

CHROMOSOME NUMBERS IN SOME SYRIAN ANGIOSPERMS

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SUMMARY

The chromosome number of 118 plants belonging to 108 species collected in the wild in Syria has been determined. Notes on some species are given.

1. INTRODUCTION

There is no doubt regarding the importance of obtaining chromosome records of as many individuals as possible within a certain species for the understanding of its cytogeography. Fine examples are the investigations by Favarger et al. in Neuchâtel (Switzerland), by Skalinska et al. in Cracow (Poland) and by Fernandes et al. in Coïmbra (Portugal). In this respect the regular reports by A. Löve in *Taxon* (IOPB) are also valuable completions. A number of data are now available owing to such studies during the last decennia. Most are concerned with the flora of the northern hemisphere, particularly of that of Europe and northern America. However, there are areas with a flora still very poorly known from the cytological viewpoint. This is the case, for instance, with the most eastern part of the mediterranean area. The present study is based upon material collected in Syria, mainly in the surroundings of Damascus. It can be considered as a contribution to the inventarisation of chromosome numbers in general and for the area mentioned in particular.

2. MATERIAL AND METHODS

Plants were cultivated from seeds collected in the wild by the junior author (B.). The seedlings were potted and from this material roottips were fixed in Karpechenko's fixative, embedded in paraffine wax, sectioned at 15 micron and stained according to Heidenhain's haematoxylin method.

From the following localities material was collected:

- 1 Deir Atiyah, North of Nebk, Antilebanon
- 2 Near A'adra, 30 km North of Damascus
- 3 Near Salenkehiye on the Euphrates, North of Meskené
- 4 Near Ta'as, 7 km North of Salenkehiye
- 5 Barada valley near Bassima, West of Damascus
- 6 Near Dimas, 25 km West of Damascus
- 7 In the neighbourhood of Damascus
- 8 Near Katana, 40 km South-West of Damascus
- 9 Aside mainroad to the International Airport of Damascus
- 10 Seidnaya, 40 km North-West of Damascus
- 11 Ma'arret Seidnaya, 45 km North of Damascus
- 12 Jodeidet el Sheibani, Barada valley, 20 km North of Damascus
- 13 Near Sanamein, 30 km South of Damascus
- 14 Jabal Kassioun, North of Damascus
- 15 Near Bloudan, East of Zebdani, Antilebanon
- 16 Sarghaya, Zebdani, Antilebanon
- 17 Near Naserah, Tell Kalakh
- 18 Near Daret Azza, Jabal Simlan

Voucher specimens of the material investigated are deposited in the Herbarium of Utrecht [U], the Netherlands.

3. RESULTS

The results of the counts are given in a table. This table gives a survey of the species investigated, the source of the material, the number of the voucher specimen, and previous counts.

In the table the species are arranged alphabetically according to family and genus.

The references to previous counts were obtained from compilation works such as: "Chromosome Numbers of Flowering Plants" – Ed. A. A. FEDEROV 1969; "Index to Plant Chromosome Number 1967–1971"; "Regnum Vegetabile 91" – Ed. R. J. MOORE 1973 and 1974, respectively, and from the IOPB reports in Taxon by A. Löve.

For the determination of the material, the following Flora's were used: "Nouvelle Flore du Liban et de la Syrie" – P. MOUTERDE, Beirut, 1966–1970; "Flora of Syria, Lebanon and Sinai" – G. E. POST, Beyrouth, 1932; "Flora of Iraq" – C. C. TOWNSEND, E. GUEST & ALI AL-RAWI, Bagdad, 1968; "Flora of Palestine" – M. ZOHARY, Jerusalem, 1966.

4. NOTES ON SOME SPECIES

Asteraceae

4. *Carduus pycnocephalus* L.

The chromosomes of this species are relatively long and show a tendency to stick together. Due to this, apparently it is difficult to ascertain the exact chromosome number. MOORE & FRANKTON (1962) investigated plants from Chili and thought it was about $2n = 54$. This is the same number as reported by PODLECH & DIETERLE (1969) for the subspecies *albides* (M. Bieb.) Kazmi found in Afghanistan. DAHLGREN et al. (1971) gave $2n = 61-64$ in plants from the Baleares, while the exact number $2n = 64$ was reported by KRAMER et al. (1972) in material collected in Malta.

Carduus pycnocephalus from Syria had $2n = 32$ chromosomes.

17. *Tragopogon longirostris* Bisch.

Within this genus most species have the basic number $X = 6$, but also the number $X = 7$ occurs. This is the case with *T. balcanicus* Vel., (BORSOS 1971); *T. crocifolius* L., (BROCK 1955) and *T. hybridus* L., (FERNANDES & QUEIROS 1971).

ARARATYAN (1939 – see FEDEROV 1969) reported for *T. longirostris* $2n = 12$. The plants from Syria clearly showed the number $2n = 14$.

Boraginaceae

21. *Echium parviflora* Moench

According to Flora Europaea, *Echium parviflora* has $2n = 16$ chromosomes. The number $2n = 12$, found in the plant from Syria is aberrant, even for the genus (most species have $2n = 16$ or $2n = 32$, while intraspecific polyploidy occurs).

The number $2n = 12$ is also known from *E. russicum* J. F. Melin (syn. *E. rubrum* Jacq.). The two species, however, can easily be distinguished: *E. parviflorum* has blue flowers and has all the stamen completely included in the corolla tube which is not the case in *E. russicum*. Besides this the last mentioned species has red flowers.

Brassicaceae

23. *Calepina irregularis* (Asso) Thell.

The determination of this plant gives difficulties. The key in Flora Europaea led to *Calepina irregularis* (Asso) Thell. Other Flora's used (see above) to *Camelina* cf. *rumelica* Velen. Both species are polymorphic, their exact position seems uncertain. In *Camelina* all species counted up to now have the chromosome number $2n = 40$ (PODLECH & DIETERLE 1969). The basic number in *Calepina* is $X = 7$. In the plant from Syria $2n = 14$ chromosomes were counted.

27. *Neslia paniculata* (L.) Desv. subsp. *thracica* (Vel.) Bornm.

This subspecies is often confused with the subspecies *paniculata*. Distinct morphological differences are mainly found in fruit characters. The sub-

Taxon	Locality	Voucher	2n	previous counts
Amaranthaceae				
1. <i>Amaranthus retroflexus</i> L.	1	S10	34	34
Apiaceae				
2. <i>Bupleurum lancifolium</i> Hornem.	2,3	S90, S133, 146	16	16
Asteraceae				
3. <i>Arctium vulgare</i> (Hill.) Evans	7	S33	36	36
4. <i>Carduus pycnocephalus</i> L.	3	S129	32	54, 64
5. <i>Carthamus tinctorius</i> L.	1	S8	24	24
6. <i>Crepis nemausensis</i> Gouan	5	S203	10	10
7. <i>Crupina crupinastrum</i> (Moris) Vis.	6	S205	28	28
8. <i>Echinops blancheanus</i> Boiss.	1	S39	28	—
9. <i>Filago pyramidata</i> L.	2, 3	S94; S101	28	28
10. <i>Garhadiolus hedynpis</i> (F. et M.) Jaub. et Sp.	2	S83	20	10
11. <i>Notobasis syriaca</i> (L.) Cass.	3	S149	34	34
12. <i>Rhagadiolus stellatus</i> (L.) Gaertn.	3	S110	10	10
13. <i>Scorzonera papposa</i> DC.	2,6	S78; S204	14	14
14. <i>Senecio vernalis</i> W. et Kitt.	2,4	S77; S155	20	20, 40
15. <i>Silybum marianum</i> (L.) Gaertn.	8	S182	34	34
16. <i>Sonchus oleraceus</i> L.	3	S128	32	16
17. <i>Tragopogon longirostris</i> Bisch.	8	S184	14	12
18. <i>Xanthium spinosum</i> L.	7	S35	36	36
19. <i>Xanthium strumarium</i> L. var. <i>antiquorum</i> (Wallr.) Boiss.	7	S34	36	—
Boraginaceae				
20. <i>Cynoglossum creticum</i> Mill.	8	S179	48	24
21. <i>Echium parviflorum</i> Moench	2	S80	12	16
Brassicaceae				
22. <i>Alyssum damascenum</i> Boiss. et Gaill.	2	S84	32	—
23. <i>Calepina irregularis</i> (Asso) Thell.	4	S156	14	14, 42
24. <i>Carrichtera annua</i> (L.) DC.	2	S72	16	16, 32
25. <i>Diplotaxis erucoides</i> (L.) DC.	9	S40B	14	14
26. <i>Eruca vesicaria</i> (L.) Cav. subsp. <i>sativa</i> (Mill.) Thell.	1	S1	22	22

27. <i>Neslia paniculata</i> (L.) Desv. subsp. <i>thracica</i> (Vel.) Bornm.	3	S121	42	—
28. <i>Schimpera arabica</i> Hochst. et St.	8	S178	14	—
29. <i>Sisymbrium orientale</i> L.	5	S202	14	14
30. <i>Texiera glastifolia</i> (DC.) Jaub. et Sp.	3	S120	14+2	—
31. <i>Torularia torulosa</i> (Desf.) Schulz	3	S118	14	—
Caryophyllaceae				
32. <i>Ankryopetalum gypsophilioides</i> Fenzl	5	S41A	26	—
33. <i>Gypsophila arabica</i> Bark.	5	S26	36	—
34. <i>Gypsophila damascena</i> Boiss.	5	S26	34	—
35. <i>Gypsophila perfoliata</i> L. var. <i>anatolica</i> (Boiss. et Heldm.) Bark.	1	S7	36	—
36. <i>Gypsophila pilosa</i> Huds.	3	S111	36	36
37. <i>Gypsophila viscosa</i> Murr.	3	S103	34	34
38. <i>Minuartia subtilis</i> (Fenzl) Hand.-Mazz.	11	S168	30	—
39. <i>Silene comiflora</i> Nees ex Otth.	2, 3	S71; S142	20	—
40. <i>Silene linearis</i> Decne	3	S131	24	—
41. <i>Silene longipetala</i> Vent.	3	S122	48	—
42. <i>Silene makmeliana</i> Boiss.	5	S38	24	—
43. <i>Spergularia diandra</i> (Guss.) Boiss.	2	S68	18	18
44. <i>Spergularia rubra</i> (L.) J. et C. Presl	2	S126	18	36, 54
45. <i>Vaccaria pyramidata</i> Med.	9	S51	30	30
46. <i>Velezia rigida</i> L.	3	S145	28	28
Chenopodiaceae				
47. <i>Atriplex rosea</i> L.	1	S29	18	18
48. <i>Rumex dentatus</i> L.	3	S40	40	40
Cistaceae				
49. <i>Helianthemum ledifolium</i> (L.) Mill.	2	S85	40	20, 40
Dipsacaceae				
50. <i>Cephalaria syriaca</i> (L.) Schrad.	13	S183	10	10
51. <i>Scabiosa aucheri</i> Boiss.	9	S60	18	18
Fabaceae				
52. <i>Astragalus tribuloides</i> Del.	9	S45	16	16
53. <i>Hippocrepis unisiliquosa</i> L.	2	S99	14	14
54. <i>Medicago polymorpha</i> L.	12	S199	14	14

Taxon	Locality	Voucher	2n	previous counts
55. <i>Medicago radiata</i> L.	9, 2	S57; S86	16	16
56. <i>Medicago rigidula</i> (L.) All.	10	S181	14	14, 16
57. <i>Medicago rotata</i> Boiss.	7	S154	16	16, 16+1, 18
58. <i>Medicago sativa</i> L.	1	S12	32	16, 32, 64
59. <i>Onobrychis crista-galli</i> (L.) Lam.	2	S81	16	14, 16, 32
60. <i>Ononis natix</i> L.	14	S22	32	32
61. <i>Trigonella noëana</i> Boiss.	9	S62	44	44
62. <i>Vicia esdraëlonensis</i> Warb. et Fig.	9	S173	14	-
63. <i>Vicia sativa</i> L.	2	S87	12	12
Fumariaceae				
64. <i>Fumaria parviflora</i> Lam.	4	S153	32	28, 32, 48
Geraniaceae				
65. <i>Erodium cicutarium</i> (L.) L'Hérit.	8	S180	40	20, 40
Hypericaceae				
66. <i>Hypericum triquetrifolium</i> Turra	12	S198	16	-
Iridaceae				
67. <i>Crocus cancellatus</i> Herb.	10	S167	16	8, 10, 16, 18
68. <i>Crocus macrobolbos</i> Jovet et Gomp.	1	S162	8	-
69. <i>Iris antilbanotica</i> Dinsm.	16	S159	20	20
70. <i>Iris basaltica</i> Dinsm.	17	S160	20	20
71. <i>Iris calcaria</i> Dinsm.	18	S158	20	-
72. <i>Iris damascena</i> Mout.	14	S161	20	-
Lamiaceae				
73. <i>Salvia spinosa</i> L.	2, 8, 14	S92; S177; S20	20	20
74. <i>Ziziphora tenuior</i> L.	3	S139	18	-
Liliaceae				
75. <i>Colchium tauri</i> Siehe	10	S166	12	-
76. <i>Fritillaria libanotica</i> (Boiss.) Baker	15	S164	24	24
77. <i>Muscari longipes</i> Boiss.	3	S135	18	18

78. <i>Tulipa montana</i> Lindl.	15	S165	24	24
Malvaceae				
79. <i>Malva aegyptia</i> L.	9	S42B	42	-
Papavaraceae				
80. <i>Papaver argemone</i> L.	2	S82	28	12, 40, 42
81. <i>Papaver syriacum</i> Boiss. et Blanche	3	S108	14	14
Plantaginaceae				
82. <i>Plantago ovata</i> Forsk.	3	S147	8	8
83. <i>Plantago psyllium</i> L.	2	S98	12	12
Poaceae				
84. <i>Aegilops crassa</i> Boiss.	3	S119	28	28, 42
85. <i>Aegilops ovata</i> L.	2	S93	28	28
86. <i>Avena barbata</i> Pott	3	S174	28	14, 28
87. <i>Avena sterilis</i> L.	1	S11	42	14, 28
88. <i>Crithopsis deileana</i> (Schult.) Rozhev.	2	S69	14	14
89. <i>Eremopyrum bonaepartis</i> (Spreng.) Nevski var. <i>bonaepartis</i>	3	S102	14	14, 28
90. <i>Eremopyrum bonaepartis</i> (Spreng.) Nevski var. <i>sublanuginosum</i> (Drob.) Meld.	9	S64	28	-
91. <i>Hordeum distichon</i> L.	9	S41B	14	14
92. <i>Hordeum geniculatum</i> All.	9	S41B	14	14, 28
93. <i>Hordeum spontaneum</i> K. Koch.	5	S200	14	14
94. <i>Secale cereale</i> L.	1	S16	14	14, 14+1, 16, 18, 27, 28, 29
Polygonaceae				
95. <i>Polygonum patulum</i> Bieb.	3	S107	20	20
Primulaceae				
96. <i>Androsace maxima</i> L.	9	S55	40	50-60
Ranunculaceae				
97. <i>Ceratocephalus falcatus</i> (L.) Pers.	2	S75	40	40
98. <i>Consolida scleroclada</i> (Boiss.) Schrödgr.	1	S30	16	-
99. <i>Ranunculus asiaticus</i> L.	3	S141	16	16

Taxon	Locality	Voucher	2n	previous counts
Resedaceae				
100. <i>Reseda lutea</i> L.	1,3	S2; S136	48	48
Rosaceae				
101. <i>Prunus dulcis</i> (Mill.) D. A. Webb.	1	S40A	16	16
102. <i>Sanguisorba spinosum</i> (L.) Spach.	14	S19	28	28
Rubiaceae				
103. <i>Callipeltis cucullaria</i> (L.) Stev.	9	S67	22	22
104. <i>Galium tricornutum</i> Dandy	9	S44	44	44
Scrophulariaceae				
105. <i>Anarrhinum orientale</i> Benth.	11	S172	18	-
106. <i>Scrophularia xanthoglossa</i> Boiss.	11	S171	52	52
Valerianaceae				
107. <i>Valerianella dactylophylla</i> Boiss. et Hoh.	3	S150	14	16
Zygophyllaceae				
108. <i>Zygophyllum fabago</i> L.	1	S5	22	22

species *paniculata* seems to have a northern distribution and the subspecies *thracica* a southern one (Flora Europaea).

The present study shows cytological differences: subspecies *paniculata* is diploid ($2n = 14$), the subspecies *thracica* turned out to be an hexaploid with $2n = 42$ chromosomes.

Caryophyllaceae

32. *Ankyropetalum gypsophiloides* Frenzl

The chromosome number $2n = 26$ assures that this genus is not only morphologically different from *Gypsophila*, but also cytologically. Some authors include it namely in *Gypsophila* (see for details: BARKOUDAH 1962).
39. *Silene coniflora* Nees ex Otth.

The chromosome number $2n = 20$ is an unusual number for the genus. Most species have the basic number $X = 12$ (with $2n = 24, 36, 48, 72, 96, 120, 192$). The number $2n = 20$ is also found in two other species e.g. *Silene conica* L. (KHOSHOO & BHATIA, 1963; PUECH, 1968; VAN LOON, GADELLA & KLIPHUIS, 1971; STRID, 1971; LÖVE & KJELLQUIST, 1972) and *Silene conoidea* L. (KHOSHOO, 1960; DAMBOLDT & PHITOS, 1968; PODLECH & DIETERLE, 1969).

Fumariaceae

64. *Fumaria parviflora* Lam.

F. parviflora is widespread in Europe extending to Baluchistan, Arabia and the Algerian Sahara. It is introduced in Mexico and South America.

The cyto geography of this species seems to be interesting and needs further investigation.

The plant from Syria showed the same chromosome number as the plants studied by RYBERG (1960) from Algeria ($2n = 32$). VAN LOON (1974) gives $2n = 48$ for plants collected in Lanzarote, the Canaries. This author considers it likely that *F. parviflora* is a species with the basic number $X = 8$. However, there are also reports of $2n = 28$ by NEGODI (1935, 1936, 1940, 1951) and FAHMY (1951) in plants from the western and central parts of the mediterranean area of the species.

Liliaceae

75. *Colchicum tauri* Siehe

The genus *Colchicum* is characterized by a great diversity of its chromosome number. The following counts are made: $2n = 14, 18, 24, 36, 38, 40, 42, 44, 54, 76, 102, 106$ and 140 (see FEDEROV 1969). The number $2n = 12$ is new and the lowest in this series.

The genus includes 65 species, mainly distributed in the eastern parts of the mediterranean area.

Papaveraceae

80. *Papaver argemone* L.

From the literature hexaploid plants with $2n = 42$ chromosomes are

known. The Syrian material turned out to be tetraploid ($2n = 28$). It was collected in a vegetation characterized by *Ononis natrix* on calcarous rocky soil in an area with the so called Batha-mountain climate, in the surroundings of A'adra. *Papaver argemone* is originally a mediterranean species. It became widespread afterwards as a weed of cultivation on light soils in Central and Northern parts of Europe, including the British Isles.

The species is closely related to *Papaver apulum* Ten. It differs from this in having a longer indument on the stem (1.5–3 mm) and having an oblong clavate ribbed capsule up to 2 cm instead of an ellipsoidal, not or slightly ribbed capsule up to 1 cm.

Primulaceae

96. *Androsace maxima* L.

This is a species with a wide distribution: the whole mediterranean extending into Iran and into Central Europe.

In spite of this widespread area, only one record was published by TITOVA (1935) in plants found in Russia. She could not establish the exact number, but thought it could be $2n = 58-60$.

Our material clearly showed the number $2n = 40$. The basic number for *Androsace* is $X = 10$, so the plant from Syria is a tetraploid.

Rubiaceae

104. *Galium tricornutum* Dandy

Galium tricornutum, originally a mediterranean annual, became widespread northwards into the whole of Europe. The tetraploid plants ($2n = 44$) from Syria confirm the counts in material from Germany, Portugal and the U.S.S.R. (Erevan, Armenia, and Ashkhabad), (KLIPHUIS 1974).

The species is very uniform in its morphology throughout the whole area. It is characterized by strongly recurved fruit stalks.

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