtica* from Morocco, by F. E. El Alaoui-Faris, H. Tahiri, P. Cubas & C. Pardo (Nos 1688-1696); *Bellevalia* from Israel, by A. Giordani & L. Peruzzi (Nos 1697); *Gagea* from Cyprus, Italy, France, by L. Peruzzi, G. Astuti, A. De Rossa & A. Giordani (Nos 1698-1701); *Calicotome* from Balearic Islands, Corse, Greece, Israel, Italy, Sardinia, Sisily, Spain, Portugal, Tunisia and Morocco, by T. Cusma Velari, L. F. Caparella & V. Kosovel (Nos 1702-1705); *Chamaecytisus* from Canary Islands, by T. Cusma Velari, L. Feoli Chiapella, V. Kosovel & A. Santos Guerra (Nos 1706-1708).

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Reports (1688-1696) by F. E. El Alaoui-Faris, H. Tahiri, P. Cubas & C. Pardo

1688. ***Allium cepa*** L. subsp. ***sativa*** **—** $2n = 16, 36, 38, 40$ (Figs 1, 7).

Ma: Maroc atlantique nord, Rabat, 34° 00' N, 6° 83' W, cultivated, 12 Mar 2007, *El Alaoui-Faris 65890* (RAB).

We counted $2n = 16$ in several cells from the same root, and variable numbers ($2n = 36$, 38, 40) in other roots from the same plant. The chromosome number $2n = 16$ has been frequently reported, although $2n = 24$ has also been indicated (Stockert & al. 1969, Roy & Ghosh 1977, Puizina & Papeš 1997, Hang & al. 2004, among others).

1689. ***Ammi majus*** L. **—** $2n = 22$ (Figs 2, 8).

Ma: Maroc atlantique nord, Réserve de Mehdia près du lac permanent, 34° 25' N, 6° 66' W, 20 Nov 2006, *Tahiri 65864* (RAB).

We counted $2n = 22$ at mitosis in several specimens of this polymorphic species, widespread in Morocco. Previous reports indicate $n = 11$ and $2n = 22$ in samples from the Iberian Peninsula (Malheiros-Gardé & Gardé 1951, Queirós 1972, 1974, 1978, Silvestre 1976, 1978), and $n = 11$ in a population from Morocco (Humphries & al. 1978).

1690. ***Andryala pinnatifida*** L. subsp. ***maroccana*** (Maire) Greuter **—** $n = 9$ (Figs 3, 9).

Ma: Maroc atlantique nord, Réserve de Mehdia près de la plage, 34° 24' N, 6° 68' W, 20 Nov 2006, *Tahiri 65865* (RAB).

Andryala pinnatifida is an endemic species of the Canary Islands and northwestern Africa (Hohenester & Welss 1993). In Morocco, four subspecies have been recognised: *A. pinnatifida* subsp. *ducellieri* (Batt.) Greuter, subsp. *maroccana* (Maire) Greuter and subsp. *mogadorensis* (Hook. f.) Greuter are restricted Moroccan endemisms while subsp. *jahandiezii* (Maire) Greuter also grows in Algeria (Greuter 2003, Fennane & Ibn Tattou, in press).

The studied population was ascribed to *A. pinnatifida* subsp. *maroccana* based on the following morphological features: leaves clearly pinnatisect, capitula usually solitary with 1-1.5 cm of diameter, involucre with bracts densely covered by stellate and black glandular hairs, and achenes enfolded by sericeous scales and covered with hairs almost ¾ of the length.

We counted $n = 9$ bivalents at diakinesis and metaphase I of meiosis of pollen mother cells from different plants. Previous results indicate $2n = 18$ at mitosis in a population of *A. pinnatifida* from Tenerife (Canary Islands) without indication of the subspecific rank (Baltisberger & Widmer 2006), and $n = 9$ in a sample of *A. pinnatifida* subsp. *mogadorensis* from Morocco (Humphries & al. 1978).

1691. *Daucus carota* L. subsp. ***carota*** **—** $n = 9$, $2n = 18$ (Figs 4, 10).

Ma: Maroc atlantique nord, Réserve de Mehdia près du lac permanent, 34° 25' N, 6° 66' W, 20 Nov 2006 & 22 Mar 2007, *Tahiri 65866* (RAB).

We counted $2n = 18$ chromosomes in root mitosis, and $n = 9$ at meiosis. Our report agrees with previous data from Moroccan (Humphries & al. 1978) and European plants (Zenkteler 1962, Queirós 1972, 1974, Dudits & al. 1977, Essad 1985, Vivek & Simon 1999).

1692. *Diplotaxis catholica* (L.) DC. **—** $n = 9$ (Figs 5, 11).

Ma: Maroc atlantique nord, Jardin Faculté des Sciences, Rabat, 34° 00' N, 6° 83' W, 22 Mar 2007, *El Alaoui-Faris 65867* (RAB).

This species is distributed in the Iberian Peninsula, Morocco and Canary Islands. It has also been reported from Asia. We found $n = 9$ at metaphase I and anaphase I at meiosis from pollen mother cells. The chromosome number reported here is the first record for *D. catholica* from Morocco and agrees with reports obtained on plants from Europe and Asia (Manton 1932, Börkqvist & al. 1969, Queirós 1973, Banga & al. 2003).

1693. *Emex spinosa* (L.) Campd. **—** $n = 10$.

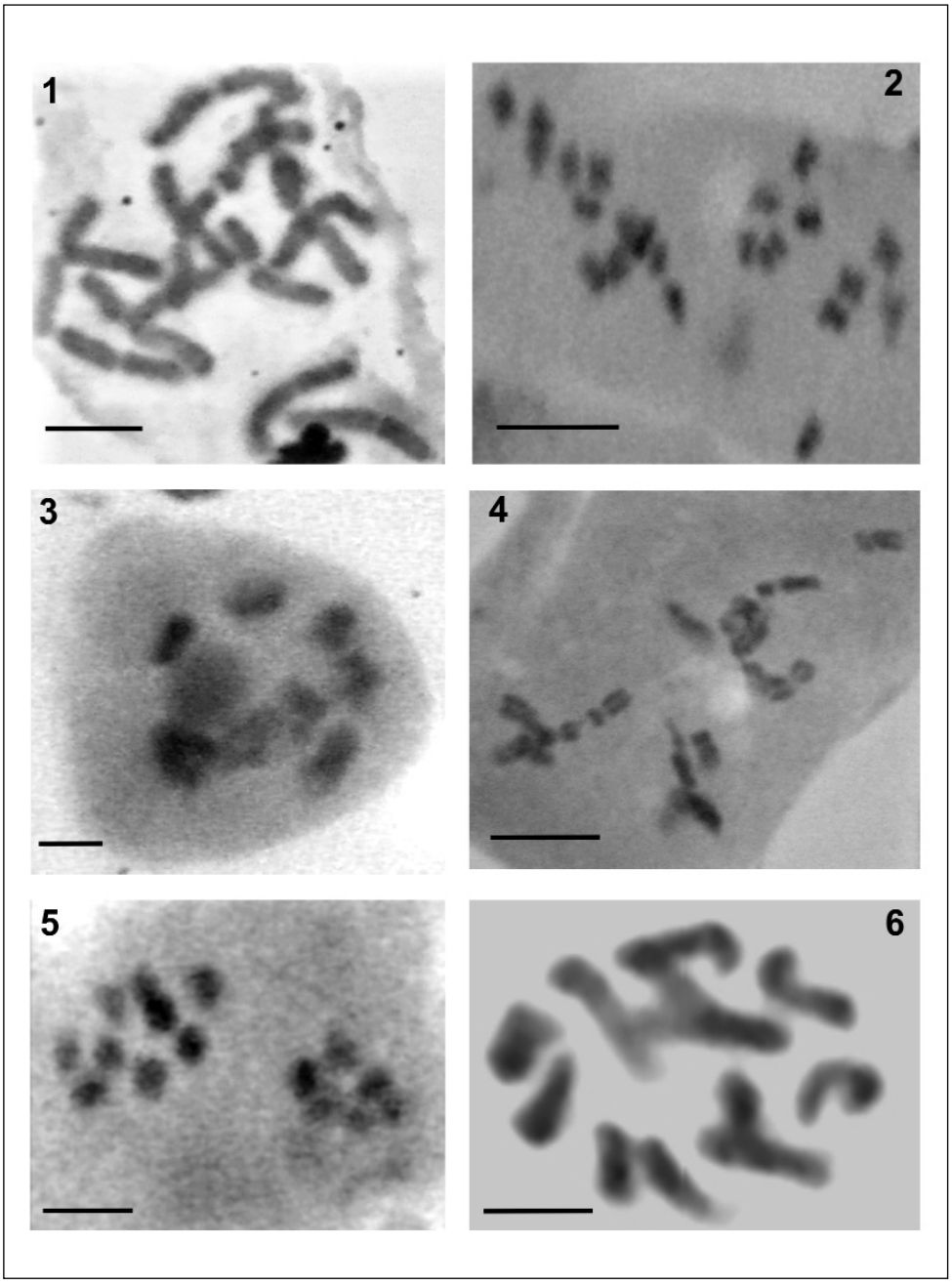
Ma: Maroc atlantique nord, Hay Riad, Rabat, 33° 97' N, 6° 86' W, 22 Mar 2007, *El Alaoui-Faris* 65868 (RAB).

This annual species is widespread in the Mediterranean and Macaronesian regions. Our result agrees with those reported on material from Portugal, Canary Islands and northern Africa (Queirós 1983, Dalgaard 1986, Runemark 1996, Fiorini & Raffaelli 1996).

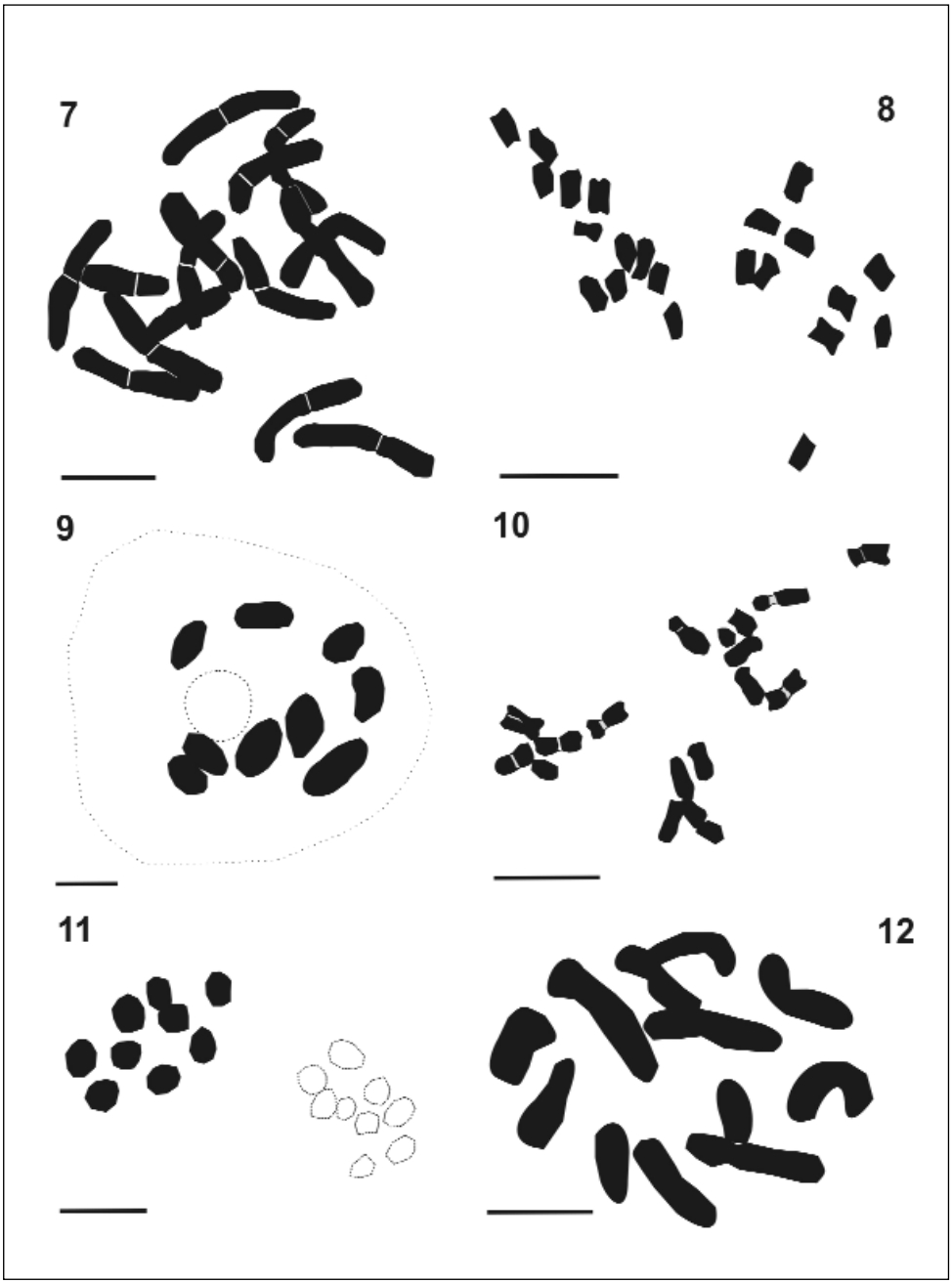
1694. *Mercurialis ambigua* L. fil. **—** $n = 24$.

Ma: Maroc atlantique nord, Faculté des Sciences, Rabat, 34° 00' N, 6° 83' W, 22 Mar 2007, *El Alaoui-Faris* 65869 (RAB).

Mercurialis ambigua is widely distributed from northern Africa to southwestern Europe. This species together with the two other annual species of *Mercurialis* (*M. annua* L. and *M. huetii* Hanry) were considered part of the *Mercurialis annua* complex (Durand 1963). Molecular data indicate that they form a western Mediterranean monophyletic clade. *Mercurialis ambigua* and *M. huetii* are limited to the western Mediterranean areas, while *M. annua* is widely spread in most part of Europe and further naturalised in North America. Besides, *M. annua* and *M. huetii* are diploid ($2n = 16$) while $2n = 32$, 48, 80, 96, and 112 have been recorded for *M. ambigua* (Krähenbühl & al. 2002).



Figs 1-6. Microphotographs of : **1,** *Allium cepa*, 2*n* = 16, mitotic metaphase; **2,** *Ammi majus*, 2*n* = 22, mitotic metaphase; **3,** *Andryala pinnatifida* subsp. *maroccana*, *n* = 9, diakinesis; **4,** *Daucus carota*, 2*n* = 18, mitotic metaphase; **5,** *Diplotaxis catholica*, *n* = 9, anaphase I; **6,** *Torilis arvensis*, 2*n* = 12, mitotic metaphase. – Scale bars = 8 µm.



Figs 7-12. Explanatory drawings of Figs 1-6: **7,** *Allium cepa*, 2*n* = 16, mitotic metaphase; **8,** *Ammi majus*, 2*n* = 22, mitotic metaphase; **9,** *Andryala pinnatifida* subsp. *maroccana*, *n* = 9, diakinesis; **10,** *Daucus carota*, 2*n* = 18, mitotic metaphase; **11,** *Diplotaxis catholica*, *n* = 9, anaphase I; **12,** *Torilis arvensis*, 2*n* = 12, mitotic metaphase. – Scale bars = 8 µm.

We found $n = 24$ in several cells at pollen meiosis. This number agrees with reports of $2n = 48$ from plants of Portugal (Queirós 1975), Spain (Luque 1983, Buggs & Pannell 2006) and Morocco (Durand 1963, Durand & Durand 1992). The studied population is formed by a mixture of monoecious (cosexual) plants with subsessile flowers and plants with glomerules of staminate flowers. This agrees with the widespread functional androdioecy (the co-occurrence of males with functional hermaphrodites) indicated for the hexaploid plants of *M. annua* complex (Pannell 1997, Krähenbühl & al. 2002, Pannell & al. 2004).

There is not general agreement in the taxonomy of the group. Thomas (1958) indicated that the diploid plants are *M. annua* s.s. while the hexaploid ones should be named *M. annua* var. *ambigua* [= *M. annua* subsp. *ambigua* (L. f.) Arcang., = *M. ambigua* L. f.]. We follow here the taxonomy proposed in recent Floras (Güemes 1997, Fennane & Ibn Tattou 2005, Fennane & al. 2007) gave this taxon specific level (*Mercurialis ambigua* L. fil.).

1695. *Torilis arvensis* subsp. ***purpurea*** (Ten.) Hayek — $n = 6$, $2n = 12$ (Figs 6, 12).

Ma: Maroc atlantique nord, Réserve Mehdia près du lac permanent, 34° 25' N, 6° 66' W, 20 Nov 2006 & 22 Mar 2007, *Tahiri & El Alaoui-Faris* 65870 (RAB).

Torilis arvensis is a widespread species native to central and southern Europe, northwestern Africa, Macaronesia and southwestern Asia, and naturalized elsewhere (USDA, 2008). In Morocco three subspecies are recognised: *Torilis arvensis* subsp. *purpurea*, subsp. *neglecta* (Schutes) Thell., and subsp. *recta* Jury. Main diagnostic characters to differentiate the subspecies refer to the number of rays in the primary umbels, the shape of the cauline leaves and the style length.

We found $2n = 12$ chromosomes in several mitotic plates, and $n = 6$ at meiosis. Based on morphology we ascribed the studied plants to subsp. *purpurea*. They have 2-3(4) rays, cauline leaves trifoliate and serrate, and styles 1.5 mm long. These are the first data obtained from Moroccan populations and agree with previous reports (Constance & al. 1976, Queirós 1972, Loon & De Jong 1978, Hamal & Koul 1988).

1696. *Urtica membranacea* Poiret — $n = 13$.

Ma: Maroc atlantique nord, Faculté des Sciences, Rabat, 34° 00' N, 6° 83' W, 22 Mar 2007, *El Alaoui-Faris* 65871 (RAB).

Urtica membranacea is a Mediterranean species extending to Macaronesia, Middle East and India. This plant differs from other Moroccan species of *Urtica* by the stipules connate in pairs at each node, the racemes mostly unisexual, and the flowers with short peduncles inserted unilaterally on an inflated axis.

We found $n = 13$ bivalents at meiosis. This is the first report obtained on Moroccan material. Previous results indicate $2n = 22$ & 26 from elsewhere (Nilsson & Lassen 1971, Dahlgren & al. 1971).

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Reports (1697) by Antonio Giordani & Lorenzo Peruzzi

1697. *Bellevalia flexuosa* Boiss. – 2*n* = 8 (Fig. 1A).

IJ: Central Israel, West part of Jerusalem, spontaneous in the Jerusalem Botanical Gardens, 31° 46' N 35° 12' E, 1 Sep 2007, *Fragman-Sapir* (cult. Hort. Bot. Univ. Pisa n. 540-03/2007).

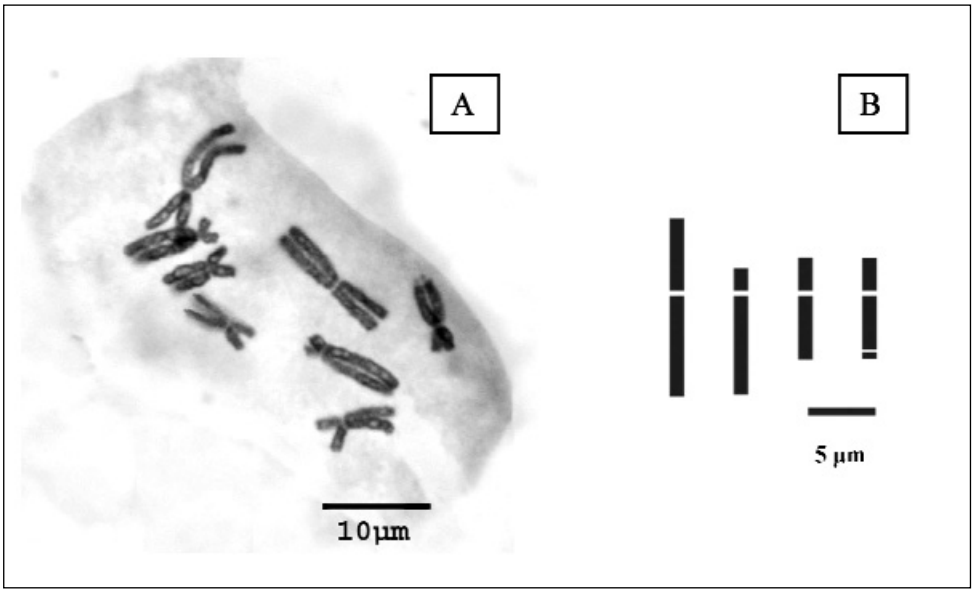

Fig. 1. A, microphotograph of metaphasic plate and B, haploid idiogram of *Bellevalia flexuosa*, 2*n* = 8.

Our counting, $2n = 8$, confirms a previous report by Feinbrun (1938), but does not agree with Bothmer & Weldelbo (1981), who counted $2n = 24$ chromosomes in plants coming from an area near the locality studied by us ("Jerusalem, near the Hebrew University"). Karyotype formula (Levan & al. 1964) can be expressed as follows: $2n = 2x = 2m + 2st + 2sm + 2m\text{-SAT} = 8$ (Fig. 1B). Mean chromosome size ranges from 6.35 to 12.83 µm.

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Reports (1698-1701) by Lorenzo Peruzzi, Giovanni Astuti, Alessandra De Rossa & Antonio Giordani

1698. *Gagea pratensis* (Pers.) Dumort. – $2n = 60$.

It: Toscana, Monte Morello (provincia di Firenze), versante meridionale del Poggio del Giro, 670 m s.l.m., 43°50' N 11°14' E, Apr 2008, *L. Peruzzi, G. Gestri & B. Pierini* (cult. Hort. Bot. Univ. Pisa n. 156/2008).

Ga: Francia meridionale, Montagne de Lachens, 1700 m s.l.m., 43° 44' N 6° 39' E, Apr 2007, *L. Peruzzi & K. F. Caparelli* (cult. Hort. Bot. Univ. Pisa n. 278/2007).

Gagea pratensis (sect. *Gagea*) is an European species, occurring also in Morocco (Tison 2004). Our counting, $2n = 60$, agrees with those reported from other localities of peninsular Italy (Peruzzi & Aquaro 2005, Peruzzi & al. 2007), France (Peruzzi & al. 2009), N Germany, Denmark (Henker 2005) and Slovakia (Měsiček & Hrouda 1974). According to the basic chromosome number x = 12, widespread in the genus *Gagea* (Peruzzi 2003), this chromosome complement is interpreted as pentaploid. However, there are at least four more ploidy levels published for this species: $2n = 24$ cytotypes are known from FYROM

(Sopova & al. 1984a, b), 2*n* = 36 cytotypes from Sweden, Slovakia and Turkey (Weimarck 1963, Murin 1976, Özhatay 2002), 2*n* = 48 cytotypes from Sweden, Czech Republic, Slovakia, Poland and Asia (Weimarck 1963, Wittenberger 1970, Měsiček & Hrouda 1974, Pogan & al. 1980, Davlianidze & Levichev 1987, Zemskova & Levichev 1998) and finally 2*n* = 72 cytotypes were recorded from N Germany and Sweden (Henker 2005). Mean chromosome size ranges from 1.3 to 5 µm.

1699. *Gagea reverchoni* Degen – 2*n* = 24 (Fig. 1A).

Ga: Francia meridionale, Montagne de Lachens, 1700 m s.l.m., 43° 44' N 6° 39' E, Apr 2007, *L. Peruzzi & K. F. Caparelli* (cult. Hort. Bot. Univ. Pisa n. 278/2007).

Gagea reverchoni (sect. *Gagea*) is a species widespread in Spain and French Maritime Alps (Uphof 1958). Our counting, 2*n* = 24, is the second one for this species, and agrees with the report published by Montserrat Marti (1981, sub *G. lutea* subsp. *orosiae* P. Monserrat Recoder) for Spanish material. It is important to note that *G. erubescens* (Besser) Besser, to which many authors related *G. reverchoni* (Uphof 1958, Peruzzi & al. 2007), is also a diploid with 2*n* = 24 chromosomes (Zemskova & Levichev 1998). Karyotype formula (Levan & al. 1964) can be expressed as follows: 2*n* = 2x = 2st + 4t + 2sm + 4st + 4sm + 2st + 6sm = 24 (Fig. 1B). Mean chromosome size ranges from 0.95 to 4.78 µm. As far karyotype asymmetry is concerned, the species shows CV_{CI} = 33.26 and CV_{CL} = 56.45 (i.e. coefficients of variations of centromeric index and of chromosome lengths, respectively; for more information see Paszko 2006). These values indicate a karyotype rather asymmetric, especially for the CV_{CL} value, which is the highest known in the genus *Gagea* as a whole (cfr. Peruzzi & al. 2009).

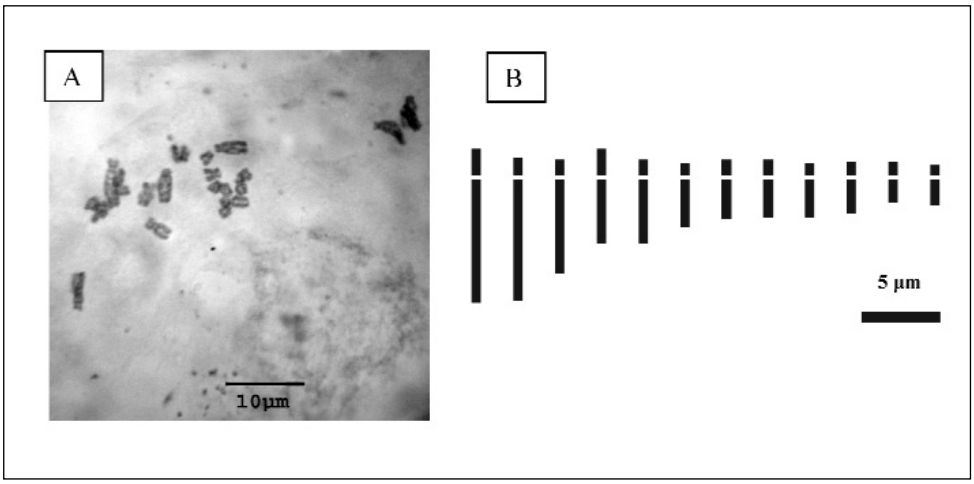

Fig. 1. A, microphotograph of metaphasic plate and B, haploid idiogram of *Gagea reverchoni*, 2*n* = 24.

1700. ***Gagea villosa*** (M. Bieb.) Sweet – 2*n* = 48 (Fig. 2A).

It: Lazio – Monte Navegna, in provincia di Rieti, 1200 m s.l.m., 42° 13' N 12° 59' E, Apr 2005, *L. Peruzzi & F. Bartolucci* (cult. Hort. Bot. Univ. Pisa n. 469/2007).

Gagea villosa (sect. *Didymobulbos* K. Koch) is an Eurasiatic species (Pignatti 1982). Our counting, 2*n* = 48, agrees with those reported from other localities of peninsular Italy (Peruzzi & Aquaro 2005, Peruzzi 2008), Spain (Löve & Kjellvist 1973, Ruiz Rejon 1978, sub *G. villosa* subsp. *hervieri* (Deg.) Löve & Kjellvist), France (Reynaud & al. 1993), Germany (Henker 2005), Czech Republic (Měsiček & Hrouda 1974), Slovakia (Uhrikova & Majovski 1978, 1980), FYROM (Sopova & al. 1984a, b) and Turkey (Özathay 2002). However, there are at least three more ploidy levels published for this species: 2*n* = 36 cytotypes are known for Turkey (Özathay 2002), 2*n* = 60 (Heyn & Dafni 1977, sub *G. villosa* var. *hermonis* Dafni & Heyn) and 2*n* = 72 cytotypes from Israel (Heyn & Dafni, 1977). Karyotype formula (Levan & al. 1964) can be expressed as follows: 2*n* = 4x = 8t +4sm + 4st + 4sm + 4st + 4sm + 4m + 16sm = 48 (Fig. 1B). Mean chromosome size ranges from 1.72 to 6.31 µm. As far karyotype asymmetry is concerned, the species shows CV_{CI} = 35.77 and CV_{CL} = 47.63 (i.e. coefficients of variations of centromeric index and of chromosome lengths, respectively; for more information see Paszko 2006). This karyotype structure differs only slightly from that of French populations (Reynaud & al. 1993).

1701. ***Gagea rigida*** Boiss. & Spruner – 2*n* = 24 (Fig. 3A).

Cy: Cipro, tra Aghia Anna e Pseudas, garighe aride, 34° 55' N 33° 31' E, Mar 1986, *Garbari, Del Prete , Grünanger & Arnold* (cult. Hort. Bot. Univ. Pisa n. 104-00/1986).

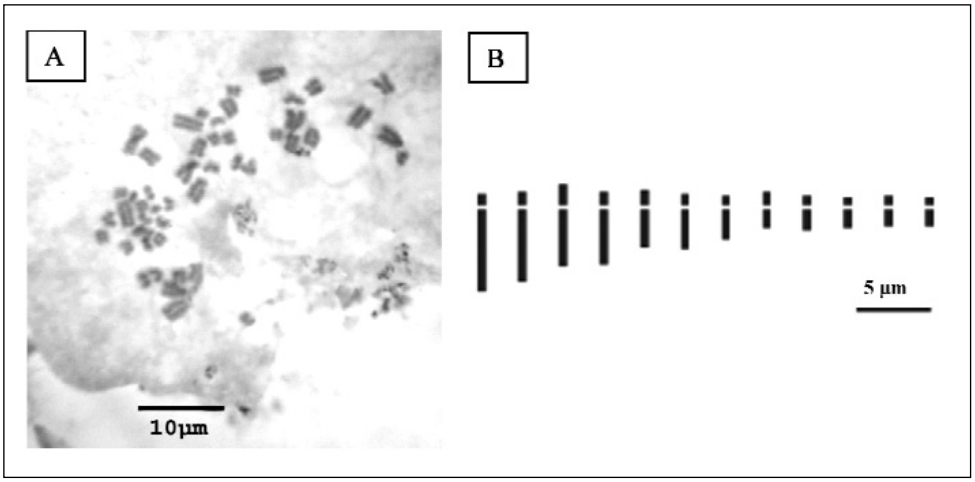

Fig. 2. A, microphotograph of metaphasic plate and B, haploid idiogram of *Gagea villosa*, 2*n* = 4x = 48.

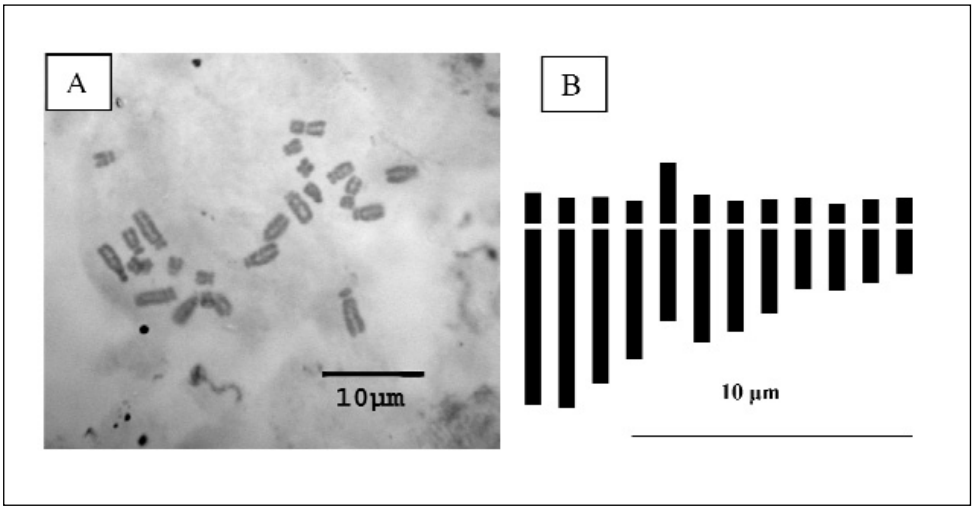

Fig. 3. A, microphotograph of metaphasic plate and B, haploid idiogram of *Gagea rigida*, 2*n* = 24.

Gagea rigida (sect. *Graminifoliae* Levichev) is a NE Mediterranean species, which was long time confused with *G. fibrosa* (Desf.) Schult. & Schult. f. (sect. *Platyspermum*), a S Mediterranean taxon (Levichev & Tison 2004, Peruzzi 2006). Our counting, 2*n* = 24, appears to be the first one for this species, even if the 2*n* = 24 report published by Heyn & Dafni (1971), under the name *G. fibrosa*, should be referred to this unit too; this can be easily deduced from the analysis of cross-sectioned basal leaf drawing depicted in that paper (Heyn & Dafni 1971). Karyotype formula (Levan & al. 1964) can be expressed as follows: 2*n* = 2x = 2st + 2t + 4st + 2m + 6st + 2sm + 2st + 4sm = 24 (Fig. 3B). Mean chromosome size ranges from 1.25 to 3.67 µm. As far karyotype asymmetry is concerned, the species shows CV_{CI} = 39.04 and CV_{CL} = 36.98 (i.e. coefficients of variations of centromeric index and of chromosome lengths, respectively; for more information see Paszko 2006). These values indicate a karyotype not particularly asymmetric, in general. However, according to the variation range of these parameters known in the genus *Gagea*, as published by Peruzzi & al. (2009), *G. rigida* shows a karyotype that, especially regarding centromere position heterogeneity (CV_{CI} value), can be considered as rather asymmetric when compared with other congeneric taxa.

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Reports (1702-1705) by Tiziana Cusma Velari, Laura Feoli Chiapella & Vera Kosovel

1702. ***Calicotome spinosa*** (L.) Link – 2*n* = 48 + 0-2B (Fig. 1a).

Hs: Girona, Cadaqués, 42° 17’ N, 3° 16’ E, seeds obtained from Botanical Garden, Barcelona (s.n., s.coll., s.exsicc.).
– Girona, Llagostera, 41° 50’ N, 2° 54’ E, seeds obtained from Botanical Garden, Barcelona (s.n., s.coll., s.exsicc.).
Bl: Mallorca, Cala Sant Vicenç, 39° 55’, 3° 4’ E, seeds obtained from Botanical Garden, Córdoba (s.n., s.coll., s.exsicc.).
– Menorca, Binisarmenya, 39° 54’ N, 4° 17’ E, seeds obtained from Botanical Garden, Sóller (s.n., s.coll., s.exsicc.).
Ga: Alpes-Maritimes, Cap-d’Ail, 43° 43’ N, 7° 24’ E, seeds obtained from Botanical Garden, Nice (s.n., s.coll., s.exsicc.). (Fig. 1a)
Co: Haute-Corse, Cap Corse, 43° 00’ N, 9° 21’ E, 200 m a.s.l., 4 Jul 1974, *L. Feoli Chiapella* (TSB).
– Haute-Corse, Lama, 42° 34’ N, 9° 10’ E, seeds obtained from Botanical Garden, Liège (s.n., s.coll., s.exsicc.).
It: Liguria, Genova, surroundings, 44° 25’ N, 8° 56’ E, seeds obtained from Botanical Garden Hanbury, Genova (s.n., s.coll., s.exsicc.).

This species is distributed in the western Mediterranean region: eastern Spain, southern France, Balearic Islands, northwestern Italy, Corse, Sardinia and northern Algeria (Gibbs 1968, Maire 1987, Greuter & al. 1989, García Murillo 1999).

The chromosome number 2*n* = 48+ 0-2B was counted on the basis of 30 metaphase plates. Chromosome size ranges from 0.52 to 2.41 μm and from 0.32 to 0.44 μm for B - chromosomes. Our counts confirms the reference reported by Kliphuis & Wieffering (1972) for a French population from Alpes-Maritimes. Sañudo (1973), on the contrary, found 2*n* = 50 in a population from Mallorca (Balearic Islands); Aboucaya & Verlaque (1990) releved both 2*n* = 24 and 2*n* = 50-52 for some populations from Var and Pyrénées-Orientales. Gilot (1965) found both 2*n* = 24 and 2*n* = 48 on cultivated material.

Forissier (1975) reported $n = 25$ for *C. spinosa* ssp. *ligustica* Burnat, a taxon wich was described from Riviera Ligure (Pignatti 1982), in material from Alassio, Italy.

1703. *Calicotome villosa* (Poiret) Link – $2n = 48 + 0\text{-}2B$ (Fig. 1b).

Lu: Alto Alentejo, Évora, Estremoz, 38° 51' N, 7° 35' W, seeds obtained from Botanical Garden, Lisboa (s.n., s.coll., s.exsicc.).
Hs: Málaga, Sierra de Mijas, 36° 35' N, 4° 38' W, seeds obtained from Botanical Garden, Malaga (s.n., s.coll., s.exsicc.).
Co: Haute-Corse, Galeria, 42° 26' N, 8° 38' E, seeds obtained from Botanical Garden, Meise (s.n., s.coll., s.exsicc.).
Sa: Cagliari, S. Girolamo-Capoterra, late-hercynian granites, 39° 10' N, 8° 59' E, 120 m a.s.l., 8 Sept 1997, *G. Bacchetta* (s.n., s.exsicc.) (Fig. 1b).
It: Grosseto, Talamone, 42° 33' N, 11° 8' E, 2 Jul 1992, seeds obtained from Botanical Garden, Firenze (s.n., s.coll., s.exsicc.).
– Grosseto, Punta Ala, cliffs on the sea, 42° 48' N, 10° 45' E, 30 m a.s.l., 9 Jul 1993, seeds obtained from Botanical Garden, Siena (s.n., s.coll., s.exsicc.).
Tn: Tabarka, 36° 55' N, 8° 45' E, 9 Jun 1990, (s.n., s.coll., s.exsicc.).
Si: Siracusa, Brucoli, 37° 17' N, 15° 11' E, Jun 1999, seeds obtained from Botanical Garden, Catania (s.n., s.coll., s.exsicc.).
Gr: Peloponnisos, Messinia, Pylos, Voidokyliá, on the maritime sand dunes, 36° 55' N, 21° 42' E, 5 m a.s.l., 13 Aug 1996, *L. Feoli Chiapella* (TSB).
– Peloponnisos, Lakonia, Limin Jerakas, 36° 47' N, 23° 5' E, 5 m a.s.l., 1995, *Beu-Mat*, seeds obtained from Botanical Garden, Berlin-Dahlem (s.n., s.coll., s.exsicc.).
IJ: Israel, Ministero dell'Agricoltura (s.n., s.coll., s.exsicc.).

The range of the species coincides with the Mediterranean region: southern Iberic Peninsula, central and southern Italy, Corse, Sardinia, Sicily, Albania, Greece, Cyprus, Turkey, Lebanon, Jordan, Israel, northern Morocco, Algeria and Tunisia (Gibbs 1968, Maire 1987, Greuter & al. 1989, García Murillo 1999).

The chromosome number $2n = 48 + 0\text{-}2B$, counted on the basis of 22 metaphase plates, confirms the references reported by many authors: Gilot (1965, on cultivated material), Sañudo (1973, originated from Málaga), Fernandes & Queirós (1978, from Montemor-o-Novo, Portugal), Luque (1984, from Algeciras, Cádiz), Runemark (2006, from Skinousa, Kiklades islands, Greece). Chromosome size ranges from 0.55 to 1.98 μm and 0.33 μm for B- chromosomes.

1704. *Calicotome infesta* (C. Presl) Guss. subsp. ***infesta*** – $2n = 48$ (Fig. 2a).

Si: Messina, Móio Álcantara, 37° 54 N, 15° 3' E, 550 m a.s.l., 17 Jul 1991, seeds obtained from Botanical Garden, Catania (s.n., s.coll., s.exsicc.).

The range of the taxon includes the northern Mediterranean region: northeastern Spain, Balearic Islands, Italy (particularly southern regions), Sicily, Croatia, Albania (Gibbs 1968, Greuter & al. 1989, García Murillo 1999).

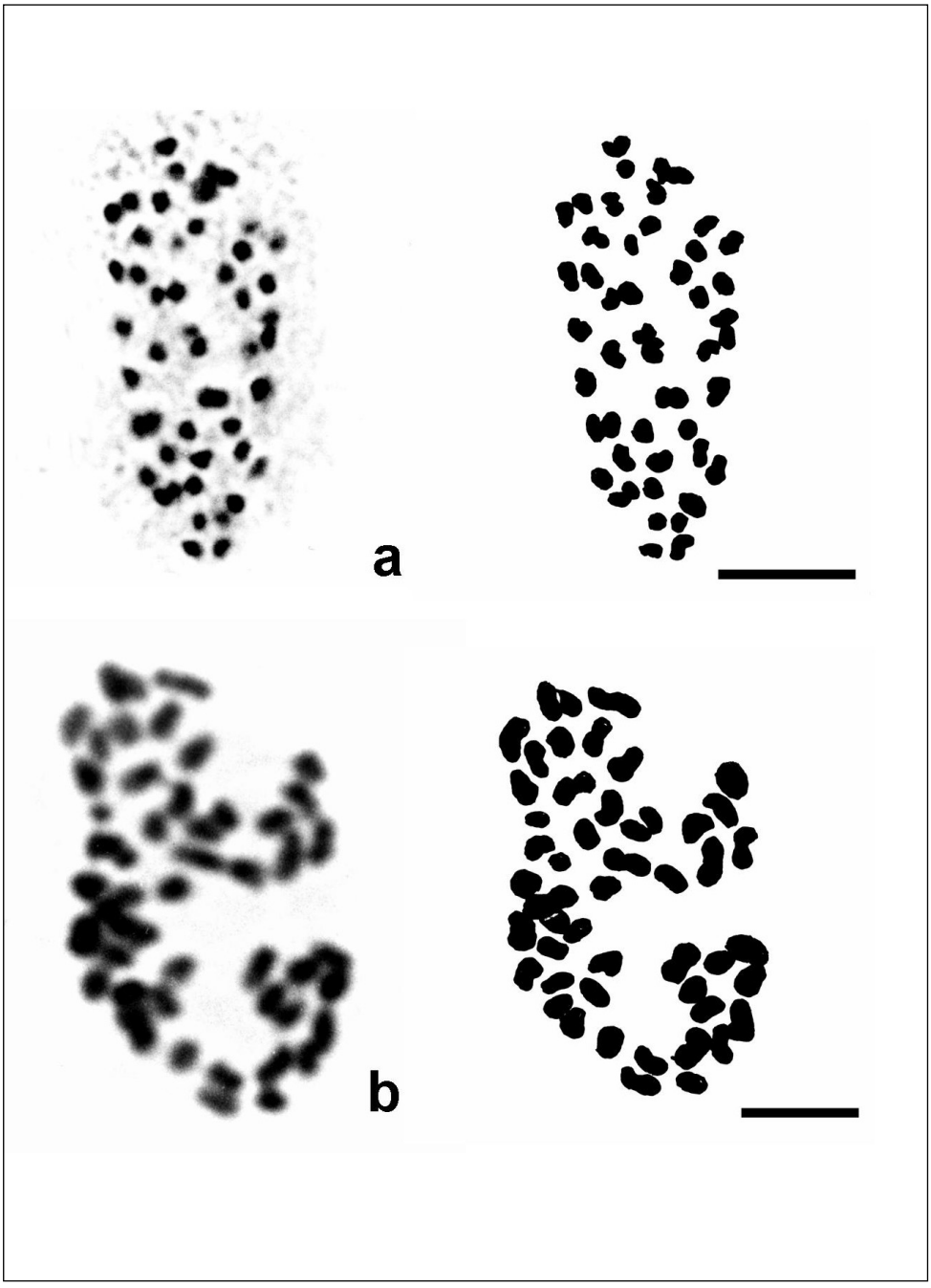

Fig. 1. Photomicrographs and relative drawings of somatic metaphase plates of: **a,** *Calicotome spinosa* (Cap-d'Ail), $2n = 48$; **b,** *C. villosa* (S. Girolamo-Capoterra), $2n = 48$. – Scale bars = 5 μm.

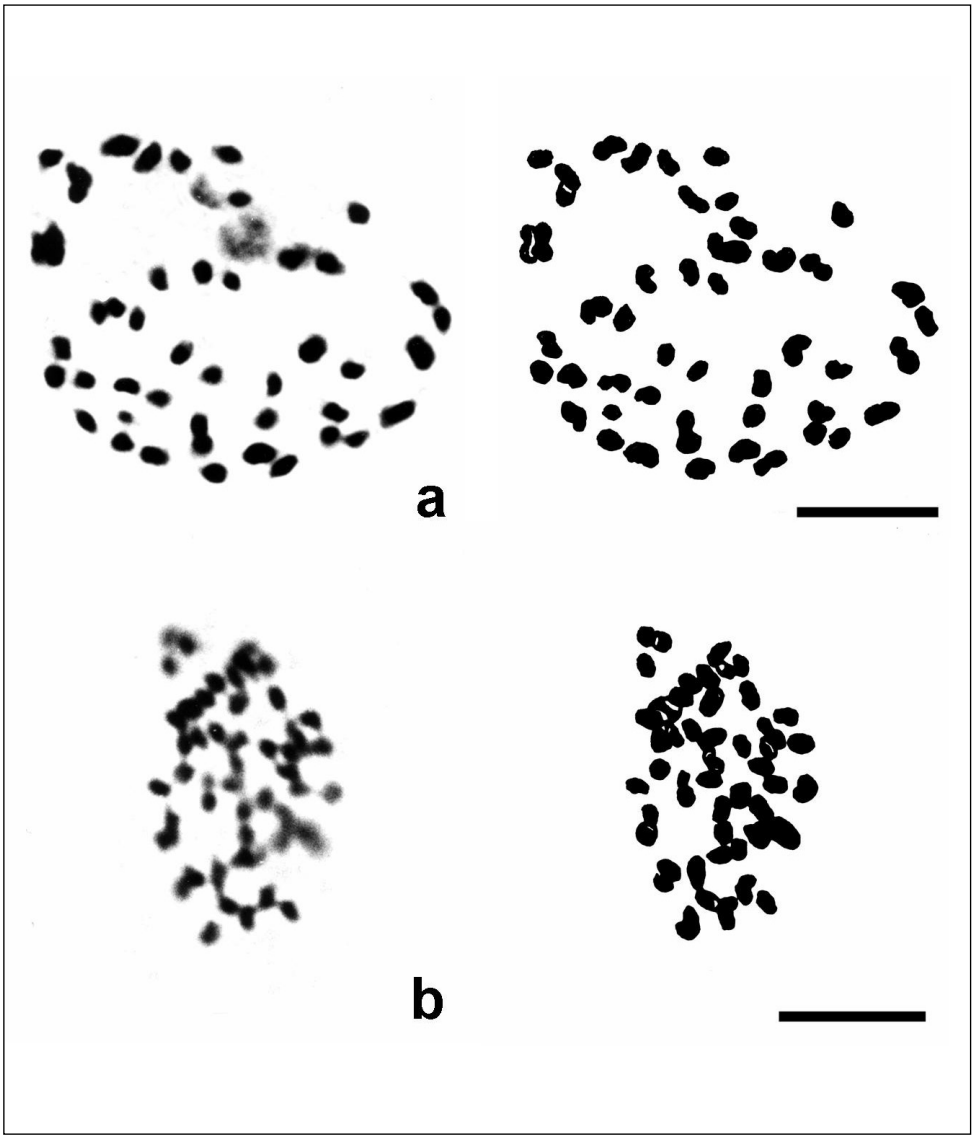

Fig. 2. Photomicrographs and relative drawings of somatic metaphase plates of: **a,** *Calicotome infesta* subsp. *infesta* (Móio Álcantara), 2*n* = 48; **b,** *C. infesta* subsp. *intermedia* (Beni Snassen), 2*n* = 48. – Scale bars = 5 µm.

The chromosome number 2*n* = 48, counted on the basis of 12 metaphase plates, confirms the only reference reported by Larsen (1956) for two populations, from Italy (west of Amalfi) and Croatia ("Yugoslavia: Mokošica near Dubrovnik"). Chromosome size ranges from 0.43 to 2.50 µm.

1705. ***Calicotome infesta*** (C. Presl) Guss. subsp. ***intermedia*** (C. Presl) Greuter – 2*n* = 48 (Fig. 2b).

Ma: Beni Snassen, limestone rocks, 34° 51'N, 2° 21' W, 890 m a.s.l., 24 Jul 1989, *L. Feoli Chiapella* (TSB).

This taxon is distributed in the western Mediterranean region: southern and southeastern Spain and northern Africa (Morocco, Algeria, Tunisia and Tripolitania) (Gibbs 1968, Maire 1987, Greuter & al. 1989, García Murillo 1999).

The chromosome number 2*n* = 48 was counted on the basis of 10 metaphase plates. Sañudo (1973), on the contrary, found *n* = 25 in a population from Torrox (province of Málaga). Chromosome size ranges from 0.59 to 1.76 μm.

Calicotome, according to Gibbs (1968) a small and distinctive genus on morphological ground, and acknowledged as a well differentiated group on the basis of molecular data (Cubas & al. 2002), results homogeneous also karyologically. As well as the prevailing eutetraploid number 2*n* = 48 (or *n* = 24), some authors releved also, more rarely, the hyperaneuploid numbers *n* = 25 and 2*n* = 50 and, exceptionally, 2*n* = 24.

Within Genisteae, *Calicotome* belongs to the *Cytisus* group on the basis of morphological characters (Polhill 1976), serological reactivity data (Cristofolini & Feoli Chiapella 1984) and on molecular ground (Käss & Wink 1997, Cubas & al. 2002). The basic number both in *Calicotome* and in the various sections of *Cytisus s.l.* is *x* = 12 (Gilot 1965, Sañudo 1979, Cusma Velari & Feoli Chiapella 1994); while *Calicotome* displays almost only tetraploid numbers, in some groups of *Cytisus* two or three ploidy levels were found: diploid (2*n* = 24), tetraploid (2*n* = 48) and octoploid (2*n* = 96). A similarity in the size and, partially, in the shape of chromosomes was also observed in the taxa of these genera.

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Reports (1706-1708) by, Tiziana Cusma Velari, Laura Feoli Chiapella, Vera Kosovel & Arnoldo Santos Guerra

1706. ***Chamaecytisus proliferus*** (L. f.) Link ssp. ***proliferus*** var. ***canariae*** (H. Christ) G. Kunkel [= *Cytisus proliferus* L.f. var. *canariae* H. Christ] — $2n = 48$, (50), 52 + 0-2B (Fig. 1a).

Ca: Canary Islands, Gran Canaria, Utiaca, 28° 1' N, 15° 33' W, 600 m a.s.l., Jun 1984, *A. Santos Guerra* (ORT 28668, 18 Jul 1984, *P. Méndez Pérez*) . – (Fig. 1a).
— Canary Islands, Gran Canaria, Gáldar, 28° 9' N, 15° 39' W, seeds obtained from Jardín Botánico Canario Viera y Clavijo (s.n., s.coll., s.exsicc.).
— Canary Islands, Gran Canaria, Hoja Pineda, 28° 7' N, 15° 38' W, seeds obtained from Jardín Botánico Canario Viera y Clavijo (s.n., s.coll., s.exsicc.).

Chamaecytisus proliferus ssp. *proliferus* var. *canariae* is endemic to Gran Canaria Island (Acebes Ginovés & al. 1991). The taxon is frequent in open areas at high elevation, in the north of the island on wind-exposed northern slopes, where the climate is subhumid because the influence of the trade winds, with lauraceous forest as potential vegetation.

The chromosome numbers $2n$ = 48, (50), 52 + 0-2B were counted on the basis of 15 metaphase plates. Chromosome size ranges from 1.10 to 2.23 µm and 0.35 µm for B- chromosomes. No previous karyological data are known for this taxon.

1707. *Chamaecytisus proliferus* (L. f.) Link ssp. ***proliferus*** var. ***palmensis*** (H. Christ) A. Hansen & Sunding [= *Cytisus proliferus* L.f. var. *palmensis* H. Christ] — $2n$ = (46), 48, 50, 52 (Fig. 1b).

Ca: Canary Islands, La Palma, Cercanías de El Paso, 28° 39' N, 17° 53' W, 500 m a.s.l., Jun 1983, *A. Santos Guerra* (ORT 28874, 14.VI.1983, *A. Calero*).

Endemic to La Palma Island, where it is often cultivated. Introduced in other Canary Islands and several countries overseas for its valuable forage interest (Lems 1960, Lid 1967, Bramwell & Bramwell 1990, Acebes Ginovés & al. 1991). It grows in open *Laurus* and *Pinus canariensis* forest areas and mostly on cliffs as refuge from goats (Santos Guerra 1983).

The chromosome numbers $2n$ = (46), 48, 50, 52 were counted on the basis of 9 metaphase plates. Chromosome size ranges from 1.43 to 1.98 µm. No previous karyological data are known for this taxon.

1708. *Chamaecytisus proliferus* (L. f.) Link ssp. ***angustifolius*** (Kuntze) G. Kunkel [= *Cytisus proliferus* L. f. var. ***angustifolius*** Kuntze] — $2n$ = 52 (Fig. 1c).

Ca: Canary Islands, Tenerife, Boca de Tauce, 28° 15' N, 16° 40' W, 1900 m a.s.l., 18 Jul 1985, *A. Santos Guerra* (ORT 29366, cultivated from seeds from loc.cit., 14 Jun 1985, *P. Méndez*).

Chamaecytisus proliferus ssp. *angustifolius* is endemic to the islands of Gomera and Tenerife, with some morphological differences (Lems 1960, Acebes Ginovés & al. 1991, Schönfelder & al. 1993). In Gomera it is growing in open areas of potential *Laurus*-forest. In Tenerife it is associated to pine forest (*Pinus canariensis*) at higher elevation, in cooler and drier habitats than in Gomera, reaching Las Cañadas del Teide at an altitude of more than 2000 m a.s.l. Locally frequent in several locations of both islands.

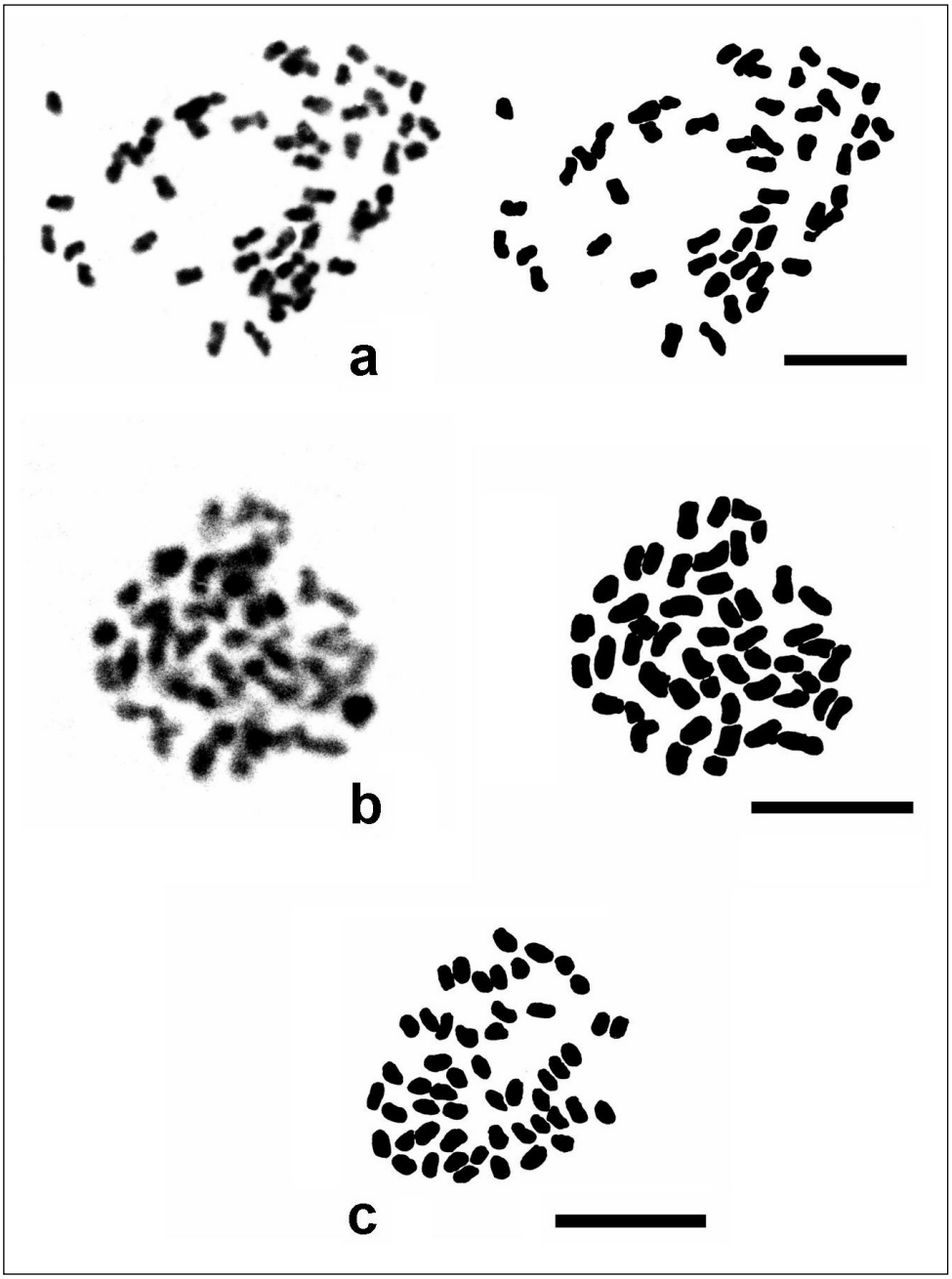

Fig. 1. Photomicrographs and relative drawings of somatic metaphase plates of: **a,** *Chamaecytisus proliferus* ssp. *proliferus* var. *canariae* (Utiaca), 2*n* = 52; **b,** *Ch. proliferus* ssp. *proliferus* var. *palmensis* (Cercanías de el Paso), 2*n* = 50; **c,** *Ch. proliferus* ssp *angustifolius* (Boca de Tauce), 2*n* = 52. – Scale bars = 5 μm.

The chromosome number $2n = 52$ was counted on the basis of 5 metaphase plates. Chromosome size ranges from 1.10 to 1.65 μm. Our counting confirms the only reference present in literature by Horjales (1975, sub *Cytisus proliferus* var. *angustifolius*), that reported $2n = 52$ from Puerto de la Cruz, Tenerife.

The distribution of *Chamaecytisus proliferus* s.l. includes all the main Canary Islands except the eastern ones (Lanzarote and Fuerteventura), with three subspecies (*proliferus*, *angustifolius* and *meridionalis*) according Acebes & al. (1991, 2004). Five varieties related to ssp. *proliferus* have been described by Acebes & al.(1991).

For *Cytisus proliferus* s.l. the chromosome number $2n = 48$ was counted by De Castro (1949) and Borgen (1969), both on cultivated material, while Horjales (1975) reported $2n = 46, 50$ for a population from Puerto de la Cruz (Tenerife).

Cytisus proliferus is the only species of the genus included by Cristofolini (1991) in series *Nivariae* (Webb) Cristof.

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