

CHROMOSOME NUMBERS IN ASTER

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Chromosome numbers are of ever-increasing importance to modern plant systematists. Although there have been numerous contributions made in this area over the past 25 years, the chromosome numbers of most plants remain unknown. Even in some large genera which contain abundant and widespread species, many chromosome numbers are known from a single count, or from a few counts taken from a restricted portion of the range of a species. Considering the value of the knowledge of chromosome numbers to evolutionary and taxonomic discussion (see Davis & Heywood 1963), it seems appropriate to expand this aspect of our knowledge whenever possible.

As a necessary early step in a study of the variability and hybridizing capability in the *Aster lateriflorus-simplicipilosus* complex, collections of these and other species of *Aster* were made, primarily in the northeastern United States, in 1970. Buds were collected in Carnoy's 6:3:1 and maintained at ambient temperatures. Chromosome numbers, using standard squash techniques, were determined in pollen mother cells undergoing meiosis, and, in a few cases, in root tip cells which were undergoing mitotic divisions. Chromosome counts from 32 populations of 17 different species, along with locality data, are found in Table 1. These data include the first count reported for *A. gracilis* ($n = 9$); a count ($n = 24$) for *A. concinnus*, different from that previously reported for the species ($2n = 46$, Huziwara 1958); and a diploid count ($n = 9$) for *A. undulatus*, a species previously reported only as a tetraploid ($n = 18$, Avers 1953a, b). In addition, previous chromosome counts for those species included in this study are presented. Voucher specimens are deposited in the herbarium at Hope College.

Table 1.

Species	Chromosome Number	Locality data
<i>Aster acuminatus</i> Michx.	$n = 9$	NEW HAMPSHIRE: CARROLL CO. North Shore of Dan Hole Pond. <i>Van Faassen</i> 2712.
	$n = 9$	MAINE: OXFORD CO. 2.6 miles North of Bethel. <i>Van Faassen</i> 2725.
	$n = 9$	VERMONT: ESSEX CO. 9.1 miles west of North Stratford. <i>Van Faassen</i> 2730.
<i>Aster ciliolatus</i> Lindl.	$n = 36$	MICHIGAN: EMMET CO. 1 mile South of Mackinaw City. <i>Van Faassen</i> 2787.
<i>Aster concinnus</i> Willd.	$n = 24$	PENNSYLVANIA: MONROE CO. 0.5 mile North of Marshalls Creek. <i>Van Faassen</i> 2776.
<i>Aster cordifolius</i> L.	$n = 18$	MAINE: OXFORD CO. 2.6 miles North of Bethel. <i>Van Faassen</i> 2724.
	$n = 18$	NEW HAMPSHIRE: COOS CO. 8.9 miles South of North Stratford. <i>Van Faassen</i> 2728.
<i>Aster gracilis</i> Nutt.	$n = 9$	NEW JERSEY: BURLINGTON CO. 1 mile North of Green Bank. <i>Van Faassen</i> 2753.
<i>Aster junciformis</i> Rydb.	$n = 16$	NEW HAMPSHIRE: COOS CO. 0.5 mile North of Gorham. <i>Van Faassen</i> 2727.
<i>Aster lateriflorus</i> (L.) Britt.	$n = 16$	PENNSYLVANIA: MONROE CO. Delaware Water Gap. <i>Van Faassen</i> 2763.

Species	Chromosome	
	Number	Locality data
	$n = 16$	NEW JERSEY: SUSSEX CO. 7 miles South of Montague. <i>Van Faasen</i> 2780.
<i>Aster lowricanus</i> Porter	$n = 18$	PENNSYLVANIA: MON- ROE CO. 5 miles North of Marshalls Creek. <i>Van Faa-</i> <i>sen</i> 2775.
<i>Aster macrophyllus</i> L.	$n = 36$	VERMONT: CALEDONIA CO. 2.8 miles North of Gro- ton. <i>Van Faasen</i> 2746.
	$n = 36$	NEW HAMPSHIRE: GRAF- TON CO. 1 mile West of Warren. <i>Van Faasen</i> 2749.
<i>Aster patens</i> Ait.	$n = 10$	NEW JERSEY: BURLING- TON CO. Chatsworth. <i>Van</i> <i>Faasen</i> 2758.
<i>Aster pilosus</i> Willd.	$2n = 48$	MICHIGAN: OTTAWA CO. 3 miles South of Zeeland. <i>Van Faasen</i> 2674.
<i>Aster puniceus</i> L.	$n = 8$	MAINE: OXFORD CO. 0.5 mile East of Bryant Pond. <i>Van Faasen</i> 2719.
	$n = 8$	VERMONT: CALEDONIA CO. 2.8 miles North of Groton. <i>Van Faasen</i> 2745.
<i>Aster sagittifolius</i> Wedem.	$n = 18$	VERMONT: CALEDONIA CO. 2.8 miles North of Groton. <i>Van Faasen</i> 2747.
<i>Aster simplex</i> Willd.	$2n = 32$	MICHIGAN: ALLEGAN CO. New Richmond. <i>Van Faa-</i> <i>sen</i> 2685.
	$n = 16$	MAINE: CUMBERLAND CO. 0.5 mile North of West Baldwin. <i>Van Faasen</i> 2717.

Species	Chromosome	
	Number	Locality data
	$n = 16$	MAINE: OXFORD CO. 2.6 miles North of Bethel. <i>Van Faasen 2723.</i>
	$n = 16$	NEW JERSEY: SUSSEX CO. 0.5 mile North of Montague. <i>Van Faasen 2778.</i>
	$n = 16$	MICHIGAN: ALGER CO. 0.5 mile South of Grand Marais. <i>Van Faasen 2785.</i>
	$n = 32$	MAINE: YORK CO. 1 mile west of Porter. <i>Van Faasen 2713.</i>
	$n = 32$	VERMONT: CALEDONIA CO. 2.8 miles North of Groton. <i>Van Faasen 2748.</i>
<i>Aster spectabilis</i> Ait.	$n = 36$	NEW JERSEY: BURLINGTON CO. 3 miles South of Chatsworth. <i>Van Faasen 2754.</i>
<i>Aster umbellatus</i> Mill.	$n = 9$	MAINE: YORK CO. 1 mile West of Porter, <i>Van Faasen 2714.</i>
	$n = 9$	MAINE: OXFORD CO. 0.5 mile East of Bryant Pond. <i>Van Faasen 2720.</i>
	$n = 9$	VERMONT: ESSEX CO. 9.1 miles West of North Stratford. <i>Van Faasen 2736.</i>
<i>Aster undulatus</i> L.	$n = 9$	MAINE: CUMBERLAND CO. 0.5 miles North of West Baldwin. <i>Van Faasen 2718.</i>
	$n = 18$	PENNSYLVANIA: MONROE CO. 0.5 mile North of Marshalls Creek. <i>Van Faasen 2777.</i>

DISCUSSION

Aster acuminatus Michx. Counts of $n = 9$ from three different populations confirm those for this species as previously reported by Nelson (1966), Smith (1966), and Hill & Rogers (1970).

Aster ciliolatus Lindl. This count ($n = 36$) is the same as reported for this species by Avers (1953a, b), Van Faasen (1963), and Löve & Löve (1964).

Aster concinnus Willd. The chromosome count ($n = 24$) for this species, as determined in this study, places *A. concinnus* in that very diverse group of asters based on $x = 8$. Huziwara (1958) reported $2n = 46$, an unusual count for *Aster*, for this species. He suggested that it was a "hypo hexaploid", presumably a product of aneuploid loss from $2n = 48$.

Aster cordifolius L. The only previous tetraploid ($n = 18$) counts for this species are by Van Faasen (1963) who also reported diploid plants. Avers (1953a, b, and 1954a, and 1957) reports only diploids for this species.

Aster gracilis Nutt. This count, $n = 9$, is apparently the first count reported for this species and places the species in that large group of *Aster* species based on $x = 9$.

Aster junciformis Rydb. A count of $n = 16$ confirms the previous count for this species made by Van Faasen (1963) but differs from the count $n = 27$ reported by Taylor (1967).

Aster lateriflorus (L) Britt. Two tetraploid populations ($n = 16$) confirm that count by Van Faasen (1963) who also reported diploid and hexaploid populations of *A. lateriflorus*. Mulligan (1967) also reports $n = 16$ in this species.

Aster lowrieanus Porter. A count of $n = 18$ confirms that count for this species made by Avers (1953a). Van Faasen's (1963) count $n = 9$ for a specimen tentatively identified as *A. lowrieanus* must be attributed to a variant form of *A. cordifolius*.

Aster macrophyllus L. Counts of $n = 36$ confirm those

reported by Huziwara (1941), Van Faasen (1963), Löve & Löve (1964), and Mulligan (1967).

Aster patens Ait. Tetraploid counts of $n = 10$ were also reported by Huziwara (1941) and Avers (1954b). Jones (1968), however, reports a diploid count of $n = 5$.

Aster pilosus Willd. Avers (1954b), Huziwara (1958) and Van Faasen (1963) also report hexaploid counts ($2n = 48$) for this species. Bostick (1965) reports the unusual count $n = 12$ for *A. pilosus*.

Aster puniceus L. The count of $n = 8$ agrees with counts previously reported by Huziwara (1958), Van Faasen (1963) and Löve & Löve (1964, 1966). Chouksanova et al. report $2n = 36$ for this species (1968).

Aster sagittifolius Wedem. Tetraploid ($n = 18$) counts were also reported by Avers (1953a, b) and Van Faasen (1963), both of whom also reported diploid counts for this species.

Aster simplex Willd. Counts of $n = 16$ and $n = 32$ confirm previous counts by Avers (1954b), Huziwara (1958), and Van Faasen (1963).

Aster spectabilis Ait. Solbrig et. al (1964) also reported $n = 36$ for this species.

Aster umbellatus Mill. Diploid ($n = 9$) counts for *A. umbellatus* were also reported by Huziwara (1962), Löve & Löve (1964, 1966), Jones (1966) and Van Faasen (1963).

Aster undulatus L. Avers (1953a, b) also reported $n = 18$ for this species but this is the first report of diploid plants ($n = 9$) for this species.

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LITERATURE CITED

- AVERS, C. J. 1953a. Biosystematic studies in *Asters* I. Crossing relationships in the *Heterophylli*. Amer. Jour. Bot. **40**: 669-675.
- . 1953b. Biosystematic studies in *Aster*. II. Isolating mechanisms and some phylogenetic considerations. Evolution **7**: 317-327.
- . 1954a. Chromosome behavior in fertile triploid *Aster* hybrids. Genetics **39**: 117-126.
- . 1954b. Documented chromosome numbers of plants. Madroño **12**: 210.
- . 1957. Fertile hybrids derived from a wide species cross in *Aster*. Evolution **11**: 482-486.
- BOSTICK, P. E. 1965. Documented chromosome numbers of plants 65: 2. Sida **2**: 165-168.
- CHOUKSANOVA, N. A., *et al.* 1968. Data on karyology of the family Compositae Giseke. Citologija **10**: 198-206.
- DAVIS, P. H., & V. H. HEYWOOD. 1963. Principles of angiosperm taxonomy. Van Nostrand, Princeton, N.J. 556 pp.
- HILL, L. M., & O. M. ROGERS. 1970. Chromosome numbers of *Aster blakei* and *A. nemoralis*. Rhodora **72**: 437-438.
- HUZIWARA, Y. 1941. On the chromosomes of some species of *Aster* from foreign countries. Bot. Zool. **9**: 75-76.
- . 1958. Karyotype analysis in some genera of Compositae. V. The chromosomes of American *Aster* species. Jap. Jour. Genet. **33**: 129-137.
- . 1962. Karyotype analysis in some genera of Compositae IX. Chromosomes of European species of *Aster*. Bot. Mag. Tokyo **75**: 143-149.
- JONES, S. B., JR. 1966. Compositae chromosome numbers. Bull. Torrey Bot. Club **93**: 278-279.
- . 1968. Chromosome numbers in southeastern United States Compositae. Bull. Torrey Bot. Club **95**: 393-395.
- LÖVE, A. & D. LÖVE. 1964. In IOPB Chromosome number reports I. Taxon **13**: 100-110.
- , & ———. 1966. Cytotaxonomy of the alpine vascular plants of Mount Washington. Univ. Colorado Studies Ser. Biol. **24**: 1-74.
- MULLIGAN, G. A. 1967. In IOPB chromosome number reports XI. Taxon **16**: 215-222.

- NELSON, A. D. 1966. *In* IOPB chromosome number reports VII. Taxon 15: 155-163.
- SMITH, E. B. 1966. *In* IOPB chromosome number reports VII. Taxon 15: 155-163.
- SOLBRIG, O. T., *et al.* 1964. Chromosome numbers in Compositae V. Astereae II. Amer. Jour. Bot. 51: 513-519.
- TAYLOR, R. L. 1967. *In* IOPB chromosome number reports XIII. Taxon 16: 445-461.
- VAN FAASEN, P. 1963. Cytotaxonomic studies in Michigan asters. Mich. Bot. 2: 17-27.

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