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Chromosome numbers of flowering plants from Calabria, S Italy, II.

Abstract

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Chromosome numbers of nine taxa from nine families of Calabrian angiosperms are reported: *Aizoon hispanicum* $2n = 32$, *Aristida adscensionis* subsp. *coerulescens* $2n = 22$, *Galium palaeoitalicum* $2n = 20$, *Lavandula multifida* $2n = 22$, *Ludwigia palustris* $2n = 16$, *Menyanthes trifoliata* $2n = 54$, *Ranunculus fontanus* $2n = 48$, *Salsola oppositifolia* $2n = 72$, *Soldanella calabrella* $2n = 40$. The reports for *Aizoon hispanicum*, *Aristida adscensionis* subsp. *coerulescens*, *Lavandula multifida* and *Salsola oppositifolia* are the first from Italian populations. Mitotic metaphase microphotographs and drawings are presented for all taxa studied. Brief comments are given on karyotype morphology, cytogeography and relationships of selected taxa.

This contribution supplements Peruzzi & Cesca (2002), also dealing with Calabrian species of particular phytogeographical interest. Both contributions are part of a wider study on the biosystematics and phytogeography of the Calabrian flora (Peruzzi 2003). The standard techniques applied are described in the first instalment. Vouchers of all taxa are preserved at CLU. The taxa are arranged alphabetically by family.

Aizoon hispanicum L. (*Aizoaceae*) – $2n = 32$ (Fig. 1-2)

Italy, Calabria, dry clays between Palizzi Marina and Capo Spartivento, $37^{\circ}55'N$, $16^{\circ}03'E$, 9.4.2003, Peruzzi, Passalacqua & Gargano, from seeds collected in situ.

Aizoon hispanicum is an annual, taxonomically rather isolated species, distributed in the S Mediterranean basin from SE Spain across N Africa and S Italy to Crete (Pignatti 1982, Greuter & al. 1984, Gonçalves 1990). In Italy (Gussone 1826, Tenore 1831, Fiori 1923-26, Pignatti 1982, Scelsi & Spampinato 1992) it is restricted to coastal habitats between Capo dell'Armi and Capo Spartivento in Calabria.

Our count of $2n = 32$ chromosomes is the first from Italy and confirms a previous report on non-Italian material (Bittrich 1986). Chromosome size ranges from 0.5 to 1.5 μm .

Salsola oppositifolia Desf. (*Chenopodiaceae*) – $2n = 72$ (Fig. 3-4)

Italy, Calabria, Capo dell'Armi (prov. Reggio Calabria), on coastal calcareous cliffs, $37^{\circ}57'N$, $15^{\circ}41'E$, 11.4.2002, Peruzzi & Passalacqua, cult. Hort. Bot. Calabria University, acc. no. 94.

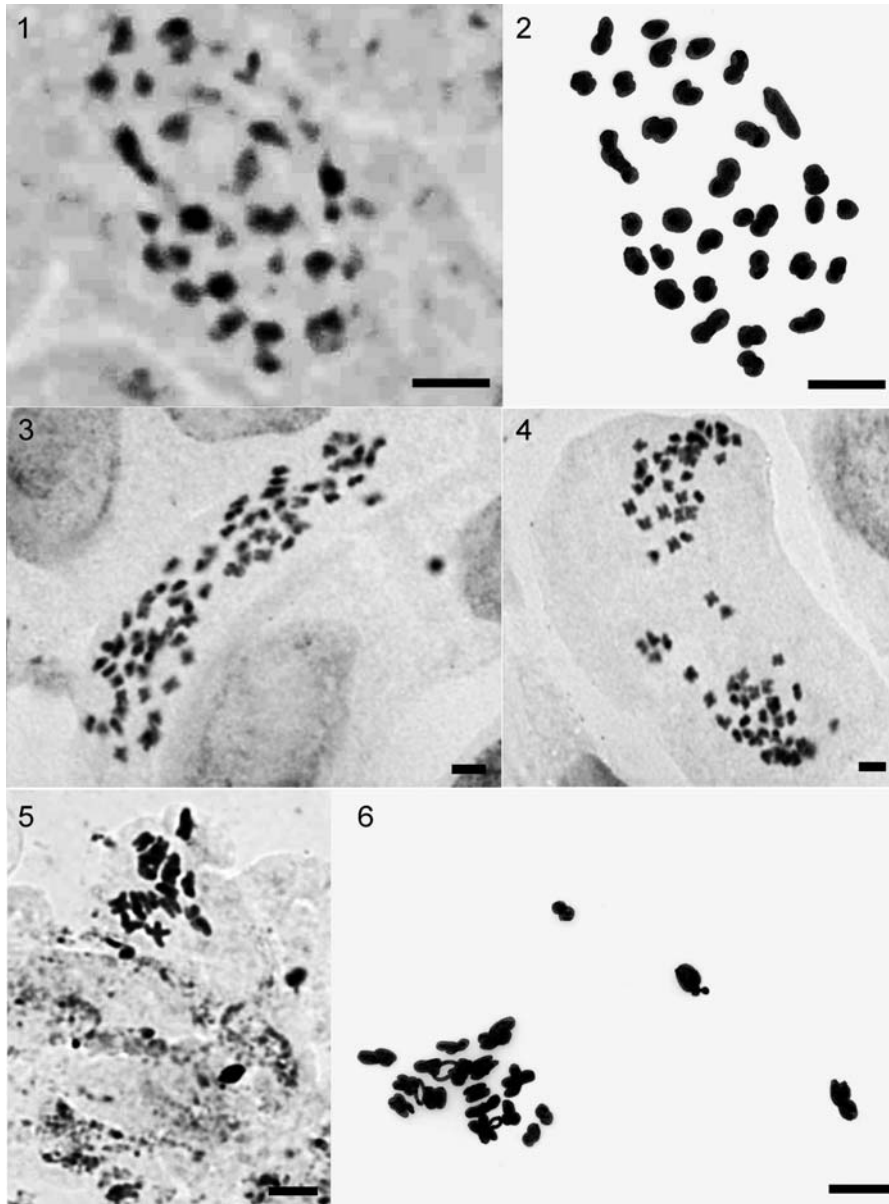


Fig. 1-6. Chromosome complements – microphotographs and drawings of: 1-2: *Aizoon hispanicum*, $2n = 32$ (scale bar = $2\ \mu\text{m}$); 3-4: *Salsola oppositifolia*, $2n = 72$ (scale bar = $5\ \mu\text{m}$); 5-6: *Lavandula multifida*, $2n = 22$ (scale bar = $5\ \mu\text{m}$).

Salsola oppositifolia Desf. is a S Mediterranean species, widespread from Morocco to Palestine (Greuter & al. 1984), which belongs to *S.* sect. *Coccosalsola* Fenzl (Botschantzev 1976). Several authors (Fiori 1923-26, Aellen in Tutin & al. 1964, Ricceri & Rizzotto 1980, Pignatti 1982) considered the binomial *Salsola oppositifolia* as a synonym of *S. verticillata* Schousboe or of *S. longifolia* Forssk., but Brullo (1982) demonstrated that the three species are completely different, and included

S. verticillata and *S. longifolia* in *S. sect. Darniella* (Maire & Weiller) Brullo. Later, Brullo (1984) considered this section as a separate genus *Darniella*, a view not shared, e.g., by Aellen & Akeroyd (in Tutin & al. 1993).

Our count of $2n = 72$ chromosomes (probably octoploid) in Calabrian plants from the only known locality on peninsular Italy is the first one from Italy and confirms a previous report from the Iberian peninsula (Castroviejo & Lago 1992). Chromosome size ranges between 1.5 and 2.5 μm . Concerning related species, we have no knowledge of counts published for *S. verticillata*, while *S. longifolia* has shown to be diploid with $2n = 18$ chromosomes (Baththacharya & al. 1971).

***Lavandula multifida* L. (Lamiaceae) – $2n = 22$ (Fig. 5-6)**

Italy, Calabria, Capo dell'Armi (prov. Reggio Calabria), old road on the right of the tunnel, calcareous cliffs, 37°57'N, 15°41'E, 8.4.2003, Peruzzi, Passalacqua & Gargano, cult. Hort. Bot. Calabria University, acc. no. 95, 96.

While Guinea (in Tutin & al. 1972) reports *Lavandula multifida* only for the W Mediterranean basin, Greuter & al. (1986) give this species for the Iberian peninsula, Morocco, Algeria, Tunisia, Italy and also for Egypt. In Italy the species occurs only in Sicily and in Calabria at Capo dell'Armi (Pignatti 1982).

Our count of $2n = 22$ chromosomes is the first from Italy and confirms previous reports by Larsen (1960), Dalgaard (1986), Baltisberger & Charpin (1989) from non-Italian material. Some reports of $2n = 24$ cited by Fedorov (1969) have to be considered as erroneous or referable to a different taxon. Chromosome size ranges between 2 and 3 μm .

***Menyanthes trifoliata* L. (Menyanthaceae) – $2n = 54$ (Fig. 7-8)**

Italy, Calabria, Piano della Lacina, Serre Calabre, Brognaturo (prov. Vibo Valentia), along the Alaco river, on marsh habitats, 990 m, 38°36'N, 16°25'E, 6.4.2002, Cesca & Peruzzi, root tips collected in situ.

The family *Menyanthaceae*, often included in *Gentianaceae*, is represented by five genera (Mabberley 1997), of which *Menyanthes* is unispecific. *M. trifoliata* is circumboreal (linked to humid places and bogs) and widespread in Europe. In the Mediterranean, it is restricted to montane areas (Tutin in Tutin & al. 1972). Pignatti (1982) gives the species for peninsular Italy up to Campania, near Avellino. The Calabrian stand represents the southern European limit of *M. trifoliata*, which otherwise occurs further south only in the Rif (N Morocco) at over 2000 m (Meusel & Jäger 1978).

The chromosome number of $2n = 54$ was also reported in plants from central Italy (Amadei & al. 1982) as well as from all provenances across the entire distribution range of the species (Fedorov 1969, Moore 1973, Goldblatt 1981, 1984, 1985, 1988, Goldblatt & Johnson 1991, 1994, 1996, 2000). Chromosome size ranges between 1 and 4.5 μm .

***Ludwigia palustris* (L.) Elliot (Onagraceae) – $2n = 16$ (Fig. 9-10)**

Italy, Calabria, Piano della Lacina (Brognaturo, prov. di Vibo Valentia), along the Alaco river, on marsh habitats, 990 m, 38°36'N, 16°25'E, 8.7.2002, Peruzzi & Gargano, root tips collected in situ.

According to Raven (1963, in Tutin & al. 1968) and Zardini & Raven (1992) the genus *Ludwigia* L. comprises 82 species, grouped in 22 sections. It is taxonomically isolated within the family *Onagraceae*, being the only genus of the tribe *Jussiaeae*. *L. palustris* is the type of *L. sect. Dantia* (DC.) Munz, which is characterised by opposite leaves, four sepals and stamens and often absent petals. *L. palustris* is a subcosmopolitan temperate species and grows on the banks of lakes, along streams and humid places. In Italy (Pignatti 1982) it occurs in Sardinia and in a few disjunct localities in N central and S Italy (Calabria: Sila and Serre Calabre).

Our count of $2n = 16$ chromosomes confirms a previous one in plants from Tuscany (Ficini & al. 1981) and agrees with several other reports from non-Italian provenances (Gregory & Klein 1960, Queiros 1976, Raven & Tai 1979). Chromosome size ranges between 0.5 and 1 μm .

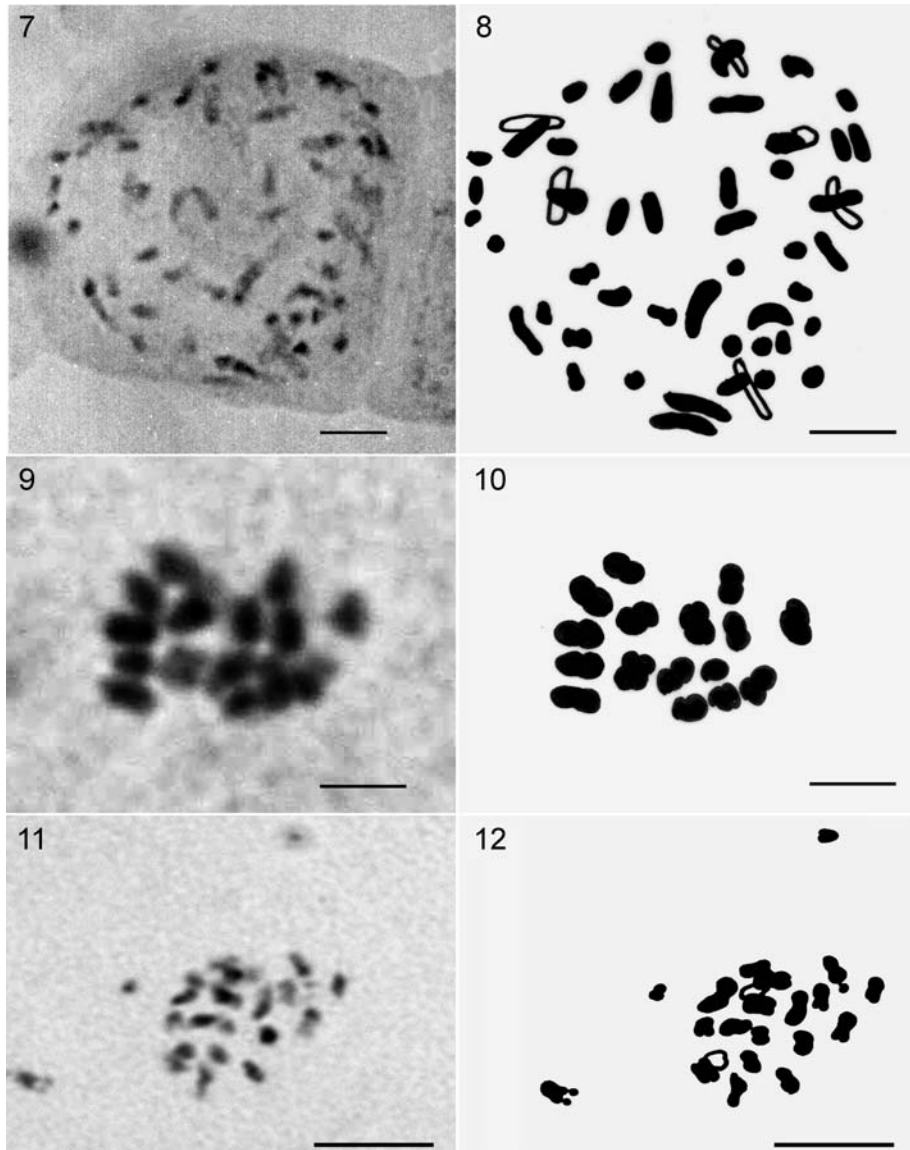


Fig. 7-12. Chromosome complements – microphotographs and drawings of: 7-8: *Menyanthes trifoliata*, $2n = 54$ (scale bar = $5 \mu\text{m}$); 9-10: *Ludwigia palustris*, $2n = 16$ (scale bar = $2 \mu\text{m}$); 11-12: *Aristida adscensionis* subsp. *coerulescens*, $2n = 22$ (scale bar = $5 \mu\text{m}$).

Aristida adscensionis subsp. *coerulescens* (Desf.) Bourreil & Trouin (*Poaceae*) – $2n = 22$ (Fig. 11-12)

Italy, Calabria, Bova Marina (prov. Reggio Calabria), at Capo S. Giovanni, $37^{\circ}56'N$, $15^{\circ}56'E$, 23.5.2001, Peruzzi & Passalacqua, from seeds collected in situ.

This subspecies is distinct from *Aristida adscensionis* subsp. *adscensionis* (Auquier & Duvigneaud 1976) for the tendency to be perennating, some features of the inflorescence and for the mainly Mediterranean distribution. Both subspecies are sympatric only in the Canary Islands.

A. adscensionis subsp. *coerulescens*, previously known in Italy only from Sicily (Pignatti 1982), was recorded recently from Calabria, between Reggio Calabria and Capo Spartivento (Brullo & al. 1987, Scelsi & Spampinato 1992).

Our count of $2n = 22$ chromosomes is the first from Italy and also for this subspecies. The same chromosome number is reported for subsp. *adscensionis* (Bir & Sahni 1983, 1985, Yan & al. 1995, Sánchez-Ken & Davila Aranda 1995). Chromosome size ranges between 1 and 2 μm .

***Soldanella calabrella* Kress (Primulaceae) – $2n = 40$ (Fig. 13-14)**

Italy, Calabria, prov. di Cosenza, Sila Grande, c. 6 km S of Camigliatello Silano, Fontana del Colonnello, c. 1 km W of M. Botte Donato, 1800-1840 m, 39°17'N, 16°26'E, 15.11.2002, Peruzzi & Caparelli, root tips collected in situ.

This interesting rare species of the *Soldanella chrysosticta* group (Greuter & al. 1989) is endemic to Calabria, where it occurs in Sila, Aspromonte (Kress 1988), and Serre Calabre (Crisafulli & al. 2003). Before its description as a new species, the corresponding populations were considered as conspecific with *S. hungarica* Simonkai, a species from the Balkans (Cristofolini & Pignatti 1962, Pignatti 1982). According to a recent morphological and molecular survey of the genus *Soldanella* (Zhang & Kadereit 2002), *S. calabrella* Kress belongs to the “S Balkans-S Italy-Tatras” clade together with *S. chrysosticta*. Following the same authors, *S. calabrella* has the same habit as *S. alpina* L. and *S. major* (Neilr.) Vierh. and glandular hairs like those of *S. pindicola* Hausskn. and *S. chrysosticta*.

Our count of $2n = 40$ chromosomes seems to be the second for this species, agrees with the previous one (reported by Zhang & Kadereit 2002 for material of unspecified origin) and is the same as in all other closely related species (Zhang & Kadereit 2002). Chromosome size ranges between 2 and 3 μm .

***Ranunculus fontanus* J. & C. Presl (Ranunculaceae) – $2n = 48$ (Fig. 15-16)**

Italy, Calabria, prov. di Cosenza, Sila Grande, c. 6 km S of Camigliatello Silano, Fontana del Colonnello, c. 1 km W of M. Botte Donato, 1800-1840 m, 39°17'N, 16°26'E, 15.11.2002, Peruzzi & Caparelli, root tips collected in situ.

Italy, Calabria, Piano della Lacina, Serre Calabre, Brognaturo (prov. Vibo Valentia), along the Alaco river, on marsh habitats, 990 m, 38°36'N, 16°25'E, 6.4.2002, Cesca & Peruzzi, cult. Hort. Bot. Calabria University, acc. no. 107.

This species of *Ranunculus* sect. *Flammula* is confined to the NE Mediterranean basin (Pignatti 1982, Tutin in Tutin & al. 1993). In S Italy it can be found in marshy and humid habitats of the montane belt.

Our counts in the material from both localities revealed $2n = 48$ chromosomes and corroborate reports by D'Ovidio & Marchi (1990) for Calabrian plants from Sila Piccola (Circicilla) and by Ferrarella & al. (1981) for plants of Sicilian provenance (Madonie). According to D'Ovidio & Marchi (1990), the closely related *R. ophioglossifolius* Vill. and *R. flammula* L. subsp. *flammula* are diploid with $2n = 16$ chromosomes and tetraploid with $2n = 32$ chromosomes, respectively. Chromosome size ranges between 2.5 and 6.5 μm .

***Galium palaeoitalicum* Ehrend. (Rubiaceae) – $2n = 20$ (Fig. 17-18)**

Italy, Calabria, Serra del Prete, along the rocks at SW of the top, 2100-2160 m, 19.7.2001, 39°55'N, 16°09'E, Peruzzi, Gargano & Passalacqua, young ovaries collected in situ.

This species is endemic to peninsular Italy (Ehrendorfer & Krendl 1974, Ehrendorfer in Pignatti 1982). Our count of $2n = 20$ chromosomes agrees with those by Ehrendorfer & Krendl (1974) for plants of unspecified origin and by Bechi & al. (1991), Bechi & Garbari (1992) on material from the Apuan Alps (Tuscany). According to Bechi & al. (1996), this species can be considered as a paleo-apoendemic, being a dispoloid descendant (both related species have $2n = 22$ chromosomes). Chromosome size ranges between 1 and 2 μm .

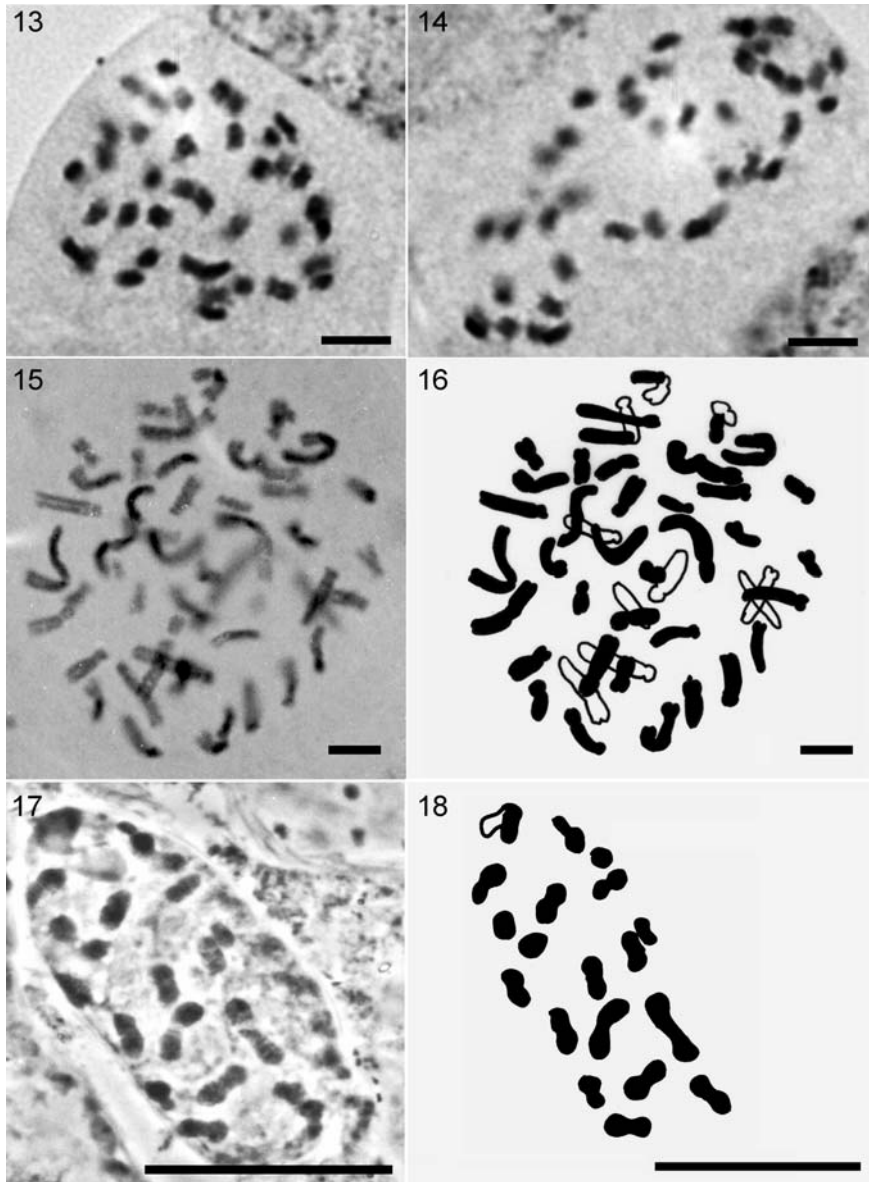


Fig. 13-18. Chromosome complements – microphotographs and drawings of: 13-14: *Soldanella calabrella*, $2n = 40$; 15-16: *Ranunculus fontanus*, $2n = 48$; 17-18: *Galium palaeoitalicum*, $2n = 20$. – Scale bars = 5 μm

References

- Amadei, L., Giordani, A. & Tomei, P. E. 1982: Numeri cromosomici per la flora italiana: 882-888. – *Inform. Bot. Ital.* **14**: 243-247.
- Auquier, P. & Duvigneaud, J. 1976: Sur la distinction des *Aristida adscensionis* L. & *A. coeruleascens* Desf. – *Soc. l'Échange Pl. Vasc. Europe Occ. Bassin Médit.* **16**: 133-137.

- Baltisberger, M. & Charpin A. 1989: Chromosomenzählungen von Gilbert Bocquet. – Ber. Geobot. Inst. ETH Stiftung Rübel **55**: 246-251.
- Bathacharya, S. S., Khalifa, M. M. & Chaudri, I. I. 1971: Reports. – [In: Löve, Å. (ed.), IOPB chromosome number reports XXXII]. – Taxon **20**: 349-350.
- Bechi, N. & Garbari, F. 1992: Mediterranean chromosome number reports 121-124. – Flora Medit. **2**: 275-278.
- , Miceli, P. & Garbari, F. 1991: Indagini biosistematiche sulla flora apuana. III contributo. – Atti. Soc. Tosc. Sci. Nat., Mem., Ser. B, **98**: 171-237.
- , Corsi, G. & Garbari, F. 1996: Indagini biosistematiche sulla flora apuana. IV contributo. – Webbia **51**: 31-57.
- Bir, S. S. & Sahni, M. 1983: SOCGI plant chromosome number reports I. – J. Cytol. Genet. **18**: 58-59.
- & — 1985: Cytological investigations on some grasses from Punjab Plain, North India. – Proc. Indian Natl. Sci. Acad., Part B, Biol. Sci. **5**: 609-626.
- Bittrich, V. 1986: Untersuchungen zu Merkmalsbestand, Gliederung und Abgrenzung der Unterfamilie *Mesembryanthemoideae* (*Mesembryanthemataceae* Fenzl). – Mitt. Inst. Allg. Bot. Hamburg **21**: 5-116.
- Botschantzev, V. 1976: Conspectus specierum sectionis *Coccosalsola* Fenzl generis *Salsola* L. – Novosti Sist. Vysš. Rast. **13**: 74-102.
- Brullo, S. 1982: Notes on the genus *Salsola* (*Chenopodiaceae*) 1. The *Salsola oppositifolia* and *S. longifolia* groups. – Willdenowia **12**: 241-247.
- 1984: Taxonomic consideration on the genus *Darniella* (*Chenopodiaceae*). – Webbia **38**: 301-328.
- , Minissale, P. & Spampinato, G. 1987: Thymo-Lavanduletum multifidae associazione nuova del Cisto-Ericion rinvenuta nella Calabria meridionale. – Boll. Acc. Gioenia Sci. Nat. **20**: 283-292.
- Castroviejo, S. & Lago, E. 1992: Nuevos datos cariológicos de *Chenopodiaceae* Ibéricas. – Nova Acta Cient. Comp. Biol. **3**: 201-203.
- Crisafulli, A., Siviglia, M. & Spampinato, G. 2003: Primi dati sulla flora vascolare delle Serre (Calabria). – Pp. 228 in: Anonymous (ed.), Atti del 98° Congresso della Società Botanica Italiana, 24-26 September, Catania. – Catania.
- Cristofolini, G. & Pignatti, S. 1962: Revisione delle forme italiane di *Soldanella* L. – Webbia **16**: 443-475.
- Dalgaard, V. 1986: Chromosome studies in flowering plants from Macaronesia. – Anales Jard. Bot. Madrid **43**: 83-111.
- D'Ovidio, R. & Marchi, P. 1990: DNA content, karyotype structure analysis and karyotype symmetry in *Ranunculus* L. (*Ranunculaceae*). Italian species belonging to sections *Flammula* (Webb) Benson and *Micranthus* (Ovcz.) Nyarady. – Caryologia **43**(2): 99-115.
- Ehrendorfer, F. & Krendl, F. 1974: Notes on *Rubiaceae* in Europe. – Bot. J. Linn. Soc. **68**: 268-272.
- Fedorov, A. A. (ed.) 1969: Hromosomnye čisla cvetkovyh rastenij [Chromosome numbers in flowering plants]. – Leningrad.
- Ferrarella, A., Grisafi, F., Lentini, F. & Melati, M. R. 1981: Numeri cromosomici per la flora italiana: 860-867. – Inform. Bot. Ital. **13**: 189-193.
- Ficini, G., Giordani, A., Tomei, P. E. 1981: Numeri cromosomici per la flora italiana: 836-841. – Inform. Bot. Ital. **13**: 172-175.
- Fiori, A. 1923-26: Nuova flora analitica d'Italia **1-2**. – Firenze.
- Goldblatt, P. (ed.) 1981, 1984, 1985, 1988: Index to plant chromosome numbers 1975-78, 1979-81, 1982-83, 1984-85. – Monogr. Syst. Bot. Missouri Bot. Gard. **5, 8, 13, 23**.
- & Johnson, D. E. (ed.) 1991, 1994, 1996, 2000: Index to plant chromosome numbers 1988-89, 1990-91, 1992-93, 1996-97. – Monogr. Syst. Bot. Missouri Bot. Gard. **40, 51, 58, 81**.
- Gonçalves, M. L. 1990: *Aizoon* L. – Pp. 72-74: in Castroviejo, S., Lafnz, M., López González, G., Montserrat, P., Muñoz Garmendia, F., Paiva & J., Villar, L. (ed.), Flora iberica **2**. – Madrid.

- Gregory, D. P. & Klein, W. M. 1960: Investigations on meiotic chromosomes of six genera in the *Onagraceae*. – *Aliso* **4**: 505-521.
- Greuter, W., Burdet, H. M. & Long, G. (ed.) 1984, 1986, 1989: *Med-Checklist* **1, 3, 4**. – Genève & Berlin.
- Gussone, G. 1826: *Plantae rariores*. – Napoli.
- Kress, A. 1988: *Primulaceen-Studien* 8. Der Formenkreis um *Soldanella chrysostricta*. – Gröbenzell bei München.
- Larsen, K. 1960: Cytological and experimental studies on the flowering plants of the Canary Islands. – *K. Danske Videnskab. Selskab. Biol. Skr.* **11(3)**: 1-60.
- Mabberley, D. J. 1997: *The plant book*, ed. 2. – Cambridge.
- Meusel, H. & Jäger, J. (ed.) 1978: *Vergleichende Chorologie der Zentraleuropäischen Flora* **2**. – Jena.
- Moore, R. J. 1973: *Index to plant chromosome numbers 1967-71*. – Utrecht.
- Peruzzi, L. 2003: *Biosistemática e fitogeografía de especies críticas de la flora calabresa*. – PhD Thesis University of Calabria.
- & Cesca G. 2002: Chromosome numbers of flowering plants from Calabria, S Italy. – *Willdenowia* **32**: 33-44.
- Pignatti, S. 1982: *Flora d'Italia* **1-3**. – Bologna.
- Queiros, M. 1976: Contribuição para o conhecimento citotaxonomico das spermatophyta de Portugal. *Onagraceae*. – *Bol. Soc. Brot.* **50**: 107-116.
- Raven, P. H. 1963: The old world species of *Ludwigia* (including *Jussiaea*), with a synopsis of the genus (*Onagraceae*). – *Reinwardtia* **6**: 327-427.
- & Tai, W. L. 1979: Observations on chromosomes in *Ludwigia* (*Onagraceae*). – *Ann. Missouri Bot. Gard.* **66**: 862-879. [[CrossRef](#)]
- Ricceri, C. & Rizzotto, M. 1980: Segnalazioni floristiche italiane: 60-61. – *Inform. Bot. Ital.* **12**: 74-75.
- Sánchez-Ken, J. & Davila Aranda, P. 1995: Numeros cromosomicos de algunas especies Mexicanas de *Aristida* (*Poaceae: Aristideae*). – *Ann. Missouri Bot. Gard.* **82**: 593-595. [[CrossRef](#)]
- Scelsi, F. & Spampinato, G. 1992: Osservazioni fitogeografiche sulla flora costiera del territorio di Reggio Calabria. – *Giorn. Bot. Ital.* **126**: 389.
- Tenore, M. 1831: *Sylloge flora neapolitana*. – Napoli.
- Tutin, T. G., Burges, N. A., Chater, A. O., Edmondson, J. R., Heywood, V. H., Moore, D. M., Valentine, D. H., Walters, S. M. & Webb, D. A. (ed.) 1993: *Flora europaea*, ed. 2, **1**. – Cambridge, etc.
- , Heywood, V. H., Burges, N. A., Moore, D. M., Valentine, D. H., Walters, S. M. & Webb, D. A. (ed.), 1964, 1968, 1972, 1976, 1980: *Flora europaea* **1-5**. – Cambridge, etc.
- Yan, G., Zheng, S., Xue, F., Yun, F., Wang, L. & Fu, X. 1995: The chromosome numbers of 35 forage species and their geographical distribution. – *Grassland China* **1995(1)**: 16-20.
- Zardini, E. & Raven, P. H. 1992: A new section of *Ludwigia* (*Onagraceae*) with a key to the sections of the genus. – *Syst. Bot.* **17**: 481-485. [[CrossRef](#)]
- Zhang, L. & Kadereit, J. W. 2002: The systematics of *Soldanella* (*Primulaceae*) based on morphological and molecular (ITS, AFLPs) evidence. – *Nordic J. Bot.* **22**: 129-169.

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