

## CHROMOSOME NUMBERS OF MACARONESIAN FLOWERING PLANTS III

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### SUMMARY

Chromosome numbers of 13 species of flowering plants from the Cape Verde Islands and eight from the Canary Islands are presented. Fourteen of the species are endemics, eight of which were previously not studied karyologically. Of the seven non-endemic species, two are studied karyologically for the first time, the other five having no previous reports for Macaronesia.

### RESUMEN

Se presenta el número cromosómico de 13 especies de fanerogamas de Cabo Verde y de 8 de las Islas Canarias. Catorce de estas especies son endémicas y ocho de estas no habían sido antes estudiadas cariológicamente. De las siete especies no endémicas, dos son estudiadas cariológicamente por primera vez y de las otras cinco no se tienen datos anteriores para Macaronesia.

### INTRODUCTION

This is the fifth in a series of papers (Borgen 1969, 1970, 1974, 1975) on chromosome numbers of vascular (mainly flowering) plants from Macaronesia.

### MATERIAL AND METHODS

All species from the Cape Verde Islands were collected by Dr. Per Sunding, Botanical Garden and Museum, University of Oslo, during his expeditions to the islands in 1972 and 1976. The species from the

Canary Islands were collected by myself, Mr. Günther Kunkel, Coín, Spain, or received from the botanical gardens in Puerto de la Cruz, Tenerife; Tafira Alta, Gran Canaria; and Berlin.

Most of the material has been raised from seeds or cuttings and cultivated in the Botanical Garden, University of Oslo. In addition one field fixation from the Canary Islands is included.

Root tips were fixed in Navashin-Karpechenko, dehydrated, embedded in paraffin, cut with a microtome, and stained with gentian violet (cf. Löve & Löve 1975).

Vouchers of all species are deposited in the Botanical Museum, University of Oslo (0), where the microscopical slides also are preserved.

#### RESULTS AND COMMENTS

The chromosome numbers are presented in Table I. The arrangement is systematically as to families, alphabetically as to species. The nomenclature and author abbreviations are in accordance with Hansen & Sunding (1979).

The following ten species are investigated karyologically for the first time: the four Canarian endemics *Silene lagunensis* Chr. Sm., *Ferula lancerottensis* Parl., *Limonium preauxii* (Webb et Berth.) O. Kuntze, and *Carex calderae* A. Hans.; the four Cape Verde Island endemics *Polycarpaea gayi* Webb, *Kickxia brunneri* (Benth.) Janchen, *Globularia amygdalifolia* Webb, and *Conyza feae* (Béguin.) Wild; and the two non-endemic species *Capraria biflora* L. and *Pluchea ovalis* (Pers.) DC. from the Cape Verde Islands.

The chromosome records on the following non-endemic species from the Cape Verde Islands are new for the Macaronesian region: *Abrus precatorius* L., *Salvia aegyptiaca* L., *Borreria verticillata* (L.) G. F. Meyer, *Heteropogon contortus* (L.) PB. ex Roem. et Schult., and *Pennisetum polystachyon* (L.) Schult.

Chromosome numbers deviating from previous reports were found in *Tornabenea hirta* Schmidt and *Pennisetum polystachyon*, and a number inconsistent with previously established basic ones was found in *Conyza feae* (Béguin.) Wild.

*Polycarpaea divaricata* (Ait.) Poir,  $2n = 18$ , Fig. 1.

*P. gayi* Webb,  $2n = 18$ , Fig. 2.

The diploid number  $2n = 18$  is commonly reported in the two spe-

cies *P. carnosa* Chr. Sm. ex Buch and *P. divaricata* from the Canary Islands (Borgen 1977). Larsen (1960) made a deviating report of  $2n = c.26$  in *P. divaricata* from Tenerife. The present material of *P. divaricata* from Tenerife was received as *P. tenuis* Webb ex Christ, but turned out to be *P. divaricata* in cultivation. *Polycarpaea divaricata* is a variable species, and the genus needs revision.

*Silene lagunensis* Chr. Sm.,  $2n = 24$  Fig. 3.

The diploid chromosome number  $2n = 24$  here reported for the first time for this narrow endemic from Tenerife, the Canary Islands, is in accordance with the reports on most other *Silene* species in the Canaries, one exception is the tetraploid *S. vulgaris* (Moench) Garcke (Larsen 1960, Borgen 1977).

*Crambe scaberrima* Webb ex Bramw.,  $2n = 30$ , Fig. 4.

The present diploid report on this species endemic to Tenerife, coincides with a previous one by Gagnieu et al. (1973), and with reports on many other endemic *Crambe* species (Borgen 1977).

*Abrus precatorius* L.,  $2n = 22$ , Fig. 5.

The present diploid report, the first from the Cape Verde Islands, coincides with five previous ones (Fedorov 1969, Fritsch 1972) for this pantropical species.

*Euphobia tuckeyana* Steud.,  $2n = 20$ , Fig. 6.

The diploid number  $2n = 20$  is previously reported in this Cape Verde Island endemic by Bramwell & Murray (1972) and Bramwell et al. (1972). Their material originated from the island of Santo Antao, mine from Sál.

*Ferula lancerottensis* Parl.,  $2n = 18$ , Fig. 7.

This endemic species from Lanzarote, The Canary Islands, was previously not investigated karyologically. It turned out to be diploid, as previously recorded for the other Canarian endemic, *F. linkii* Webb (Borgen 1977).

*Tornabenea hirta* Schmidt,  $2n = 16$ , Fig. 8.

In this species endemic to the Cape Verde Islands, Bramwell & Murray (1972) and Bramwell et al. (1972) previously reported a different number,  $2n = 18$ , in material from Santiago. My material originated from Sao Nicolau. The chromosome numbers in this endemic Ca-

pe Verde Island genus are variable:  $2n = 16$  is previously reported for *T. tenuissima* (Chev.) A. Hans. et Sund. from Fogo (Borgen 1974);  $2n = 22$  for *T. bischoffii* Schmidt from Santo Antao (Bramwell & Murray 1972, Bramwell et al. 1972). The plants from Santiago and Sao-Nicolau referred to *T. hirta* may belong to different species. The genus needs revision, and a further cytotaxonomic study would reveal if there are erroneous counts, unstable chromosome numbers, or taxonomical confusion.

*Limonium preauxii* (Webb et Berth.) O. Kuntze,  $2n = 14$ , Fig. 9.

*Limonium preauxii* is endemic to Gran Canaria, The Canary Islands. The diploid number here reported for the first time for this species coincides with one group of diploid endemic *Limonium* species with the basic number  $x = 7$ .

*Salvia aegyptiaca* L.  $2n = 28$ , Fig. 10.

In this weed from N Africa and SW Asia both  $2n = 28$ , from unknown origin, (Delestaing 1954) and  $2n = 38$ , from Libya, (Bhattacharya et al. 1971) have been reported. The present tetraploid report coincides with that of Delestaing (1954) and is the first from Macaronesia.

*Capraria biflora* L.,  $2n = c.60$ , Fig. 11.

The present report from the Cape Verde Islands is the first for this tropical species originating from Central and S America. Four species with their main distribution in America and the West Indies are recognized in the genus (Engler & Prantl 1897, Willis 1966), none of which has been studied karyologically before. *Capraria biflora* is polyploid, may be hexaploid. The basic number  $x = 10$  is reported in two related genera of the Rhinanthoideae-Digitaleae, *Scoparia* L. and *Sibthorpia* L. (Fedorov 1969).

*Kickxia brunneri* (Benth.) Janchen,  $2n = 18$ , Fig. 12.

The present diploid chromosome number record is the first for this species endemic to the Cape Verde Islands. The same number is reported in other Macaronesian endemics of the genus (Borgen 1977).

*Scrophularia smithii* Hornem.,  $2n = 58$ , Fig. 13.

The present record in this Canarian endemic is in accordance with those of Dalgaard (1979).

*Globularia amygdalifolia* Webb,  $2n = 16$ , fig. 14.

This record, the first in this species endemic to the Cape Verde Islands, coincides with previous ones for other species of the genus (Fedorov 1969, Moore 1974, 1977).

*Borreria verticillata* (L.) G. F. Meyer,  $2n = 28$ , Fig. 15.

The present report is the first from Macaronesia. In this pantropical species, the same number is reported previously in plants from Senegal, W Africa (Miège 1962) and S America (Lewis et al. 1967).

*Conyza feae* (Béguin.) Wild,  $2n = 24$ , Fig. 16.

No previous chromosome record exists for this species endemic to the Cape Verde Islands. In the related *C. varia* (Webb) Wild, also endemic to the Cape Verde Islands,  $2n = 36$  is reported (Borgen 1975). A common basic number in the genus is  $x = 9$ , and many reports state  $x = 18$ ; some  $x = 36, 54$ , and  $72$  (Fedorov 1969). The present report deviates from this pattern, indicating another basic number,  $x = 6$  or  $x = 12$ , for *Conyza* in the Cape Verde Islands.

*Pluchea ovalis* (Pers.) DC.,  $2n = 40$ , Fig. 17.

This tropical African species has not been studied karyologically before. The present report is in accordance with those for six other *Pluchea* species (Fedorov 1969, Moore 1974).

*Tanacetum ptarmiciflorum* (Webb) Sch. Bip.,  $2n = 18$ , Fig. 18.

Aldridge & Ortega (1976) previously reported  $n = 9$  for this rare endemic from Gran Canaria.

*Heteropogon contortus* (L.) PB. ex Roem. et Schult.,  $2n = 60$ , Fig. 19.

A series of chromosome numbers,  $2n = 20, 40, 50, 60$ , and  $80$ , (Fedorov 1969, Moore 1973, 1974, 1977) are reported for this species which has a wide distribution in S Europe, the tropics and subtropics. The hexaploid number here reported from the Cape Verde Islands is commonly reported from elsewhere, often together with other numbers in the same population or even the same plant. Unstable chromosome numbers and probably apomixis seem to occur in this grass.

*Pennisetum polystachyon* (L.) Schult.,  $2n = 72$ , Fig. 20.

In this grass from tropical Africa and Asia, the hexaploid number  $2n = 54$  of the basic number  $x = 9$  is reported by many authors (Krishnaswamy & Raman 1949, Singh & Godward 1960, Tateoka 1965, Ran-

gasamy 1972, Gould & Soderstrom 1974). The deviating octoploid number here reported, the first from the Cape Verde Islands, indicates a neopolyploid race in these islands.

*Carex calderae* A. Hans.,  $2n = c.68$ , Fig. 21.

This endemic species is confined to a small area in Las Cañadas, Tenerife. Its high, polyploid, chromosome number is recorded for the first time.

#### ACKNOWLEDGEMENTS

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Table I. Chromosome numbers of flowering plants from the Cape Verde Islands (C.V.) and the Canary Islands (Can.). Species investigated karyologically for the first time are marked with an asterisk. 'Fix.' refers to my fixation numbers and 'Cult.' to the accession numbers of cultivated plants in the Botanical Garden, University of Oslo.

Taxon	2n	Fig.	Fix.	Cult.	Origin
CARYOPHYLLACEAE					
<i>Polycarpaea divaricata</i> (Ait.) Poir.	18	1	78-104	76-1344	Can.: Tenerife: Las Cañadas, above Cañada de Diego Hernández, alt. 2200 m. La Laguna, Tenerife, 1975 seed list no. 62.
* <i>Polycarpaea gayi</i> Webb	18	2	74-21	73-1743	C.V.: Santo Antão: Ribeira do Paul, alt. 1050 m. Sunding 24.10.1972.
* <i>Silene lagunensis</i> Chr. Sm.	24	3	78-98	78-128	Can.: Tenerife. Berlin-Dahlem 1978 seed list no. 2374.
CRUCIFERAE					
<i>Crambe scaberrima</i> Webb ex Bramw.	30	4	74-77	72-245	Can.: Tenerife: Buenavista. Puerto de la Cruz, Tenerife, 1972 seed list no. 66.
LEGUMINOSAE					
<i>Abrus precatorius</i> L.	22	5	74-66	73-1775	C.V.: Santo Antão: Ribeira do Barbasso. Sunding 25.10.1972.
EUPHORBIACEAE					
<i>Euphorbia tuckeyana</i> Steud.	20	6	74-64	73-1831	C.V.: Sal: Monte Grande, alt. 400 m. Sunding 19.10.1972.
APIACEAE					
* <i>Ferula lancerottensis</i> Parl.	22	7	74-74	70-1876	Can.: Lanzarote: Valle Haria. Puerto de la Cruz, Tenerife, 1970 seed list no. 186.
<i>Tornabenea hirta</i> Schmidt	16	8	78-96	78-269	C.V.: São Nicolau. Alta Joaquina, alt. 500 m. Sunding 24.11.1976.
PLUMBAGINACEAE					
* <i>Limonium preauxii</i> (Webb et Berth.) O. Kuntze	14	9	74-89	73-1738	Can.: Gran Canaria: Viña Almagro. Kunkel June 1973.



## LABIATAE

*Salvia aegyptiaca* L. 28 10 78-89 78-285 C.V.: Santo Antão: Ribeira da Garca. Sunding 10.11.1976.

## SCROPHULARIACEAE

\**Capraria biflora* L. c.60 11 78-99 78-266 C.V.: Santo Antão: Ribeira da Garca. Sunding 10.11.1976.

\**Kickxia brunneri* (Benth.) Janchen 18 12 78-92 78-265 C.V.: São Vicente: Monte Verde, 200 m. Sunding 5.11.1976.

*Scrophularia smithii* Hornem. 58 13 78-4 Can.: Tenerife: El Bailadero, alt. 790 m. Borgen 2476.

## GLOBULARIACEAE

\**Globularia amygdalifolia* Webb 16 14' 78-101 78-284 C.V.: Santo Antão: Cova, alt. 1150 m. Sunding 7.11.1976.

## RUBIACEAE

*Borreria verticillata* (L.) G. F. Meyer 28 15 78-95 78-263 C.V.: Santiago: Orgãos Pequenas NW of S Domingos, alt. 400 m. Sunding 17.11.1976.

## COMPOSITAE

\**Conyza feae* (Béguin.) Wild 24 16 78-87 78-276 C.V.: Santo Antão: Montanho Conceição, alt. 1200 m. Sunding 7.11.1976.

\**Pluchea ovalis* (Pers.) DC. 40 17 78-88 78-277 C.V.: São Vicente: Monte Verde, alt. 200 m. Sunding 5.11.1976.

*Tanacetum ptarmiciflorum* (Webb) Sch. Bip. 18 18 78-91 78-259 Can.: Gran Canaria: Risco Blanco. Ex cult. Jardin Canario 'Viera y Clavijo', Gran Canaria.

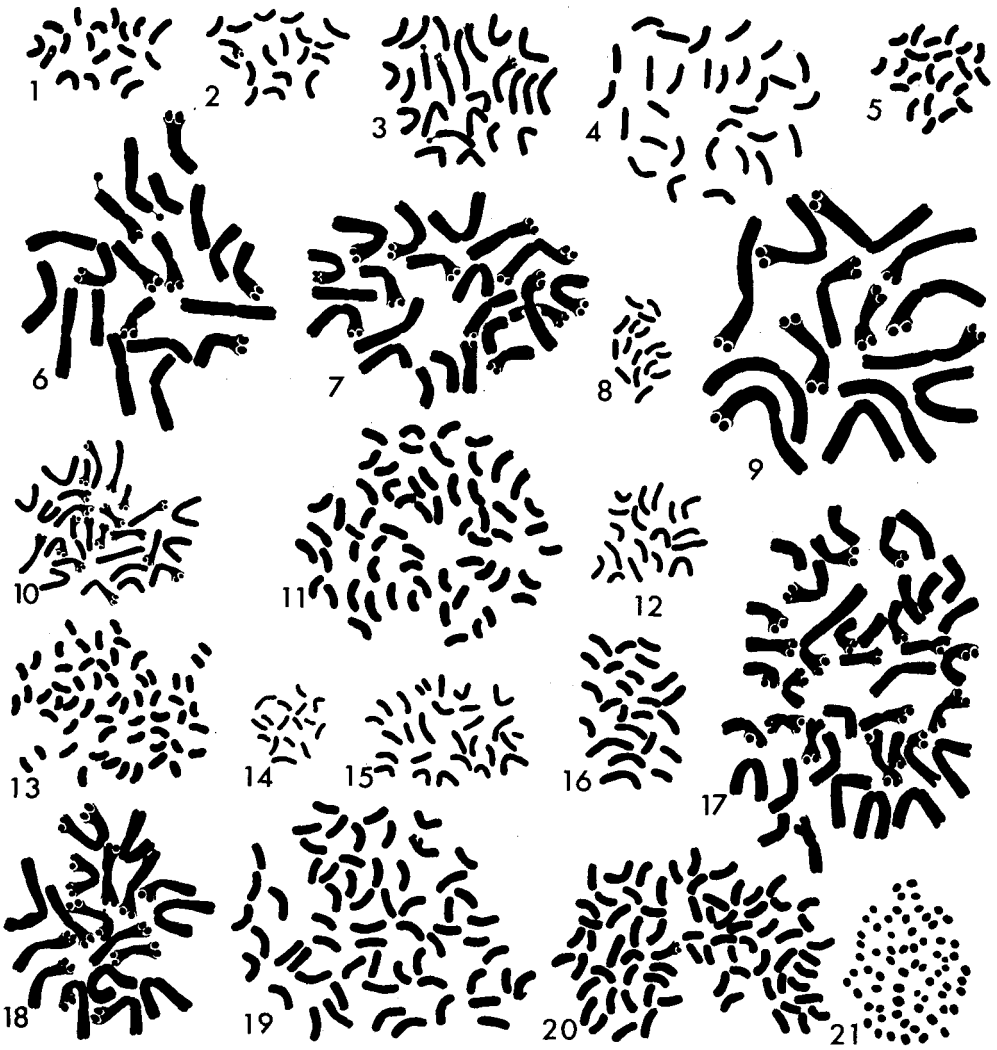
## POACEAE

*Heteropogon contortus* (L.) PB. ex Roem. et Schult. 60 19 78-103 78-288 C.V.: Santo Antão: Ribeira das Pedras, alt. 1250 m. Sunding 9.11.1976.

*Pennisetum polystachyon* (L.) Schult. 72 20 74-72 73-1779 C.V.: Fogo: Chã das Caldeiras, near Fernão Gomes, alt. 1600 m. Sunding 1.11.1972.

## CYPERACEAE

\**Carex calderae* A. Hans. c.68 21 78-100 78-294 Can.: Tenerife: Las Cañadas, Topo de la Grieta, 2140 m. Borgen 3.3.1978.



## LEGENDS TO THE FIGURES

Figs. 1-21. Mitotic metaphase plates. Fig. 1. *Polycarpaea divaricata*. Fig. 2. *P. gayi*. Fig. 3. *Silene lagunensis*. Fig. 4. *Crambe scaberrima*. Fig. 5. *Abrus precatorius*. Fig. 6. *Euphorbia tuckeyana*. Fig. 7. *Ferula lancerottensis*. Fig. 8. *Tornabenea hirta*. Fig. 9. *Limonium preauxii*. Fig. 10. *Salvia aegyptiaca*. Fig. 11. *Capraria biflora*. Fig. 12. *Kickxia brunneri*. Fig. 13. *Scrophularia smithii*. Fig. 14. *Globularia amygdalifolia*. Fig. 15. *Borreria verticillata*. Fig. 16. *Conyza feae*. Fig. 17. *Pluchea ovalis*. Fig. 18. *Tanacetum ptarmiciflorum*. Fig. 19. *Heteropogon contortus*. Fig. 20. *Pennisetum polystachyon*. Fig. 21. *Carex calderae*. x. c. 2300.