Cytological Observations on Some East-Himalayan Monocots

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The Himalayas inhabit a fairly large number of representatives of the various monocotyledonous families, its eastern wing being comparatively much richer than the western (cf. Hooker 1894). Our previous communications in this journal provided cytological information on some W. Himalayan monocots (Mehra and Sachdeva 1975a,b; 1976a-e). The present paper deals with 21 taxa belonging to 18 species from the eastern part.

Material and methods

The materials were collected from the wild in the hills of Darjeeling and Gangtok. Voucher specimens have been deposited in the Herbarium of the Department of Botany, Panjab University, Chandigarh. The methods followed were the same as described earlier (Mehra and Sachdeva 1976a).

Results

Table 1 lists the species, their chromosome numbers and the specific localities from where they were collected. Only interesting features in some of the genera are described below:

Fig. 1. *Smilacina fusca*, $2n=72$ in root-tip cell. $\times 1500$.

Table 1

Taxa	Collection number	Locality and altitude	Chromosome number n 2n	Fig. no.	Previous reports
Liliaceae					
<i>Smilacina fusca</i> Wall.	4132	Gandhi Road, Darjeeling 2,100 m	72	1	2n=36: Kumar 1959; 2n=72: Kurosawa 1966, Sharma and Sarkar 1967, 68
<i>S. oleracea</i> Hook. f. et Thom.	4104	Tiger Hill, Darjeeling 2,500 m	36	2, 2a,b	2n=36: Kumar 1959; n=18: Hara and Kurosawa 1963
Trilliaceae					
<i>Paris polyphylla</i> Smith	4105	Tiger Hill, Darjeeling 2,400 m	20	3, 3a,b	2n=10+0-1B: Darlington 1941; 2n=20, 20+1-2B: Malik 1961; 2n=10+2B: Larsen 1963; 2n=20: Kurosawa 1966, Hara 1969, Mehra and Sachdeva 1975b; 2n=20+0-1B: Mehra and Sachdeva 1975f
Araceae					
<i>Arisaema intermedium</i> Bl.	4135	Tiger Hill, Darjeeling 2,400 m	14		2n=28: Malik 1961, Mehra and Sachdeva 1975e
<i>A. tortuosum</i> Schott.	4103	Lloyd Bot. Garden, Darjeeling 2,000 m	14		2n=26: Malik 1961; 2n=24: Sharma and Mukhopadhyay 1965; 2n=28: Hotta 1971, Mehra and Sachdeva 1971, 1975e; 2n=52: Mehra and Sachdeva 1975f
* <i>Alocasia acuminata</i> Schott.	4125	Aloobari, Darjeeling 1,900 m	28	4	
Commelinaceae					
<i>Commelina coelestis</i> Willd.	4127	Jalapahar, Darjeeling 2,250 m	45		2n=90: Darlington 1929, Anderson and Sax 1936; n=45: Mehra and Sachdeva 1975d
Bromeliaceae					
<i>Pitcairnia caerulea</i> Benth and Hook.	4111	Lloyd Bot. Garden, Darjeeling 2,000 m	25		2n=50: Marchant 1967
Zingiberaceae					
* <i>Cautleya lutea</i> Royle	4102	Zoological Park,	12	5	

—	4128	Darjeeling 2,150 m Tiger Hill,	13	6	
<i>C. spicata</i> Baker	4126	Darjeeling 2,300 m Jalapahar,	13	7	2n=34: Sharma and Bhattacharyya 1959; n=13: Mehra and Sachdeva 1971, 1975d
+ <i>Globba hookeri</i> Clarke	4133	Darjeeling 2,200 m Gandhi Road,	12	8	2n=22: Sharma and Bhattacharyya 1959
<i>Roscoeia procera</i> Smith	4134	Darjeeling 2,100 m Lloyd Bot. Garden, Darjeeling 2,000 m	13		n=13: Mehra and Sachdeva 1971, 1975d
Cyperaceae					
* <i>Carex insignis</i> Boott	4109	Ring road, Darjeeling 2,100 m	24	9	
* <i>C. longipes</i> Don.	4110	Lloyd Bot. Garden, Darjeeling 2,000 m	21	10	
+ <i>C. filicina</i> Nees	4130	Tiger Hill, Darjeeling 2,400 m	24	11	n=21: Mehra and Sachdeva 1971
+ <i>Fimbristylis complanata</i> Link	4129	Jalapahar, Darjeeling 2,200 m	10	12	n=5: Kral 1971; 2n=10: Sharma, B.R. 1962, Nijalingappa 1972; 2n=16: Tanaka 1939
<i>F. dichotoma</i> Vahl	4124	Teesta, Darjeeling 210 m	5		n=5: Mehra and Sachdeva 1975a; 2n=10: Sharma and Bal 1956, Sharma, B.R. 1962, Baquar 1969, Murin and Chaudhri 1970
—	4120	Teesta-Melli Road, Darjeeling 250 m	10		2n=12: Hsu 1967; n=10: Mehra and Sachdeva 1971, 1975a; 2n=20: Sanyal and Sharma 1972, Nijalingappa 1972; n=15: Kral 1971
<i>F. diphylla</i> Vahl	4121	Shingtham, Sikkim 550 m	5		n=5: Mehra and Sachdeva 1975a;
—	4118	Teesta, Darjeeling 210 m	10	13	2n=20: Sharma and Bal 1956, Sanyal and Sharma 1972

* Species worked out for the first time.

+ New report for the species (New cytotype).

Literature cited in Table 1 according to Federov (1969), Moore (1973), Taxon (1972-1974) and Mehra and Sachdeva (1975a,b,d,e,f).

Figs. 2, a, b. 2, *Smilacina oleracea*, $2n=36$ in root-tip cell. $\times 1500$. 2a, explanatory diagram to Fig. 2. 2b, idiogram.

Smilacina. Two species, *S. oleracea* ($2n=36$; Figs. 2, 2a,b) and *S. fusca* ($2n=72$; Fig. 1), were studied. *S. oleracea* possessed four pairs of median, ten pairs of submedian, and four pairs of subterminal chromosomes (Fig. 2b). Secondary constrictions were not noticed in any of the pairs. Chromosome size ranged between $15\ \mu$ to $5\ \mu$. The karyotype of *S. fusca* (Fig. 1) agrees with that described by Kurosawa (1966) i.e. it consisted of eight pairs of median, sixteen pairs of submedian, and twelve pairs of subterminal chromosomes. Chromosome size ranged between $12\ \mu$ to $3\ \mu$.

Paris. *P. polyphylla* was found to possess $2n=20$ (Figs. 3, 3a,b). The karyotype consisted of two pairs (A, B) of median, four pairs (C, D, E, F) of submedian, and four pairs (G, H, I, J) of subterminal chromosomes. Pairs C and J were found to be heteromorphic (Fig. 3b). The West-Himalayan taxon of this species previously worked out by us (Mehra and Sachdeva 1976a) had revealed several pairs to be heteromorphic though the same basic karyotype of two pairs of median, four pairs of submedian and four pairs of subterminal chromosomes was manifested. It would be appropriate to mention that karyotype polymorphism has been observed by us earlier in *Trillium govanianum* (Mehra and Sachdeva 1976a) and *Allium victorialis* (Mehra and Sachdeva 1976b).

Caulleya. *C. lutea* has been investigated for the first time. Two cytological races with $n=12$ and $n=13$ were found to occur in Darjeeling hills (Figs. 5, 6). Meiosis in both the taxa was found to be normal. Plants with $n=13$ were shorter, possessed small-sized leaves and bracts and had lesser flowers per spike, in comparison to plants with $n=12$. However, the size of the flower was almost the same in both the cases. It may be pointed out that the plants with $n=13$ were

always found to be occurring at higher altitudes (2,250–2,500 m) in contrast to those with $n=12$ which occurred between 2,000–2,200 m.

With regard to *C. spicata*, Sharma and Bhattacharyya's (1959) report of $2n=34$ appears to be erroneous as our present investigation from the same area from where they studied this species showed $n=13$ (Fig. 7). Our previous study of this species from the West-Himalayas had also revealed $n=13$ (Mehra and Sachdeva 1976c).

Figs. 3, a, b. 3, *Paris polyphylla*, $2n=20$ in root-tip cell. $\times 1500$. 3a, explanatory diagram to Fig. 3. 3b, idiogram.

Globba. *G. hookeri* showed $n=12$ (Fig. 8). The present report differs from that of Sharma and Bhattacharyya (1959) who observed $2n=22$ in the root-tip cells of this species.

Carex. Two of the three species of *Carex*, *C. insignis* ($n=24$, Fig. 9) and *C. longipes* ($n=21$, Fig. 10) provide the first cytological reports for the species. *C. flicina* showed $n=24$ (Fig. 11). However, the West-Himalayan taxon of this

species worked out from Nainital hills had revealed a count of $n=21$ (Mehra and Sachdeva 1971) indicating the presence of cytological races in this species. The role of polyploidy and aneuploidy in the evolution of various species of this genus

Figs. 4-12. 4, *Alocasia acuminata*, $2n=28$ in root-tip cell. 5, *Cautleya lutea*, $n=12$ at M_1 . 6, *C. lutea*, $n=13$ at M_1 . 7, *C. spicata*, $n=13$ at M_1 . 8, *Globba hookeri*, $n=12$ at M_1 ; 9, *Carex insignis*, $n=24$ at M_1 . 10, *C. longipes*, $n=21$ at diakinesis. 11, *C. filicina*, $n=21$ at M_1 . 12, *Fimbristylis complanata*, $n=10$ at M_1 . All $\times 1500$.

has already been discussed by us previously (Mehra and Sachdeva 1975).

Fimbristylis. The present reports for *F. dichotoma* ($n=5, 10$) and *F. diphylla* ($n=5, 10$; Fig. 13) agree with the observations of the various authors mentioned in Table 1. It is seen that both diploid and tetraploid races of these two species are quite common in the Eastern as well as in the Western Himalayas. However, Kral

Fig. 13. *Fimbristylis diphylla*, cytotypes with $n=5$ and $n=10$.

(1971) reported the occurrence of hexaploid race from North America. *F. complanata* ($n=10$, Fig. 12) was found to be occurring at tetraploid level in Darjeeling hills. Diploid forms of this species were earlier reported by Sharma, B. R. (1962) from North India and by Kral (1971) from North America. Tanaka (1939) had, however, observed $2n=16$ in this species.

Summary

Twenty one taxa belonging to 18 species of monocots are studied. Four species i.e. *Alocasia acuminata* ($2n=28$), *Cautleya lutea* ($n=12, 13$), *Carex insignis* ($n=24$) and *C. longipes* ($n=21$) are investigated for the first time. New chromosome numbers are reported for another three species, namely, *Globba hookeri* ($n=12$), *Carex filicina* ($n=21$) and *Fimbristylis complanata* ($n=10$). Heteromorphic chromosome pairs are noticed in *Paris polyphylla* ($2n=20$).

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Literature cited

- Federov, An. A. (Ed.) 1969. Chromosome Numbers of Flowering Plants. Academy of Sciences of the USSR, V. L. Komarov Botanical Institute.
- Hooker, J. D. 1894. The Flora of British India. Vol. VI. L. Reeve and Co., London.
- Kral, R. 1971. A treatment of *Abildgardja*, *Bulbostylis* and *Fimbristylis* for North America. *Sida* 4: 57-227.
- Mehra, P. N. and Sachdeva, S. K. 1971. In IOPB chromosome number reports. XXXIII. *Taxon* 20: 609-614.
- . 1975a. In IOPB chromosome number reports XLIX. *Taxon* 24: 501-516.
- . 1975b. Cytology of some W. Himalayan Cyperaceae. *Cytologia* 40: 497-515.
- . 1976a. Cytological observations on some West-Himalayan monocots II. Smilacaceae, Liliaceae and Trilliaceae. *Cytologia* 41: 5-22.
- . 1976b. Cytological observations on some West-Himalayan monocots III. Alliaceae. *Cytologia* 41: 23-30.
- . 1976c. Cytological observations on some West-Himalayan monocots IV. Several families. *Cytologia* 41: 31-53.
- . 1976d. Cytological observations on some West-Himalayan monocots V. Araceae. *Cytologia* 41: 55-61.
- Moore, R. J. (Ed.) 1973. Index to plant chromosome numbers 1967-1971. Oosthoek's Uitgeversmaatschappij B.V., Domstraat 5-13, Utrecht, Neetherlands.
- Sharma, A. K. and Bhattacharyya, N. K. 1959. Cytology of several members of Zingiberaceae and a study of the inconstancy of their chromosome complement. *Cellule* 59: 299-345.
- Sharma, B. R. 1962. Cytology of Cyperaceae. Proc. 49th Indian Sci. Congr. Abstracts 337-338.
- Tanaka, N. 1939. Chromosome studies in Cyperaceae VII. *Bot. Mag. (Tokyo)* 53: 480-488.
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