

Chromosome count in *Dendrobium* I. 87 species\*

Kiyoshi Hashimoto\*\*

デンドロビウム属の染色体数 I. 87種

橋本清美

The genus *Dendrobium* comprising over 2,000 species is floriculturally one of the most useful orchid. The species have been subdivided into 41 sections by Schlechter (1912), while taxonomists today placed them in genera *Ephemerantha*, *Epigenium*, *Diplocaulobium* and so on (Brieger 1981). In the present paper the taxonomy of the species was followed to Schlechter (1912, 1927).

Chromosome numbers of the genus *Dendrobium* have been recorded by many authors, e.g. Hoffmann 1929, 1930, Miduno 1940, Eftimiu-Heim 1941, Ito and Mitsuura 1957, Kosaki 1958, Tanaka 1962, 1964, 1965, Mitsuura and Nakahira 1958, 1959, Vajrabhaya and Randolph 1960, Kamemoto *et al.* 1961, Kosaki and Kamemoto 1961, Dorn and Kamemoto 1962, Jones 1963, Chardard 1963, Shindo and Kamemoto 1963, Pancho 1965, Sharma and Chatterji 1966, Kamemoto and Sagarik 1967, Kamemoto *et al.* 1967, Kamemoto and Tara 1968, Arora 1968, 1971, Mehra and Vij 1970, Sharma 1970, Banerji and Chaudhuri 1972, Hsu 1972, Roy and Sharma 1972, Hedge and Boraiah 1973, Mehra and Sehgal 1975, 1976, Mehra and Kashyap 1976, 1978, Chatterji 1976, Vij *et al.* 1976, Malla *et al.* 1977, 1978, and Sarkar *et al.* 1978.

According to these records the chromosome numbers have been reported in 143 species and 34 varieties. Except the horticultural or irregular variants, 106 taxa of them are  $2n=38$ , 24 are  $2n=40$ , 24 are both  $2n=38$  and  $2n=40$ , and the rest 23 are various from  $2n=30$  to  $2n=114$ . The present paper was undertaken to expand the chromosome number determinations of 87 species in the genus *Dendrobium*.

## Acknowledgement

This work has been carried out under the direction of Professor Dr. Ryuso Tanaka of Hiroshima University, to whom the author wishes to express his sincerest gratitude. I also wish to thank Dr. Kohji Karasawa of Director of the Hiroshima Botanical Garden, to whom the author is indebted for the identification of the materials studied.

---

\* Contribution from the Hiroshima Botanical Garden No.17

\*\*The Hiroshima Botanical Garden

Bulletin of The Hiroshima Botanical Garden, No.4: 63-80, 1981.

### Materials and Methods

All materials identified by the observation of flowers were grown in the Hiroshima Botanical Garden.

Observation of somatic chromosomes was made with the aceto-orcein technique developed by Tanaka and Kamemoto (1960) : Active root tips were immersed in 0.002 M 8-hydroxyquinoline for 4 hours at 16°C. They were then transferred to a modified Carnoy's solution (1:1:2) for 15 minutes at 16°C, hydrolyzed in IN HCl at 60°C for 2 minutes, transferred to 45% acetic acid for 3 minutes, and squashed and stained in 1% aceto-orcein.

For observation of meiosis, bud materials were prepared essentially as above but omitting the pretreatment and maceration.

### Results and Discussion

The somatic chromosomes observed in the present investigation were shown in Figs. 1-9. Results of the chromosome counts of all species investigated were listed in alphabetical orders in Table 1. In Table 1 the previous counts appeared in papers were also listed. Among the 87 species in the genus *Dendrobium*, 59 were  $2n=38$ , 21 were  $2n=40$  and the rest were other numbers such as  $2n=36+2f$  in *D. insigne*,  $2n=39$  in *D. dicuphum*,  $2n=40+1f$  in *D. densiflorum*,  $2n=40+2f$  in *D. dixanthum*,  $2n=43$  in *D. longicornu* var. *java*, and  $2n=76$  in *D. kingianum*. *D. distichum* was both  $2n=38$  (diploid) and  $2n=57$  (triploid).

The chromosome numbers of following 36 species were recorded for the first time: *D. acerosum*  $2n=38$ , *D. aemulum*  $2n=38$ , *D. agrostophyllum*  $2n=38$ , *D. amethystoglossum*  $2n=40$ , *D. aphrodite*  $2n=40$ , *D. batanense*  $2n=38$ , *D. beckleri*  $2n=38$ , *D. cucumerinum*  $2n=38$ , *D. cymbidioides*  $2n=40$ , *D. equitans*  $2n=38$ , *D. falconeri*  $2n=38$ , *D. finisterrae*  $2n=40$ , *D. forbesii*  $2n=40$ , *D. guerreroi*  $2n=40$ , *D. insigne*  $2n=36+2f$ , *D. lasianthera*  $2n=38$ , *D. lichenastrum*  $2n=40$ , *D. longicornu* var. *java*  $2n=43$ , *D. ophioglossum*  $2n=38$ , *D. phlox* var. *flava*  $2n=38$ , *D. platygastrium*  $2n=40$ , *D. plicatile*  $2n=38$ , *D. pugioniforme*  $2n=38$ , *D. quinquecostatum*  $2n=38$ , *D. ramosii*  $2n=40$ , *D. rhodopterigium*  $2n=38$ , *D. ruppianum*  $2n=38$ , *D. sanseiense*  $2n=40$ , *D. schneiderae*  $2n=38$ , *D. scopa*  $2n=38$ , *D. stuposum*  $2n=38$ , *D. sulcatum*  $2n=40$ , *D. teretifolium* var. *fasciculatum*  $2n=40$ , *D. terminale*  $2n=38$ , *D. tetragonum* var. *giganteum*  $2n=38$ , and *D. wassellii*  $2n=38$ .

The chromosome number of 14 species were here redocumented as follows:  $2n=38$  to  $2n=40$  in *D. delacourii*, *D. densiflorum*, *D. senile*,  $2n=40$  ( $n=20$ ) to  $2n=38$  in *D. crumenatum*, *D. infundibulum*, *D. leonis*, *D. moschatum*, *D. nobile*, *D. parishii*, *D. pierardii*, *D. superbum*, *D. tosaense*,  $2n=ca. 80$  to  $2n=38$  in *D. sophronites*,  $n=20$  and  $2n=36$  to  $2n=38$  in *D. heterocarpum*. Those appear to be either in error or representing abnormal types of the species.

The chromosome numbers of  $2n=38+1f$ ,  $40+1f$ ,  $40+2f$ , 43, 57 and 76 investigated,

Table 1. Chromosome numbers of the species of *Dendrobium* studied

Species	Chromosome number				References
	Present count		Previous count		
	2n	n	2n	n	
<i>acerosum</i> Lindl.	38				
<i>aemulum</i> R.Br.	38				
<i>aggregatum</i> Roxb.					
var. <i>majus</i> Rolfe	38		38		Kosaki 1958
<i>agrostophyllum</i> F. Muell.	38				
<i>amethystoglossum</i> Rchb. f.	40	20			
<i>aphrodite</i> Rchb. f.	40				
<i>batanense</i> Ames et Quisumb.	38				
<i>beckleri</i> F. Muell.	38				
<i>bigibbum</i> Lindl.					
var. <i>superbum</i> Hort.					
subvar. <i>compactum</i>					
Dockr.	38		38, ca. 57		Jones 1963
<i>canaliculatum</i> R.Br.	38	19	2x		Jones 1963
			38		Wilfret & Kamemoto 1971
<i>candidum</i> Wall.	38		38		Jones 1963
<i>capra</i> J.J.Sm		19		19	Malla <i>et al.</i> 1977
<i>chrysotoxum</i> Lindl.	38		38		Jones 1963
<i>compactum</i> Rolfe	40	20			
<i>crassinode</i> Benth. & Rchb. f.	38		38		Kamemoto & Sagarik 1967
			2x		Jones 1963
<i>crumenatum</i> Sw.	38		38		Kamemoto & Sagarik 1967
					Wilfret & Kamemoto 1971
			38+1f		Jones 1963
			40		Pancho 1965
<i>cucumerinum</i> Macleay	38				
<i>cymbidioides</i> Lindl.	40				
<i>delacourii</i> Guill.	40	20	38		Kamemoto & Sagarik 1967
					Wilfret & Kamemoto 1971
<i>densiflorum</i> Wall.	40+1f		40+2f		Kosaki 1958
			20+(1-2)		Mehra & Vij 1970
			42		Chatterji 1976
			38		Sharma 1970
				20	Mehra & Sehgal 1976
<i>denudans</i> D. Don	40		40		Jones 1963
				20	Vij <i>et al.</i> 1976
<i>dicuphum</i> Muell.	39	19,20	38		Jones 1963
<i>distichum</i> Rchb. f.	57	variable	57		Vajrabhaya & Randolph 1960
	38	19	38		Pancho 1965,
					Wilfret & Kamemoto 1971

Table 1. (continued)

Species	Chromosome number				References
	Present count		Previous count		
	2n	n	2n	n	
<i>dixanthum</i> Rchb. f.	40+2f		40		Kamemoto & Sagarik 1967 Wilfret & Kamemoto 1971 Jones 1963
<i>equitans</i> Kränzl.	38			41	
<i>falconeri</i> Hk.	38		2x		Jones 1963
<i>farmeri</i> Paxt.	40		40		Kamemoto & Sagarik 1967 Sharma 1970 Banerji & Chaudhuri 1972
<i>fimbriatum</i> Lindl.					
var. <i>oculatum</i> Hk.	38		38		Ito & Mutsuura 1957 Kosaki & Kamemoto 1961 Vij <i>et al.</i> 1976
<i>findlayanum</i> Par. & Rchb. f.	38		38+2B 38		Jones 1963 Kamemoto & Sagarik 1967
<i>finisterrae</i> Schltr.	40				
<i>forbesii</i> Ridl.	40				
<i>formosum</i> Roxb.					
var. <i>giganteum</i>	38		38		Kosaki & Kamemoto 1961 Kamemoto & Sagarik 1967 Wilfret & Kamemoto 1971
<i>friedericksianum</i> Rchb. f.	38		38		Jones 1963, Chardard 1963 Kamemoto & Sagarik 1967
<i>guerreroi</i> Ames & Quisumb.	40				
<i>heterocarpum</i> Wall.	38		38		Kosaki 1958 Kosaki & Kamemoto 1961 Jones 1963, Pancho 1965 Kamemoto & Sagarik 1967 Wilfret & Kamemoto 1971 Banerji & Chaudhuri 1971 Sharma 1970
<i>infundibulum</i> Lindl.	38		38	20	Mehra & Sehgal 1976 Tanaka 1964 Kamemoto & Sagarik 1967 Hoffmann 1930 Vij <i>et al.</i> 1976 Hoffmann 1929
<i>insigne</i> Rchb. f.	36+2f				
<i>kingianum</i> Bidw.	76		76		Vajrabhaya & Randolph 1961 Tanaka 1964 Jones 1963 Jones 1963 112-114 Jones 1963
<i>lasianthera</i> J. J. Sm.	38				
<i>leonis</i> Rchb. f.	38	19	40		Wilfret & Kamemoto 1971

Table 1. (continued)

<i>lichenastrum</i> Kränzl.	40			
<i>linguiforme</i> Smith. <sup>Sw.</sup>	38		38	Jones 1963
<i>longicornu</i> Lindl.				
var. <i>java</i>	43			
<i>lyonii</i> Ames	40	20	40	Kosaki & Kamemoto 1961
<i>macraei</i> Lindl.	38		38	Vij <i>et al.</i> 1976
				19 Mehra & Vij 1970
<i>macrophyllum</i> A. Rich.	38		38	Kosaki 1958
				Kosaki & Kamemoto 1961
<i>miyakei</i> Schltr.	38		38	Hsu 1972
<i>monile</i> Kränzl.	38		38	Miduno 1940
				Ito & Mutsuura 1957
				Mutsuura & Nakahira 1958
				Kosaki & Kamemoto 1961
				Jones 1963, Tanaka 1971
				Hsu 1972
			ca.38	Nakasone & Moromizato 1964
			38+1-3f	Jones 1963
<i>moschatum</i> Sw.	38		38	Chardard 1963
				Kamemoto & Sagarik 1967
				Wilfret & Kamemoto 1971
			39	Kamemoto & Sagarik 1967
			40	Jones 1963, Sharma 1970
				19 Vij <i>et al.</i> 1976
<i>nobile</i> Lindl.	38		ca.20	Hoffmann 1929, 1930
			38	Miduno 1940b
				Ito & Mutsuura 1957
				Vajrabhaya & Randolph 1960
				Jones 1963
				Kamemoto & Sagarik 1967
				Sharma 1970, Tanaka 1971
			19	Miduno 1940b
				Ito & Mutsuura 1957
				Vajrabhaya & Randolph 1960
				Chardard 1963
			40	Eftimiu-Heim 1941
			57	Jones 1963
<i>ophioglossum</i> Rchb. f.	38			
<i>parishii</i> Rchb. f.	38		40	Ito & Mutsuura 1957
				Sharma 1970, Chatterji 1976
			38	Jones 1963
				Kamemoto & Sagarik 1967
<i>phalaenopsis</i> Fitzg.	38		38	Kosaki 1958
				Kosaki & Kamemoto 1961
				Wilfret & Kamemoto 1971
			19	Kosaki & Kamemoto 1961

Table 1. (continued)

Species	Chromosome number				References
	Present count		Previous count		
	2n	n	2n	n	
<i>phlox</i> Schltr.					
<i>var. flava</i>	38				
<i>pierardii</i> Roxb. ex. Hook.	38	19	38		Vajrabhaya & Randolph 1960 Sharma & Chatterji 1966 Jones 1963 Kamemoto & Sagarik 1967 Sarkar <i>et al.</i> 1978
				19	Kosaki 1958
				40	Kosaki & Kamemoto 1961 Sharma & Chatterji 1966 Sharma 1970
				19-20	Roy & Sharma 1972 Chardard 1963
				57	Sharma & Chatterji 1966
<i>platygastrium</i> Rchb. f.	40				
<i>plicatile</i> Lindl.	38				
<i>pugioniforme</i> A. Cunn.	38				
<i>quinquecostatum</i> Schltr.	38				
<i>ramosii</i> Ames	40				
<i>revolutum</i> Lindl.	40		40		Kamemoto & Sagarik 1967
<i>rhodopterygium</i> Rchb. f.	38				
<i>ruppianum</i> A.D. Hawkes	38				
<i>sanseiense</i> Hayata	40				
<i>scabrilingue</i> Lindl.	38		38		Kamemoto & Sagarik 1967
<i>schneiderae</i> F.M. Bail.	38				
<i>scopa</i> Lindl.	38				
<i>secundum</i> Lindl.	40	20	40		Jones 1963 Kamemoto & Sagarik 1967
				20	Chardard 1963
<i>senile</i> Par. & Rchb. f.	40		38		Kamemoto & Sagarik 1967 Wilfret & Kamemoto 1971
<i>milliae</i> F.v. Muell.	38		38		Jones 1963
<i>sophonites</i> Schltr.	38		ca.80		Jones 1963
<i>strebloceras</i> Rchb. f.	38		38		Jones 1963 Wilfret & Kamemoto 1971
<i>stuposum</i> Lindl.	38				
<i>sulcatum</i> Rchb. f.	40				
<i>superbiens</i> Rchb. f.	38		38		Vajrabhaya & Randolph 1960 Jones 1963 Vij <i>et al.</i> 1976
				19	Vajrabhaya & Randolph 1960
<i>superbum</i> Rchb. f.	38		40		Eftimiu-Ileim 1941 Ito & Mitsuura 1957

Table 1. (continued)

			19	Kosaki 1958
				Vajrabhaya & Randolph 1960
				Kosaki & Kamemoto 1961
<i>sutepense</i> Rolph et Downie	38	2x		Jones 1963
			38	Wilfret & Kamemoto 1961
<i>taurinum</i> Lindl.	38		38	Kosaki 1958
				Kosaki & Kamemoto 1961
<i>teretifolium</i> R.Br.				
var. <i>fasciculatum</i> Rupp.	40			
<i>terminale</i> Par. et Rchb. f.	38			
<i>tetragonum</i> A. Cunn.				
var. <i>giganteum</i> Gilbert	38			
<i>thyrsiflorum</i> Rchb. f.	40	40		Vajrabhaya & Randolph 1960
				Kosaki & Kamemoto 1961
				Kamemoto & Sagarik 1967
			20	Hoffmann 1929, 1930
<i>topaziacum</i> Ames	38	19	38	Pancho 1965
<i>tortile</i> Lindl.	38		38	Kosaki & Kamemoto 1961
				Jones 1963
				Kamemoto & Sagarik 1967
				Wilfret & Kamemoto 1971
<i>tosaense</i> Makino	38	19	38	Tanaka 1965, 1971
			40	Mutsuura & Nakahira 1959
<i>wardianum</i> Warn.	38		2x	Jones 1963
				19
				Mehra & Sehgal 1976
<i>wassellii</i> S.T. Blake	38			

might have been horticultural or natural variants. On the other hand the chromosome number of  $2n=39$  in *D. dicuphum*, a new count, was found to be hybrid combination since the meiotic configuration was observed to be  $19\text{ II} + 1\text{ I}$ .

### Summary

1. Chromosome counts were carried out in 87 species of *Dendrobium*.
2. Among these 87 species, 59 species were  $2n=38$ , 21 were  $2n=40$ , and the rest seven were  $2n=36+2f$ ,  $2n=39$ ,  $2n=40+1f$ ,  $2n=40+2f$ ,  $2n=43$ ,  $2n=76$ , and  $2n=38$  and  $57$ , respectively.
3. The chromosome numbers of 36 species were recorded for the first time and those of 14 species were redocumented.

### References

- Arora, C.M. 1968. IOPB chromosome number reports XVI. *Taxon* 17 : 199–204.  
 \_\_\_\_\_ 1971. IOPB chromosome number reports XXXIV. *Taxon* 20 : 785–797.

- Banerji, M. & Chaudhuri, M. 1972. Further studies on chromosomes of some Orchidaceae and Iridaceae from the temperate Himalayas. Proc. Indian Sci. Congr. Assoc. 59(3) : 347.
- Brieger, F.G. 1981. Die Orchideen. Parey, Berlin. 3 Auflage. 636–753.
- Chardard, R. 1963. Contribution à l'étude cyto-taxinomique des Orchidées. Rev. Cyt. et Biol. Vég. 26 : 1–58.
- Chatterji, A.K. 1976. Chromosome studies in some orchids. Proc. Indian Sci. Congr. Assoc. 63 : 114.
- Dorn, E.C. & Kamemoto, H.H. 1962. Chromosome Transmission of *Dendrobium phalaenopsis* 'Lyons Light No.1'. Amer. Orchid Soc. Bull. 31(12) : 997–1006.
- Eftimiu-Heim, P. 1941. Recherches sur le noyaux des Orchidées. Le Botaniste 31 : 65–111.
- Hedge, S.N. & Boraiah, G. 1973. Cytotaxonomical studies in the genus *Dendrobium* Sw. Proc. Indian Sci. Congr. Assoc. 60(III) : 309.
- Hoffmann, K. 1929. Zytologische Studien der Orchidaceen. Ber. Deutschen Bot. Gesell. 47 : 321–326.
- \_\_\_\_\_ 1930. Beiträge zur cytologie der Orchidaceen. Planta 10 : 523–595.
- Hsu, C.C. 1972. Preliminary chromosome studies on the vascular plants of Taiwan (V). Taiwania 17 : 48–65.
- Ito, I. & Mutsuura, O. 1957. Chromosome numbers in *Dendrobium* species and hybrids. Jap. Orchid Soc. Bull. 3(1) : 1–3.
- Jones, K. 1963. The chromosomes of *Dendrobium*. Amer. Orchid Soc. Bull. 5(2) : 1–2.
- Kamemoto, H.H., Tanaka, R. & Kosaki, K. 1961. Chromosome number of orchids in Hawaii. Univ. Hawaii Agr. Exp. Sta. Bull. 127 : 1–28.
- \_\_\_\_\_ & Sagarik, R. 1967. Chromosome numbers of *Dendrobium* species of Thailand. Am. Orchid Soc. Bull. 36(10) 889–894.
- \_\_\_\_\_, Kosaki, K. & Shindo, K. 1967. Chromosome counts of orchids in Hawaii. Na Pua Okika o Hawaii Nei 17(3) : 79–82.
- \_\_\_\_\_ & Tara, M. 1968. Chromosome inheritance in reciprocal crosses of *Dendrobium phalaenopsis* 'Lyons Light No.1'. Proc. Amer. Soc. Hort. Sci. 92 : 665–671.
- Kosaki, K. 1958. Preliminary investigations on the cytogenetics of *Dendrobium*. Proc. II World Orc. Conf. Harvard Univ. Press, Cambridge, Mass.: 25–29.
- \_\_\_\_\_ & Kamemoto, H.H. 1961. Chromosomes of some *Dendrobium* species and hybrids. Na Pua Okika o Hawaii Nei. 11(7) : 75–86.
- Malla, S.B., Bhattarai, S., Gorkhali, M., Saiju, H. & Singh, P. 1977. IOPB chromosome number reports LVII. Taxon 26 : 443–452.
- \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_ & Kayastha, N. 1978. IOPB chromosome number reports LXII. Taxon 27 : 519–535.
- Maxwell, M.K. 1967. \*A cytological study of Australian orchid genera, the *Dendrobium kingianum* Bidw. ex Lindl. Complex. Aust. Orchid Rev. 22 : 25–30.
- Mehra, P.N. & Vij, S.P. 1970. IOPB chromosome number reports XXV. Taxon 19 : 102–113.
- \_\_\_\_\_ & Sehgal, R.N. 1975. IOPB chromosome number reports XLIX, Taxon 24 :



- 501–516.  
 \_\_\_\_\_ & \_\_\_\_\_ 1976. IOPB chromosome number reports LIV. *Taxon* 25 : 631–649.  
 \_\_\_\_\_ & Kashyap, S.K. 1976. IOPB chromosome number reports LII. *Taxon* 25 : 483–500.  
 \_\_\_\_\_ & \_\_\_\_\_ 1978. IOPB chromosome number reports LX. *Taxon* 27 : 223–231.
- Miduno, T. 1940. Chromosomenstudien an Orchidazeen IV. *Cytologia* 11: 179–185.
- Mutsuura, O. & Nakahira, R. 1958. Chromosome numbers of the family Orchidaceae in Japan (1). *Sci. Rep. Saikyo Univ.* 2(5) : 25–30.  
 \_\_\_\_\_ & \_\_\_\_\_ 1959. Chromosome numbers of the family Orchidaceae in Japan (2). *Sci. Rep. Kyoto Univ.* 3(1) : 27–31.  
 \_\_\_\_\_ & \_\_\_\_\_ 1960. Chromosome numbers of the family Orchidaceae in Japan (3). *Sci. Rep. Kyoto Univ.* 3(2) : 11–16.
- Pancho, J.V. 1965. IOPB chromosome number reports III. *Taxon* 14(2) : 50–57.
- Roy, S.C. & Sharma, A.K. 1972. Cytological studies on Indian Orchids. *Proc. Indian Nat. Sci. Acad. Biol.* 38 : 72–86.
- Sarkar, A.K., Chakraborty, M., Saha, N.C. & Das, S.K. 1978. IOPB chromosome number reports LXIII. *Taxon* 27 : 519–535.
- Schlechter, R. 1912; Die Orchideen von Deutsch New Guinea. *Fedde Report.* 1. (6) : 440–643.  
 \_\_\_\_\_ 1927. *Die Orchideen*. Parey, Berlin. 2d. ed., 956pp.
- Sharma, A.K. 1970. Annual report 1967–1968. *Res. Bull. Univ. Calcutta* 2 : 1–50.  
 \_\_\_\_\_ & Chatterji, K. 1966. Cytological studies on orchids with respect to their evolution and affinities. *The Nucleus* 9 : 177–203.
- Shindo, K. & Kamemoto, H.H. 1963. Chromosome numbers and genome relationships of some species in the *Nigrohirsutae* section of *Dendrobium*. *Cytologia* 28 : 68–75.
- Tanaka, R. 1962. Chromosome count of orchids in Japan I. *Jap. Orchid Soc. Bull.* 8(1) : 1–4.  
 \_\_\_\_\_ 1964. Chromosome count of orchids in Japan II. *Jap. Orchid Soc. Bull.* 10(1): 1–5.  
 \_\_\_\_\_ 1965. Chromosome numbers of some species of Orchidaceae from Japan and its neighbouring areas. *Journ. Jap. Bot.* 40(3) : 65–77.  
 \_\_\_\_\_ 1971. Types of resting nuclei in Orchidaceae. *Bot. Mag. (Tokyo)* 84 : 118–122.  
 \_\_\_\_\_ & Kamemoto, H.H. 1960. Meiotic chromosome behavior in diploid and polyploid *Vanda* orchid hybrids. *Cytologia* 25 : 405–418.
- Vajrabhaya, T. & Randolph, L.F. 1960. Chromosome studies in *Dendrobium*. *Amer. Orchid Soc. Bull.* 29 : 507–517.
- Vij, S.P. & Gupta, G.C. 1976. IOPB chromosome number reports LIV. *Taxon* 25 : 631–649.
- Wilfret, G.J. & Kamemoto, H.H. 1969. Genome and Karyotype relationship in the genus *Dendrobium* (Orchidaceae). *Cytologia* 36(4) : 604–613.

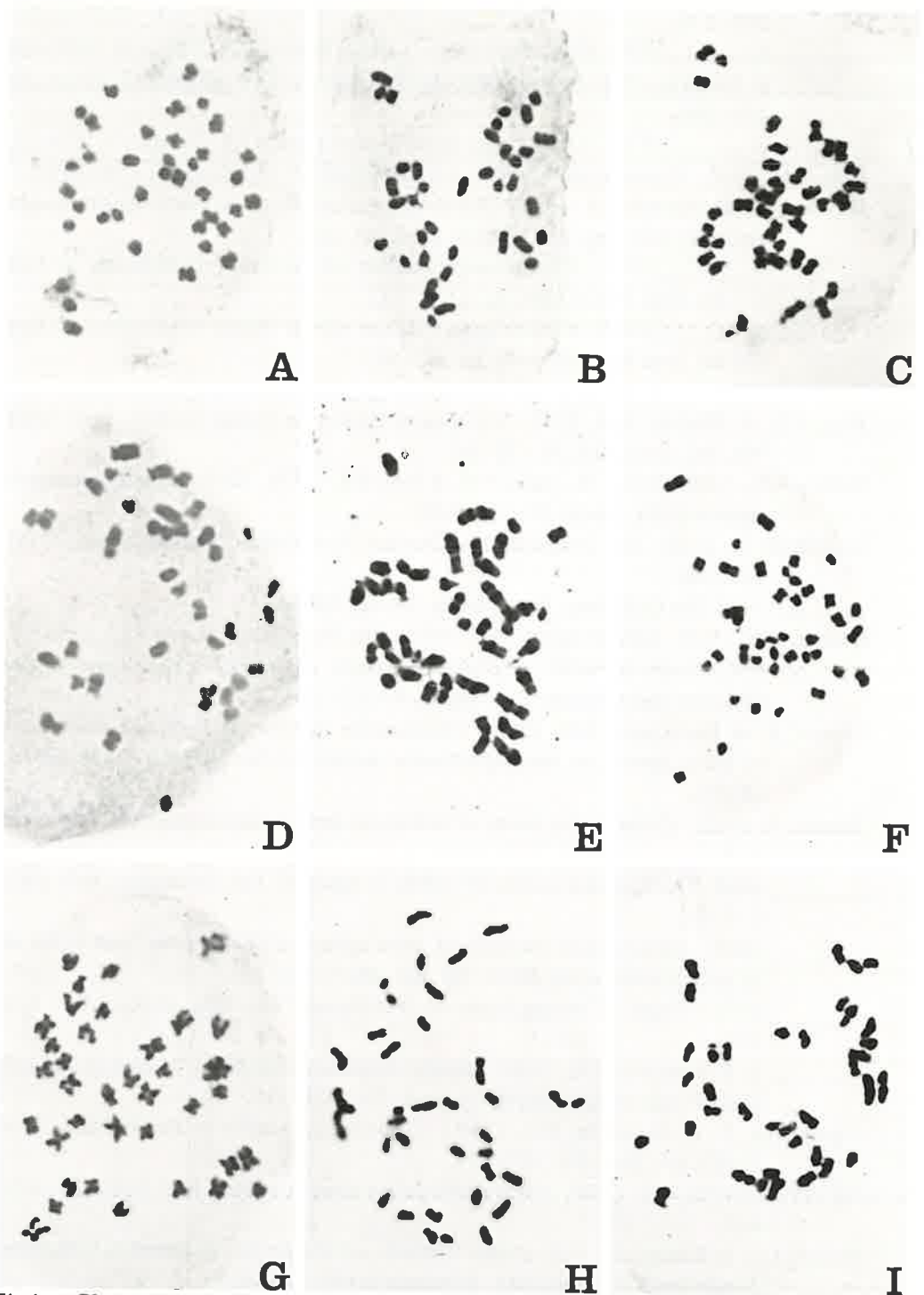


Fig 1. Photomicrographs of somatic chromosomes of *Dendrobium*.  $\times 2000$ .  
 A, *D. acerosum*  $2n=38$ . B, *D. aemulum*  $2n=38$ . C, *D. aggregatum* var. *majus*  $2n=38$ . D, *D. agrostophyllum*  $2n=38$ . E, *D. amethystoglossum*  $2n=40$ . F, *D. aphrodite*  $2n=40$ . G, *D. batanense*  $2n=38$ . H, *D. beckleri*  $2n=38$ . I, *D. bigibbum* var. *superbum* subvar. *compactum*  $2n=38$ .

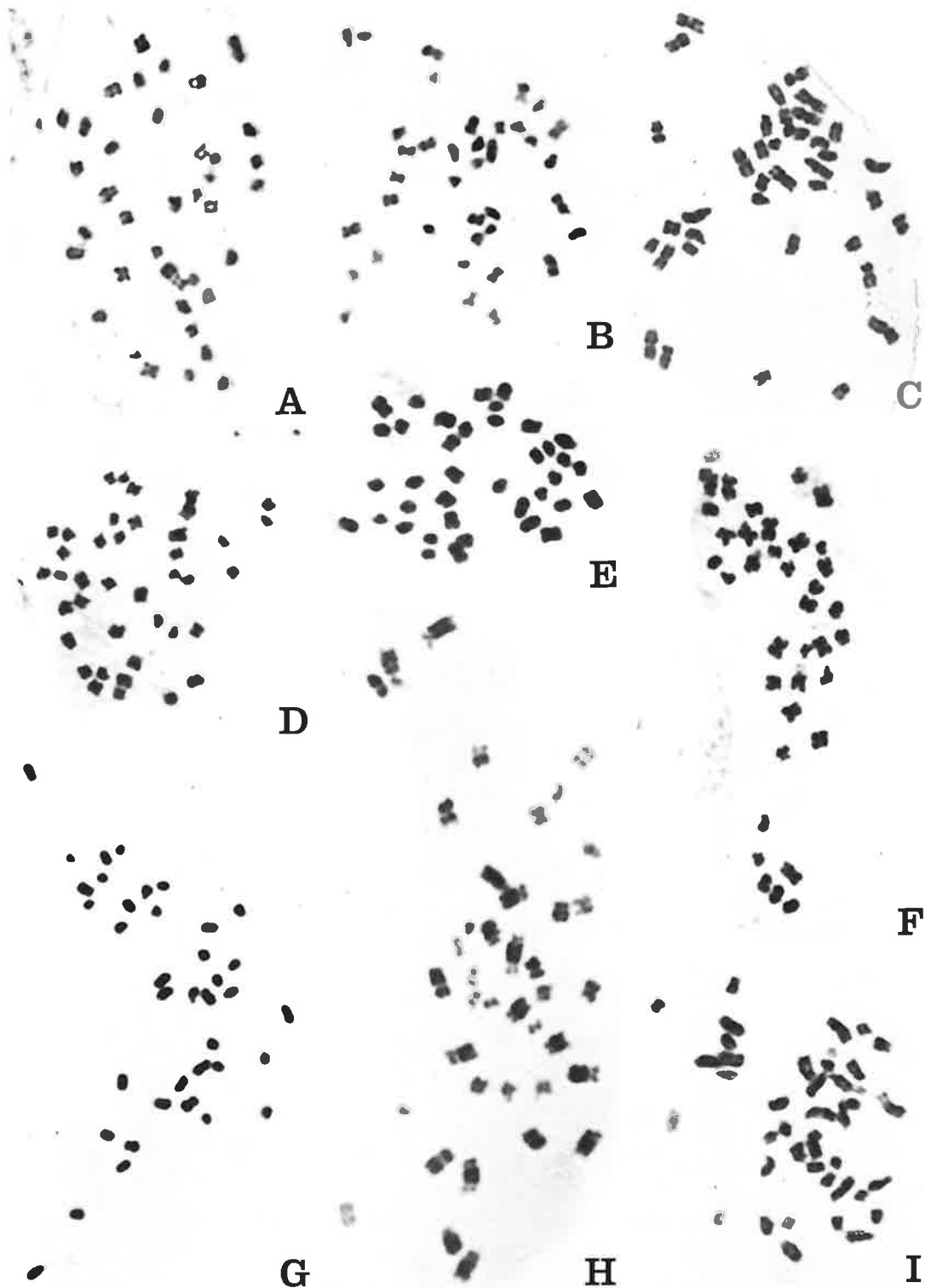


Fig. 2 Photomicrographs of somatic chromosomes of *Dendrobium*.  $\times 2000$ .  
 A, *D. canaliculatum*  $2n=38$ . B, *D. candidum*  $2n=38$ . C, *D. chrysotoxum*  $2n=38$ .  
 D, *D. compactum*  $2n=40$ . E, *D. crassinode*  $2n=38$ . F, *D. crumenatum*  $2n=38$ .  
 G, *D. cucumerinum*  $2n=38$ . H, *D. cymbidioides*  $2n=40$ . I, *D. delacourii*  $2n=40$ .

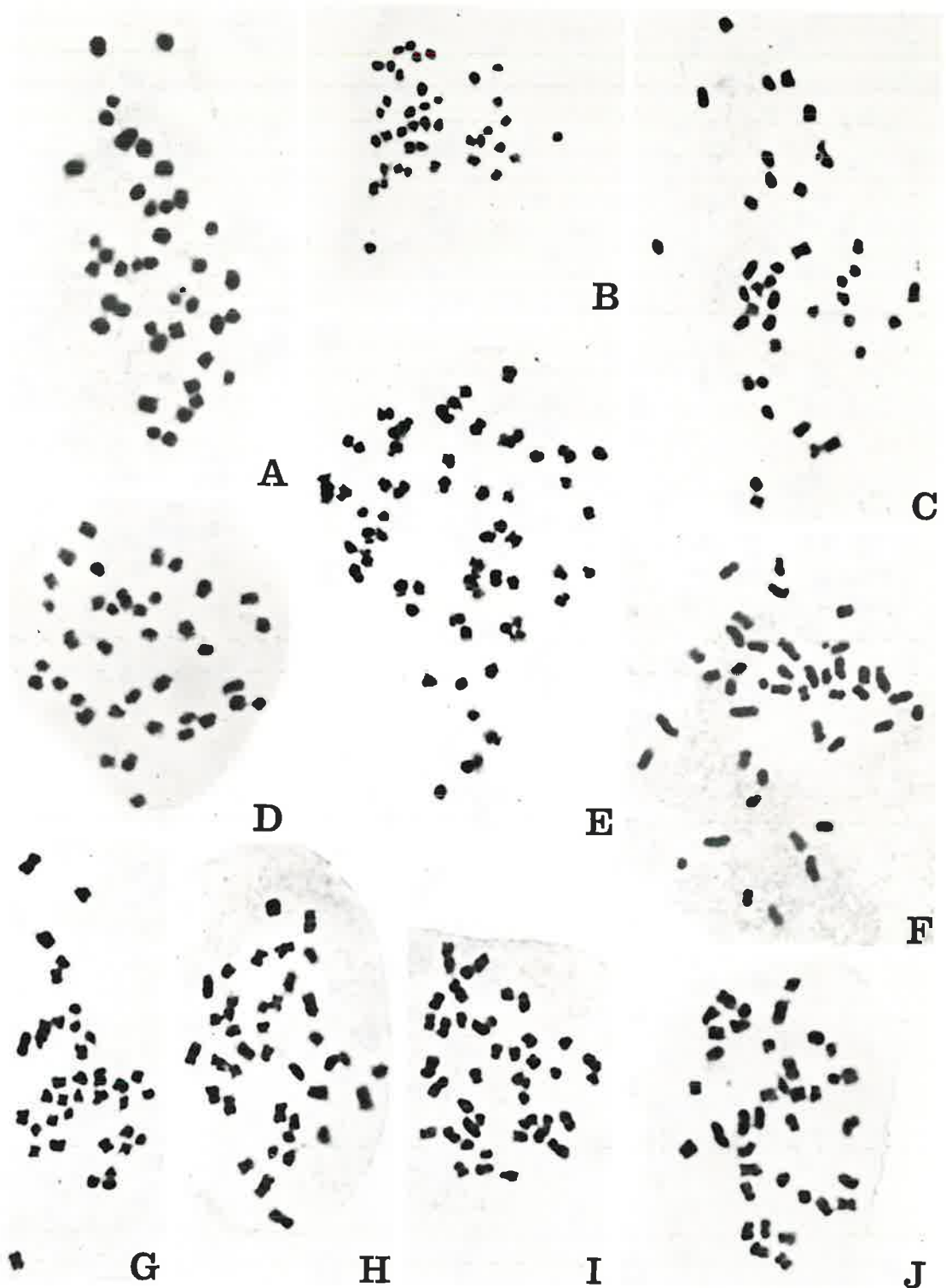


Fig. 3. Photomicrographs of somatic chromosomes of *Dendrobium*.  $\times 2000$ .  
 A, *D. densiflorum*  $2n=40+1f$ . B, *D. denudans*  $2n=40$ . C, *D. dicuphum*  $2n=39$ .  
 D, *D. distichum*  $2n=38$  (diploid). E, *D. distichum*  $2n=57$  (triploid). F, *D. dix-*  
*anthum*  $2n=40+2f$ . G, *D. equitans*  $2n=38$ . H, *D. falconeri*  $2n=38$ . I, *D. farmeri*  
 $2n=40$ . J, *D. findlayanum*  $2n=38$ .

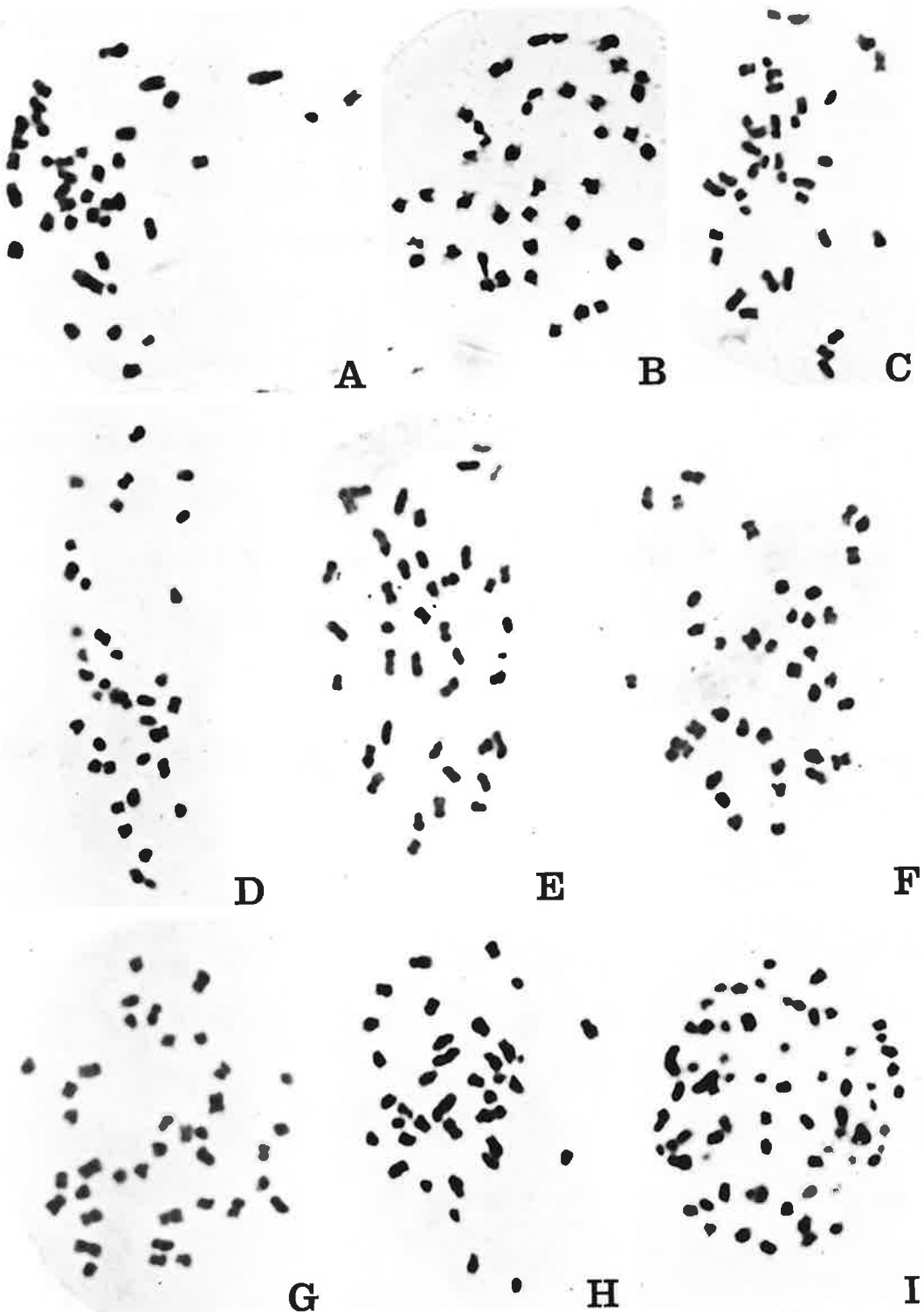


Fig. 4. Photomicrographs of somatic chromosomes of *Dendrobium*.  $\times 2000$ .  
 A, *D. finisterrae*  $2n=40$ . B, *D. forbesii*  $2n=40$ . C, *D. formosum* var. *giganteum*  $2n=38$ . D, *D. friedericksianum*  $2n=38$ . E, *D. guerreroi*  $2n=40$ . F, *D. heterocarpum*  $2n=38$ . G, *D. infundibulum*  $2n=38$ . H, *D. insigne*  $2n=36+2f$ . I, *D. kingianum*  $2n=76$  (tetraploid).

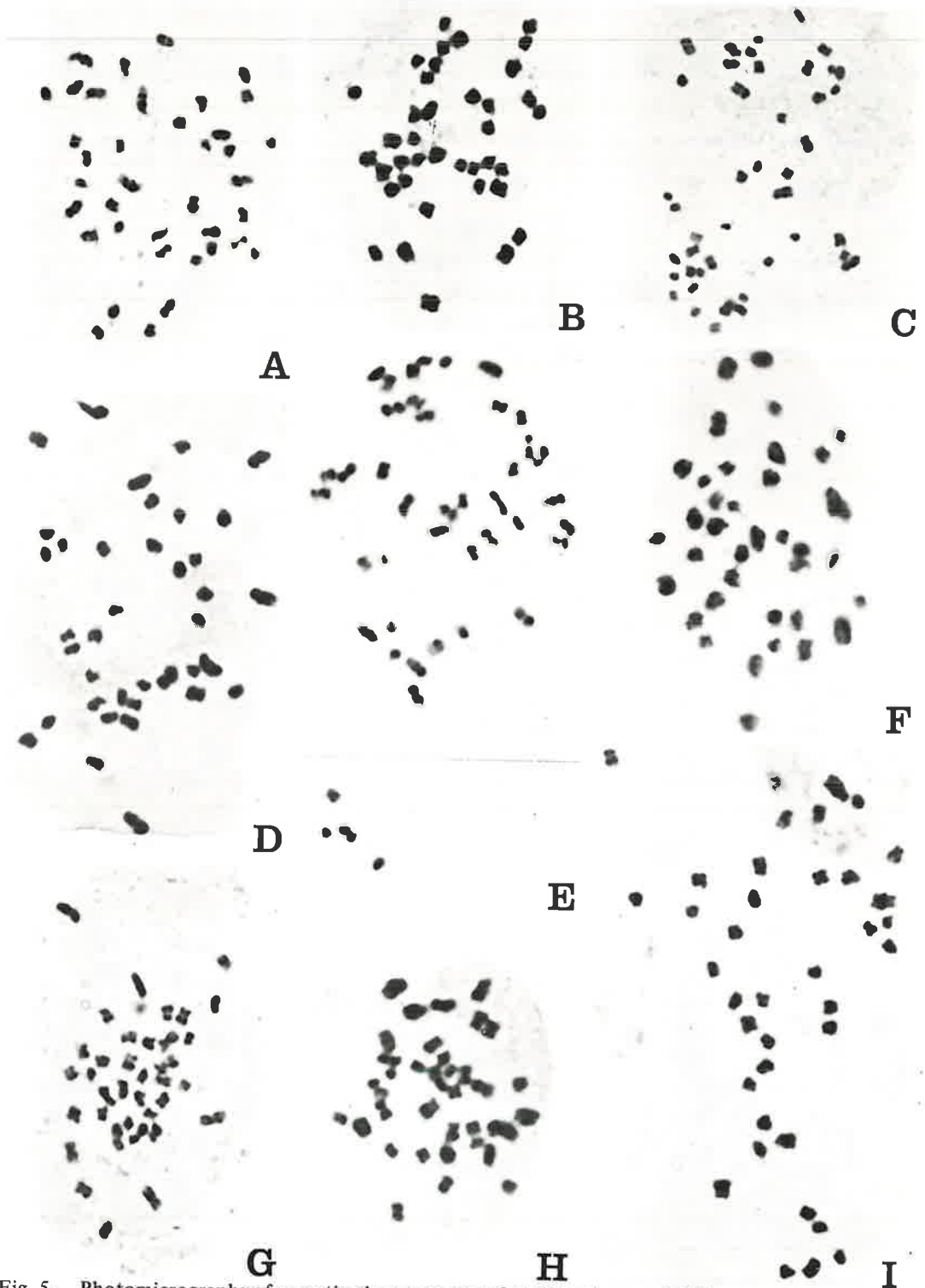


Fig. 5. Photomicrographs of somatic chromosomes of *Dendrobium*.  $\times 2000$ .  
 A, *D. lasianthera*  $2n=38$ . B, *D. leonis*  $2n=38$ . C, *D. lichenastrum*  $2n=40$ . D, *D. linguiforme*  $2n=38$ . E, *D. longicornu* var. *java*  $2n=43$ . F, *D. lyonii*  $2n=40$ . G, *D. macraei*  $2n=38$ . H, *D. macrophyllum*  $2n=38$ . I, *D. miyakei*  $2n=38$ .

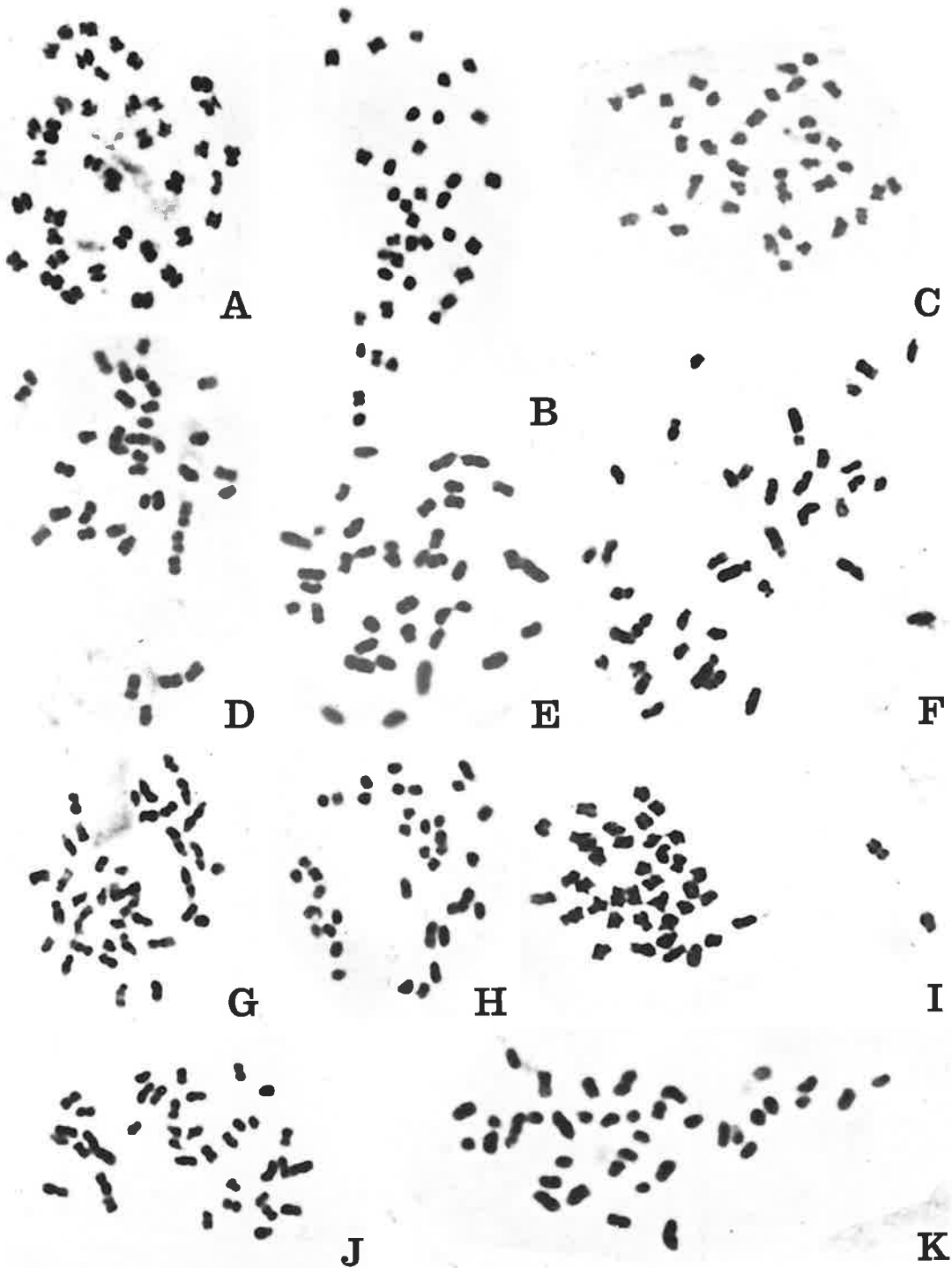


Fig. 6. Photomicrographs of somatic chromosomes of *Dendrobium*.  $\times 2000$ .  
 A, *D. monile*  $2n=38$ . B, *D. moschatum*  $2n=38$ . C, *D. nobile*  $2n=38$ . D, *D. ophioglossum*  $2n=38$ . E, *D. parishii*  $2n=38$ . F, *D. phalaenopsis*  $2n=38$ . G, *D. phlox* var. *flava*  $2n=38$ . H, *D. pierardii*  $2n=38$ . I, *D. platygastrium*  $2n=40$ . J, *D. plicatile*  $2n=38$ . K, *D. pugioniforme*  $2n=38$ .

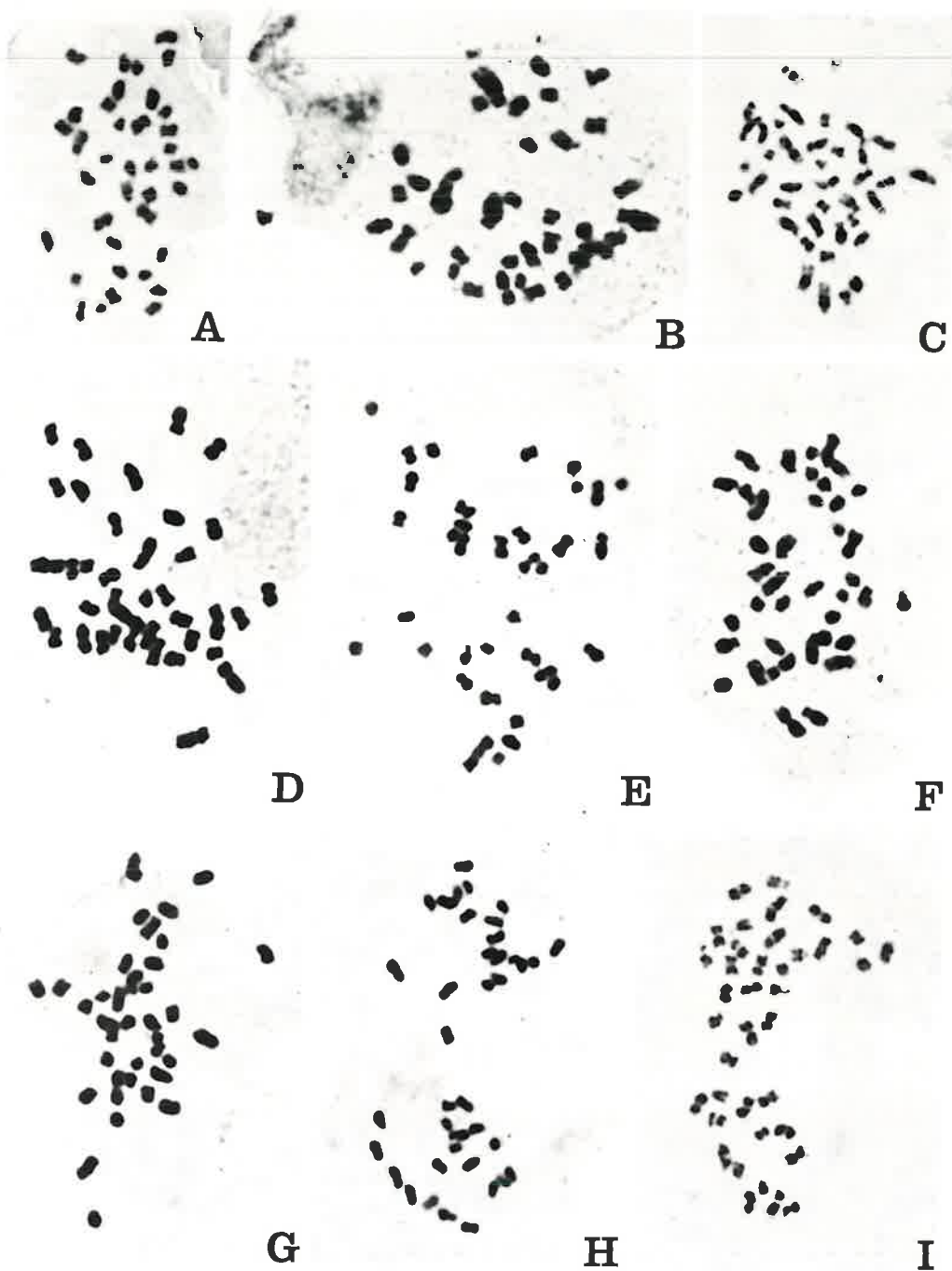


Fig. 7. Photomicrographs of somatic chromosomes of *Dendrobium*.  $\times 2000$ .  
 A, *D. quinquecostatum*  $2n=38$ . B, *D. ramosii*  $2n=40$ . C, *D. revolutum*  $2n=40$ .  
 D, *D. rhodopterygium*  $2n=38$ . E, *D. ruppianum*  $2n=38$ . F, *D. sanseiense*  $2n=40$ .  
 G, *D. scabrilingue*  $2n=38$ . H, *D. schneiderae*  $2n=38$ . I, *D. scopa*  $2n=38$ .



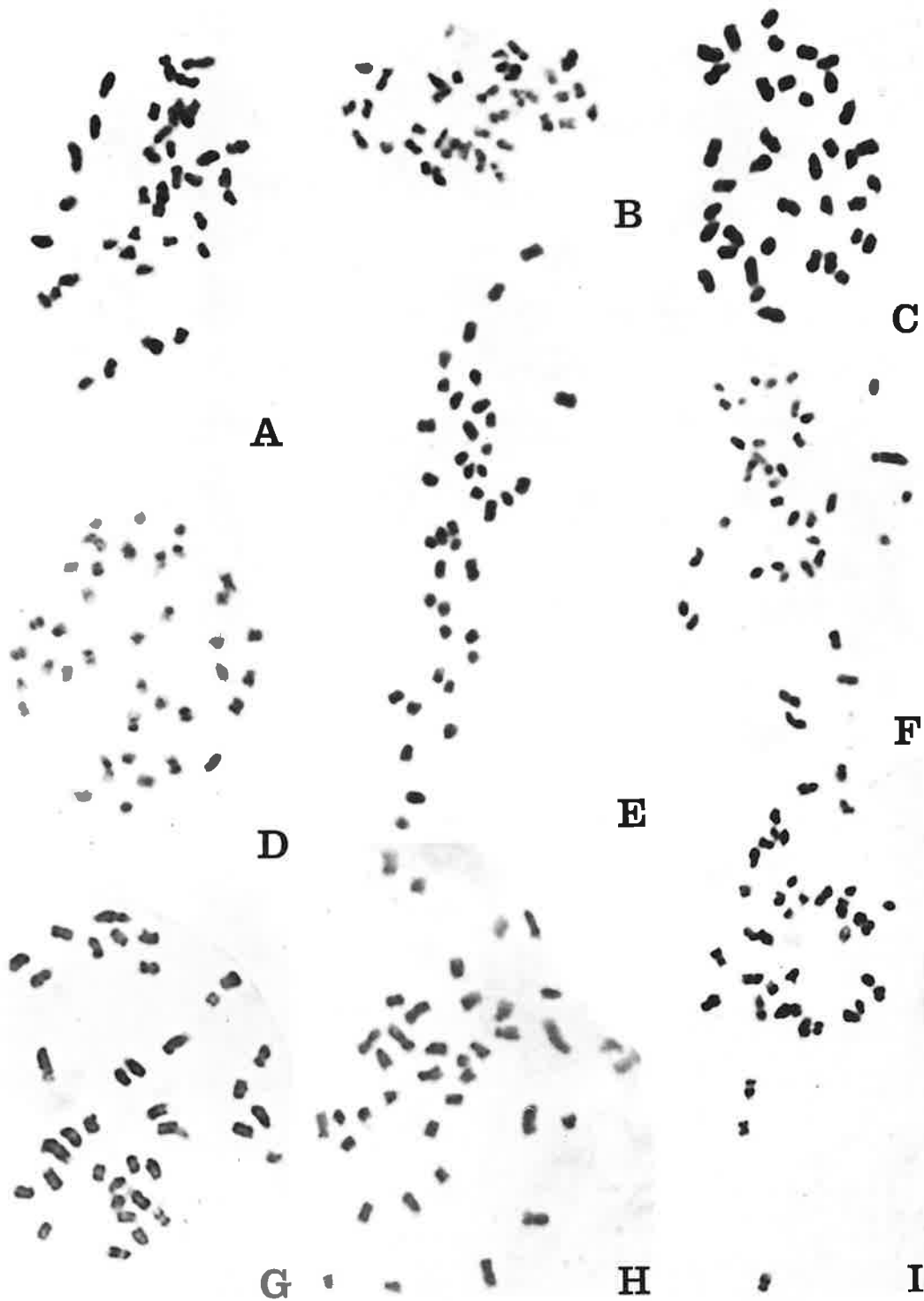


Fig. 8. Photomicrographs of somatic chromosomes of *Dendrobium*.  $\times 2000$ .  
 A, *D. senile*  $2n=40$ . B, *D. smilliae*  $2n=38$ . C, *D. sophronites*  $2n=38$ . D, *D. stuposum*  $2n=38$ . E, *D. sulcatum*  $2n=40$ . F, *D. superbiens*  $2n=38$ . G, *D. superbium*  $2n=38$ . H, *D. sutepense*  $2n=38$ . I, *D. taurinum*  $2n=38$ .

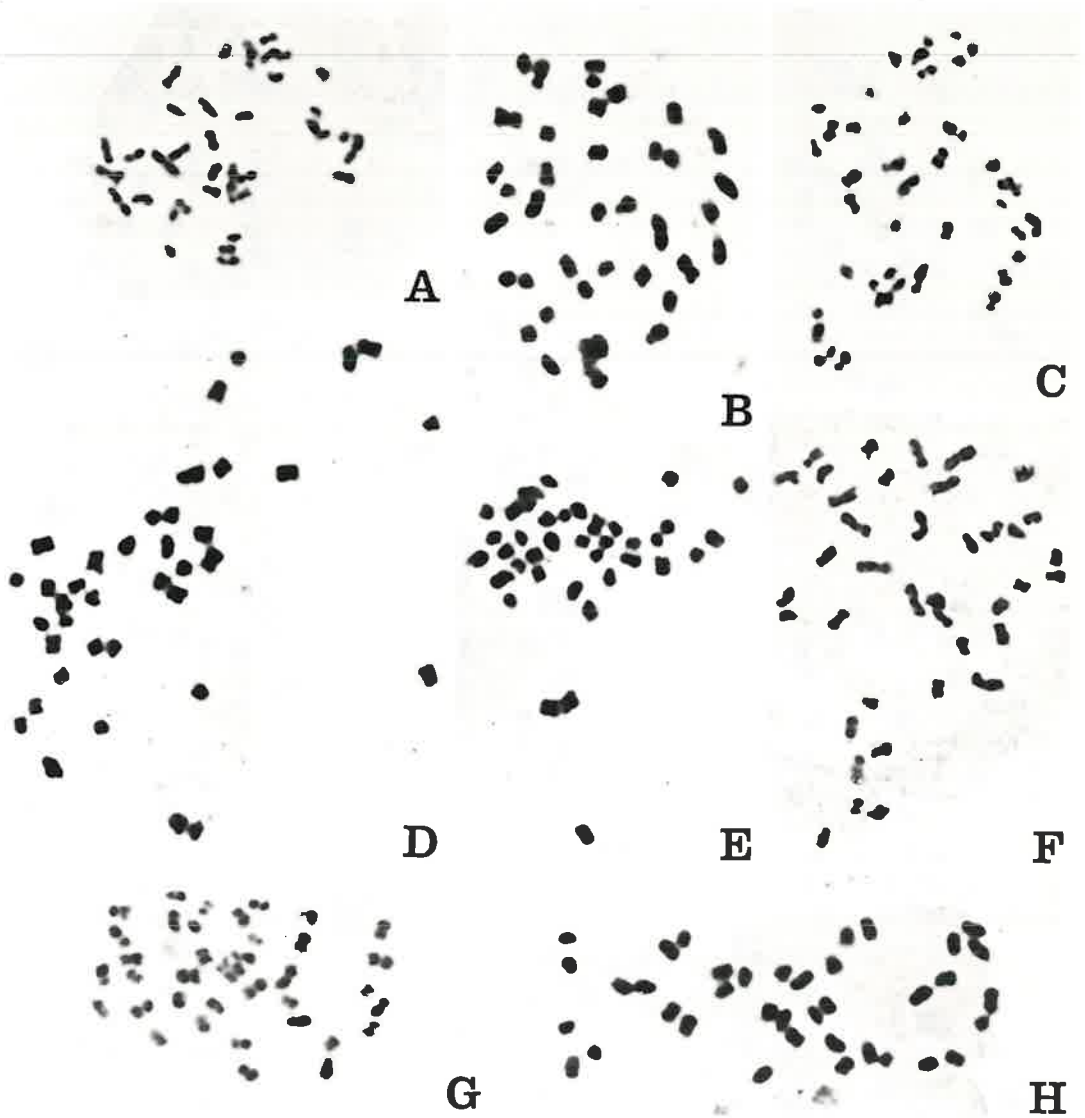


Fig. 9. Photomicrographs of somatic chromosomes of *Dendrobium*.  $\times 2000$ .  
A, *D. teretifolium* var. *fasciculatum*  $2n=40$ . B, *D. terminale*  $2n=38$ . C, *D. tetragonum* var. *giganteum*  $2n=38$ . D, *D. topaziacum*  $2n=38$ . E, *D. tortile*  $2n=38$ . F, *D. tosaense*  $2n=38$ . G, *D. wardianum*  $2n=38$ . H, *D. wassellii*  $2n=38$ .