ISSN 0386–5304
No. 6 Dec. 1983

Bulletin of
The Hiroshima Botanical Garden

Published by

The Hiroshima Botanical Garden
(Municipal)
Kurashige, Itsukaichi, Hiroshima
Japan

Karyomorphological observations on some species of *Eria**

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エリア属数種の核形態学的観察

橋本清美・田中隆荘

Introduction

The genus *Eria* which is known as one of the large genera of the Orchidaceae with 400 species or more is distributed mainly in Southeast Asia and only three species occur in Japan (Hatusima 1975, Ohwi 1978). These species are known to be highly variable in external morphology, but taxonomically this genus is distinctly separated from the closely related genus *Dendrobium*. The chromosome numbers of *Eria* have been reported to be highly variable; 2n=36, 38, 40, 44 and 66 (Mutsuura & Nakahira 1958, Chardard 1963, Tanaka 1965, Pancho 1965, Sharma & Chatterji 1966, Mehra & Vij 1970, Terasaka & Tanaka 1974 and Mehra & Sehgal 1974), while those of *Dendrobium* have been reported to be 2n=36, 38 and 40 (Hashimoto 1981, 1982, Tanaka & Kamemoto 1982 and Jones *et al.* 1982). However, the morphological study of chromosomes in *Eria* is lacking in most standard references. The present paper deals with the karyomorphological observations in 18 species of *Eria*.

Materials and Methods

The species, the sources and the numbers of materials studied are shown in Table 1. These materials were grown in the Hiroshima Botanical Garden, Hiroshima City, Japan.

Nomenclature followed mostly Seidenfaden & Smitinand (1960) and some Holttum (1958), Hatusima (1975), Ohwi (1978), Liu & Su (1978) and Pradhan (1979).

Chromosomes were observed by the aceto-orcein squash method developed by Tanaka and Kamemoto (1960): Active root tips were cut into small pieces of 1.0–2.0 mm long and were immersed in 0.002 M 8-hydroxyquinoline for 4 hours at 16°C. They were then transferred to a modified Carnoy's solution (99% ethanol : chloroform : gracial acetic acid = 1 : 1 : 2) for 15 minutes at 16°C, hydrolyzed in lN HCl at 60°C for two minutes, transferred to 45% acetic acid for three minutes, squashed and stained in 1% aceto-orcein.

The chromosomes at mitotic metaphase were measured by lengths of long and short arms.

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* Contribution from the Hiroshima Botanical Garden No. 22

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Bulletin of The Hiroshima Botanical Garden, No. 6: 1–46, 1983.

Table 1. Sources, chromosome numbers and number of clones of the species of *Eria* studied

Section	Species	Source	Chromosome number, 2n	No. of clones	Previous report, 2n
Trichotosia	*rufinula* Rchb. f.	Thailand	38	2	
Goniorhabdos	*corneri* Rchb. f.	Yakushima Isl. (Japan)	36	3	36 Tanaka 1965
		Amami Isl. (Japan)	36	1	
		Okinawa Pref. (Japan)	36	1	
	javanica (Sw.) Bl.	Thailand	36	3	
Dendrolirium	*ornata* (Bl.) Ldl.	Thailand	38	1	
Strongyleria	*pannea* Ldl.	Thailand	38	2	36* Mehra & Vij 1970
Cymboglossum	*stricta* Ldl.	Thailand	40	3	
Cylindrolobus	*coronaria* Rchb. f.	Thailand	36	1	36* Mehra & Vij 1970
	biflora Griff.	Thailand	46	1	
Urostachya	*floribunda* Ldl.	Thailand	38	1	44 Pancho 1965
	pachystachya Ldl.	Malaysia	38	1	
Hymneria	*acervata* Ldl.	Thailand	38	1	20 Mehra & Sehgal 1974
	bractescens Ldl.	Thailand	38	1	40 Sharma & Chatterji 1966
	graminifolia Ldl.	India	42	1	38* Mehra & Vij 1970
	hyacinsoides (Bl.) Ldl.	Malaysia	38	2	
	ovata Ldl.	Iriomote Isl. (Japan)	38	3	44 Pancho 1965
					36 Tanaka 1965
					36* Terasaka & Tanaka 1974
	reptans (Fran. & Sav.) Makino	Miyazaki Pref. (Japan)	38	1	40 Mutsuura & Nakahira 1958
		Yakushima Isl. (Japan)	38	1	38 Tanaka 1965
		Formosa	38	3	
	spicata (D. Don) Hand.-Mazz.	Thailand	38	1	38* Chardard 1963
					20 Mehra & Vij 1970
	tomentosiflora Hayata	Formosa	38	2	44 Pancho 1965

* counted from observation of mitosis in pollen or of meiosis in pollen mother cells

Arm ratio was calculated by length of long arm/length of short arm, and expressed by the value of arm ratio 1.0 to 1.7 as "median", 1.8 to 3.0 as "submedian" and 3.1 to 7.0 as "subterminal" according to Levan *et al.* (1964). The chromosomes were aligned in desending order and were given numbers 1, 2, 3, ...

Observations

Mitotic cell divisions were observed in the root tips of the investigated plants. Observations on chromosome morphology were made in the chromosomes at resting stage and at prophase and metaphase stages of mitosis.

The results of the observations in the 18 species were as follows:

1. *Eria rufinula* Rchb. f., 2n=38, Table 2 and Fig. 1. Validated specimen No. 3117.

Two clones were obtained from Thailand. External morphological characteristics of the clones were as follows: Pendulous stems were slender and leafy throughout their length. Leaves were lanceolate and covered with thick hairs. Inflorescence was not long and pendulous. Flowers were 8–10 mm long. Thus, this description is same as that of Seidenfaden and Smitinand (1960).

The chromosome number of *Eria rufinula* was examined in two clones to be 2n=38, which was a new report to this species.

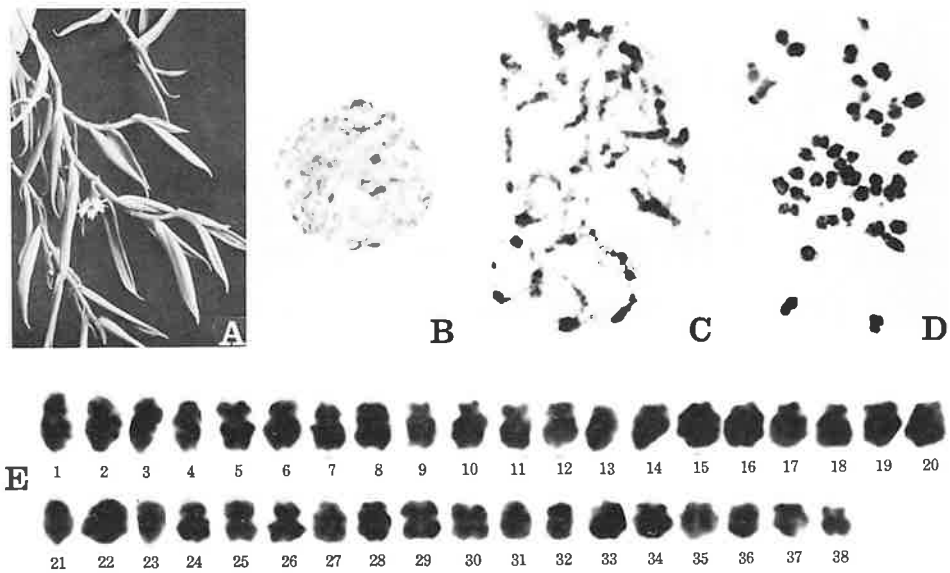

Fig. 1. Photomicrographs of the somatic chromosomes of *Eria rufinula*.
A. flowers. B, chromosomes at resting stage. C, chromosomes at mitotic prophase. D, chromosomes at mitotic metaphase, 2n=38.
A, × 0.2. B–D, × 1500. E, × 3000.

Chromosomes at resting stage were observed as chromomeric granules and fibrous threads scattered in the whole region of nucleus. Several spherical chromocentral blocks which varied in number from 6 to 10 per nucleus were observed in the resting nuclei. The chromocentral blocks were approximately 0.8 μm in diameter. At prophase the heterochromatic segments were located in the proximal regions and transformed gradually to euchromatic segments located distally. Thus, the karyotype at resting chromosomes was considered to belong to an intermediate category between the complex chromocenter type and the simple chromocenter type proposed by Tanaka (1971).

The chromosomes at mitotic metaphase showed the gradual variation of length ranging from approximately 2.5 μm to 1.3 μm, and the positions of centromeres were median, submedian and subterminal. Among the 38 chromosomes about 15 were median, 11 (Nos. 9, 10, 23, 24, 31, 33–38) were submedian and 12 (Nos. 11–20, 27, 28) were subterminal.

This species was found to show homogenous and a gradual type according to chromosome length and an asymmetric karyotype according to arm ratio.

2. *Eria corneri* Rchb. f., 2n=36, Table 3 and Fig. 2. Validated specimen No. 3082–3085, 3090.

Five clones were collected from three localities shown in Table 1. External morphological characteristics of the five clones were as follows: Stems transformed into the pseudobulbs which were 4-angled and on their apical regions had two oblanceolate leaves. One spike arose

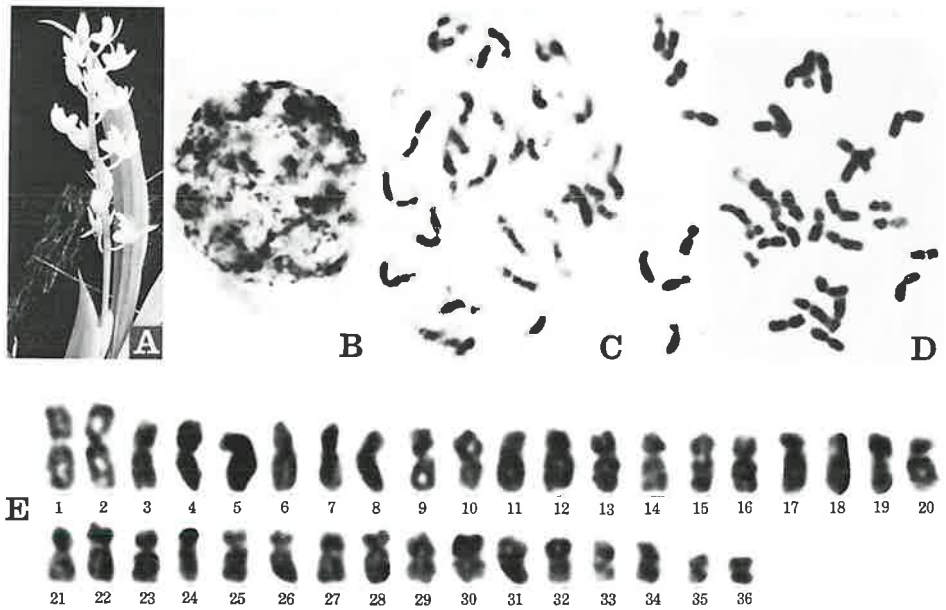

Fig. 2. Photomicrographs of the somatic chromosomes of *Eria corneri*.
A, flowers. B, chromosomes at resting stage. C, chromosomes at mitotic prophase. D, chromosomes at mitotic metaphase, 2n=36.
A, × 0.3. B–D, × 1500. E, × 3000.

from near the apex of pseudobulb and bore about 20 flowers of which color was greenish yellow. Thus, this description is same as that of Ohwi (1978).

The chromosome number of the five clones was examined to be 2n=36 which confirmed the previous report (cf. Tanaka 1965).

The chromosomes in the resting nucleus formed many chromomeric granules scattered in nuclear space. Some of the chromomeric granules formed chromocentral blocks which varied in number from 10 to 15 showing irregular margin. The chromocentral blocks were approximately 2.4 μm in diameter. At prophase the chromosomes formed early condensed long segments located proximally which transformed gradually into late condensed segments located proximally. A pair of the shortest chromosomes was found without picnotic segments. It was stained faintly and had median centromeres. Thus, the karyotype of the chromosomes at resting stage was considered to belong to the complex chromocenter type proposed by Tanaka (1971).

The chromosomes at mitotic metaphase were observed to be longer as compared to the chromosomes of *Eria rufinula* described above (p. 3). They varied in length gradually and ranged from 3.4 μm to 1.2 μm. The positions of centromeres of the complement were either median or submedian. Among the 36 chromosomes about 27 were median and nine (Nos. 17, 18, 20, 22–26 and 28) were submedian. The two longest chromosomes were 3.4 μm in length and had the centromeres in the median region, while the two shortest chromosomes were 1.2 μm in length and had the centromeres in the median region. The other 32 chromosomes ranging from 3.1 μm to 1.8 μm in length. The metaphase chromosomes were categorized to be heterogenous and a trimodal karyotype according to chromosome length and a symmetric karyotype according to arm ratio.

3. *Eria javanica* (Sw.) Bl., 2n=36, Table 4 and Fig. 3. Validated specimen No. 3093, 3094, 3097.

Three clones were obtained from Thailand. External morphological characteristics of the clones were as follows: Stems transformed into the pseudobulbs which were ovoid and had two lanceolate leaves on its apical region. Leaves were leathery and about 20–30 cm in length. Inflorescence was longer than the leaf and drooping. Flowers were sweetly scented and white with red spots on the lip. Thus, this description is same as that of Seidenfaden and Smitinand (1960).

The chromosome number of this species was examined in three clones to be 2n=36, which was a new count.

Chromosomes in the resting nuclei were found to be similar to those of *Eria corneri* described above (p. 4). That is, many chromomeric granules dispersed in the nucleus were observed. Some of the chromomeric granules formed many large chromocentral blocks which were loosely aggregated. They varied in size from 2 μm to 4 μm in diameter and showed irregular shape with rough surface. At prophase the chromosomes formed early condensed segments located in proximal and interstitial regions. In some chromosomes early condensed small segments were additionally found in the distal region. They early condensed segments were observed transforming gradually to the late condensed segments. Thus, the karyotype

at resting chromosomes were considered to belong to the category of the complex chromocenter type proposed by Tanaka (1971).

The chromosomes at mitotic metaphase were found to be similar to those of *Eria corneri*. The 36 chromosomes varied in length gradually and ranged from 4.6 μm to 2.4 μm. The positions of centromeres of the complement were median and submedian. Among the 36 chromosomes about 28 were median and eight (Nos. 5–8, 17–20) were submedian. The two longest chromosomes were distinct. They were 4.6 μm and 4.4 μm in length, respectively and both had the centromeres in median regions, while the four shortest chromosomes ranged from 2.6 μm to 2.4 μm in length and had the centromeres in median regions. The other 30 chromosomes ranged from 3.8 μm to 3.0 μm in length. Thus, the metaphase chromosomes were categorized to be heterogenous and a trimodal karyotype according to chromosome length and the category of a symmetric karyotype according to arm ratio.

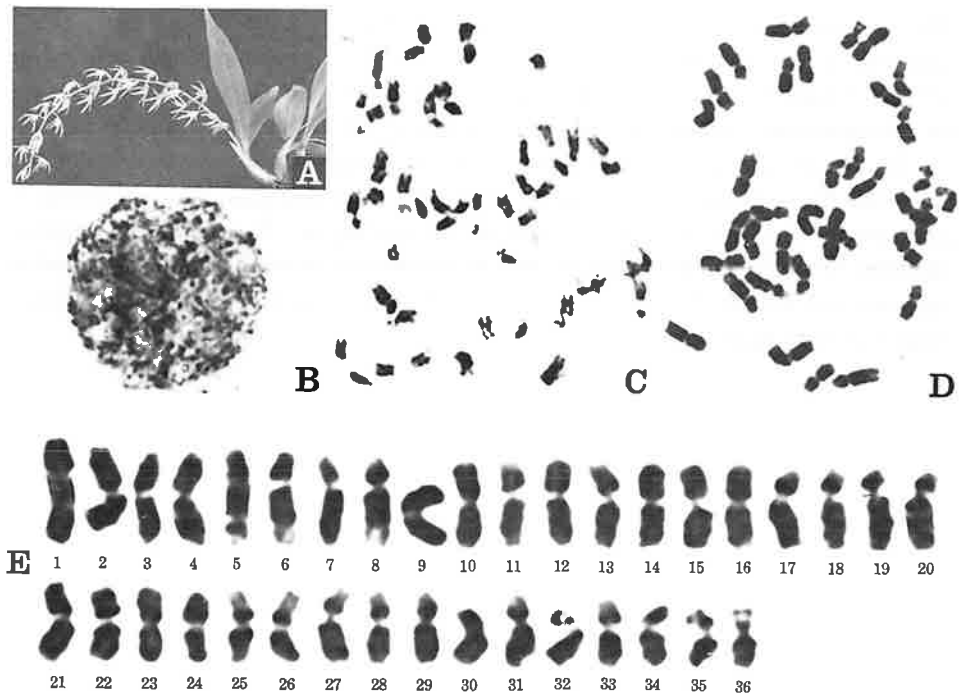

Fig. 3. Photomicrographs of the somatic chromosomes of *Eria javanica*.
A, flowers. B, chromosomes at resting stage. C, chromosomes at mitotic prophase. D, chromosomes at mitotic metaphase, 2n=36.
A, × 0.1. B–D, × 1500. E. × 3000.

4. *Eria ornata* Ldl. 2n=38, Table 5 and Fig. 4. Validated specimen No. 3121.

A clone was obtained from Thailand. External morphological characteristics of the clone was as follows: Large pseudobulb was about 10 by 4 cm in length and bore 4 to 5 leaves. Inflorescence covered with red-brown hairs was about 45 cm in length. The bracts were orange

in color and the flowers were greenish yellow. Thus, this description is same as that of Seidenfaden and Smitinand (1960).

The chromosome number of the clone was examined to be 2n=38, a new report to this species.

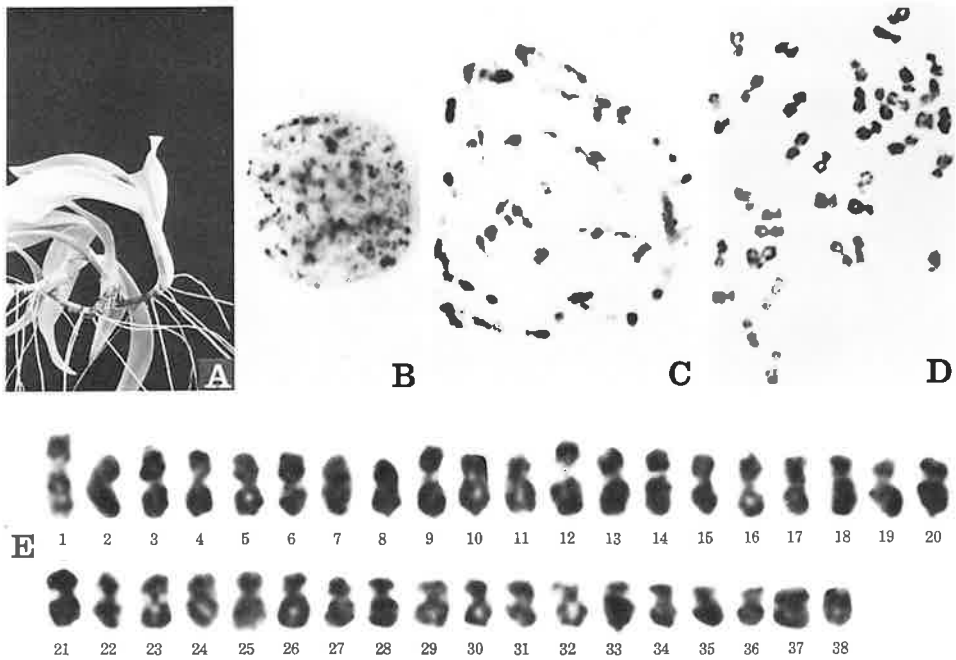

Fig. 4. Photomicrographs of the somatic chromosomes of *Eria ornata*.
A, seedling. B, chromosomes at resting stage. C, chromosomes at mitotic prophase. D, chromosomes at mitotic metaphase, 2n=38.
A, x 0.1. B–D, x 1500. E, x 3000.

The chromosomes at resting stage formed many chromomeric granules and fibrous threads scattered in the nuclear space. Many spherical chromocentral blocks which varied in numbers from 30 to 40 per nucleus were observed in the resting nuclei. The chromocentral blocks were approximately 0.8 μm in diameter. The chromosomes at mitotic prophase had early condensed large segments in the proximal regions, late condensed segments in distal regions, and gradually condensed segments in the interstitial regions. Thus, the karyomorphological features were found to be similar to those of *Eria rufinula* described in the previous paragraph (No. 1), with an exception of the shape of mitotic metaphase chromosomes. That is, chromosomes at metaphase were longer than those of *Eria rufinula* and showed the gradual variation of length ranging from 2.7 μm to 1.5 μm. The positions of centromeres were either median or submedian. Among the 38 chromosomes about 29 were median and nine (Nos. 1, 2, 14, 18–20, 25, 26, 32) were submedian.

This species was found to show homogenous and a gradient type according to chromosome length and a symmetric karyotype according to arm ratio.

5. *Eria pannea* Ldl., 2n=38, Table 6 and Fig. 5. Validated specimen No. 3087, 3101.

Two clones were obtained from Malaysia. External morphological characteristics of the clones were as follows: Erect shoots were well spread on the creeping rhizome and about 1.5 cm in length. Leaves were slightly flattened laterally and about 10 cm in length. Flowers were about 2 cm in width and pale yellowish green in color. Thus, this description is same as that of Holttum (1953).

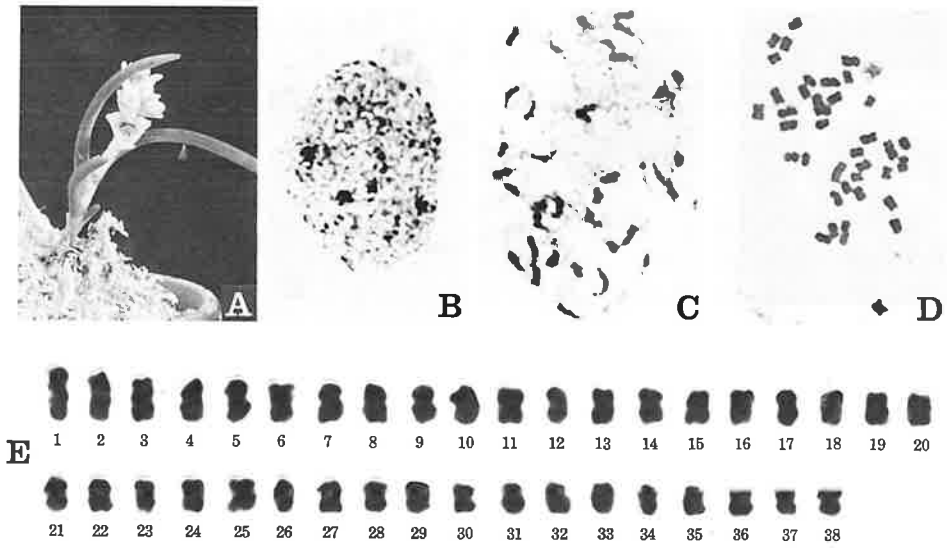

Fig. 5. Photomicrographs of the somatic chromosomes of *Eria pannea*.
A, flowers. B, chromosomes at resting stage. C, chromosomes at mitotic prophase. D, chromosomes at mitotic metaphase, 2n=38.
A, x 1.0. B–D, x 1500. E, x 3000.

The chromosome number of this species was counted to be 2n=38 at mitotic metaphase in the two clones examined, which was different from the chromosome number of n=18 in PMC's reported by Mehra (1970).

The chromosomes at resting stage formed many chromomeric granules and fibrous threads scattered in the whole region of nucleus. Several spherical chromocentral blocks which varied in number from 6 to 10 per nucleus were observed in the resting nuclei. The chromocentral blocks were approximately 0.8 μm in diameter. The chromosomes at mitotic prophase had early condensed large segments in the proximal regions, late condensed segments in the distal regions, and gradually condensed segments in the interstitial regions. Thus, the karyotype of the resting chromosomes was considered to belong to an intermediate category between the complex chromocenter type and the simple chromocenter type according to Tanaka's classification (1971).

The chromosomes at mitotic metaphase showed the gradual variation of length ranging from 2.3 μm to 1.0 μm, and the positions of centromeres were either median or submedian.

Among the 38 chromosomes about 34 were median and only four (Nos. 31–34) were submedian. The two longest chromosomes were distinct. They were 2.3 μm and 2.2 μm in length respectively, and both had the centromeres in the median region.

This species was found to have smaller chromosomes and showed heterogenous and a bimodal karyotype according to chromosome length and a symmetric karyotype according to arm ratio.

6. *Eria stricta* Ldl., 2n=40. Table 7 and Fig. 6. Validated specimen No. 3076, 3077, 3080.

Three clones were obtained from Thailand. External morphological characteristics of the clones were as follows: Pseudobulbs were erect, slender and about 10 cm long, with two leaves at near the apex. Inflorescence which bore about 30 small flowers arose from the top of stem and was erect. Flowers were distichous and about 0.3 cm in width. Thus, this description is same as that of Seidenfaden and Smitinand (1960).

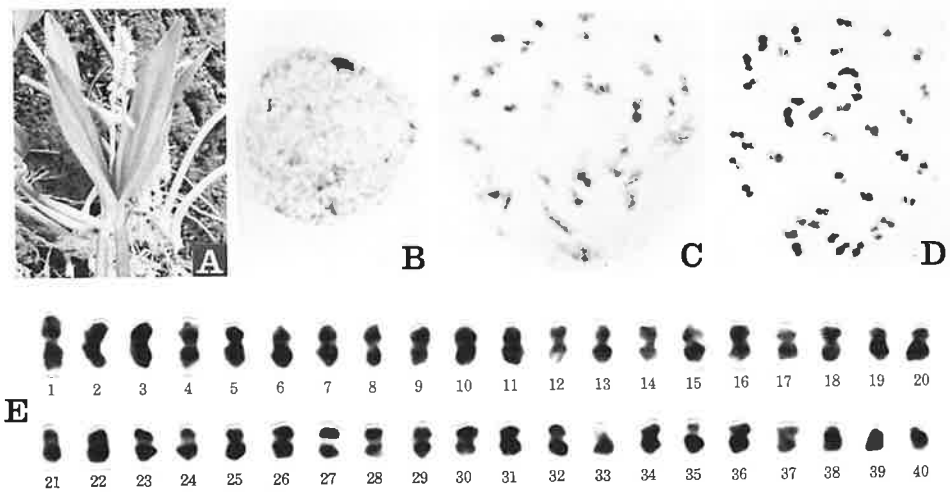

Fig. 6. Photomicrographs of the somatic chromosomes of *Eria stricta*.
A, flowers. B, chromosomes at resting stage. C, chromosomes at mitotic prophase. D, chromosomes at mitotic metaphase, 2n=40.
A, x 0.4. B–D, x 1500. E, x 3000.

The chromosome number of the three clones was examined to be 2n=40, a new report to this species.

The chromosomes at resting stage were conspicuous. They were observed as chromomeric granules and fibrous threads which were stained lightly. A few spherical chromocentral blocks which varied in size and number from 2 to 6 per nucleus were observed in the resting nucleus. The two largest blocks were approximately 0.8 μm in diameter. At prophase the largest blocks formed the heterochromatic segments of the longest mitotic chromosomes. Including the largest blocks, all of the heterochromatic segments were located in the proximal regions and

transformed gradually to euchromatic segments located distally. Thus, the karyotype of the resting chromosomes was considered to belong to the category of the simple chromocenter type according to Tanaka's classification (1971).

The chromosomes at mitotic metaphase showed the gradual variation of length ranging from 2.2 μm to 1.0 μm, and the positions of centromeres were median, except for two (Nos. 35, 36) submedian chromosomes.

Among the species described in this paper, this species was found to have a distinct chromosome number and showed homogenous and gradual type according to chromosome length and a symmetric karyotype according to arm ratio.

7. *Eria coronaria* (Ldl.) Rchb. f., 2n=36, Table 8 and Fig. 7. Validated specimen No. 3086.

A clone was obtained from Thailand. External morphological characteristics of the clone was as follows: Pseudobulb was about 10 cm long and had two leaves at apex. Leaves were coriaceous and lanceolate. Inflorescence was terminal and set 2–8 flowers. Flowers were fragrant, yellowish white in color and about 2.5 cm in width. Thus, this description is same as that of Seidenfaden and Smitinand (1960).

The chromosome number of this species was counted to be 2n=36 in all of the well spread mitotic figures, which confirmed n=18 in PMC's reported by Mehra & Vij (1970).

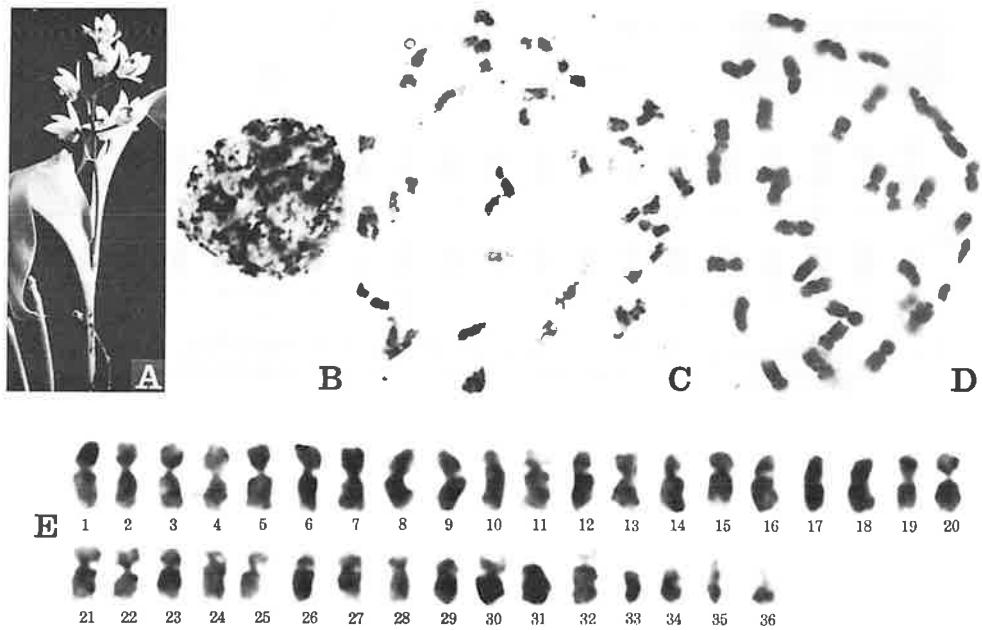

Fig. 7. Photomicrographs of the somatic chromosomes of *Eria coronaria*.
A, flowers. B, chromosomes at resting stage. C, chromosomes at mitotic prophase. D, chromosomes at mitotic metaphase, 2n=36.
A, × 0.2. B–D, × 1500. E × 3000.

The chromosomes in the resting nucleus were similar to those of *Eria corneri* described above (p. 4). That is, some of the chromomeric granules formed large chromocentral blocks which varied in number from 15 to 20 showing irregular margin. The chromocentral blocks were approximately 2.0 μm in diameter. At prophase the chromosomes formed early condensed segments located in the proximal and interstitial regions. In some chromosomes early condensed segments were additionally found in the distal regions. The early condensed segments situated between the condensed segments were observed transforming gradually to the late condensed segments. Thus, chromosome morphology at resting stage was considered to belong to the category of the complex chromocenter type according to Tanaka's classification (1971).

The chromosomes at mitotic metaphase were found to be similar to those of *Eria corneri* and showed the gradual variation of length ranging from 3.0 μm to 1.4 μm. The positions of centromeres of the chromosomes were median, submedian or subterminal. Among the 36 chromosomes about 24 were median, ten (Nos. 15, 16, 25–30, 35, 36) were submedian and two (Nos. 12 and 24) were subterminal.

The metaphase chromosomes were categorized to be homogenous and a gradual karyotype according to chromosome length and the category of the asymmetric karyotype according to arm ratio.

8. *Eria biflora* Griff., 2n=46, Table 9 and Fig. 8. Validated specimen No. 3098.

A clone was obtained from Thailand. External morphological characteristics of the clone were as follows: Stem was about 15 cm in length and flattened at the apex which bore 3 to 5 leaves. Flowers were pale yellow and bloomed in pairs. Thus, this description is same as that of Seidenfaden and Smitinand (1960).

The chromosome number of the clone was examined to be 2n=46, a new report to this species.

The chromosomes at resting stage were conspicuous in this report. Large spherical chromocentral blocks which varied in number from 20 to 25 per nucleus were observed in resting nuclei. Especially six large chromocentral blocks were obvious. They ranged from 1.5 μm to 2.0 μm in diameter. At prophase the heterochromatic segments were located almost in the whole region of the six longest chromosomes. The heterochromatic segments of another chromosomes were located in proximal regions and transformed gradually to euchromatic segments located distally. Thus, the morphology of chromosomes at resting stage was considered to be intermediate between the complex chromocenter type and the prochromosome type according to Tanaka's classification (1971).

The chromosomes at mitotic metaphase showed gradual variations of length ranging from 2.9 μm to 1.1 μm, and the positions of centromeres were mostly median, except for four (Nos. 1, 3, 5, 14) submedian chromosomes.

This species was found to have distinct chromosome number and showed partially heterogenous and a bimodal type according to chromosome length and a symmetric karyotype according to arm ratio.

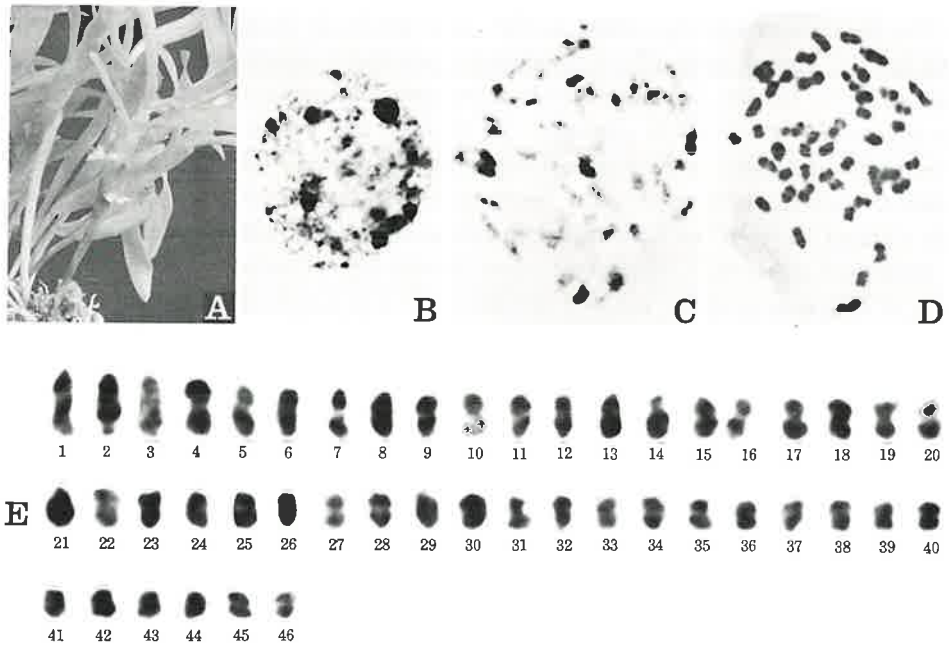

Fig. 8. Photomicrographs of the somatic chromosomes of *Eria biflora*.
A, flowers. B, chromosomes at resting stage. C, chromosomes at mitotic prophase. D, chromosomes at mitotic metaphase, 2n=46.
A, × 0.2. B–D, × 1500. E, × 3000.

9. *Eria floribunda* Ldl., 2n=38, Table 10 and Fig. 9. Validated specimen No. 3096.

A clone was obtained from Thailand. External morphological characteristics of the clone were as follows: Stem was clavate and had four to six leaves near the apex. Leaves were thin and elliptical. Inflorescence spread horizontally from the upper half of the stem and bore often at the same time. Flowers were densely crowded and white in color, faintly tinged with pink. Thus, this description is same as that of Seidenfaden and Smitinand (1960).

The chromosome number of the clone was examined to be 2n=38, which was different from the number of 2n=44 previously reported by Pancho (1965).

The chromosomes at resting stage formed several spherical chromocentral blocks which varied in number from 6 to 10 per nucleus. The chromocentral blocks were approximately 0.8 μm in diameter. Some of the chromatin formed chromomeric small granules and the others formed chromomeric fibrous threads scattered in the whole region of nucleus. At prophase heterochromatic segments were located almost in the whole region of several chromosomes. The heterochromatic segments of another chromosome which was located in the proximal region was transformed gradually into euchromatic segments located distally. Chromosome morphology at resting stage was found to be similar to that of *Eria rufinula* described above (p. 3). That is, the karyotypes of the chromosomes were an intermediate category between the complex chromocenter type and the simple chromocenter type proposed by Tanaka (1971).

The chromosomes at mitotic metaphase showed the gradual variations of length ranging from 1.5 μm to 0.7 μm, and the positions of centromeres were all median, except for two (Nos. 13, 14) submedian chromosomes. Among the 38 chromosomes two longest chromosomes were distinct. They were both 1.5 μm in length. Arm ratios of these chromosomes were both 1.1, and the positions of centromeres were median.

This species was found the show heterogenous and bimodal type in length and more symmetric karyotype in arm ratio.

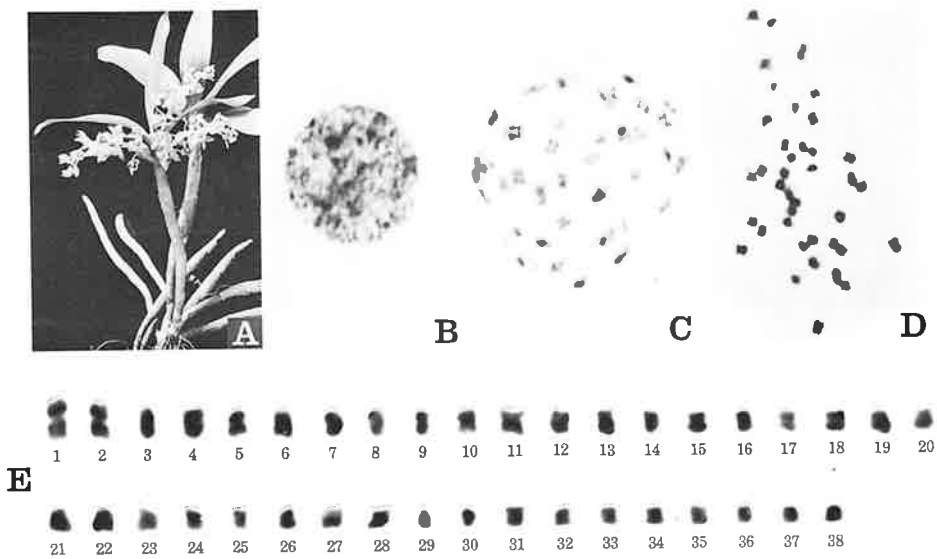

Fig. 9. Photomicrographs of the somatic chromosomes of *Eria floribunda*.
A, flowers. B, chromosomes at resting stage. C, chromosomes at mitotic prophase. D, chromosomes at mitotic metaphase, 2n=38.
A, x 0.2. B–D, x 1500. E, x 3000.

10. *Eria pachystachya* Ldl., 2n=38, Table 11 and Fig. 10. Validated specimen No. 3106.

A clone was obtained from Malaysia. External morphological characteristics of the clone were as follows: Stems was cylindirical and about 30 cm long. Leaves were thin and elliptical. Inflorescence obliquely ascending was about 12 cm long. Flowers were crowded and white in color with faint pink suffusion on the lip. Thus, this description is same as that of Holttum (1953).

The chromosome number of the clone was examined to be 2n=38, a new report to this species.

The chromosomes in the resting nuclei were observed as chromomeric granules and fibrous threads scattered in the whole region of nucleus. Several spherical chromocentral blocks which were approximately 0.8 μm in diameter varied in number from 6 to 10 per nucleus. Some of the chromatin formed chromomeric, small granules and the others formed chromomeric fibrous threads scattered in the whole region of nucleus. At prophase the heterochromatic segments

were located almost on the whole regions of several chromosomes. The heterochromatic segments of another chromosome which was located in the proximal region was transformed gradually into euchromatic segments located distally. The morphology of chromosomes at the resting stage was found to be similar to that of *Eria rufinula* described above (p. 3). That is, the karyotype of the chromosomes were an intermediate category between the complex chromocenter type and the simple chromocenter type proposed by Tanaka (1971).

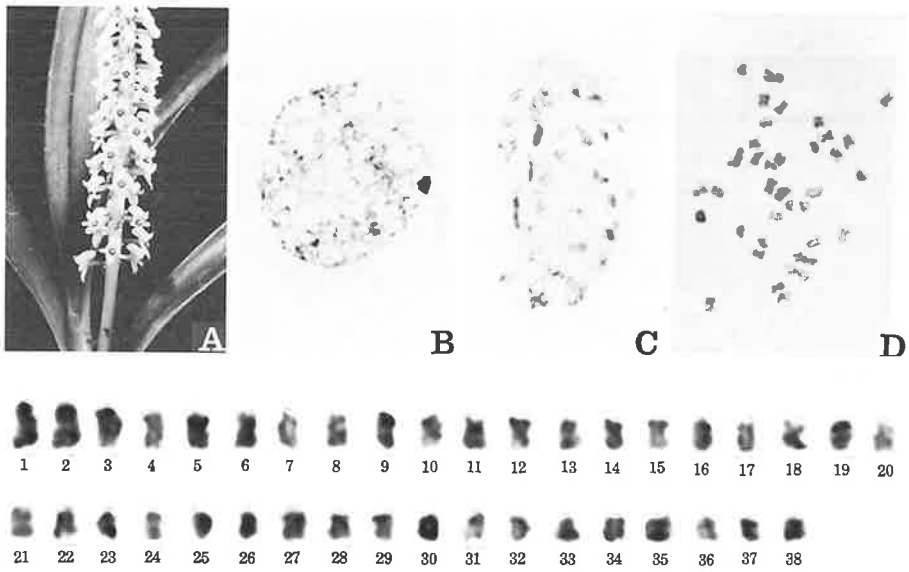

Fig. 10. Photomicrographs of the somatic chromosomes of *Eria pachystachya*.
A, flowers. B, chromosomes at resting stage. C, chromosomes at mitotic prophase. D, chromosomes at mitotic metaphase, 2n=38.
A, × 0.9. B–D, × 1500. E, × 3000.

The chromosomes at mitotic metaphase showed the gradual variations of length ranging from 1.8 μm to 0.9 μm, and the positions of centromeres were all median, except for four (Nos. 17–20) submedian chromosomes. Among the 38 chromosomes two longest chromosomes were distinct. They were both 1.8 μm in length. Arm ratios of both these chromosomes were 1.3, and thus the positions of centromeres were median.

This species was found to show heterogenous and a bimodal karyotype according to chromosome length and more symmetric karyotype according to arm ratio.

11. *Eria acervata* Ldl., 2n=38, Table 12 and Fig. 11. Validated specimen No. 3118.

A clone was obtained from Thailand. External morphological characteristics of the clone were as follows: Pseudobulbs were compressed and about 10 cm in length. Leaves were thin and lanceolate. Inflorescence arose from near the apex of new pseudobulb and bore loose flowers. Thus, this description is same as that of Seidenfaden and Smitinand (1960).

The chromosome number of the clone was examined to be 2n=38, which was different

from the number of n=20 in PMC's reported by Mehra & Sehgal (1975).

The chromosomes at resting stage formed many chromomeric granules and fibrous threads scattered in the whole region of nucleus. Many spherical chromocentral blocks which varied in number from 20 to 30 per nucleus were observed in the resting nuclei. The chromocentral blocks were approximately 0.8 μm in diameter. The chromosomes at mitotic prophase had early condensed large segments in the proximal regions, late condensed segments in the distal regions, and gradually condensed segments in the interstitial regions. Chromosomes morphology at resting stage was found to be similar to that of *Eria rufinula* described in the previous paragraph (No. 1). That is, the karyotypes of the chromosomes were an intermediate category between the complex chromocenter type and the simple chromocenter type proposed by Tanaka (1971).

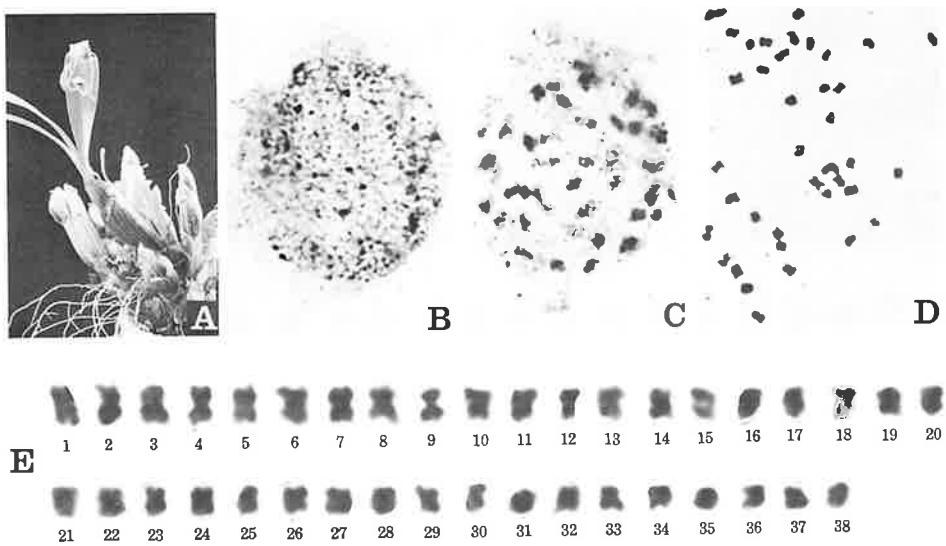

Fig. 11. Photomicrographs of the somatic chromosomes of *Eria acervata*.
A, seedling. B, chromosomes at resting stage. C, chromosomes at mitotic prophase. D, chromosomes at mitotic metaphase, 2n=38.
A, x 0.2. B–D, x 1500. E, x 3000.

The chromosomes at mitotic metaphase were found to be similar to those of *Eria rufinula*. The 38 chromosomes varied in length gradually and ranged from 1.7 μm to 0.9 μm, and the positions of centromeres were all median, except for six (Nos. 27–32) submedian chromosomes. Among 38 chromosomes four longest chromosomes were distinct. They were 1.7 μm in length. Arm ratios of both these chromosomes were 1.5 and 1.1 and the positions of centromeres were median.

The metaphase chromosomes of this species were categorized to be the homogenous and a gradual karyotype according to chromosome length and the category of the symmetric karyotype according to arm ratio.

12. *Eria bractescens* Ldl., 2n=38, Table 13 and Fig. 12. Validated specimen No. 3112.

A clone was obtained from Thailand. External morphological characteristics of the clone were as follows: Pseudobulb was thick and freshy. Leaves were lanceolate and about 15 cm in length. Inflorescence was erect and about 15 cm in length. Flowers were white in color. Thus, this description is same as that of Seidenfaden and Smitinand (1960).

The chromosome number of the clone was examined to be 2n=38, which was different from the number of 2n=40 previously reported by Sharma & Chatterji (1966).

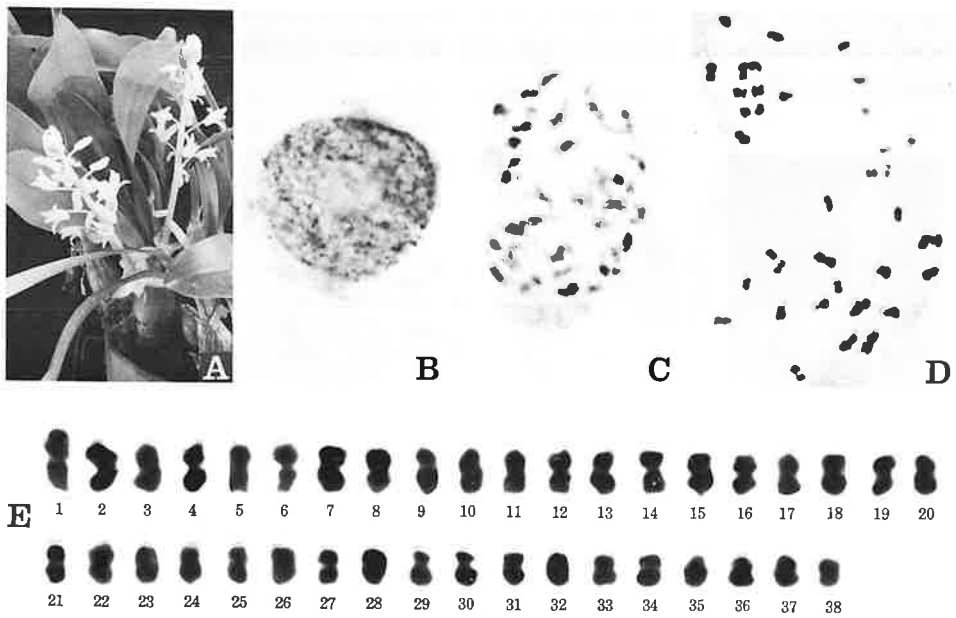

Fig. 12. Photomicrographs of the somatic chromosomes of *Eria bractescens*.
A, flowers. B, chromosomes at resting stage. C, chromosomes at mitotic prophase. D, chromosomes at mitotic metaphase, 2n=38.
A, × 0.2. B–D, × 1500. E, × 3000.

The chromosomes at resting stage were observed as chromomeric granules and fibrous threads scattered in the whole region of nucleus. Several spherical chromocentral blocks which varied in number from 6 to 10 per nucleus were observed in the resting nuclei. The chromocentral blocks were approximately 0.8 μm in diameter. The chromosomes at mitotic prophase had early condensed large segments in the proximal regions, late condensed segments in the distal regions, and gradually condensed segments in the interstitial regions. Chromosome morphology at resting stage was found to be similar to that of *Eria rufinula* described above (p. 3). That is, the karyotype of the chromosomes were an intermediate category between the complex chromocenter type and the simple chromocenter type at resting stage according to Tanaka's classification (1971).

The chromosomes at mitotic metaphase were found to be similar to those of *Eria rufinula*.

The 38 chromosomes varied in length gradually and ranged from 2.7 μm to 1.2 μm, and the positions of centromeres were all median.

The metaphase chromosomes of this species were categorized to be heterogenous and a bimodal karyotype according to chromosome length and the category of the most symmetric karyotype according to arm ratio.

13. *Eria graminifolia* Ldl., 2n=42, Table 14 and Fig. 13. Validated specimen No. 3105.

A clone was obtained from India. External morphological characteristics of the clone were as follows: Pseudobulbs were tufted and had two to four leaves near the apex. Leaves were lanceolate and about 15 cm in length. This clone has not yet bloomed in our garden. Thus, this description is same as that of Pradhan (1979).

The chromosome number of the clone was examined to be 2n=42, which was differed from the number of n=19 in PMC's previously reported by Mehra and Vij (1970).

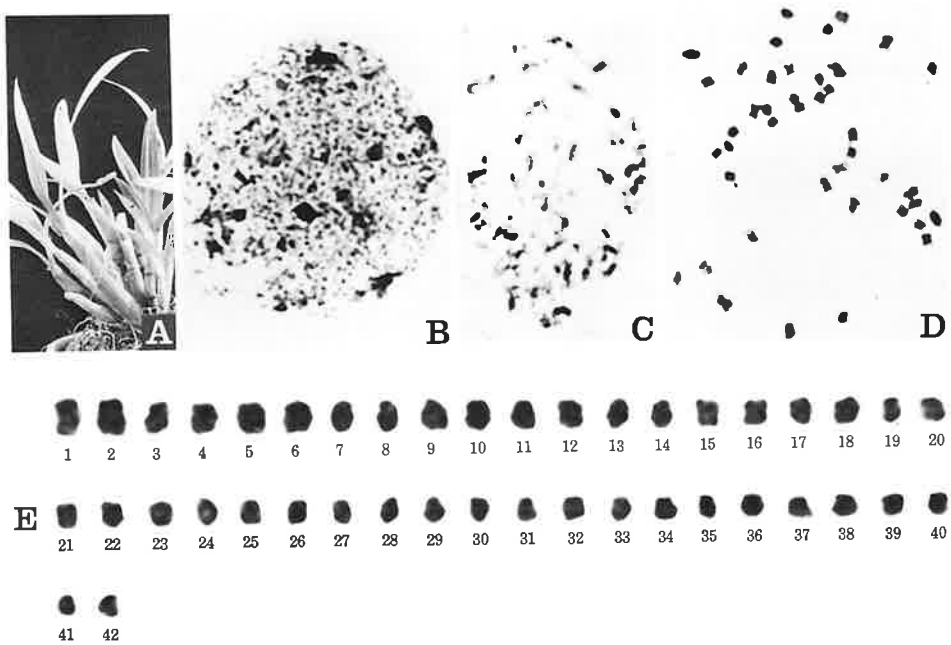

Fig. 13. Photomicrographs of the somatic chromosomes of *Eria graminifolia*.
A, seedling. B, chromosomes at resting stage. C, chromosomes at mitotic prophase. D, chromosomes at mitotic metaphase, 2n=42.
A, × 0.2. B–D, × 1500. E, × 3000.

The chromosomes at resting stage were observed as chromomeric granules and fibrous threads scattered in the whole region of nucleus. Several spherical chromocentral blocks which varied in number from 6 to 10 per nucleus were observed in the nuclei. The chromocentral blocks were approximately 0.8 μm in diameter. At prophase the heterochromatic segments which were located in the proximal regions, transformed gradually to euchromatic segments

located distally. Thus, the karyotype of the resting chromosomes was considered to belong to an intermediate category between the complex chromocenter type and the simple chromocenter type proposed by Tanaka (1971).

The chromosomes at mitotic metaphase showed the gradual variation of length ranging from 1.6 μm to 0.8 μm, and the positions of centromeres were either median or submedian. Among the 42 chromosomes about 24 were median and 18 (Nos. 3–9, 13, 14, 19, 29–42) were submedian. Two longest chromosomes were distinct. They were about 1.6 μm in length and the positions of their centromeres were median.

This species was found to show heterogenous and a bimodal karyotype according to chromosome length and an asymmetric karyotype according to arm ratio.

14. *Eria hyacinosoides* (Bl.) Ldl., 2n=38 Table 15 and Fig. 14. Validated specimen No. 3099, 3110.

Two clones were obtained from Malaysia. External morphological characteristics of the clones were as follows: Pseudobulbs were thick and freshy, covered with loose sheaths. Leaves were lanceolate and about 20 cm in length. Inflorescences were erect and about 15 cm long. Flowers were white in color. Thus, this description is same as that of Holttum (1953).

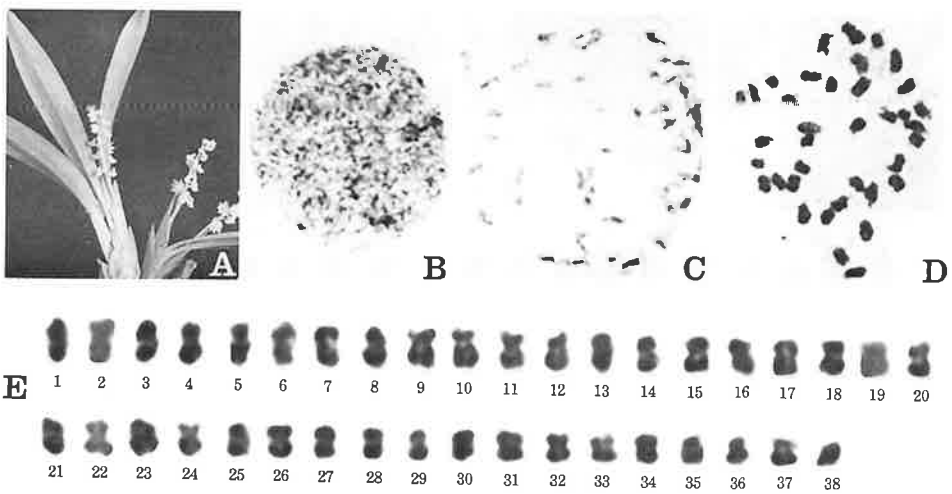

Fig. 14. Photomicrographs of the somatic chromosomes of *Eria hyacinsoides*.
A, flowers. B, chromosomes at resting stage. C, chromosomes at mitotic prophase. D, chromosomes at mitotic metaphase, 2n=38.
A, x 0.1. B–D, x 1500. E, x 3000.

The chromosome number of the two clones was examined to be 2n=38, a new report to this species.

The chromosomes at resting stage were observed as chromomeric granules and fibrous threads scattered in the whole region of nucleus. Several spherical chromocentral blocks which varied in number from 20 to 30 per nucleus were observed in the resting nuclei. The chromo-

central blocks were approximately 0.8 μm in diameter. Chromosomes at mitotic prophase formed early condensed segments located in proximal regions and transformed gradually to euchromatic segments located distally. Chromosome morphology at resting stage was found to be similar to that of *Eria rufinula* described above (p. 3). That is, the karyotypes of chromosomes were considered to belong to an intermediate category between the complex chromocenter type and the simple chromocenter type proposed by Tanaka (1971).

The chromosomes at mitotic metaphase were found to be similar to those of *Eria rufinula*. The 38 chromosomes varied in length gradually and ranged from 1.8 μm to 1.0 μm, and the positions of centromeres were all median, except for two (Nos. 9, 10) submedian chromosomes.

The metaphase chromosomes of this species were categorized to be the homogenous and a gradual karyotype according to chromosome length and the category of the symmetric karyotype according to arm ratio.

15. *Eria ovata* Ldl., 2n=38, Table 16 and Fig. 15. Validated specimen No. 3079, 3081, 3095.

Three clones were collected from Iriomote Island in Japan. External morphological char-

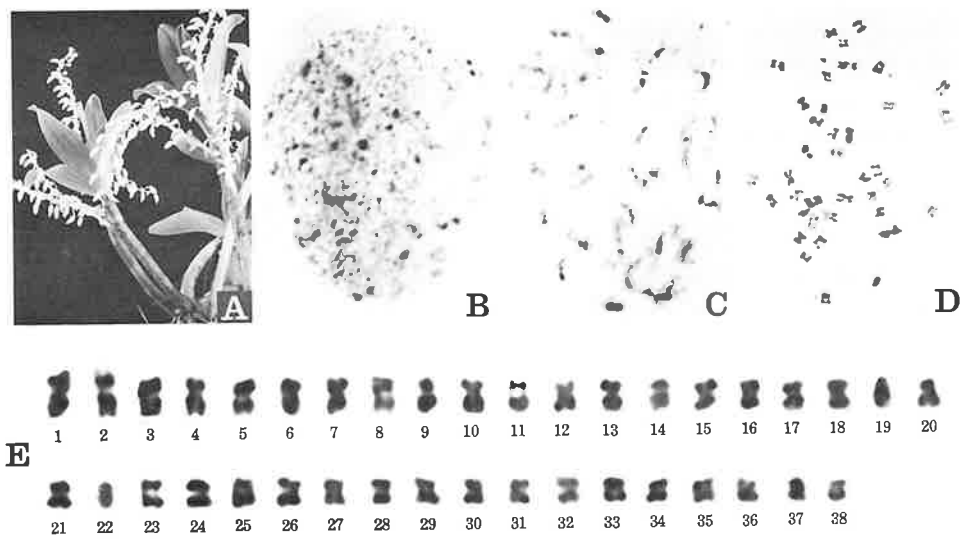

Fig. 15. Photomicrographs of the somatic chromosomes of *Eria ovata*.
A, flowers. B, chromosomes at resting stage. C, chromosomes at mitotic prophase. D, chromosomes at mitotic metaphase, 2n=38.
A, x 0.1. B–D, x 1500. E, x 3000.

acteristics of the clones were as follows: Stem was cylindrical, erect and usually 20 cm in length. Leaves were thick and narrowly elliptic. Inflorescences were lateral and about 15 cm in length. Flowers were yellowish white in color. Thus, this description is same as that of Liu and Su (1978).

The chromosome number of the three clones was examined to be all 2n=38, which was different from the number of 2n=44 previously reported by Pancho (1965), 2n=36 by Tanaka (1965) and n=18 in PMC's in *E. luchuensis* Yatabe; a synonym of this species by Terasaka and Tanaka (1974).

The chromosomes at resting stage were observed as chromomeric granules and fibrous threads scattered in the whole region of nucleus. Many spherical chromocentral blocks which varied in number from 20 to 30 per nucleus were observed in the resting nucleus. The chromocentral blocks were approximately 0.8 μm in diameter. At prophase the heterochromatic segments were located in the proximal regions and transformed gradually to euchromatic segments located distally. Chromosome morphology at resting stage was found to be similar to that of *Eria rufinula* described above (p. 3). That is, the karyotypes of chromosomes were an intermediate category between the complex chromocenter type and the simple chromocenter type proposed by Tanaka (1971).

The chromosomes at mitotic metaphase were found to be similar to those of *Eria bractescens*. The 38 chromosomes varied in length gradually and ranged from 2.0 μm to 0.9 μm, and the positions of centromeres were all median, except for two (Nos. 13, 14) submedian chromosomes. Among the 38 chromosomes two longest chromosomes were distinct. They were both 2.0 μm in length. Arm ratios of these two chromosomes were 1.5, and thus the positions of centromeres were median.

The metaphase chromosomes of this species were categorized to be heterogenous and a bimodal karyotype according to chromosome length and the category of the symmetric karyotype according to arm ratio.

16. *Eria reptans* (Fr. et Sav.) Makino, 2n=38, Table 17 and Fig. 16. Validated specimen No. 1273, 1274, 3078, 3088, 3089.

Five clones were collected from three localities shown in Table 1. External morphological characteristics of this species were as follows: Pseudobulb was ellipsoid and about 2.5 cm in length. Leaves were narrowly elliptic and about 5.5 cm in length. Inflorescence which bore one to four flowers was terminal and arose between the two leaves of the apex of stem. Flowers were white in color. Thus, this description is same as that of Ohwi (1978).

The chromosome numbers of the five clones were examined to be 2n=38 which confirmed the previous report (Tanaka 1965), and which did not confirmed the number of 2n=40 by Mutsuura & Nakahira (1958).

The chromosomes at resting stage were observed as chromomeric granules and fibrous threads scattered in the whole region of nucleus. Several spherical chromocentral blocks which varied in number from 6 to 10 per nucleus were observed in the resting nuclei. The chromocentral blocks were approximately 0.8 μm in diameter. The chromosomes at mitotic prophase formed early condensed segments located in proximal regions and transformed gradually to euchromatic segments located distally. Chromosome morphology at resting stage was found to be similar to that of *Eria rufinula* described above (p. 3). That is, the karyotype of chromosomes were an intermediate category between the complex chromocenter type and the simple chromocenter type proposed by Tanaka (1971).

The chromosomes at mitotic metaphase were found to be similar to those of *Eria bractescens*. The 38 chromosomes varied in length gradually and ranged from about 2.1 μm to 1.0 μm, and the positions of centromeres were all median, except for two (Nos. 17, 18) submedian

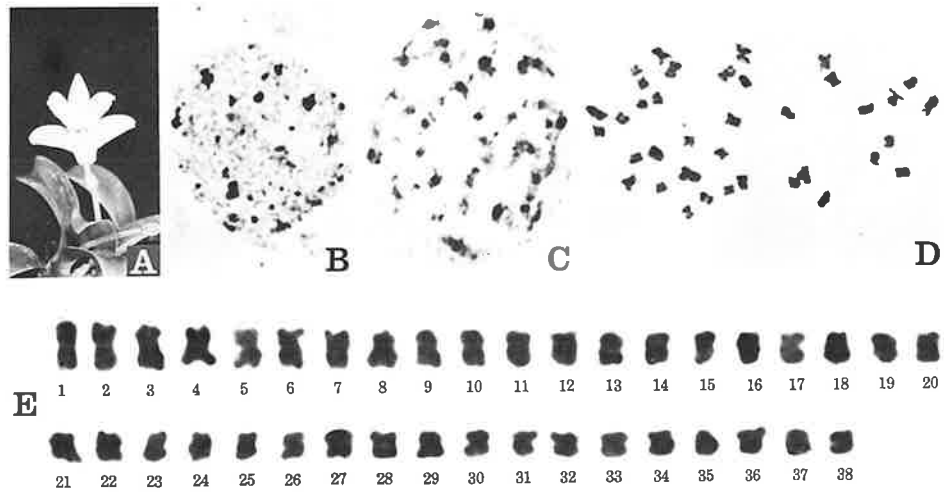

Fig. 16. Photomicrographs of the somatic chromosomes of *Eria reptans*.
A, flower. B, chromosomes at resting stage. C, chromosomes at mitotic prophase. D, chromosomes at mitotic metaphase, 2n=38.
A, x 0.8. B–D, x 1500. E, x 3000.

chromosomes.

The metaphase chromosomes of this species were categorized to be homogenous and a gradual karyotype according to chromosome length and the category of the symmetric karyotype according to arm ratio.

17. *Eria spicata* (D. Don) Hand.-Mazz., 2n=38, Table 18 and Fig. 17. Validated specimen No. 3119.

A clone was obtained from Thailand. External morphological characteristics of the clone were as follows: Pseudobulbs were stout and about 10 cm in length. Leaves were lanceolate and about 15 cm long. Inflorescence was spicate and densely flowered. Flowers were white in color. This species is still cultivated as *Eria convallarioides* Ldl.. Thus, this description is same as that of Seidenfaden and Smitinand (1960).

The chromosome number of the clone was examined to be 2n=38 which confirmed the previous report of n=19 in PMC's by Chardard (1963) and which did not confirmed the number of n=20 reported by Mehra & Vij (1970).

The chromosomes at resting stage were observed as chromomeric granules and fibrous threads scattered in the whole region of nucleus like other species described in this report. Besides some spherical chromocentral blocks two large blocks which were approximately 2.0 μm in diameter were also observed in the nuclei. At prophase the heterochromatic segments were

located almost in whole regions of two large chromosomes. The heterochromatic segments of other chromosome were located in the proximal regions and transformed gradually to euchromatic segments located distally. Thus, chromosome morphology at resting stage was considered to be an intermediate category between the complex chromocenter type and the simple chromocenter type proposed by Tanaka (1971).

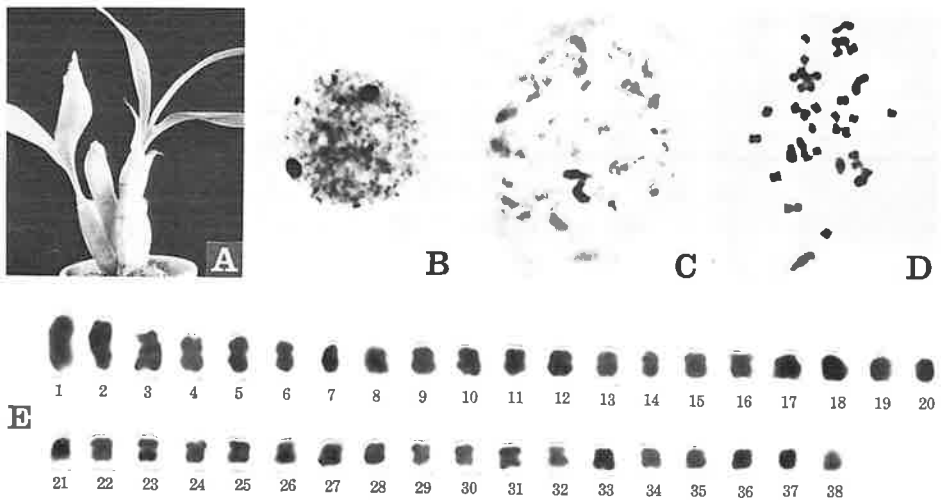

Fig. 17. Photomicrographs of the somatic chromosomes of *Eria spicata*.
A, seedling. B, chromosomes at resting stage. C, chromosomes at mitotic prophase. D, chromosomes at mitotic metaphase, 2n=38.
A, × 0.2. B–D, × 1500. E, × 3000.

The metaphase chromosomes were categorized to be heterogenous and a bimodal karyotype according to chromosome length and the category of the symmetric karyotype according to arm ratio.

Chromosomes at mitotic metaphase showed the gradual variation of length ranging from approximately 2.2 μm to 0.9 μm, and the positions of centromeres were median and submedian. Of the 38 chromosomes about 23 chromosomes were median and five (Nos. 3, 15 – 17, 18) were submedian. Two longest chromosomes were distinct. They were 2.2 μm in length and had the centromeres in median regions.

18. *Eria tomentosiflora* Hayata, 2n=38, Table 19 and Fig. 18. Validated specimen No. 3114, 3116.

Two clones were obtained from Formosa. External morphological characteristics of the clones were as follows: Stem was pendulous and new branches were developing from the middle nodes of old ones. Leaves were narrow and about 15 cm in length. Inflorescences were lateral and arose from under the leaves. Flowers were greenish yellow in color, tinged with redbrown. Thus, this description is same as that of Liu and Su (1978).

The chromosome number of the two clones was examined to be 2n=38, which was dif-

ferent from the number of 2n=44 in *Eria philippinensis* Ames, a synonym of this species, reported by Pancho (1965).

The chromosomes at resting stage were observed as chromomeric granules and fibrous

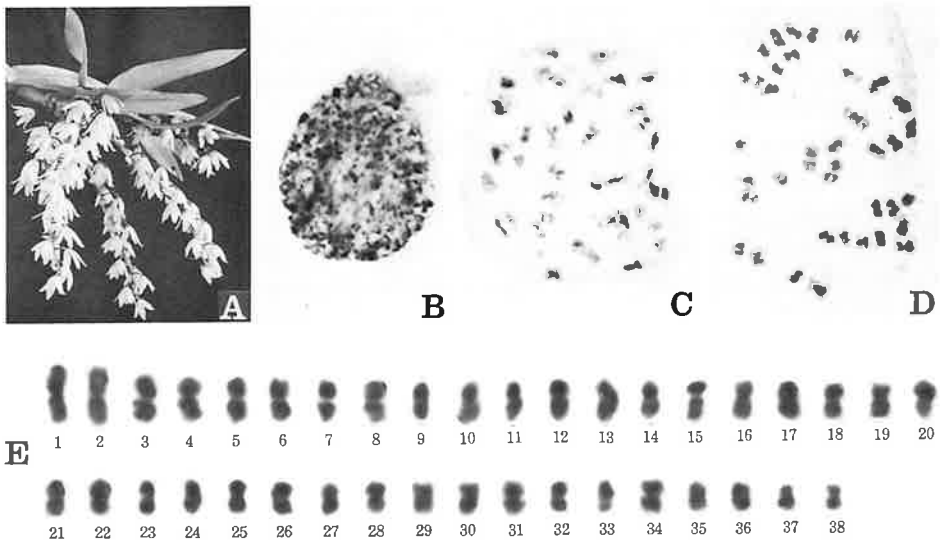

Fig. 18. Photomicrographs of the somatic chromosomes of *Eria tomentosiflora*.
A, flowers. B, chromosomes at resting stage. C, chromosomes at mitotic prophase. D, chromosomes at mitotic metaphase, 2n=38.
A, x 0.2. B–D, x 1500. E, x 3000.

threads scattered in the whole region of nucleus. Many spherical blocks which varied in number from 30 to 40 per nucleus were observed in the resting nuclei. The chromocentral blocks were approximately 0.8 μm in diameter. At prophase the heterochromatic segments were located in the proximal regions and transformed gradually to euchromatic segments located distally. Thus, the karyotype features were found to those of *Eria rufinula* described above (p. 3) with the exception of the shape of mitotic metaphase chromosomes. That is, chromosomes at metaphase showed the gradual variation of length ranging from approximately 2.5 μm to 1.1 μm, and the positions of the centromeres were median and submedian. Among the 38 chromosomes about 36 were median and two (Nos. 37, 38) were submedian.

The metaphase chromosomes were categorized to be heterogenous and a bimodal karyotype according to chromosome length and the category of the symmetric karyotype according to arm ratio.

Results and Discussion

In the present observations, chromosomes in the resting nuclei of 18 species of *Eria* were found to be highly variable amongst the species. There were four clear different karyotypes

classified in their resting nuclei proposed by Tanaka (1971): the simple chromocenter type, the complex chromocenter type, intermediate between one of those, and the prochromosome type. Among the 18 species only one species, *E. stricta* 2n=40, was observed to have the resting chromosomes of the simple chromocenter type. Three species, *E. corneri* 2n=36, *E. javanica* 2n=36 and *E. coronaria* 2n=36, were observed to have the resting chromosomes of the complex chromocenter type. The other 13 species showed resting chromosomes intermediate between the simple and the complex chromocenter type, with the exception for *E. biflora* 2n=46 of the prochromosome type.

The chromosome numbers of the species of *Eria* have been previously reported to be 2n= 36, 38, 40, 44 and 66 (Mutsuura & Nakahira 1958, Chardard 1963, Tanaka 1965, Pancho 1965, Sharma & Chatterji 1966, Mehra & Vij 1970, Terasaka & Tanaka 1974 and Mehra & Sehgal 1974). Thus, the chromosome numbers of 2n=42 and 2n=46 in the genus were counted here for the first time. In this study, the 2n=36 was observed in three species; *E. corneri, E. javanica* and *E. coronaria,* the 2n=38 in 12 species; *E. rufinula, E. ornata, E. pannea, E. floribunda, E. pachystachya, E. acervata, E. bractescens, E. hyacinsoides, E. ovata, E. reptans, E. spicata* and *E. tomentosiflora*; the 2n=40 in one species; *E. stricta*, the 2n=42 in one species; *E. graminifolia,* and the 2n=46 in one species; *E. biflora.* However, the 2n=44 and 2n=66 previously reported were not observed in the present materials.

Three species with the chromosome number 2n=36 had conspicuously long chromosomes, average lengths 3.2 μm, 2.5 μm and 2.3 μm, respectively, while *E. floribunda* 2n=38 had short sized chromosomes with the average length as 0.9 μm.

According to size variation in the member of the chromosome sets, there were three different types: gradient, bimodal and trimodal karyotypes. Seven species, *E. rufinula* 2n=38, *E. ornata* 2n=38, *E. stricta* 2n=40, *E. coronaria* 2n=36, *E. acervata* 2n=38, *E. hyacinsoides* 2n=38 and *E. reptans* 2n=38, were found to have gradient type, nine species, *E. pannea* 2n=38, *E. biflora* 2n=46, *E. floribunda* 2n=38, *E. pachystachya* 2n=38 and *E. bractescens* 2n=38, *E. graminifolia* 2n=42, *E. ovata* 2n=38, *E. spicata* 2n=38 and *E. tomentosiflora* 2n=38, bimodal type, and the other two species, *E. corneri* 2n=36 and *E. javanica* 2n=36, trimodal type.

According to symmetry degree depended on arm ratio, there were two types: symmetric and asymmetric types. The symmetric karyotype was observed in the species with the chromosome numbers of 2n=36, *E. corneri, E. javanica,* 2n=38, *E. ornata, E. pannea, E. floribunda, E. pachystachya, E. acervata, E. bractescens, E. hyacinsoides, E. ovata, E. reptans, E. spicata* and *E. tomentosiflora,* 2n=40, *E. stricta,* and 2n=46, *E. biflora,* while the asymmetric karyotype was observed in the species with the chromosome numbers of 2n=36, *E. coronaria,* 2n=38, *E. rufinula,* and 2n=42, *E. graminifolia.*

Thus, the present karyomorphological study classified and categorized the 18 species into nine groups:

Type A: *E. javanica, E. corneri*

Key characters; 2n=36, longer chromosomes, complex chromocenter type, heterogenous and trimodal karyotype according to chromosome length, symmetric karyotype according to arm ratio.

Type B: *E. coronaria*

Key characters; 2n=36, longer chromosomes, complex chromocenter type, homogenous and gradient karyotype according to chromosome length, asymmetric karyotype according to arm ratio.

Type C: *E. ornata*
Key characters; 2n=38, medium size chromosomes, intermediate chromocenter type, homogenous and gradient karyotype according to chromosome length, symmetric karyotype according to arm ratio.

Type D: *E. rufinula*
Key characters; 2n=38, medium size chromosomes, intermediate chromocenter type, homogenous and gradient karyotype according to chromosome length, asymmetric karyotype according to arm ratio.

Type E: *E. acervata, E. hyacinsoides, E. reptans*
Key characters; 2n=38, shorter chromosomes, intermediate chromocenter type, homogenous and gradient karyotype according to chromosome length, symmetric karyotype according to arm ratio.

Type F: *E. pannea, E. floribunda, E. pachystachya, E. bractescens, E. ovata, E. spicata, E. tomentosiflora*
Key characters; 2n=38, shorter chromosomes, intermediate chromocenter type, heterogenous and bimodal karyotype according to chromosome length, symmetric karyotype according to arm ratio.

Type G: *E. stricta*
Key characters; 2n=40, shorter chromosomes, simple chromocenter type, homogenous and gradient karyotype according to chromosome length, symmetric karyotype according to arm ratio.

Type H: *E. graminifolia*
Key characters; 2n=42, shorter chromosomes, intermediate chromocenter type, heterogenous and bimodal karyotype according to chromosome length, asymmetric karyotype according to arm ratio.

Type I: *E. biflora*
Key characters; 2n=46, shorter chromosomes, prochromosome type, heterogenous and bimodal karyotype according to chromosome length, symmetric karyotype according to arm ratio.

The basic classification of Thailand species of the genus *Eria* was established by Seidenfaden and Smitinand (1960): the 44 species were divided into 13 sections mainly by the morphology of pseudobulbs, inflorescences and floral structures. Eleven species belonged to eight sections were here studied: the karyotypes of nine species belonged to six sections justified Seidenfaden and Smitinand's classification (1960), but those of *E. pannea* and *E. floribunda* which belonged to sect. Strongyleria and sect. Urostachya were not karyomorphologically distinguished from the species of sect. Hymneria.

Among seven species which were not treated by Seidenfaden and Smitinand (1960), three from Japan, one from Formosa, two from Malaysia and one from India, could be grouped

into three sections, Goniorhabdos, Urostachya and Hymneria, of Seidenfaden and Smitinand's system (1960) (Table 1). Indeed, the results of the present karyotype analysis of six species, *E. corneri, E. pachystachya, E. hyacinsoides, E. ovata, E. reptans E. tomentosiflora,* supported Seidenfaden and Smitinand's system except for *E. graminifolia,* while those of *E. graminifolia* of sect. *Hymneria* taxonomically treated by Pradhan (1979) did not support the system since the chromosome number of this species was 2n=42, different from 2n=38 of the other species of this section.

Acknowledgements

The authors wish to express their cordial thanks to Dr. Ahmed Shakeel Chouhdry, Assistant Professor of Botany, Government Science College, Quetta, Pakistan and Dr. Katsuhiko Kondo, Associate Professor of Faculty of Integrated Arts and Sciences, Hiroshima University, Hiroshima for their valuable suggestions during the course of this study. We are also indebted to Dr. Kohji Karasawa, Director of the Hiroshima Botanical Garden, for his identifications of the materials studied.

Summary

1. Karyomorphological observations were carried out in 18 species of *Eria*.
2. The chromosome numbers of seven out of the 18 species studied, *E. rufinula* 2n=38, *E. javanica* 2n=36, *E. ornata* 2n=38, *E. stricta* 2n=40, *E. biflora* 2n=46, *E. pachystachya* 2n=38 and *E. hyacinsoides* 2n=38, were newly reported.
3. The chromosome numbers of seven species, *E. pannea* 2n=38, *E. floribunda* 2n=38, *E. acervata* 2n=38, *E. bractescens* 2n=38, *E. graminifolia* 2n=42, *E. ovata* 2n=38 and *E. tomentosiflora* 2n=38, differed from those which have been reported previously.
4. The chromosome numbers of 2n=42 and 2n=46 were reported as new to the genus *Eria.*
5. *E. corneri, E. javanica and E. coronaria* were found to have longer chromosomes than those of the other 15 species.
6. On the variation of chromosome length in a chromosome set, three different types, gradient, bimodal and trimodal, were observed.
7. On the degree of symmetry according to arm ratio of chromosome, the karyotypes of *E. corneri, E. javanica, E. coronaria, E. ornata, E. rufinula* and *E. graminifolia* were categorized to be of asymmetric types.
8. The eighteen species investigated were classified by chromosome morphology at resting stage into four groups: one species, *E. stricta* 2n=40, with the simple chromocenter type, three species, *E. corneri* 2n=36, *E. javanica* 2n=36 and *E. coronaria* 2n=36, with the complex chromocenter types, 13 species, *E. rufinula* 2n=38, *E. ornata* 2n=38, *E. pannea* 2n=38, *E. floribunda* 2n=38, *E. pachystachya* 2n=38, *E. acervata* 2n=38, *E. bractescens* 2n=38, *E. graminifolia* 2n=42, *E. hyacinosoides* 2n=38, *E. ovata* 2n=38, *E. reptans* 2n=38, *E. spicata*

2n=38 and *E. tomentosiflora* 2n=38, with the intermediate type and one species, *E. biflora* 2n=46, with the prochromosome type.

9. On the basis of the results of the karyomorphological study, the 18 species of *Eria* investigated were categorized into nine types: type A; *E. corneri, E. javanica,* type B; *E. coronaria*, type C; *E. ornata,* type D; *E. rufinula,* type E; *E. acervata, E. hyacinsoides, E. reptans,* type F; *E. pannea, E. floribunda, E. pachystachya, E. bractescens, E. ovata, E. spicata, E. tomentosiflora,* type G; *E. stricta,* type H; *E. graminifolia,* type I; *E. biflora.*

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Table 2. Measurements of somatic chromosomes of *Eria rufinula*, 2n = 38 at metaphase

Chromosome	Length (μm)	Relative length	Arm ratio	Form
1	1.0 + 1.5 = 2.5	3.6	1.5	m
2	0.9 + 1.5 = 2.4	3.4	1.7	m
3	1.0 + 1.3 = 2.3	3.3	1.3	m
4	0.9 + 1.3 = 2.2	3.2	1.4	m
5	0.7 + 1.4 = 2.1	3.0	1.4	m
6	0.7 + 1.4 = 2.1	3.0	1.4	m
7	0.9 + 1.1 = 2.0	2.9	1.2	m
8	0.9 + 1.1 = 2.0	2.9	1.2	m
9	0.5 + 1.5 = 2.0	2.9	3.0	sm
10	0.5 + 1.5 = 2.0	2.9	3.0	sm
11	0.4 + 1.5 = 1.9	2.7	3.8	st
12	0.4 + 1.5 = 1.9	2.7	3.8	st
13	0.4 + 1.5 = 1.9	2.7	3.8	st
14	0.4 + 1.5 = 1.9	2.7	3.8	st
15	0.4 + 1.5 = 1.9	2.7	3.8	st
16	0.4 + 1.5 = 1.9	2.7	3.8	st
17	0.4 + 1.5 = 1.9	2.7	3.8	st
18	0.4 + 1.5 = 1.9	2.7	3.8	st
19	0.4 + 1.5 = 1.9	2.7	3.8	st
20	0.4 + 1.5 = 1.9	2.7	3.8	st
21	0.8 + 1.1 = 1.9	2.7	1.4	m
22	0.8 + 1.1 = 1.9	2.7	1.4	m
23	0.6 + 1.1 = 1.7	2.4	1.8	sm
24	0.6 + 1.1 = 1.7	2.4	1.8	sm
25	0.8 + 0.9 = 1.7	2.4	1.1	m
26	0.8 + 0.9 = 1.7	2.4	1.1	m
27	0.4 + 1.3 = 1.7	2.4	3.3	st
28	0.4 + 1.3 = 1.7	2.4	3.3	st
29	0.7 + 0.9 = 1.6	2.3	1.3	m
30	0.7 + 0.9 = 1.6	2.3	1.3	m
31	0.5 + 1.1 = 1.6	2.3	2.2	sm
32	0.6 + 1.0 = 1.6	2.3	1.7	m
33	0.4 + 1.1 = 1.5	2.2	2.8	sm
34	0.4 + 1.1 = 1.5	2.2	2.8	sm
35	0.4 + 1.1 = 1.5	2.2	2.8	sm
36	0.4 + 1.1 = 1.5	2.2	2.8	sm
37	0.5 + 0.9 = 1.4	2.0	1.8	sm
38	0.4 + 0.9 = 1.3	1.9	2.3	sm

Table 3. Measurements of somatic chromosomes of *Eria corneri*, 2n = 36 at metaphase

Chromosome	Length (μm)	Relative length	Arm ratio	Form
1	1.5 + 1.9 = 3.4	3.8	1.3	m
2	1.5 + 1.9 = 3.4	3.8	1.3	m
3	1.2 = 1.9 = 3.1	3.5	1.6	m
4	1.2 + 1.9 = 3.1	3.5	1.6	m
5	1.2 + 1.9 = 3.1	3.5	1.6	m
6	1.2 + 1.9 = 3.1	3.5	1.6	m
7	1.1 + 1.8 = 2.9	3.2	1.6	m
8	1.1 + 1.8 = 2.9	3.2	1.6	m
9	1.3 + 1.4 = 2.7	3.0	1.1	m
10	1.3 + 1.4 = 2.7	3.0	1.1	m
11	1.0 + 1.7 = 2.7	3.0	1.7	m
12	1.0 + 1.7 = 2.7	3.0	1.7	m
13	1.0 + 1.7 = 2.7	3.0	1.7	m
14	1.0 + 1.7 = 2.7	3.0	1.7	m
15	1.1 + 1.5 = 2.6	2.9	1.4	m
16	1.1 + 1.5 = 2.6	2.9	1.4	m
17	0.7 + 1.9 = 2.6	2.9	2.7	sm
18	0.7 + 1.9 = 2.6	2.9	2.7	sm
19	1.0 + 1.6 = 2.6	2.9	1.6	m
20	0.9 + 1.6 = 2.5	2.8	1.8	sm
21	1.0 + 1.4 = 2.4	2.7	1.4	m
22	0.8 + 1.6 = 2.4	2.7	2.0	sm
23	0.8 + 1.5 = 2.3	2.6	1.9	sm
24	0.8 + 1.5 = 2.3	2.6	1.9	sm
25	0.7 + 1.6 = 2.3	2.6	2.3	sm
26	0.7 + 1.6 = 2.3	2.6	2.3	sm
27	0.9 + 1.3 = 2.2	2.5	1.4	m
28	0.8 + 1.4 = 2.2	2.5	1.8	sm
29	1.0 + 1.1 = 2.1	2.3	1.1	m
30	1.0 + 1.1 = 2.1	2.3	1.1	m
31	0.9 + 1.1 = 2.0	2.2	1.2	m
32	0.9 + 1.1 = 2.0	2.2	1.2	m
33	0.9 + 1.0 = 1.9	2.1	1.1	m
34	0.8 + 1.0 = 1.8	2.0	1.3	m
35	0.6 + 0.6 = 1.2	1.3	1.0	m
36	0.6 + 0.6 = 1.2	1.3	1.0	m

Table 4. Measurements of somatic chromosomes of *Eria javanica*, 2n = 36 at metaphase

Chromosome	Length (μm)	Relative length	Arm ratio	Form
1	2.2 + 2.4 = 4.6	3.9	1.1	m
2	2.0 + 2.4 = 4.4	3.7	1.2	m
3	1.8 + 2.0 = 3.8	3.2	1.1	m
4	1.8 + 2.0 = 3.8	3.2	1.1	m
5	1.3 + 2.5 = 3.8	3.2	1.9	sm
6	1.2 + 2.5 = 3.7	3.2	2.1	sm
7	1.2 + 2.4 = 3.6	3.1	2.0	sm
8	1.1 + 2.4 = 3.5	3.0	2.2	sm
9	1.6 + 1.9 = 3.5	3.0	1.2	m
10	1.6 + 1.9 = 3.5	3.0	1.2	m
11	1.4 + 2.1 = 3.5	3.0	1.5	m
12	1.4 + 2.1 = 3.5	3.0	1.5	m
13	1.6 + 1.9 = 3.5	3.0	1.2	m
14	1.6 + 1.9 = 3.5	3.0	1.2	m
15	1.6 + 1.8 = 3.4	2.8	1.1	m
16	1.6 + 1.8 = 3.4	2.8	1.1	m
17	1.1 + 2.1 = 3.2	2.7	1.9	sm
18	1.1 + 2.1 = 3.2	2.7	1.9	sm
19	0.8 + 2.3 = 3.1	2.6	2.9	sm
20	0.8 + 2.3 = 3.1	2.6	2.9	sm
21	1.3 + 1.8 = 3.1	2.6	1.4	m
22	1.3 + 1.7 = 3.0	2.6	1.4	m
23	1.5 + 1.5= 3.0	2.6	1.0	m
24	1.4 + 1.5 = 2.9	2.5	1.1	m
25	1.5 + 1.5 = 3.0	2.6	1.0	m
26	1.5 + 1.5 = 3.0	2.6	1.0	m
27	1.3 + 1.7 = 3.0	2.6	1.3	m
28	1.3 + 1.7 = 3.0	2.6	1.3	m
29	1.3 + 1.7 = 3.0	2.6	1.3	m
30	1.3 + 1.7 = 3.0	2.6	1.3	m
31	1.1 + 1.9 = 3.0	2.6	1.7	m
32	1.1 + 1.9 = 3.0	2.6	1.7	m
33	1.1 + 1.5 = 2.6	2.2	1.4	m
34	1.1 + 1.5 = 2.6	2.2	1.4	m
35	1.0 + 1.4 = 2.4	2.1	1.4	m
36	1.0 + 1.4 = 2.4	2.1	1.4	m

Table 5. Measurements of somatic chromosomes of *Eria ornata*, 2n = 38 at metaphase

Chromosome	Length (μm)	Relative length	Arm ratio	Form
1	0.9 + 1.8 = 2.7	3.3	2.0	sm
2	0.9 + 1.8 = 2.7	3.3	2.0	sm
3	1.2 + 1.3 = 2.5	3.0	1.1	m
4	1.2 + 1.3 = 2.5	3.0	1.1	m
5	1.2 + 1.3 = 2.5	3.0	1.1	m
6	1.2 + 1.3 = 2.5	3.0	1.1	m
7	1.2 + 1.3 = 2.5	3.0	1.1	m
8	1.2 + 1.2 = 2.4	2.9	1.0	m
9	1.0 + 1.4 = 2.4	2.9	1.4	m
10	0.9 + 1.5 = 2.4	2.9	1.7	m
11	0.9 + 1.5 = 2.4	2.9	1.7	m
12	0.9 + 1.5 = 2.4	2.9	1.7	m
13	0.9 + 1.5 = 2.4	2.9	1.7	m
14	0.8 + 1.6 = 2.4	2.9	2.0	sm
15	0.9 + 1.4 = 2.3	2.8	1.6	m
16	1.0 + 1.2 = 2.2	2.7	1.2	m
17	1.0 + 1.2 = 2.2	2.7	1.2	m
18	0.7 + 1.5 = 2.2	2.7	2.1	sm
19	0.7 + 1.5 = 2.2	2.7	2.1	sm
20	0.7 + 1.5 = 2.2	2.7	2.1	sm
21	0.9 + 1.2 = 2.1	2.6	1.3	m
22	0.9 + 1.2 = 2.1	2.6	1.3	m
23	0.9 + 1.2 = 2.1	2.6	1.3	m
24	0.9 + 1.2 = 2.1	2.6	1.3	m
25	0.7 + 1.4 = 2.1	2.6	2.0	sm
26	0.7 + 1.4 = 2.1	2.6	2.0	sm
27	0.8 + 1.2 = 2.0	2.4	1.5	m
28	0.8 + 1.2 = 2.0	2.4	1.5	m
29	0.8 + 1.2 = 2.0	2.4	1.5	m
30	0.8 + 1.1 = 1.9	2.3	1.4	m
31	0.8 + 1.1 = 1.9	2.3	1.4	m
32	0.5 + 1.4 = 1.9	2.3	2.8	sm
33	0.7 + 1.1 = 1.8	2.2	1.6	m
34	0.7 + 1.1 = 1.8	2.2	1.6	m
35	0.7 + 1.0 = 1.7	2.1	1.4	m
36	0.7 + 1.0 = 1.7	2.1	1.4	m
37	0.6 + 0.9 = 1.5	1.8	1.5	m
38	0.6 + 0.9 = 1.5	1.8	1.5	m

Table 6. Measurements of somatic chromosomes of *Eria pannea*, 2n = 38 at metaphase

Chromosome	Length (μm)	Relative length	Arm ratio	Form
1	1.0 + 1.3 = 2.3	4.0	1.3	m
2	1.0 + 1.2 = 2.2	3.8	1.2	m
3	0.9 + 1.0 = 1.9	3.3	1.1	m
4	0.9 + 1.0 = 1.9	3.3	1.1	m
5	0.8 + 1.0 = 1.8	3.1	1.3	m
6	0.8 + 0.9 = 1.7	3.0	1.1	m
7	0.7 + 1.0 = 1.7	3.0	1.4	m
8	0.7 + 1.0 = 1.7	3.0	1.4	m
9	0.7 + 1.0 = 1.7	3.0	1.4	m
10	0.7 + 1.0 = 1.7	3.0	1.4	m
11	0.8 + 0.8 = 1.6	2.8	1.0	m
12	0.8 + 0.8 = 1.6	2.8	1.0	m
13	0.7 + 0.9 = 1.6	2.8	1.3	m
14	0.7 + 0.9 = 1.6	2.8	1.3	m
15	0.7 + 0.8 = 1.5	2.6	1.1	m
16	0.7 + 0.8 = 1.5	2.6	1.1	m
17	0.7 + 0.8 = 1.5	2.6	1.1	m
18	0.7 + 0.8 = 1.5	2.6	1.1	m
19	0.6 + 0.9 = 1.5	2.6	1.5	m
20	0.6 + 0.9 = 1.5	2.6	1.5	m
21	0.7 + 0.7 = 1.4	2.4	1.0	m
22	0.7 + 0.7 = 1.4	2.4	1.0	m
23	0.7 + 0.7 = 1.4	2.4	1.0	m
24	0.7 + 0.7 = 1.4	2.4	1.0	m
25	0.6 + 0.8 = 1.4	2.4	1.3	m
26	0.6 + 0.8 = 1.4	2.4	1.3	m
27	0.6 + 0.7 = 1.3	2.3	1.2	m
28	0.6 + 0.7 = 1.3	2.3	1.2	m
29	0.6 + 0.7 = 1.3	2.3	1.2	m
30	0.6 + 0.7 = 1.3	2.3	1.2	m
31	0.4 + 0.9 = 1.3	2.3	2.3	sm
32	0.4 + 0.9 = 1.3	2.3	2.3	sm
33	0.4 + 0.9 = 1.3	2.3	2.3	sm
34	0.4 + 0.9 = 1.3	2.3	2.3	sm
35	0.5 + 0.7 = 1.2	2.1	1.4	m
36	0.5 + 0.7 = 1.2	2.1	1.4	m
37	0.4 + 0.6 = 1.0	1.9	1.5	m
38	0.4 + 0.6 = 1.0	1.9	1.5	m

Table 7. Measurements of somatic chromosomes of *Eria stricta*, 2n = 40 at metaphase

Chromosome	Length (μm)	Relative length	Arm ratio	Form
1	0.9 + 1.3 = 2.2	3.6	1.4	m
2	0.9 + 1.3 = 2.2	3.6	1.4	m
3	0.9 + 1.1 = 2.0	3.3	1.2	m
4	0.9 + 1.1 = 2.0	3.3	1.2	m
5	0.7 + 1.1 = 1.8	3.0	1.6	m
6	0.8 + 1.0 = 1.8	3.0	1.3	m
7	0.8 + 1.0 = 1.8	3.0	1.3	m
8	0.9 + 0.9 = 1.8	3.0	1.0	m
9	0.8 + 0.9 = 1.7	2.8	1.1	m
10	0.8 + 0.9 = 1.7	2.8	1.1	m
11	0.7 + 1.0 = 1.7	2.8	1.4	m
12	0.7 + 1.0 = 1.7	2.8	1.4	m
13	0.7 + 0.9 = 1.6	2.6	1.3	m
14	0.7 + 0.9 = 1.6	2.6	1.3	m
15	0.7 + 0.9 = 1.6	2.6	1.3	m
16	0.7 + 0.9 = 1.6	2.6	1.3	m
17	0.7 + 0.8 = 1.5	2.5	1.1	m
18	0.7 + 0.8 = 1.5	2.5	1.1	m
19	0.6 + 0.9 = 1.5	2.5	1.5	m
20	0.6 + 0.9 = 1.5	2.5	1.5	m
21	0.6 + 0.8 = 1.4	2.3	1.3	m
22	0.6 + 0.8 = 1.4	2.3	1.3	m
23	0.6 + 0.8 = 1.4	2.3	1.3	m
24	0.6 + 0.8 = 1.4	2.3	1.3	m
25	0.6 + 0.8 = 1.4	2.3	1.3	m
26	0.6 + 0.8 = 1.4	2.3	1.3	m
27	0.7 + 0.7 = 1.4	2.3	1.0	m
28	0.7 + 0.7 = 1.4	2.3	1.0	m
29	0.6 + 0.7 = 1.3	2.1	1.2	m
30	0.6 + 0.7 = 1.3	2.1	1.2	m
31	0.5 + 0.8 = 1.3	2.1	1.6	m
32	0.5 + 0.8 = 1.3	2.1	1.6	m
33	0.5 + 0.8 = 1.3	2.1	1.6	m
34	0.5 + 0.8 = 1.3	2.1	1.6	m
35	0.4 + 0.9 = 1.3	2.1	2.3	sm
36	0.4 + 0.9 = 1.3	2.1	2.3	sm
37	0.5 + 0.6 = 1.1	1.8	1.2	m
38	0.5 + 0.6 = 1.1	1.8	1.2	m
39	0.5 + 0.5 = 1.0	1.7	1.0	m
40	0.5 + 0.5 = 1.0	1.7	1.0	m

Table 8. Measurements of somatic chromosomes of *Eria coronaria*, 2n = 36 at metaphase

Chromosome	Length (μm)	Relative length	Arm ratio	Form
1	1.2 + 1.8 = 3.0	3.6	1.5	m
2	1.2 + 1.8 = 3.0	3.6	1.5	m
3	1.2 + 1.8 = 3.0	3.6	1.5	m
4	1.3 + 1.6 = 2.9	3.4	1.2	m
5	1.2 + 1.6 = 2.8	3.3	1.3	m
6	1.1 + 1.7 = 2.8	3.3	1.5	m
7	1.1 + 1.6 = 2.7	3.2	1.5	m
8	1.1 + 1.6 = 2.7	3.2	1.5	m
9	1.1 + 1.6 = 2.7	3.2	1.5	m
10	1.0 + 1.7 = 2.7	3.2	1.7	m
11	1.0 + 1.7 = 2.7	3.2	1.7	m
12	0.6 + 2.1 = 2.7	3.2	3.5	st
13	1.1 + 1.5 = 2.6	3.1	1.4	m
14	1.0 + 1.6 = 2.6	3.1	1.6	m
15	0.9 + 1.7 = 2.6	3.1	1.9	sm
16	0.9 + 1.6 = 2.5	3.0	1.9	sm
17	1.1 + 1.3 = 2.4	2.8	1.2	m
18	1.1 + 1.3 = 2.4	2.8	1.2	m
19	1.1 + 1.3 = 2.4	2.8	1.2	m
20	1.0 + 1.4 = 2.4	2.8	1.4	m
21	0.9 + 1.5 = 2.4	2.8	1.7	m
22	0.9 + 1.4 = 2.3	2.7	1.6	m
23	0.9 + 1.4 = 2.3	2.7	1.6	m
24	0.5 + 1.8 = 2.3	2.7	3.6	st
25	0.8 + 1.4 = 2.2	2.6	1.8	sm
26	0.6 + 1.5 = 2.1	2.5	2.5	sm
27	0.6 + 1.5 = 2.1	2.5	2.5	sm
28	0.6 + 1.4 = 2.0	2.4	2.3	sm
29	0.6 + 1.3 = 1.9	2.3	2.2	sm
30	0.6 + 1.3 = 1.9	2.3	2.2	sm
31	0.7 + 1.1 = 1.8	2.1	1.6	m
32	0.8 + 0.9 = 1.7	2.0	1.1	m
33	0.7 + 0.8 = 1.5	1.8	1.1	m
34	0.6 + 0.9 = 1.5	1.8	1.5	m
35	0.5 + 0.9 = 1.4	1.7	1.8	sm
36	0.5 + 0.9 = 1.4	1.7	1.8	sm

Table 9. Measurements of somatic chromosomes of *Eria biflora*, 2n = 46 at metaphase

Chromosome	Length (μm)	Relative length	Arm ratio	Form
1	1.0 + 1.9 = 2.9	3.8	1.9	sm
2	1.0 + 1.7 = 2.7	3.5	1.7	m
3	0.9 + 1.8 = 2.7	3.5	2.0	sm
4	1.1 + 1.3 = 2.4	3.1	1.2	m
5	0.8 + 1.4 = 2.2	2.9	1.8	sm
6	0.8 + 1.3 = 2.1	2.7	1.6	m
7	0.9 + 1.2 = 2.1	2.7	1.3	m
8	0.9 + 1.0 = 1.9	2.5	1.1	m
9	0.9 + 1.0 = 1.9	2.5	1.1	m
10	0.9 + 1.0 = 1.9	2.5	1.1	m
11	0.9 + 1.0 = 1.9	2.5	1.1	m
12	0.9 + 1.0 = 1.9	2.5	1.1	m
13	0.8 + 1.1 = 1.9	2.5	1.4	m
14	0.6 + 1.3 = 1.9	2.5	2.2	sm
15	0.9 + 0.9 = 1.8	2.3	1.0	m
16	0.9 + 0.9 = 1.8	2.3	1.0	m
17	0.9 + 0.9 = 1.8	2.3	1.0	m
18	0.9 + 0.9 = 1.8	2.3	1.0	m
19	0.8 + 0.9 = 1.7	2.2	1.1	m
20	0.8 + 0.9 = 1.7	2.2	1.1	m
21	0.8 + 0.9 = 1.7	2.2	1.1	m
22	0.8 + 0.9 = 1.7	2.2	1.1	m
23	0.7 + 0.9 = 1.6	2.1	1.3	m
24	0.7 + 0.9 = 1.6	2.1	1.3	m
25	0.7 + 0.8 = 1.5	2.0	1.1	m
26	0.7 + 0.8 = 1.5	2.0	1.1	m
27	0.7 + 0.8 = 1.5	2.0	1.1	m
28	0.7 + 0.8 = 1.5	2.0	1.1	m
29	0.7 + 0.8 = 1.5	2.0	1.1	m
30	0.7 + 0.8 = 1.5	2.0	1.1	m
31	0.6 + 0.8 = 1.4	1.8	1.3	m
32	0.6 + 0.8 = 1.4	1.8	1.3	m
33	0.7 + 0.7 = 1.4	1.8	1.0	m
34	0.7 + 0.7 = 1.4	1.8	1.0	m
35	0.6 + 0.7 = 1.3	1.7	1.2	m
36	0.5 + 0.8 = 1.3	1.7	1.6	m
37	0.5 + 0.8 = 1.3	1.7	1.6	m
38	0.6 + 0.7 = 1.3	1.7	1.2	m
39	0.6 + 0.6 = 1.2	1.6	1.0	m
40	0.6 + 0.6 = 1.2	1.6	1.0	m
41	0.5 + 0.7 = 1.2	1.6	1.4	m
42	0.5 + 0.7 = 1.2	1.6	1.4	m
43	0.5 + 0.7 = 1.2	1.6	1.4	m
44	0.5 + 0.7 = 1.2	1.6	1.4	m
45	0.5 + 0.6 = 1.1	1.4	1.2	m
46	0.5 + 0.6 = 1.1	1.4	1.2	m

Table 10. Measurements of somatic chromosomes of *Eria floribunda*, 2n = 38 at metaphase

Chromosome	Length (μm)	Relative length	Arm ratio	Form
1	0.7 + 0.8 = 1.5	4.5	1.1	m
2	0.7 + 0.8 = 1.5	4.5	1.1	m
3	0.5 + 0.7 = 1.2	3.6	1.4	m
4	0.5 + 0.7 = 1.2	3.6	1.4	m
5	0.5 + 0.6 = 1.1	3.3	1.2	m
6	0.5 + 0.6 = 1.1	3.3	1.2	m
7	0.4 + 0.6 = 1.0	3.0	1.5	m
8	0.4 + 0.6 = 1.0	3.0	1.5	m
9	0.4 + 0.6 = 1.0	3.0	1.5	m
10	0.4 + 0.6 = 1.0	3.0	1.5	m
11	0.4 + 0.6 = 1.0	3.0	1.5	m
12	0.4 + 0.6 = 1.0	3.0	1.5	m
13	0.3 + 0.6 = 0.9	2.7	2.0	sm
14	0.3 + 0.6 = 0.9	2.7	2.0	sm
15	0.4 + 0.4 = 0.8	2.4	1.0	m
16	0.4 + 0.4 = 0.8	2.4	1.0	m
17	0.4 + 0.4 = 0.8	2.4	1.0	m
18	0.4 + 0.4 = 0.8	2.4	1.0	m
19	0.3 + 0.5 = 0.8	2.4	1.7	m
20	0.3 + 0.5 = 0.8	2.4	1.7	m
21	0.3 + 0.5 = 0.8	2.4	1.7	m
22	0.3 + 0.5 = 0.8	2.4	1.7	m
23	0.3 + 0.5 = 0.8	2.4	1.7	m
24	0.3 + 0.5 = 0.8	2.4	1.7	m
25	0.3 + 0.5 = 0.8	2.4	1.7	m
26	0.3 + 0.5 = 0.8	2.4	1.7	m
27	0.3 + 0.4 = 0.7	2.1	1.3	m
28	0.3 + 0.4 = 0.7	2.1	1.3	m
29	0.3 + 0.4 = 0.7	2.1	1.3	m
30	0.3 + 0.4 = 0.7	2.1	1.3	m
31	0.3 + 0.4 = 0.7	2.1	1.3	m
32	0.3 + 0.4 = 0.7	2.1	1.3	m
33	0.3 + 0.4 = 0.7	2.1	1.3	m
34	0.3 + 0.4 = 0.7	2.1	1.3	m
35	0.3 + 0.4 = 0.7	2.1	1.3	m
36	0.3 + 0.4 = 0.7	2.1	1.3	m
37	0.3 + 0.4 = 0.7	2.1	1.3	m
38	0.3 + 0.4 = 0.7	2.1	1.3	m

Table 11. Measurements of somatic chromosomes of *Eria pachystachya*, 2n=38 at metaphase

Chromosome	Length (μm)	Relative length	Arm ratio	Form
1	0.8 + 1.0 = 1.8	4.0	1.3	m
2	0.8 + 1.0 = 1.8	4.0	1.3	m
3	0.6 + 1.0 = 1.6	3.5	1.7	m
4	0.6 + 0.9 = 1.5	3.3	1.5	m
5	0.6 + 0.8 = 1.4	3.1	1.3	m
6	0.6 + 0.8 = 1.4	3.1	1.3	m
7	0.6 + 0.8 = 1.4	3.1	1.3	m
8	0.6 + 0.8 = 1.4	3.1	1.3	m
9	0.6 + 0.8 = 1.4	3.1	1.3	m
10	0.6 + 0.8 = 1.4	3.1	1.3	m
11	0.6 + 0.7 = 1.3	2.9	1.2	m
12	0.6 + 0.7 = 1.3	2.9	1.2	m
13	0.6 + 0.6 = 1.2	2.6	1.0	m
14	0.6 + 0.6 = 1.2	2.6	1.0	m
15	0.5 + 0.7 = 1.2	2.6	1.4	m
16	0.5 + 0.7 = 1.2	2.6	1.4	m
17	0.4 + 0.8 = 1.2	2.6	2.0	sm
18	0.4 + 0.8 = 1.2	2.6	2.0	sm
19	0.4 + 0.8 = 1.2	2.6	2.0	sm
20	0.4 + 0.8 = 1.2	2.6	2.0	sm
21	0.5 + 0.6 = 1.1	2.4	1.2	m
22	0.5 + 0.6 = 1.1	2.4	1.2	m
23	0.5 + 0.6 = 1.1	2.4	1.2	m
24	0.5 + 0.6 = 1.1	2.4	1.2	m
25	0.5 + 0.6 = 1.1	2.4	1.2	m
26	0.5 + 0.6 = 1.1	2.4	1.2	m
27	0.4 + 0.6 = 1.0	2.2	1.5	m
28	0.4 + 0.6 = 1.0	2.2	1.5	m
29	0.4 + 0.6 = 1.0	2.2	1.5	m
30	0.4 + 0.6 = 1.0	2.2	1.5	m
31	0.4 + 0.6 = 1.0	2.2	1.5	m
32	0.4 + 0.6 = 1.0	2.2	1.5	m
33	0.4 + 0.5 = 0.9	2.0	1.3	m
34	0.4 + 0.5 = 0.9	2.0	1.3	m
35	0.4 + 0.5 = 0.9	2.0	1.3	m
36	0.4 + 0.5 = 0.9	2.0	1.3	m
37	0.4 + 0.5 = 0.9	2.0	1.3	m
38	0.4 + 0.5 = 0.9	2.0	1.3	m

Table 12. Measurements of somatic chromosomes of *Eria acervata*, 2n = 38 at metaphase

Chromosome	Length (μm)	Relative length	Arm ratio	Form
1	0.7 + 1.0 = 1.7	3.6	1.4	m
2	0.7 + 1.0 = 1.7	3.6	1.4	m
3	0.8 + 0.9 = 1.7	3.6	1.1	m
4	0.8 + 0.9 = 1.7	3.6	1.1	m
5	0.7 + 0.8 = 1.5	3.1	1.1	m
6	0.7 + 0.8 = 1.5	3.1	1.1	m
7	0.7 + 0.8 = 1.5	3.1	1.1	m
8	0.7 + 0.8 = 1.5	3.1	1.1	m
9	0.6 + 0.8 = 1.4	2.9	1.3	m
10	0.6 + 0.8 = 1.4	2.9	1.3	m
11	0.6 + 0.8 = 1.4	2.9	1.3	m
12	0.6 + 0.8 = 1.4	2.9	1.3	m
13	0.6 + 0.7 = 1.3	2.7	1.2	m
14	0.6 + 0.7 = 1.3	2.7	1.2	m
15	0.6 + 0.7 = 1.3	2.7	1.2	m
16	0.6 + 0.7 = 1.3	2.7	1.2	m
17	0.5 + 0.8 = 1.3	2.7	1.6	m
18	0.5 + 0.8 = 1.3	2.7	1.6	m
19	0.6 + 0.6 = 1.2	2.5	1.0	m
20	0.6 + 0.6 = 1.2	2.5	1.0	m
21	0.5 + 0.7 = 1.2	2.5	1.4	m
22	0.5 + 0.7 = 1.2	2.5	1.4	m
23	0.5 + 0.7 = 1.2	2.5	1.4	m
24	0.5 + 0.7 = 1.2	2.5	1.4	m
25	0.5 + 0.6 = 1.1	2.3	1.2	m
26	0.5 + 0.6 = 1.1	2.3	1.2	m
27	0.4 + 0.7 = 1.1	2.3	1.8	sm
28	0.4 + 0.7 = 1.1	2.3	1.8	sm
29	0.4 + 0.7 = 1.1	2.3	1.8	sm
30	0.4 + 0.7 = 1.1	2.3	1.8	sm
31	0.3 + 0.8 = 1.1	2.3	2.7	sm
32	0.3 + 0.8 = 1.1	2.3	2.7	sm
33	0.4 + 0.6 = 1.0	2.1	1.5	m
34	0.4 + 0.6 = 1.0	2.1	1.5	m
35	0.4 + 0.5 = 0.9	1.9	1.3	m
36	0.4 + 0.5 = 0.9	1.9	1.3	m
37	0.4 + 0.5 = 0.9	1.9	1.3	m
38	0.4 + 0.5 = 0.9	1.9	1.3	m

Table 13. Measurements of somatic chromosomes of *Eria bractescens*, 2n = 38 at metaphase

Chromosome	Length (μm)	Relative length	Arm ratio	Form
1	1.3 + 1.4 = 2.7	4.2	1.1	m
2	1.3 + 1.4 = 2.7	4.2	1.1	m
3	1.0 + 1.0 = 2.0	3.1	1.0	m
4	1.0 + 1.0 = 2.0	3.1	1.0	m
5	0.9 + 1.1 = 2.0	3.1	1.2	m
6	0.9 + 1.1 = 2.0	3.1	1.2	m
7	0.7 + 1.2 = 1.9	3.0	1.7	m
8	0.7 + 1.2 = 1.9	3.0	1.7	m
9	0.9 + 1.0 = 1.9	3.0	1.1	m
10	0.9 + 1.0 = 1.9	3.0	1.1	m
11	0.8 + 1.0 = 1.8	2.8	1.3	m
12	0.8 + 1.0 = 1.8	2.8	1.3	m
13	0.8 + 1.0 = 1.8	2.8	1.3	m
14	0.8 + 1.0 = 1.8	2.8	1.3	m
15	0.8 + 0.9 = 1.7	2.6	1.1	m
16	0.8 + 0.9 = 1.7	2.6	1.1	m
17	0.8 + 0.9 = 1.7	2.6	1.1	m
18	0.8 + 0.9 = 1.7	2.6	1.1	m
19	0.8 + 0.9 = 1.7	2.6	1.1	m
20	0.8 + 0.9 = 1.7	2.6	1.1	m
21	0.7 + 0.9 = 1.6	2.5	1.3	m
22	0.7 + 0.9 = 1.6	2.5	1.3	m
23	0.7 + 0.9 = 1.6	2.5	1.3	m
24	0.7 + 0.9 = 1.6	2.5	1.3	m
25	0.7 + 0.9 = 1.6	2.5	1.3	m
26	0.7 + 0.9 = 1.6	2.5	1.3	m
27	0.7 + 0.8 = 1.5	2.3	1.1	m
28	0.7 + 0.8 = 1.5	2.3	1.1	m
29	0.6 + 0.9 = 1.5	2.3	1.5	m
30	0.6 + 0.9 = 1.5	2.3	1.5	m
31	0.6 + 0.8 = 1.4	2.2	1.3	m
32	0.6 + 0.8 = 1.4	2.2	1.3	m
33	0.6 + 0.7 = 1.3	2.0	1.2	m
34	0.6 + 0.7 = 1.3	2.0	1.2	m
35	0.5 + 0.7 = 1.2	1.9	1.4	m
36	0.5 + 0.7 = 1.2	1.9	1.4	m
37	0.5 + 0.7 = 1.2	1.9	1.4	m
38	0.5 + 0.7 = 1.2	1.9	1.4	m

Table 14. Measurements of somatic chromosomes of *Eria graminifolia*, 2n = 42 at metaphase

Chromosome	Length (μm)	Relative length	Arm ratio	Form
1	0.6 + 1.0 = 1.6	3.5	1.7	m
2	0.6 + 1.0 = 1.6	3.5	1.7	m
3	0.4 + 0.9 = 1.3	2.9	2.3	sm
4	0.4 + 0.9 = 1.3	2.9	2.3	sm
5	0.4 + 0.9 = 1.3	2.9	2.3	sm
6	0.4 + 0.9 = 1.3	2.9	2.3	sm
7	0.4 + 0.9 = 1.3	2.9	2.3	sm
8	0.4 + 0.9 = 1.3	2.9	2.3	sm
9	0.4 + 0.9 = 1.3	2.9	2.3	sm
10	0.5 + 0.7 = 1.2	2.7	1.4	m
11	0.5 + 0.7 = 1.2	2.7	1.4	m
12	0.5 + 0.7 = 1.2	2.7	1.4	m
13	0.4 + 0.8 = 1.2	2.7	2.0	sm
14	0.4 + 0.8 = 1.2	2.7	2.0	sm
15	0.5 + 0.6 = 1.1	2.4	1.2	m
16	0.5 + 0.6 = 1.1	2.4	1.2	m
17	0.5 + 0.6 = 1.1	2.4	1.2	m
18	0.5 + 0.6 = 1.1	2.4	1.2	m
19	0.4 + 0.7 = 1.1	2.4	1.8	sm
20	0.5 + 0.5 = 1.0	2.2	1.0	m
21	0.5 + 0.5 = 1.0	2.2	1.0	m
22	0.5 + 0.5 = 1.0	2.2	1.0	m
23	0.5 + 0.5 = 1.0	2.2	1.0	m
24	0.5 + 0.5 = 1.0	2.2	1.0	m
25	0.5 + 0.5 = 1.0	2.2	1.0	m
26	0.5 + 0.5 = 1.0	2.2	1.0	m
27	0.5 + 0.5 = 1.0	2.2	1.0	m
28	0.5 + 0.5 = 1.0	2.2	1.0	m
29	0.3 + 0.7 = 1.0	2.2	2.3	sm
30	0.3 + 0.7 = 1.0	2.2	2.3	sm
31	0.3 + 0.7 = 1.0	2.2	2.3	sm
32	0.3 + 0.7 = 1.0	2.2	2.3	sm
33	0.3 + 0.6 = 0.9	2.0	2.0	sm
34	0.3 + 0.6 = 0.9	2.0	2.0	sm
35	0.3 + 0.6 = 0.9	2.0	2.0	sm
36	0.3 + 0.6 = 0.9	2.0	2.0	sm
37	0.3 + 0.5 = 0.8	1.8	1.7	m
38	0.3 + 0.5 = 0.8	1.8	1.7	m
39	0.3 + 0.5 = 0.8	1.8	1.7	m
40	0.3 + 0.5 = 0.8	1.8	1.7	m
41	0.3 + 0.5 = 0.8	1.8	1.7	m
42	0.3 + 0.5 = 0.8	1.8	1.7	m

Table 15. Measurements of somatic chromosomes of *Eria hyacinsoides*, 2n = 38 at metaphase

Chromosome	Length (μm)	Relative length	Arm ratio	Form
1	0.8 + 1.0 = 1.8	3.2	1.3	m
2	0.8 + 1.0 = 1.8	3.2	1.3	m
3	0.7 + 1.1 = 1.8	3.2	1.6	m
4	0.7 + 1.1 = 1.8	3.2	1.6	m
5	0.7 + 1.1 = 1.8	3.2	1.6	m
6	0.7 + 1.1 = 1.8	3.2	1.6	m
7	0.8 + 0.9 = 1.7	3.0	1.1	m
8	0.8 + 0.9 = 1.7	3.0	1.1	m
9	0.6 + 1.1 = 1.7	3.0	1.8	sm
10	0.6 + 1.1 = 1.7	3.0	1.8	sm
11	0.7 + 0.9 = 1.6	2.8	1.3	m
12	0.7 + 0.9 = 1.6	2.8	1.3	m
13	0.7 + 0.9 = 1.6	2.8	1.3	m
14	0.7 + 0.9 = 1.6	2.8	1.3	m
15	0.7 + 0.9 = 1.6	2.8	1.3	m
16	0.7 + 0.9 = 1.6	2.8	1.3	m
17	0.7 + 0.8 = 1.5	2.6	1.1	m
18	0.7 + 0.8 = 1.5	2.6	1.1	m
19	0.7 + 0.8 = 1.5	2.6	1.1	m
20	0.7 + 0.8 = 1.5	2.6	1.1	m
21	0.7 + 0.8 = 1.5	2.6	1.1	m
22	0.7 + 0.8 = 1.5	2.6	1.1	m
23	0.6 + 0.9 = 1.5	2.6	1.5	m
24	0.6 + 0.9 = 1.5	2.6	1.5	m
25	0.7 + 0.7 = 1.4	2.5	1.0	m
26	0.7 + 0.7 = 1.4	2.5	1.0	m
27	0.7 + 0.7 = 1.4	2.5	1.0	m
28	0.7 + 0.7 = 1.4	2.5	1.0	m
29	0.6 + 0.7 = 1.3	2.3	1.2	m
30	0.6 + 0.7 = 1.3	2.3	1.2	m
31	0.6 + 0.7 = 1.3	2.3	1.2	m
32	0.6 + 0.7 = 1.3	2.3	1.2	m
33	0.5 + 0.7 = 1.2	2.1	1.4	m
34	0.5 + 0.7 = 1.2	2.1	1.4	m
35	0.5 + 0.7 = 1.2	2.1	1.4	m
36	0.5 + 0.7 = 1.2	2.1	1.4	m
37	0.5 + 0.7 = 1.2	2.1	1.4	m
38	0.4 + 0.6 = 1.0	1.8	1.5	m

Table 16. Measurements of somatic chromosomes of *Eria ovata*, 2n = 38 at metaphase

Chromosome	Length (μm)	Relative length	Arm ratio	Form
1	0.8 + 1.2 = 2.0	4.1	1.5	m
2	0.8 + 1.2 = 2.0	4.1	1.5	m
3	0.7 + 0.9 = 1.6	3.3	1.3	m
4	0.6 + 1.0 = 1.6	3.3	1.7	m
5	0.7 + 0.8 = 1.5	3.1	1.1	m
6	0.7 + 0.8 = 1.5	3.1	1.1	m
7	0.7 + 0.8 = 1.5	3.1	1.1	m
8	0.7 + 0.8 = 1.5	3.1	1.1	m
9	0.6 + 0.9 = 1.5	3.1	1.5	m
10	0.6 + 0.9 = 1.5	3.1	1.5	m
11	0.6 + 0.8 = 1.4	2.9	1.3	m
12	0.6 + 0.8 = 1.4	2.9	1.3	m
13	0.5 + 0.9 = 1.4	2.9	1.8	sm
14	0.5 + 0.9 = 1.4	2.9	1.8	sm
15	0.6 + 0.7 = 1.3	2.7	1.2	m
16	0.6 + 0.7 = 1.3	2.7	1.2	m
17	0.6 + 0.7 = 1.3	2.7	1.2	m
18	0.6 + 0.7 = 1.3	2.7	1.2	m
19	0.5 + 0.8 = 1.3	2.7	1.6	m
20	0.5 + 0.8 = 1.3	2.7	1.6	m
21	0.5 + 0.7 = 1.2	2.4	1.4	m
22	0.5 + 0.7 = 1.2	2.4	1.4	m
23	0.6 + 0.6 = 1.2	2.4	1.0	m
24	0.6 + 0.6 = 1.2	2.4	1.0	m
25	0.6 + 0.6 = 1.2	2.4	1.0	m
26	0.6 + 0.6 = 1.2	2.4	1.0	m
27	0.5 + 0.6 = 1.1	2.2	1.2	m
28	0.5 + 0.6 = 1.1	2.2	1.2	m
29	0.5 + 0.6 = 1.1	2.2	1.2	m
30	0.5 + 0.6 = 1.1	2.2	1.2	m
31	0.5 + 0.5 = 1.0	2.0	1.0	m
32	0.5 + 0.5 = 1.0	2.0	1.0	m
33	0.5 + 0.5 = 1.0	2.0	1.0	m
34	0.5 + 0.5 = 1.0	2.0	1.0	m
35	0.4 + 0.6 = 1.0	2.0	1.5	m
36	0.4 + 0.6 = 1.0	2.0	1.5	m
37	0.4 + 0.5 = 0.9	1.8	1.2	m
38	0.4 + 0.5 = 0.9	1.8	1.2	m

Table 17. Measurements of somatic chromosomes of *Eria reptans*, 2n = 38 at metaphase

Chromosome	Length (μm)	Relative length	Arm ratio	Form
1	1.0 + 1.1 = 2.1	4.0	1.1	m
2	1.0 + 1.1 = 2.1	4.0	1.1	m
3	0.9 + 1.0 = 1.9	3.6	1.1	m
4	0.9 + 1.0 = 1.9	3.6	1.1	m
5	0.8 + 0.9 = 1.7	3.2	1.1	m
6	0.8 + 0.9 = 1.7	3.2	1.1	m
7	0.7 + 0.9 = 1.6	3.0	1.3	m
8	0.7 + 0.9 = 1.6	3.0	1.3	m
9	0.7 + 0.9 = 1.6	3.0	1.3	m
10	0.7 + 0.9 = 1.6	3.0	1.3	m
11	0.6 + 0.9 = 1.5	2.8	1.5	m
12	0.6 + 0.9 = 1.5	2.8	1.5	m
13	0.6 + 0.8 = 1.4	2.7	1.3	m
14	0.6 + 0.8 = 1.4	2.7	1.3	m
15	0.6 + 0.8 = 1.4	2.7	1.3	m
16	0.6 + 0.8 = 1.4	2.7	1.3	m
17	0.5 + 0.9 = 1.4	2.7	1.8	sm
18	0.5 + 0.9 = 1.4	2.7	1.8	sm
19	0.6 + 0.7 = 1.3	2.5	1.2	m
20	0.6 + 0.7 = 1.3	2.5	1.2	m
21	0.6 + 0.7 = 1.3	2.5	1.2	m
22	0.6 + 0.7 = 1.3	2.5	1.2	m
23	0.6 + 0.7 = 1.3	2.5	1.2	m
24	0.6 + 0.7 = 1.3	2.5	1.2	m
25	0.5 + 0.7 = 1.2	2.3	1.4	m
26	0.5 + 0.7 = 1.2	2.3	1.4	m
27	0.5 + 0.7 = 1.2	2.3	1.4	m
28	0.5 + 0.7 = 1.2	2.3	1.4	m
29	0.5 + 0.7 = 1.2	2.3	1.4	m
30	0.5 + 0.7 = 1.2	2.3	1.4	m
31	0.5 + 0.6 = 1.1	2.1	1.2	m
32	0.5 + 0.6 = 1.1	2.1	1.2	m
33	0.5 + 0.6 = 1.1	2.1	1.2	m
34	0.5 + 0.6 = 1.1	2.1	1.2	m
35	0.5 + 0.6 = 1.1	2.1	1.2	m
36	0.5 + 0.6 = 1.1	2.1	1.2	m
37	0.5 + 0.5 = 1.0	1.9	1.0	m
38	0.5 + 0.5 = 1.0	1.9	1.0	m

Table 18. Measurements of somatic chromosomes of *Eria spicata*, 2n = 38 at metaphase

Chromosome	Length (μm)	Relative length	Arm ratio	Form
1	1.0 + 1.2 = 2.2	5.1	1.2	m
2	1.0 + 1.2 = 2.2	5.1	1.2	m
3	0.5 + 1.3 = 1.8	4.2	2.6	sm
4	0.7 + 0.9 = 1.6	3.7	1.3	m
5	0.7 + 0.8 = 1.5	3.5	1.1	m
6	0.6 + 0.8 = 1.4	3.2	1.3	m
7	0.5 + 0.7 = 1.2	2.8	1.4	m
8	0.5 + 0.7 = 1.2	2.8	1.4	m
9	0.5 + 0.7 = 1.2	2.8	1.4	m
10	0.5 + 0.7 = 1.2	2.8	1.4	m
11	0.5 + 0.7 = 1.2	2.8	1.4	m
12	0.5 + 0.7 = 1.2	2.8	1.4	m
13	0.5 + 0.6 = 1.1	2.6	1.2	m
14	0.5 + 0.6 = 1.1	2.6	1.2	m
15	0.4 + 0.7 = 1.1	2.6	1.8	sm
16	0.4 + 0.7 = 1.1	2.6	1.8	sm
17	0.4 + 0.7 = 1.1	2.6	1.8	sm
18	0.4 + 0.7 = 1.1	2.6	1.8	sm
19	0.5 + 0.5 = 1.0	2.3	1.0	m
20	0.5 + 0.5 = 1.0	2.3	1.0	m
21	0.5 + 0.5 = 1.0	2.3	1.0	m
22	0.5 + 0.5 = 1.0	2.3	1.0	m
23	0.5 + 0.5 = 1.0	2.3	1.0	m
24	0.5 + 0.5 = 1.0	2.3	1.0	m
25	0.4 + 0.5 = 0.9	2.1	1.3	m
26	0.4 + 0.5 = 0.9	2.1	1.3	m
27	0.4 + 0.5 = 0.9	2.1	1.3	m
28	0.4 + 0.5 = 0.9	2.1	1.3	m
29	0.4 + 0.5 = 0.9	2.1	1.3	m
30	0.4 + 0.5 = 0.9	2.1	1.3	m
31	0.4 + 0.5 = 0.9	2.1	1.3	m
32	0.4 + 0.5 = 0.9	2.1	1.3	m
33	0.4 + 0.5 = 0.9	2.1	1.3	m
34	0.4 + 0.5 = 0.9	2.1	1.3	m
35	0.4 + 0.5 = 0.9	2.1	1.3	m
36	0.4 + 0.5 = 0.9	2.1	1.3	m
37	0.4 + 0.5 = 0.9	2.1	1.3	m
38	0.4 + 0.5 = 0.9	2.1	1.3	m

Table 19. Measurements of somatic chromosomes of *Eria tomentosiflora*, 2n=38 at metaphase

Chromosome	Length (μm)	Relative length	Arm ratio	Form
1	1.2 + 1.3 = 2.5	4.2	1.1	m
2	1.2 + 1.3 = 2.5	4.2	1.1	m
3	0.9 + 1.1 = 2.0	3.3	1.2	m
4	0.9 + 1.1 = 2.0	3.3	1.2	m
5	0.9 + 1.0 = 1.9	3.2	1.1	m
6	0.9 + 1.0 = 1.9	3.2	1.1	m
7	0.9 + 0.9 = 1.8	3.0	1.0	m
8	0.9 + 0.9 = 1.8	3.0	1.0	m
9	0.8 + 0.9 = 1.7	2.8	1.1	m
10	0.8 + 0.9 = 1.7	2.8	1.1	m
11	0.7 + 1.0 = 1.7	2.8	1.4	m
12	0.7 + 1.0 = 1.7	2.8	1.4	m
13	0.7 + 1.0 = 1.7	2.8	1.4	m
14	0.7 + 1.0 = 1.7	2.8	1.4	m
15	0.6 + 1.0 = 1.6	2.7	1.7	m
16	0.6 + 1.0 = 1.6	2.7	1.7	m
17	0.7 + 0.8 = 1.5	2.5	1.1	m
18	0.7 + 0.8 = 1.5	2.5	1.1	m
19	0.7 + 0.8 = 1.5	2.5	1.1	m
20	0.7 + 0.8 = 1.5	2.5	1.1	m
21	0.7 + 0.8 = 1.5	2.5	1.1	m
22	0.7 + 0.8 = 1.5	2.5	1.1	m
23	0.7 + 0.8 = 1.5	2.5	1.1	m
24	0.7 + 0.8 = 1.5	2.5	1.1	m
25	0.6 + 0.8 = 1.4	2.3	1.3	m
26	0.6 + 0.8 = 1.4	2.3	1.3	m
27	0.6 + 0.8 = 1.4	2.3	1.3	m
28	0.6 + 0.8 = 1.4	2.3	1.3	m
29	0.6 + 0.7 = 1.3	2.2	1.2	m
30	0.6 + 0.7 = 1.3	2.2	1.2	m
31	0.6 + 0.7 = 1.3	2.2	1.2	m
32	0.6 + 0.7 = 1.3	2.2	1.2	m
33	0.6 + 0.7 = 1.3	2.2	1.2	m
34	0.6 + 0.7 = 1.3	2.2	1.2	m
35	0.5 + 0.7 = 1.2	2.0	1.4	m
36	0.5 + 0.7 = 1.2	2.0	1.4	m
37	0.4 + 0.7 = 1.1	1.8	1.8	sm
38	0.4 + 0.7 = 1.1	1.8	1.8	sm

パフィオペディルム属交雑種の染色体数Ⅰ．91品種*

唐　澤　耕　司**

Chromosome count in the hybrids of *Paphiopedilum* I. 91 cultivars

Kohji Karasawa

*Paphiopedilum*属はラン科植物の中では最も原始的な構造をしていて興味を持たれるばかりでなく，園芸的にも観賞価値が高く，1869年以来多くの交雑種が作出され，広く栽培される重要な属である。

植物体は染色体の数や形の変化によって異なり，園芸的に優れた個体の多くが染色体の増加によってもたらされていることはよく知られている。

本属の交雑種の基となった種（ species ）は東南アジアを中心に，西はデカン半島からヒマラヤ山麓，中国南部，ホンコン，フィリッピンからスンダ列島を経て，東はニューギニア，ブーゲンビル島に至る広い範囲に分布している。これら野生種の核形態についてはすでに Duncan & MacLeod（1948,1949, 1950），Karasawa（1978, 1979, 1980）らによって詳細に分析されている。交雑種の染色体数に関しては，Mehlquist（ 1947 ），Duncan（ 1947 ），Lenz（ 1960 ）らによって約100 個体についての報告があるにすぎず，1960年代以後は行われていない。

近年特に交雑改良の盛んな本属についての核形態の調査は，その改良の歴史を知るばかりでなく，稔性の高い優良な交配親を見出すためにも必要であると思われる。筆者は本属の核形態の研究を進めているが，今回，観察した交雑種の染色体数の一部を報告する。資料の作成はKarasawa（1979）と同様の方法によって行い，調査した91個体の染色体数とその写真は表１および図１～10に示した通りである。

結　果　と　考　察

今回報告した91個体のうち81個体については新たに染色体数を算定したものである。調査した91個体において染色体数は 2n ＝ 26，27，28，29，30，31，32，34，39，40，41，42，43，45，46，47，52，53，54，55，56，57，58，62と63が算定された。

本属の種（ species ）の染色体数については 2n ＝ 26から 2n＝42までが算定されている（ Duncan & MacLeod 1947，1949，1950，Karasawa 1978,1979, 1980，など）。これらのうち 2n ＝26個 の染色体はいずれもＶ型（ 中部動原体型染色体，２腕染色体 ）染色体からなり，2n ＝ 26 Ｖの染色体構成をしており，2n ＝ 30個 以上の染色体を有する種では，Ｖ型染色体の減少にともないＩ型染色体（ 端部動原体型染色体，１腕染色体 ）の偶数的増加がみられる。これはＶ型染色体の中央切断（ 動原体切断 ）に起因すると考えられている（ Karasawa 1979，Karasawa & Tanaka 1980 ）。事実，2n＝30から2n＝42 までの種においては，Ｉ型染色体２個をＶ型染色体１個に換算したときの合計はいずれも 2n＝ 26Ｖ となり，本属の基本染色体数は n ＝13Ｖである。従って，本属では単に染色体の数だけで倍数性を論ずることはできない。

複雑な交配を重ねて生じている交雑種は，それにかかわってきた種（ species ）を考慮し，染色体の数

* Contribution from the Hiroshima Botanical Garden No. 23
** The Hiroshima Botanical Garden
Bulletin of The Hiroshima Botanical Garden, No. 6: 47–64, 1983.

Table 1. Chromosome numbers of *Paphiopedilum* hybrid.

Hybrid	Parentage	Year of Registered	Chromosome number (2n)
Aiko Yamamoto 'Elegance'	Finetta x Yumedono	1957	27
Aiko Yamamoto 'Grace'	Finetta x Yumedono	1957	28
Albion FCC/RHS	Astarte x *niveum*	1922	39
Astarte	*insigne* x Psyche	1914	40
Atlantis 'The Cardinal'	Cardinal Mercier x Chloris	1927	40
Awayuki 'My First Dream'	Chrysostom x Phips	1967	57
Besnow	Yerba Buena x *niveum*	1973	27
Betsy Raper FCC/MOS	Cardinal Mercier x Warrior	1934	63
Betty Bracy 'Cameo'	Gwenpur x Actaeus Bianca	1956	41
Betty Bracy 'Springtime'	Gwenpur x Actaeus Bianca	1956	41
Boltonii 'Magnificum'	*insigne* x *niveum*	1909	26
Borburn 'Bunbry'	Bordube x Chardmoore	1937	41
Bradford 'Dawnland'	Bahram x Grace Darling	1950	29
Chardmoore 'Mrs. Corburn'	Christopher x Lena	1927	27
Chilton AM/RHS	Culver x Grace Darling	1952	28
Christopher 'Grand Duke Nicholas'	Actaeus x Leeanum	1902	27
Chrysostom 'Our King'	Christopher x Pyramus	1922	41
Clair de Lune	Emerald x Alma Gavaert	1927	34
Cockade 'Chilton'	Ernest E. Platt x Allure	1960	40
Decameron 'Amaranth'	Garibaldi x Muriel II	1932	52
Diana Broughton 'Golden Queen'	Doris Black x Grace Darling	1936	27
Euryostom 'The King'	Chrysostom x Eurybiades	1930	41
F. C. Puddle FCC/RHS	Actaeus x Astarte	1932	41
Finetta AM/JOS	Christopher x Chrysostom	1930	27
Floralies 'The Cardinal'	Atlantis x Meigle	1933	54
Gan 'Tommy'	F. C. Puddle x Finetta	1973	55
Gertrude West 'The Queen'	Lady Phulmoni x Robert Paterson	1937	52
Giallo 'White Crown'	Dramatic x Lemon Hart	1964	41
Glosan 'A'	Glorita x *insigne*	1963	26
Glosan 'E'	Glorita x *insigne*	1963	26
Golden Acres 'Go Boy'	Golden Diana x McLaren Park	1963	27
Golden Fleece	*insigne* x Antinous	1915	26
Grove 'Cupid'	Radley x Dalla	1957	40
Gwen Hannen FCC/RHS	Christopher x Florence Spencer	1922	30
Harrisianum	*barbatum* x *villosum*	1869	32
Hassallii 'St. Mary'	Bingleyense x *charlesworthii*	1912	47
Hellas 'Westonbirt'	Desdemona x Tania	1940	27
H. Yamamoto 'Mikage'	Gertrude West x Mrs. Eley	1955	56
Jocelyn 'Suwada'	Minster Lovell x Desire	1967	27
Lady Dillon 'Magnificum'	Mrs. William Mostyn x Nitens	1913	27
La Honda 'Guy Stoddard'	Dianalus x Cadina	1956	27
Leeanum	*insigne* x *spicerianum*	1884	28
Lemon Hart AM/RHS	Ann Harper x Desire	1956	27
Lohengrin 'H. H. Tanaka'	Golden Beauty x F. C. Puddle	1954	55

Table 1. (continued)

London Wall 'Sun Beam'	Akeley x Commander Howard Wethy	1947	40
Lord Derby	*rothschildianum* x *superbiens*	1894	31
Madam Martinet 'Spring Field'	*callosum* x *delenatii*	1932	29
May Green 'No. 2'	Aiko Yamamoto x Langtye	1973	28
Medowsweet 'Purity'	Chilton x F. C. Puddle	1956	46
Mem. F. M. Ogilvie	Curtmanni x Pyramus	1919	42
Midas	Actaeus x Golden Fleece	1927	27
Miller's Daughter	Chantal xDusty Miller	1971	43
Moreton Bay 'Shigedonia'	Spring Verdure x Whitehall	1950	54
Olney Mill	Dusty Miller x Battersea	1974	58
Paeony 'Regency'	Noble x Belisaire	1956	58
Phips	Aureum x Boltonii	1925	39
Puddleham 'Doolittle'	F. C. Puddle x Golden Diana	1966	54
Robert Paterson	Eurybiades x Mem. F. M. Ogilvie	1925	52
Rose Freckles	Susan Tucker x Wendwater	1973	54
Rosy Dawn AM/RHS	Astarte x Gwen Hannen	1935	40
Sandra Mary 'Diablo'	Noyo x Santa Margarita	1963	52
Saraband	King Arthur x Newbury	1932	45
Sheerline 'Rondo'	Bradford x Lemon Hart	1962	41
Silvara 'Aphrodite'	Sungrove x F. C. Puddle	1964	54
Silvara 'Madonna'	Sungrove x F. C. Puddle	1964	54
Snow Bunting 'Muriel'	F. C. Puddle x Florence Spencer	1942	54
Sparsholt 'Jaguar'	Ernest E. Platt x Blendia	1959	55
Sumurun 'Pearl'	Boltonii x Christopher	—	39
Susan Tucker 'Snow Heaven'	Shalimar x F. C. Puddle	1954	54
Susan Tucker 'South Pole'	Shalimar x F. C. Puddle	1954	54
Susan Tucker 'White Pearl'	Shalimar x F. C. Puddle	1954	54
Tarbaby 'Night Glow'	Lunar Orbit x Huntava	1966	41
Thrums 'Hasky'	Chrysostom x J. M. Black	1928	39
Tommie Hanes 'Althea'	Gwenpur x Greensleeves	1967	41
Tsuya Ikeda 'Hamatake'	Golden Fleece x Phips	1958	53
Tsuya Ikeda 'Koiso'	Golden Fleece x Phips	1958	52
Tsuya Ikeda 'Oiso'	Golden Fleece x Phips	1958	52
Tsuya Ikeda 'No. 4'	Golden Fleece x Phips	1958	52
Wakeswood 'Africa'	A. Lomax x Wendover	1948	53
Wendover 'Red Giant'	Atlantis x John Henry	1936	55
White Christmas	Mem. Joe Ozzella x Lohengrin	1964	41
White Condor	Phips x Glosan	1980	52
Whitelur	F. C. Puddle x Wallur	1967	54
Winston Churchill 'Redoubtable'	Eridge x Hampden	1951	54
Yokohama 'A'	Gertrude West x Ilium	1956	27
Yoshiko Yamamoto 'Asuka'	Aiko Yamamoto x Lemon Hart	1969	27
Yumedono 'Gessho'	Midas x Yokohama	1956	28
Unnamed	Euryostom x F. C. Puddle		62
Unnamed 'No. 1'	Gan x Langtye		41
Unnamed '354–L'	Lohengrin x Lemon Hart		26
Unnamed '354–H'	Lohengrin x Lemon Hart		40

と形態を詳細に分析検討する必要がある。また，今日栽培されている個体の多くは同一交配から生じた多数の兄弟株の中で何らかの優れた特徴のある個体が選抜されてきたものであると考えられる。従って，今後さらに多数の個体を調査したうえで詳細な分析が必要である。

今日栽培されている交雑種の大多数は緑葉に1茎1花をつける系統である。これらの作出に関与しているおもな種はPaphiopedilum亜属の *Paph. insigne*（2n＝26＝26V），*Paph. villosum*（2n＝26＝26V）と *Paph. spicerianum*（2n＝30＝22V＋8I）である。さらに，白色花ではBrachypetalum亜属の *Paph. niveum*（2n＝26＝26V）が，また，近年の紅色花や斑点花には同亜属の弁巾の広い *Paph. bellatulum*（2n＝26＝26V）が交配されている。Sigmatopetalum 亜属の斑入葉種は染色体の中央切断によって種分化した種群（ Karasawa & Saito 1982 ）で2n＝28～42までの染色体数からなり，これらの交雑種では染色体構成は複雑で，多くは稔性が低い。

1950年代までに作出登録された優良個体は *Paph.* Christopher ' Grand Duke Nicholas', *Paph.* Finetta AM/JOS, *Paph.* Hellas 'Westonbirt' FCC/RHS, *Paph.* Jocelyn 'Suwada', *Paph.* La Honda 'Guy Stoddard' HCC/AOS, *Paph.* Lemon Hart FCC/JOS などでみられるように2n＝27の個体が多い。これら2n＝27個の染色体は必ずしも2n＝26V＋αの構成ではなく，稔性のよい *Paph.* Finetta, *Paph.* Hellas, *Paph.* Lemon Hart, *Paph.* Yoshiko Yamamoto 'Asuka'などはI型染色体を2個有し，2n＝27＝25V＋2I＝26Vとなり，正常な2倍体に相当するものである。

黄緑色花をつける系統で，花が一段と大きく，弁巾が広い個体が入賞し始めたのは1950年代からである。それらのうち *Paph.* Betty Bracy 'Springtime' AM/JOS（2n＝41, 1956年登録）や *Paph.* Moreton Bay 'Shigedonia' FCC/JOS（2n＝54, 1950年登録）などは3倍体的および4倍体的な個体である。

斑点花や紅紫色花ではすでに1900年代の初期に *Paph.* Chrysostom 'Our King'（2n＝41, 1922年登録），*Paph.* Mem. F. M. Ogilvie（2n＝41, 1919年登録）や *Paph.* Robert Patterson 'Good'（2n＝52, 1925年登録）などの3倍体的または4倍体的個体が出現している。

白色花系統の白色は *Paph. niveum*（2n＝26）に由来し，多くは黄緑色花との交配によって改良されてきている。この *Paph. niveum* の白色は強く子孫に遺伝し，後代にまで白色花を生じている。近年の白色花の多くは *Paph.* F. C. Puddle FCC/RHS,（2n＝41）を片親として作出されていて，その子供の優良個体は *Paph.* Gan 'Tommy' AM/JOS (2n=55), *Paph.* Lohengrin 'H. H. Tanaka' AM/JOS (2n = 55), *Paph.* Puddleham 'Doolittle' (2n=54), *Paph.* Silvara 'Aphrodite' (2n=54), *Paph.* Susan Tucker 'South Pole' (2n=54) などいずれも4倍体的染色体構成をしている。また，日本で作出された *Paph.* Tsuya Ikeda の4個体でも 2n＝52, 53が算定された。*Paph.* Tsuya Ikeda は *Paph.* Golden Fleece（2n＝26）× Phips（2n＝39）から4倍体的子孫を生じている。これら白色花は *Paph.* F. C. Puddle や *Paph.* Phips の非還元性配偶子から生じたものと推測される。

白色花の4倍体的個体を片親として作出された，*Paph.* Gan 'Tommy' × *Paph.* Langtye 'Oberon' や *Paph.* Lohengrin 'H. H. Tanaka' × *Paph.* Lemon Hart の調査個体の花はいずれも黄緑色花であった。

優れた交配親として多用され成功している *Paph.* Gertrude West 'The Queen' (2n=52), *Paph.* H. Yamamoto 'Mikage' (2n=56), *Paph.* Paeony 'Regency' (2n=58), *Paph.* Robert Patterson 'Good' (2n=52), *Paph.* Sparsholt 'Jaguar' (2n=55) *Paph.* Winston Churchill 'Redoubtable' (2n=54) などは4倍体的染色体構成であることが知られた。

要　　約

1. *Paphiopedilum*の交雑種91個体について染色体数を調査し，2n＝26，27，28，29，30，31，32，34，39，40，41，42，43，45，46，47，52，53，54，55，56，57，58，62と63を算定した。うち81個体は新たに染色体数を算定したものである。
2. 1950年代頃までの優良個体には染色体数 2n＝27個を有する個体が多い。これらは必ずしも 2n＝27＝26V＋αの異数体ばかりでなく，2n＝27＝25V＋2I＝26Vの構成からなり，正常な2倍体に相当する個体がみられた。
3. 斑点花や紅紫色花系統では，すでに1900年代初頭から，3倍体的または4倍体的個体が出現しているが，黄緑色花系統では比較的近年，（1950年代以降）染色体の倍化がみられた。
4. 白色花をつける *Paph.* F. C. Puddle FCC/RHS や *Paph.* Phips は3倍体的染色体構成からなり，これらと2倍体的個体との交配から生じた白色優良個体は4倍体的染色体構成をしていたがこれは *Paph.* F. C. Puddle や *Paph.* Phips の非還元性配偶子に由来すると思われる。
5. 近年，交配親として良結果を生じている個体は4倍体的染色体構成であることが知られた。

Summary

1. Chromosome counts were carried out in 91 hybrids of *Paphiopedilum*. The chromosome number of 81 out of the 91 hybrids were determined for the first time.
2. A wide range of chromosome numbers, 2n=26, 27, 28, 29, 30, 31, 32, 34, 39, 40, 41, 42, 43, 45, 46, 47, 52, 53, 54, 55, 56, 57, 58, 62 and 63 was found.
3. Most of the finest hybrids with greenish-yellow flowers produced before 1960 had the same chromosome number of 2n=27. The 27 chromosomes of these hybrids were composed of 25 metacentric or submetacentric (V-shaped) and two telocentric (I-shaped) chromosomes, and their karyotypes were expressed 2n=27=25V + 2I and converted into 2n=26V. This suggests that the hybrids with greenish-yellow flowers are not aneuploids with one additional chromosome but diploids with 26V-shaped chromosomes originally.
4. The triploid- and tetraploid-level hybrids with dotted or redish-purple flowers were produced till the early part of the 20th century, while those with greenish-yellow flowers did not appear till quite recentry.
5. The chromosome number of the superior progenies with white flowers, except for *Paph.* Medowsweet 'Purity', of *Paph.* F. C. Puddle and *Paph.* Phips crossed with diploid hybrids was found to be tetraploid-level. We assume that this is due to the unreduced gamate derived from triploid-level parents, *Paph.* F. C. Puddle and *Paph.* Phips.
6. The chromosome number of breeding parents producing superior progenies, *e.g.* *Paph.* Paeony 'Regency', *Paph.* Sparsholt 'Jaguar', *Paph.* Winston Churchill 'Redoubtable', were determined to be tetraploid-level.

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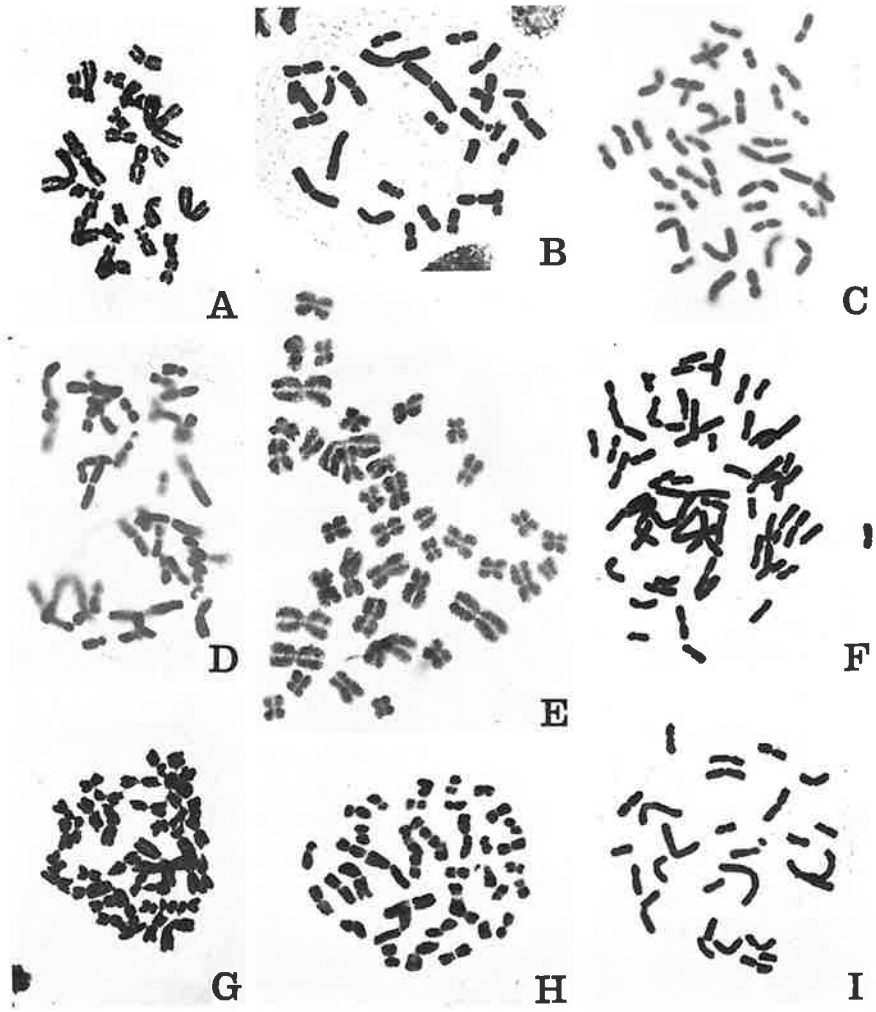

Fig. 1. Photomicrographs of the somatic chromosomes of *Paphiopedilum*. A, *P.* Aiko Yamamoto 'Elegance' 2n=27. B, *P.* Aiko Yamamoto 'Grace' 2n=28. C, *P.* Albion FCC/RHS 2n=39. D, *P.* Astarte 2n=40. E, *P.* Atlantis 'The Cardinal' 2n=40. F, *P.* Awayuki 'My First Dream' 2n=57. G, *P.* Betty Bracy 'Cameo' 2n=41. H, *P.* Betty Bracy 'Springtime' 2n=41. I, *P.* Besnow 2n=27. x 700.

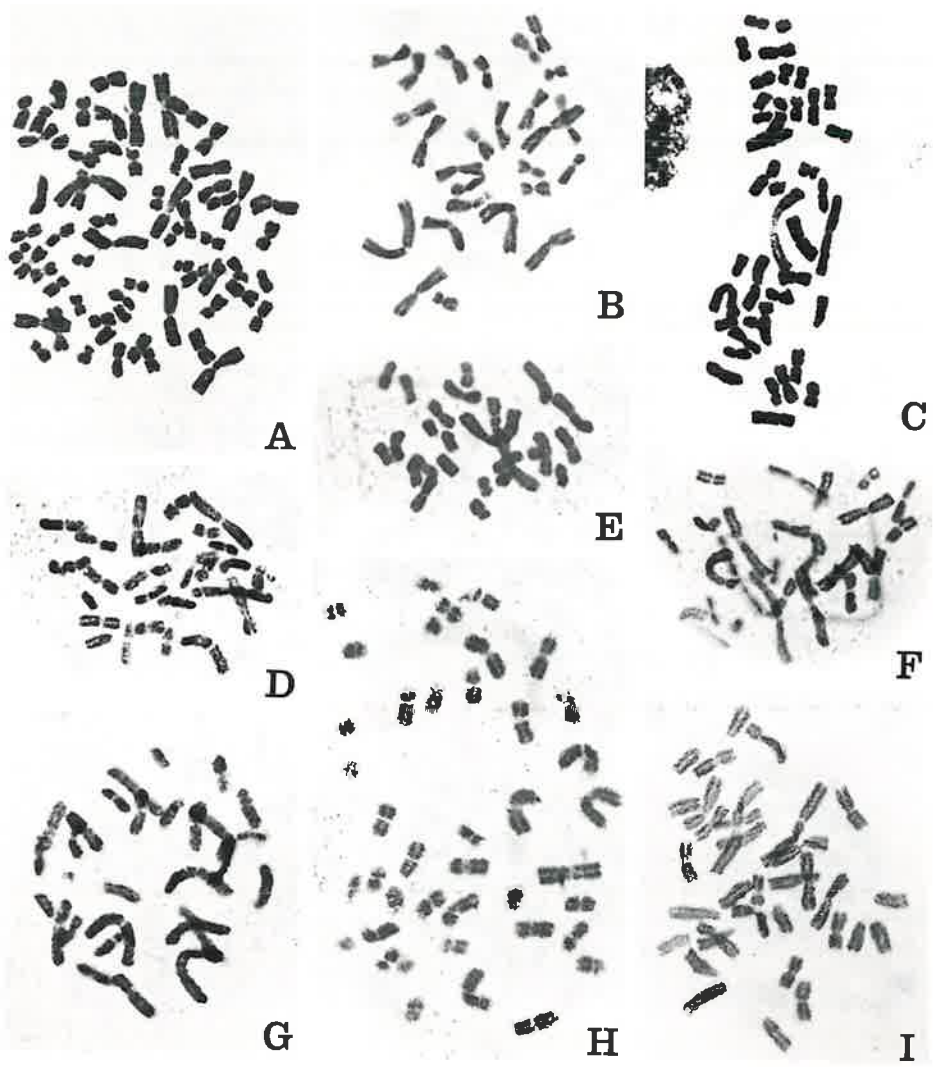

Fig. 2. Photomicrographs of the somatic chromosomes of *Paphiopedilum*. A, *P.* Betsy Raper FCC/MOS 2n=63. B, *P.* Boltonii 'Magnificum' 2n=26. C, *P.* Borburn 'Bunbry' 2n=41. D, *P.* Bradford 'Dawnland' 2n=29. E, *P.* Chardmoore 'Mrs. Corburn' 2n=27. F, *P.* Chilton AM/RHS 2n=28. G, *P.* Christopher 'Grand Duke Nicholas' 2n=27. H, *P.* Chrysostom 'Our King' 2n=41. I, *P.* Clair de Lune 2n=34. × 700.

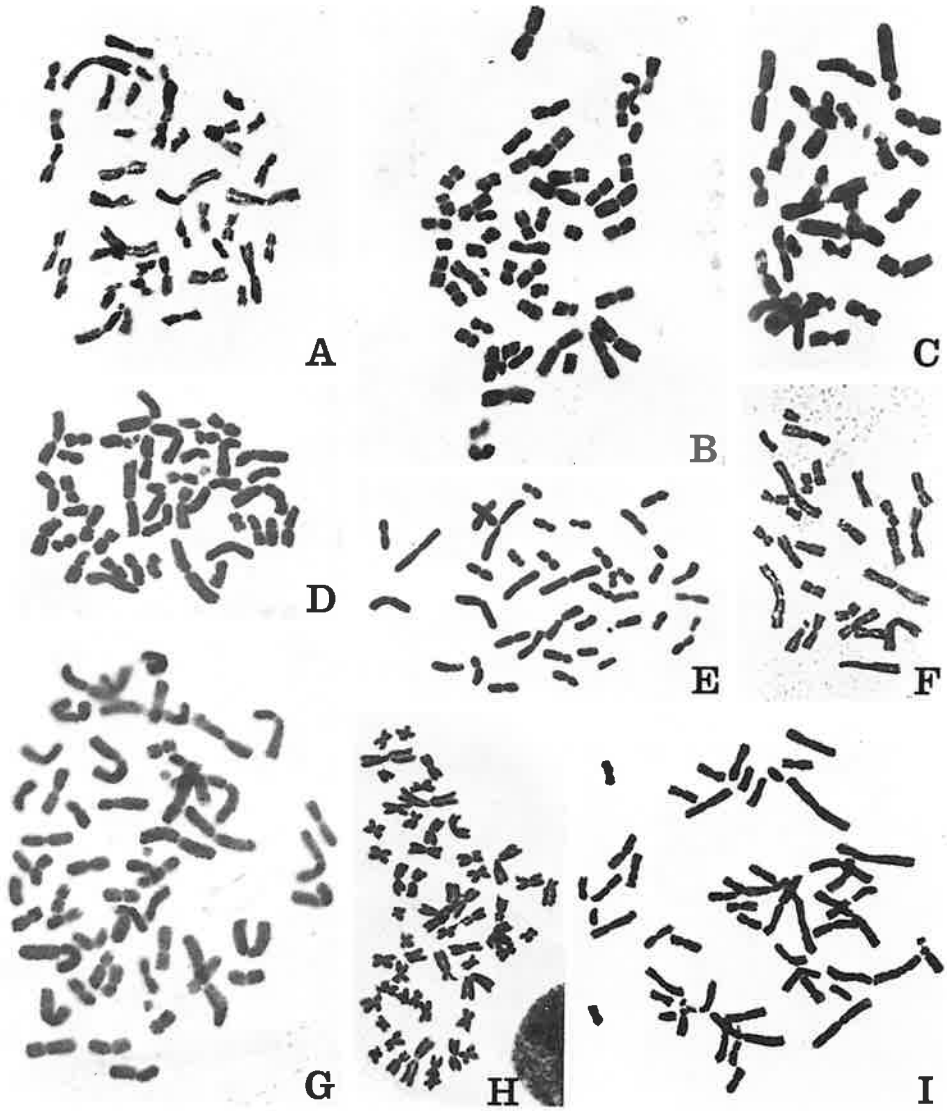

Fig. 3. Photomicrographs of the somatic chromosomes of *Paphiopedilum*. A, *P.* Cockade 'Chilton' 2n=40. B, *P.* Decameron 'Amaranth' 2n=52. C, *P.* Diana Broughton 'Golden Queen' 2n=27. D, *P.* Euryostom 'The King' 2n=41. E, *P.* F. C. Puddle FCC/RHS 2n=41. F, *P.* Finetta AM/JOS 2n=27. G, *P.* Floralies 'The Cardinal' 2n=54. H, *P.* Gan 'Tommy' 2n=55. I, *P.* Gertrude West 'The Queen' 2n=52. × 700.

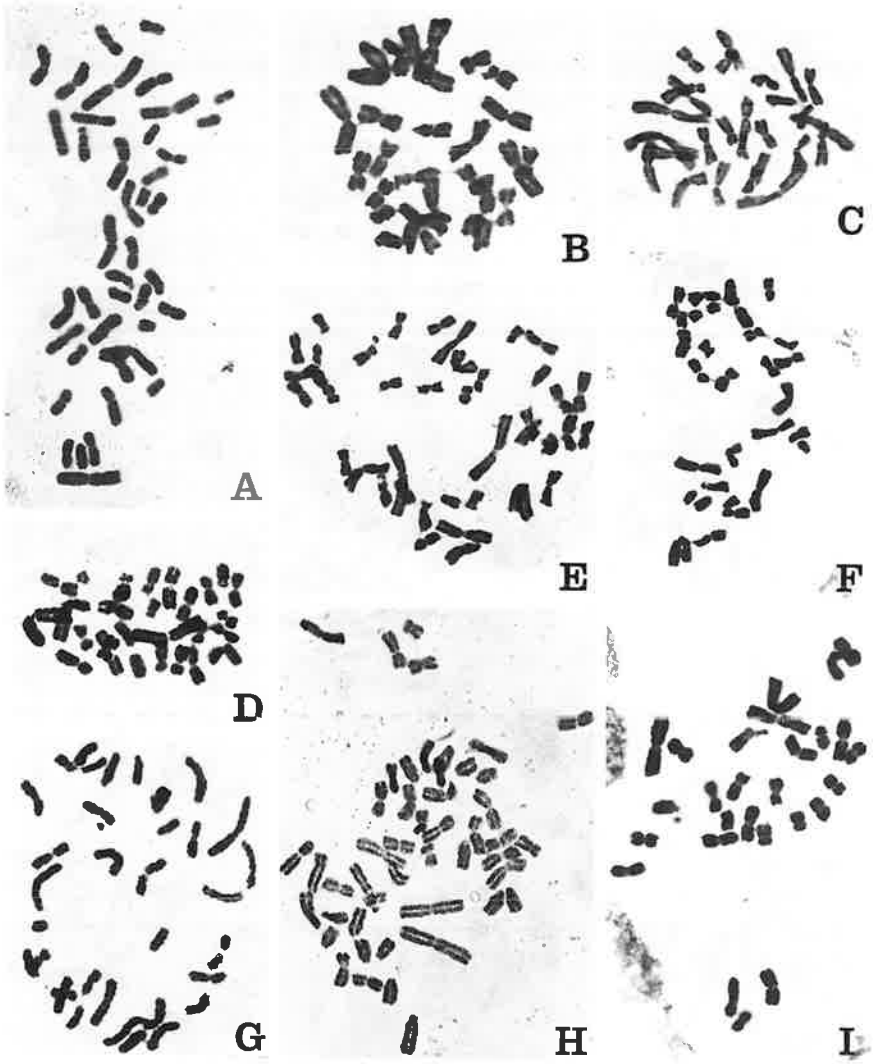

Fig. 4. Photomicrographs of the somatic chromosomes of *Paphiopedilum*. A, *P.* Giallo 'White Crown' 2n=41. B, *P.* Glosan 'A' 2n=26. C, *P.* Glosan 'E' 2n=26. D, *P.* Golden Acres 'Go Boy' 2n=27. E, *P.* Grove 'Cupid' 2n=40. F, *P.* Gwen Hannen FCC/RHS 2n=30. G, *P.* Harrisianum 2n=32. H, *P.* Hassallii 'St. Mary' 2n=47. I, *P.* Hellas 'Westonbirt' 2n=27. x 700.

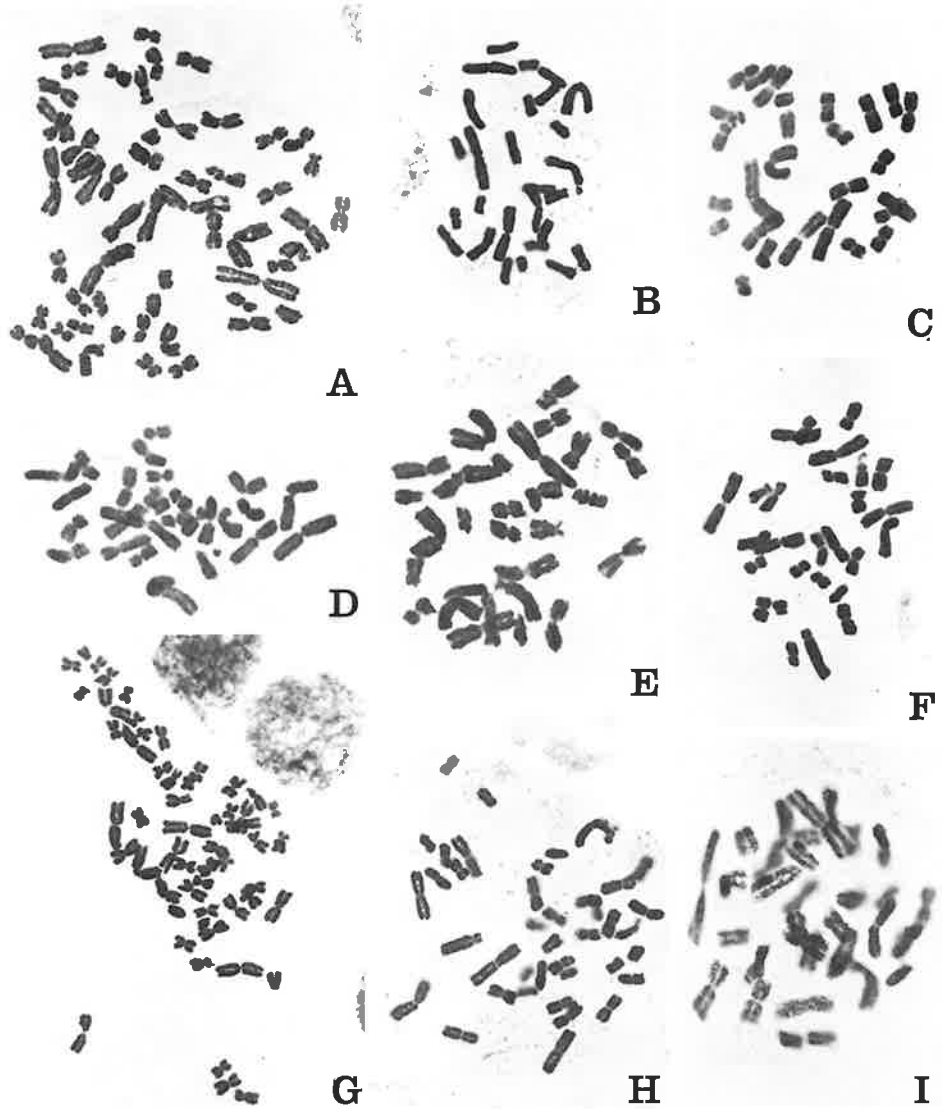

Fig. 5. Photomicrographs of the somatic chromosomes of *Paphiopedilum*. A, *P.* H. Yamamoto 'Mikage' 2n=56. B, *P.* Jocelyn 'Suwada' 2n=27. C, *P.* Lady Dillon 'Magnificum' 2n=27. D, *P.* La Honda 'Guy Stoddard' 2n=27. E, *P.* Leeanum 2n=28. F, *P.* Lemon Hart AM/RHS 2n=27. G, *P.* Lohengrin 'H. H. Tanaka' 2n=55. H, *P.* London Wall 'Sun Beam' 2n=40. I, *P.* Lord Derby 2n=31. x 700.

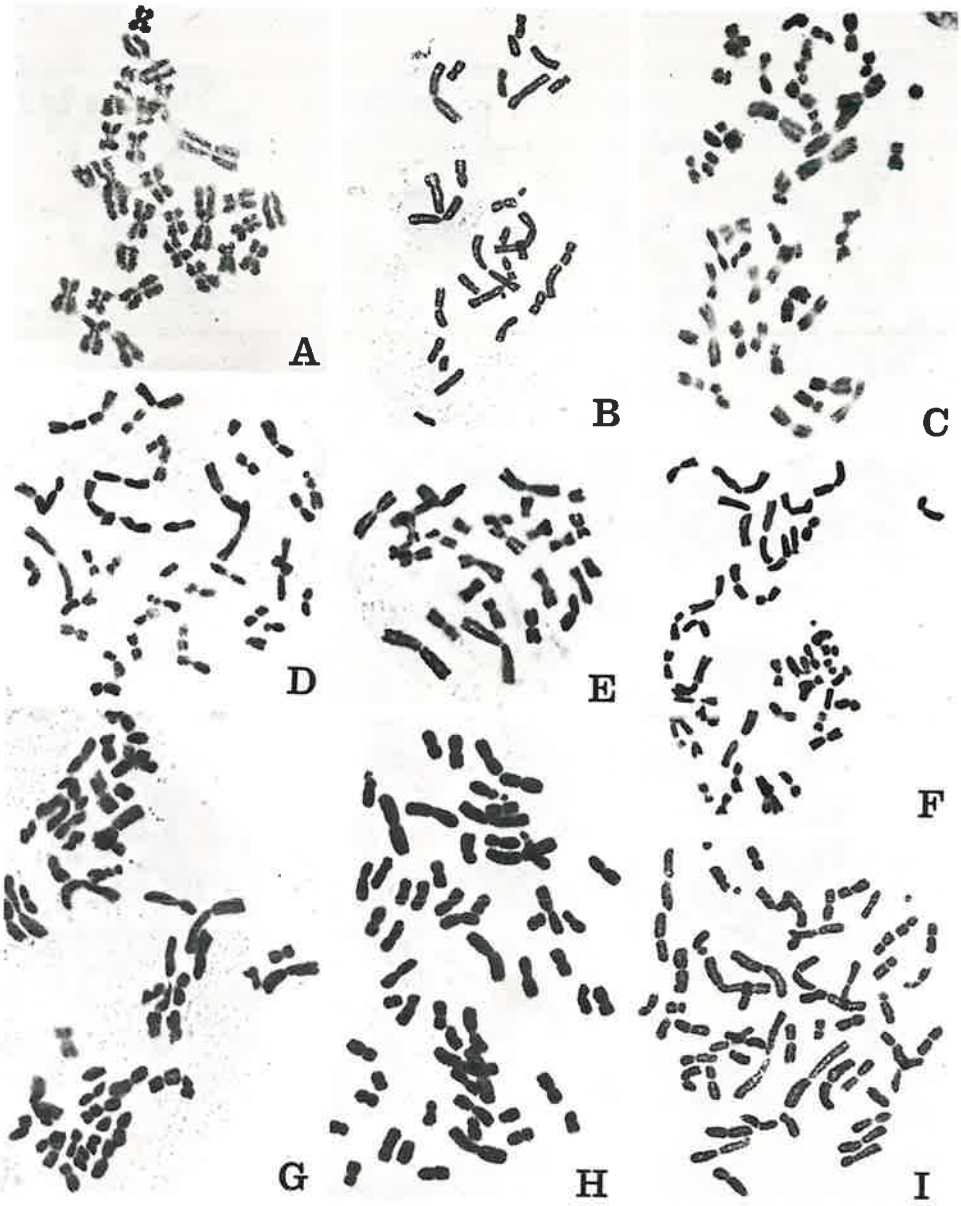

Fig. 6. Photomicrographs of the somatic chromosomes of *Paphiopedilum*. A, *P.* Madam Martinet 'Spring Field' 2n=29. B, *P.* May Green 'No. 2' 2n=28. C, *P.* Medowsweet 'Purity' 2n=46. D, *P.* Mem. F. M. Ogilvie 2n=42. E, *P.* Midas 2n=27. F, *P.* Miller's Daughter 2n=43. G, *P.* Moreton Bay 'Shigedonia' 2n=54. H, *P.* Olney Mill 2n=58. I, *P.* Puddleham 'Doolittle' 2n=54. × 700.

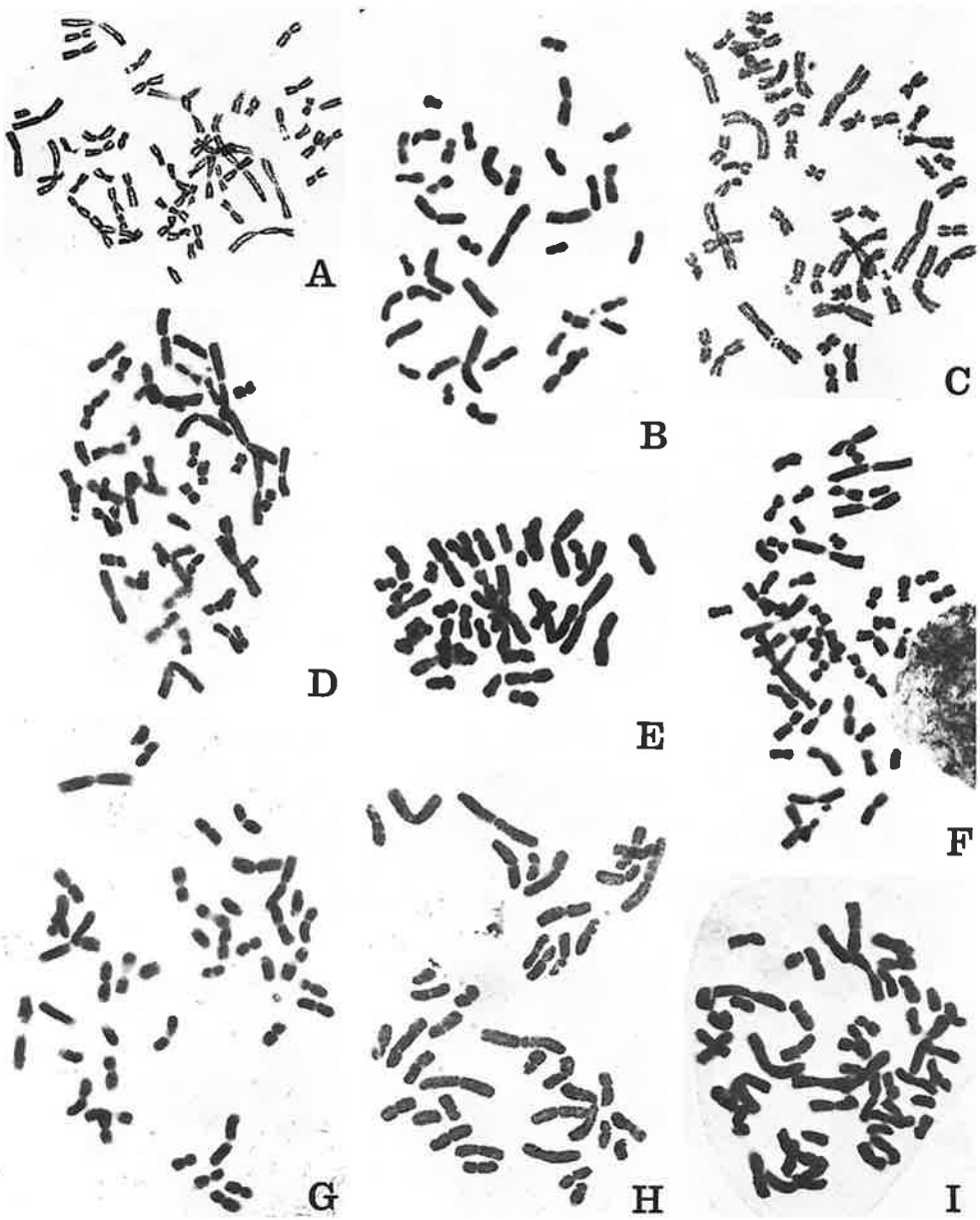

Fig. 7. Photomicrographs of the somatic chromosomes of *Paphiopedilum*. A, *P.* Paeony 'Regency' 2n=58. B, *P.* Phips 2n=39. C, *P.* Robert Paterson 2n=52. D, *P.* Rose Freckles 2n=54. E, *P.* Rosy Dawn AM/RHS 2n=40. F, *P.* Sandra Mary 'Diablo' 2n=52. G, *P.* Saraband 2n=45. H, *P.* Sheerline 'Rondo' 2n=41. I, *P.* Silvara 'Aphrodite' 2n=54. × 700.

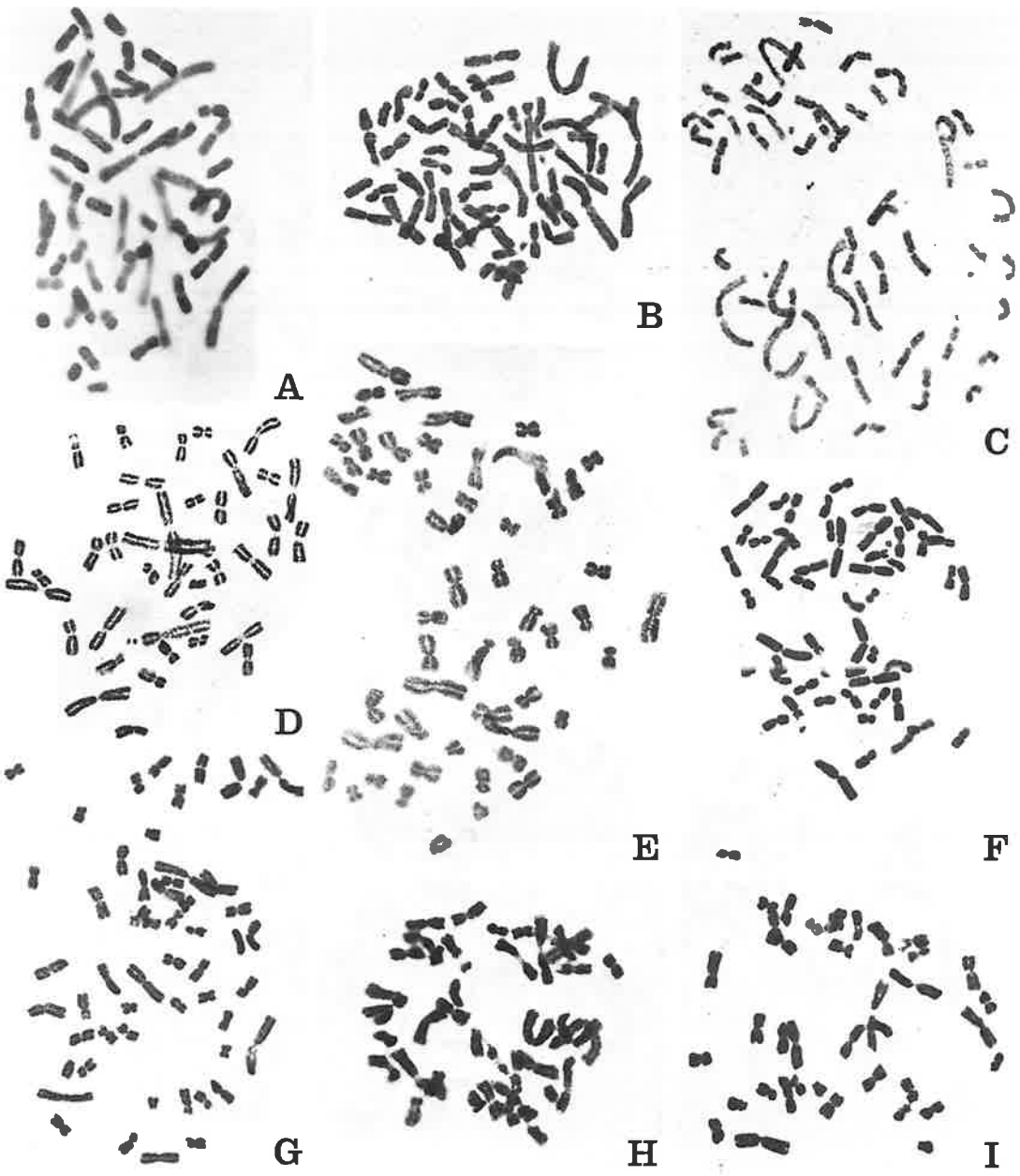

Fig. 8. Photomicrographs of the somatic chromosomes of *Paphiopedilum*. A, *P.* Silvara 'Madonna' 2n=54. B, *P.* Snow Bunting 'Muriel' 2n=54. C, *P.* Sparsholt 'Jaguar' 2n=55. D, *P.* Sumurun 'Pearl' 2n=39. E, *P.* Susan Tucker 'Snow Heaven' 2n=54. F, *P.* Susan Tucker 'South Pole' 2n=54. G, *P.* Susan Tucker 'White Pearl' 2n=54. H, *P.* Tarbaby 'Night Glow' 2n=41. I, *P.* Thrums 'Husky' 2n=39. × 700.

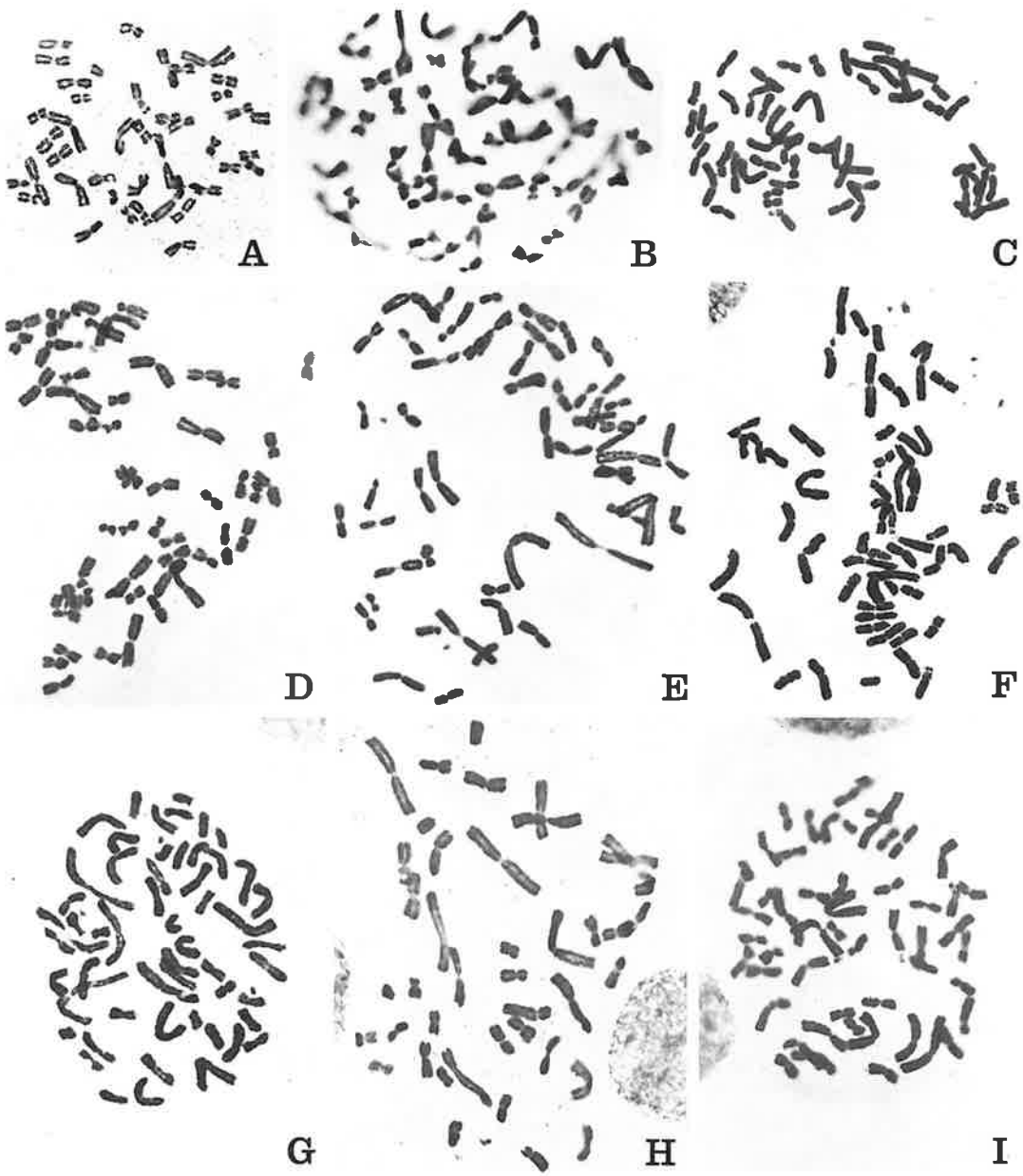

Fig. 9. Photomicrographs of the somatic chromosomes of *Paphiopedilum*. A, *P.* Tommie Hanes 'Althea' 2n=41. B, *P.* Tsuya Ikeda 'Hamatake' 2n=53. C, *P.* Tsuya Ikeda 'Koiso' 2n=52. D, *P.* Tsuya Ikeda 'Oiso' 2n=52. E, *P.* Tsuya Ikeda 'No. 4' 2n=52. F, *P.* Wakeswood 'Africa' 2n=53. G, *P.* Wendover 'Red Giant' 2n=55. H, *P.* White Christmas 2n=41. I, *P.* White Condor 2n=52. × 700.

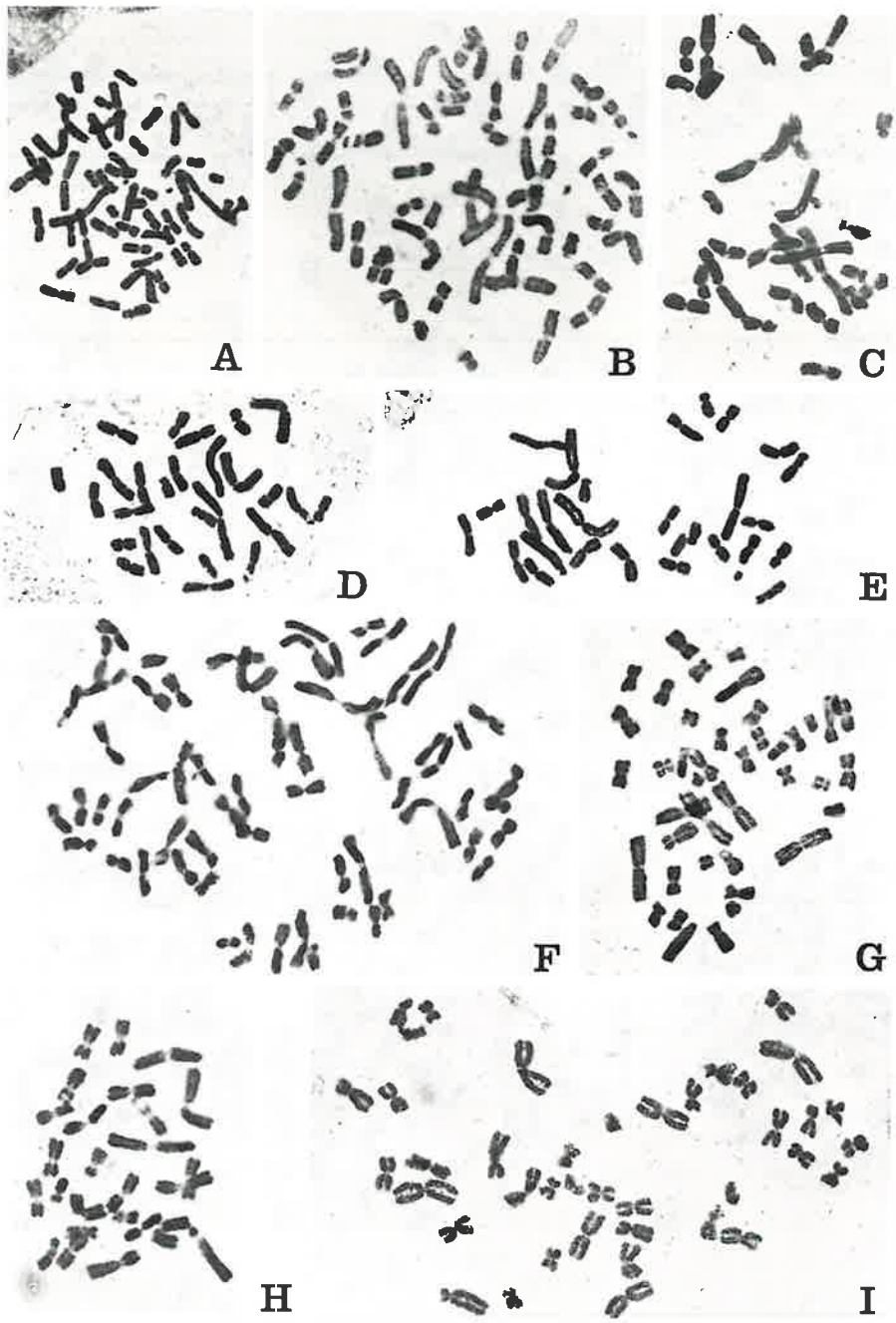

Fig. 10. Photomicrographs of the somatic chromosomes of *Paphiopedilum*. A, *P.* White-lur 2n=54. B, *P.* Winston Churchill 'Redoubtable' 2n=54. C, *P.* Yokohama 'A' 2n=27. D, *P.* Yoshiko Yamamoto 'Asuka' 2n=27. E, *P.* Yumedono 'Gessho' 2n=28. F, *P.* (Euryostom × F. C. Puddle) 2n=62. G, *P.* (Gan × Langtye) 'No. 1' 2n=41. H, *P.* (Lohengrin × Lemon Hart) '354–L' 2n=26. I, *P.* (Lohengrin × Lemon Hart) '354–H' 2n=40. ×700.

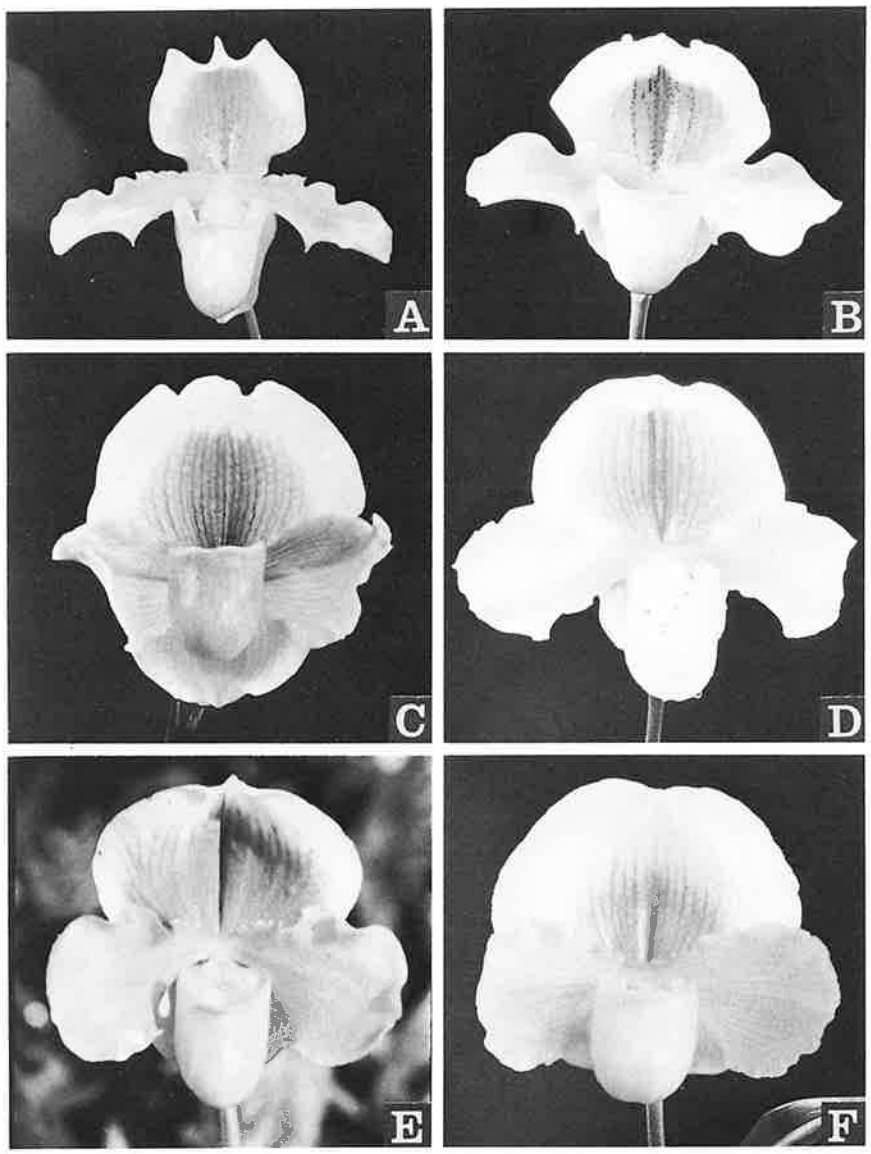

Fig. 11. Flowers of *Paphiopedilum*.
A, *P.* Glosan 'A' 2n=26. B, *P.* May Green 'No. 2' 2n=28. C, *P.* Hellas 'Westonbirt' 2n=27. D, *P.* La Honda 'Guy Stoddard' 2n=27. E, *P.* Lemon Hart AM/RHS 2n=27. F, *P.* Tommie Hanes 'Althea' 2n=41. x 0.4.

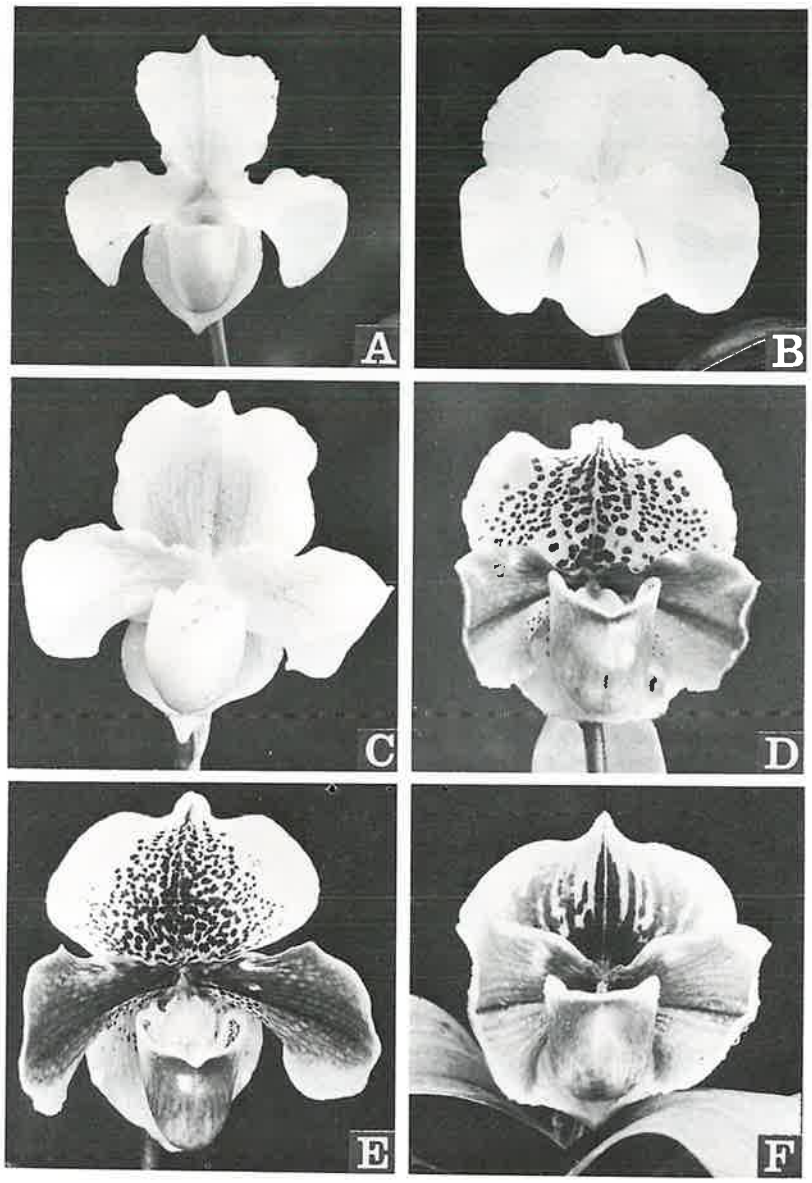

Fig. 12. Flowers of *Paphiopedilum*.
A, *P.* Tsuya Ikeda 'Hamatake' 2n=53. B, *P.* Medowsweet 'Purity' 2n=46. C, *P.* Susan Tucker 'South Pole' 2n=54. D, *P.* Cockade 'Chilton' 2n=40. E, *P.* H. Yamamoto 'Mikage' 2n=56. F, *P.* Paeony 'Regency' 2n=58. x 0.4.

広島市植物公園の植物相と植生*

青山幹男**・橋本清美**

Flora and vegetation of the Hiroshima Botanical Garden

Mikio Aoyama and Kiyoshi Hashimoto

本園の植生は1966年に広島大学理学部植物学教室によって調べられ，現存植生図（図１）とその解説書が作成された。これによると本園の植生は相観的に森林植生と耕地植生に分けられる。森林植生としてアカマツ二次林が形成されているが，土壌湿度および腐植層の発達の程度により随伴する植物が異り，次の６つの群落に区分することができる。すなわち乾燥地より湿潤地にかけてカギバニワスギゴケ群落，ヒメヤシャブシ群落，ワラビ群落，コシダ群落，ヤブコウジ群落，リョウブ群落が形成される。また耕地植生も土壌湿度および優占植物のちがいにより15群落が区分される。すなわちオオアレチノギク群落，ネザサ群落，クズ群落，ホシダ群落，オオアレチノギクーコブナグサ群落，ホウキギク群落，スイバ群落，ジシバリ群落，アキノノゲシ群落，コブナグサ群落，ミゾソバ群落，チゴザサ群落，サトイモ群落，イネ群落，竹林である。なおこの調査では植物目録は作成されていない。

その後，1969年から1973年にかけて園内の造成工事が行われ，耕地植生の全域と森林植生の一部が園路や樹木園として利用されたため，当初の植生が残っているのは園の東側および北側のアカマツ林である。

本園の植物相および植生は今後とも園内の整備にともなって変動すると思われるが，自然植生に配慮しながら園の整備を推進するため，また，現在の植生を記録に残すために本調査を行った。

本稿をまとめるにあたり長崎大学教養部植物学教室の中西弘樹博士および広島大学理学部植物学教室の下田路子氏に種の同定や校閲についてお世話になった。ここであつくお礼申し上げる。

調査地の概要

本園は広島市の西方10kmに位置し，瀬戸内海に面した南向きの緩傾斜面に広がっている。面積は17.6haで南北に細長く，海抜60mから153mまでの範囲にある。地質は花崗岩が風化してできた酸性の砂質土壌が大部分である。気候は山陽気候区に属し，本園の気象状況を表１に示した。園内には灌漑用の人工のため池があり，そこに２つの谷から流れ込む小さな水流があるが，渇水期には水流はなくなる。

植物相

園内における自生植物として，シダ植物９科28種，裸子植物３科４種，被子植物90科392種（単子葉植物11科86種，双子葉植物79科306種）の合計102科424種を確認した。基礎資料として標本の作成に努め末尾の目録には標本番号を付したが，一部未作成の種もある。

園内に自生する植物の中には園の活動に伴って侵入した帰化植物が多く見出される。その種数は60種

* Contribution from the Hiroshima Botanical Garden No. 24
** The Hiroshima Botanical Garden
Bulletin of The Hiroshima Botanical Garden No. 6: 65–89, 1983

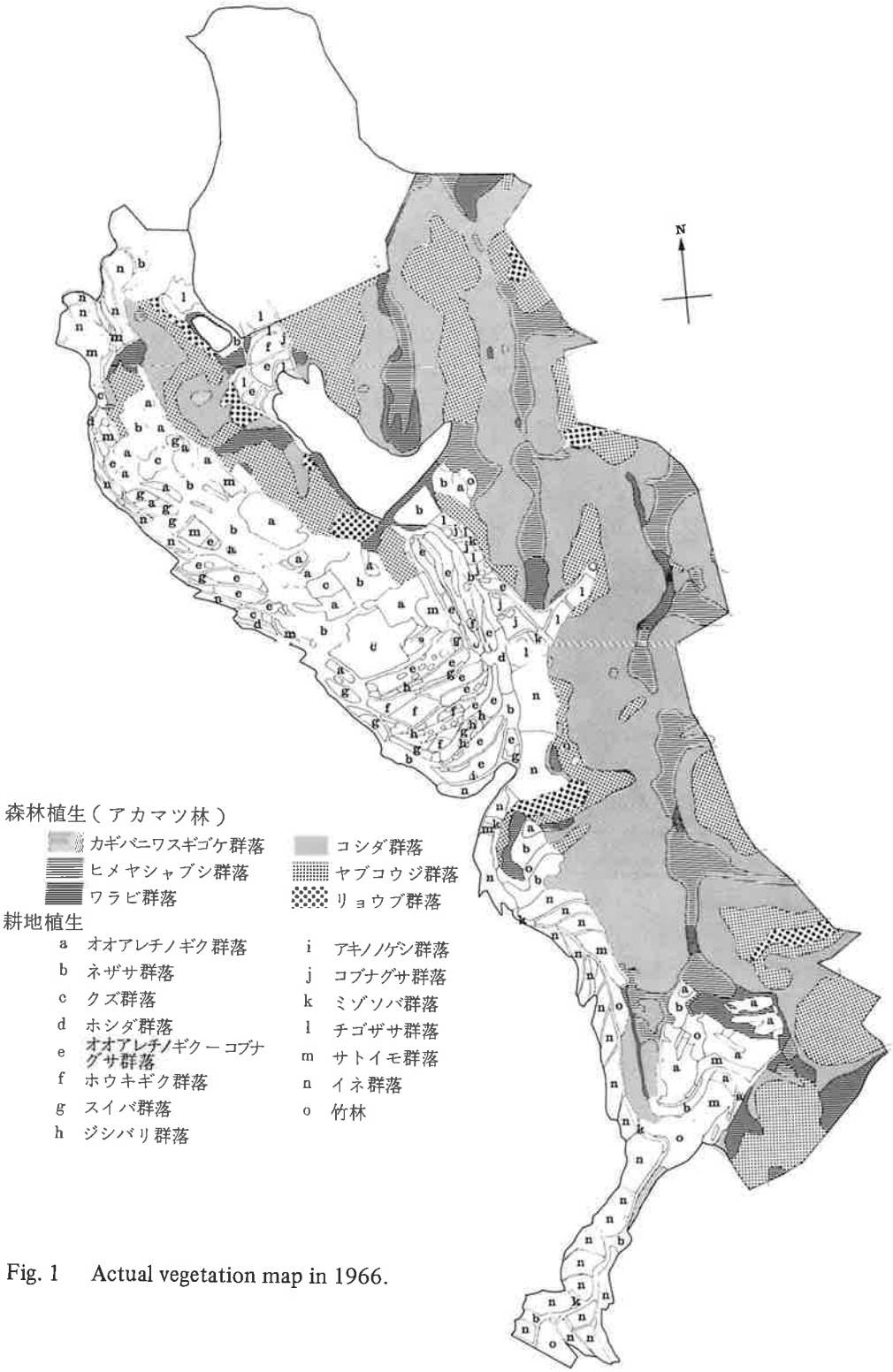

Fig. 1 Actual vegetation map in 1966.

にのぼり，中でもマツバウンラン，フラサバソウ，タチオオバコは比較的めずらしい帰化植物である。また，キダチコミカンソウは温室植物とともに侵入したものと思われ，大温室内でも多数生ずる。

寄生植物としてはアメリカネナシカズラ，ナンバンギセル，ヒノキバヤドリギ，マツグミを，半寄生植物としてカナビキソウ，ママコナを産する。これらの植物は特殊な生活状態を示し，教材植物としても貴重な存在である。

池北側の2つの谷にはシダ植物の大部分とイチヤクソウ，フユイチゴ，ミヤマウズラ等の陰性植物を多数産する。また，シイノキ，アラカシ，ヤブツバキ等を主体とした常緑樹林が形成されている部分もあり，本地域の利用には十分な配慮を必要とする。

その他に注目すべき植物として次の種がある。

フジツツジ　紫紅色の花をつける常緑低木のツツジであるが，園内には近縁種の朱色の花をつけるヤマツツジが見られない。関太郎他(1975)では中間的な個体が見られることなどにより，本種をヤマツツジの一型として扱っている。

クロキ　暖地の沿岸部に多い常緑小高木であるが園内にも多く産する。東側斜面には大木になったものが多く，最大のものは樹高10m胸高周囲0.4m6本立ちの株になっている。

植　　生

本園の植生は狭い地域に多くの要素がはいり込み，人為的な影響を常に受けている。ここでは本園の植生を相観的に3つに区分した。

(1)　アカマツ二次林

豊原・鈴木(1975)によると山陽地方のアカマツ林はアカマツーコバノミツバツツジ群集に区分され，さらに沿岸部の典型亜群集と内陸部のコシアブラ亜群集とに下位区分されている。本園のアカマツ林にはアカマツーコバノミツバツツジ群集の識別種であるコナラ，ナツハゼ，ネザサ，ワラビ，イヌツゲ等が普通に見られ，コバノガマズミだけが比較的少ない。また，コシアブラ亜群集の識別種であるコシアブラ，ウラジロノキ，タカノツメ，アオハダ等は1～数株自生するのみである。

典型亜群集はさらに土壌湿度や二次林の遷移度のちがいをもとに，陽性植物と陰性植物を識別種として3変群集に下位区分されている。すなわち，トゲシバリ，ハナゴケ等の地衣植物やヒメハギ，アリノトウグサ等の陽性植物を識別種としたハナゴケ変群集。シュンラン，ヤブコウジ，マンリョウ等の陰性植物を識別種としたマンリョウ変群集。これらの識別種を含まない典型変群集である。調査票№1はハ

表1.　園内気象記録(昭和57年1月1日～12月31日)

区分 / 月別	気温 平均最低	気温 平均最高	湿度 平均最低	湿度 平均最高	降水量
1月	0.6℃	7.8℃	48.1%	90.1%	24.5mm
2月	1.4	8.6	49.9	91.9	50.0
3月	5.0	14.4	47.1	90.6	141.5
4月	9.1	18.3	45.7	89.7	96.5
5月	15.0	23.9	54.7	94.5	95.0
6月	17.3	25.9	53.6	93.6	42.5
7月	21.1	27.2	70.0	96.6	399.5
8月	23.3	30.2	63.0	95.6	264.5
9月	18.8	25.3	60.7	93.9	109.5
10月	12.5	21.9	50.3	93.5	32.0
11月	9.1	16.5	57.4	92.1	144.0
12月	2.9	10.6	49.5	92.1	8.0
					1,407.5

<参考>
最低気温記録日
1月8日,19日,29日,30日
−3℃
最高気温記録日
8月25日　33℃
最高降水量記録日
8月23日　218mm

観測は本園植物課事務所横に設置した自記温度湿度計(二段記入型バイメタル，毛髪式，太田計器製作所製)及び自記雨量計(隔測顛倒ます型太田計器製作所)により行ったものである。

ナゴケ変群集に，調査票№2は典型変群集に，調査票№3，4はマンリョウ変群集にそれぞれ対応するものと思われる。また池北側の谷にはシイノキ，アラカシが優占する常緑樹林が形成されている（調査票№5）。

以上のごとく本園のアカマツ林は大部分がアカマツーコバノミツバツツジ群集，典型亜群集，マンリョウ変群集に位置づけられるが，造成や伐採後の年数，土壌水分条件等の差により多様な遷移の状態を見ることができる。また種組成のうえでコシアブラ亜群集の要素が見られるとともに，ハナゴケ変群集，典型変群集の地域も混在している。

(2) 耕地植生

人為的な植栽による耕地植生は，アカマツ林を伐採，下刈りして樹木等を植栽した部分と，造成等により裸地にしたあと植栽した部分，および開園以前からあるスギやモウソウチクを植林した部分の3つに便宜上区分され，造成以前の水田，畑地はすべて残っていない。本園では，樹木植栽地を中心に年3回の下刈り除草を実施しているが，下草としてススキ，ヤマハギ等の陽性植物が増加している。また数ケ所においてセイタカアワダチソウやブタナ等の帰化植物の侵入が見られ，拡がっていく傾向にある。

造成した部分は草本園，樹木園，芝地，苗圃場等に利用しているが，人為的な影響が大きく，水田雑草，畑地雑草，帰化雑草が多く生ずる（調査票№6）。

スギやモウソウチクの植林地は林床が暗くなり，ヤブラン，フユイチゴ等の陰性植物が見られる。

(3) 水生植物群落

池の北側の水辺には，ヒルムシロ，コシロネ，ミソハギ，カサスゲ，チゴザサ，ネコヤナギ等からなる水生植物群落が形成されている（調査票№7）。この水生植物群落の外側には土砂の流入とともにススキ，ウツギ，ツルヨシ，ノイバラ，スイカズラ，センニンソウ等の陽性草本・低木類が侵入している。

要　　約

広島市植物公園内の自生植物として，シダ植物28種，裸子植物4種，被子植物392種，計424種が確認された。

園内の植生は相観的にアカマツ二次林，耕地植生，水生植物群落の3つに区分され，アカマツ二次林は大部分がアカマツーコバノミツバツツジ群集，典型亜群集，マンリョウ変群集に属している。

SUMMARY

The present investigation was carried out on the natural flora and vegetation of the Hiroshima Botanical Garden.

As to the flora, 28spp. of Pteridophyta, four spp. of Gymnospermae and 392 spp. of Angiospermae were recognized.

As to the vegetation, Pine secondary forest, agricultural community and aquatic plants community were investigated. Pine secondary forest was mainly belong to association *Rhododendro reticulati – Pinetum densiflorae*, typical subassociation, *Ardisia crenata* variant.

参 考 文 献

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＿＿＿＿・中西弘樹・鈴木兵二・堀川芳雄（1975）　厳島（宮島）の維管束植物，厳島の自然：221－232.

植生調査票

19 年 月 日 調査者

No. 1 調査地

図幅 1:5万 上右 下左

(地形) 山頂・尾根・斜面(上・中・下・凸・凹)・台地・扇状地・平地・谷 (風当) 強・中・弱 座標 m

(群系) 高・低・植林:草・湿原:海(岸・浜・中):河(岸・中):池 (日当) 陽・中陰・陰 方位 S

(岸・中):路・水田・畑・道:砂・岩・樹上 (土湿) 乾・適・湿・過湿 傾斜 25

(土壌) ポド性・褐森・赤・黄・黄褐森・アンド・グライ・疑グライ・泥炭 (母岩) 花崗岩 面積 10×10 m

沖積・高燈草・非固結層・固結層・水面下 (露岩) % 出現種類 17

階層	高さ m	植被率(%)	優占種	胸径 cm	種数
I 高木層	~				
II 亜高木層	~				
III 低木層	2-3	70	アカマツ	3(6年生)	4
	~				
IV 草本層	0.1~1	10	ススキ		12
	~				
V コケ層	~0.01		アカミゴケ		1

	D-S	V		D-S	V		D-S	V		D-S	V	
1							4.4	III	アカマツ	2.2	IV	ススキ
2							1.1		ヒメヤシャブシ	3.3		シナダレスズメガヤ
3							+		ヤシャブシ	1.1		ネコハギ
4							+		ヤマハゼ	1.1		ブタナ
5										+		ナツハゼ
6										+		アキノキリンソウ
7										+		ネザサ
8										+		サルトリイバラ
9										+		ヤマハギ
10										+		フジツツジ
11										+		ヒサカキ(K)
12										+		アカマツ(K)
13												
14												
15												
16											V	
17										3.3		アカミゴケ
18												
19												
20												
21												
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24												
25												
26												
27												
28												
29												
30												

群系名 整理番号 No.

植生調査票

19 年 月 日 調査者

No. 2 調査地

図幅 1:5万 上右 下左

(地形) 山頂・尾根・斜面(上・中・下・凸・凹)・台地・扇状地・平地・谷 (風当) 強・中・弱 座標 m

(群系) 高・低・植林:草・湿原:海(岸・浜・中):河(岸・中):池 (日当) 陽・中陰・陰 方位

(岸・中):路・水田・畑・道:砂・岩・樹上 (土湿) 乾・適・湿・過湿 傾斜 0

(土壌) ポド性・褐森・赤・黄・黄褐森・アンド・グライ・疑グライ・泥炭 (母岩) 面積 10×10 m

沖積・高燈草・非固結層・固結層・水面下 (露岩) % 出現種類 24

階層	高さ m	植被率(%)	優占種	胸径 cm	種数
I 高木層	8~10	80	アカマツ	8(16年生)	2
II 亜高木層	~				
III 低木層	~2	90	コバノミツバツツジ		14
	~				
IV 草本層	~0.3	50	コシダ		8
	~				
V コケ層	~				

	D-S	V		D-S	V		D-S	V		D-S	V	
1	5.5	I	アカマツ				3.3	III	コバノミツバツツジ	3.3	IV	コシダ
2	+		ヤマウルシ				2.2		ミヤマガマズミ	1.1		コバノミツバツツジ
3							2.2		ネジキ	1.1		フジツツジ
4							1.1		ナツハゼ	+		ネザサ
5							1.1		コツクバネワツキ	+		イヌツゲ(K)
6							+		ヤマウルシ	+		ナツハゼ(K)
7							+		フジツツジ	+		ヤマハギ
8							+		コナラ	+		ススキ
9							+		ネズ			
10							+		シャシャンボ			
11							+		ヒサカキ			
12							+		イヌツゲ			
13							+		アカマツ			
14							+		アセビ			
15												
16												
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29												
30												

群系名 整理番号 No.

植生調査票

19　年　月　日　調査者

No. 3　調査地

図幅 1:5万　上右 下左

(地形) 山頂・尾根・斜面(上・(中)・下・凸・凹)・台地・扇状地・平地・谷　(風当) 強・(中)・弱　海抜 m

(群系) (森)・低・植林：草・湿原：海(岸・浜・中)：河(岸・中)：池(岸・中)：路・水田・畑・堤：砂・岩・樹上　(日当) (陽)・中陰・陰　方位 W

(土壌) ボド性・(褐色)・赤・黄・黄褐色・アンド・グライ・礫グライ・泥沢 沖積・高湿草・非固岩屑・固岩屑・水面下　(土湿) 乾・(適)・湿・過湿　傾斜 35

(母岩)　面積 10×10 m

(露岩) %　出現種類 28

階層	高さ m	植被率(%)	優占種	胸径 cm	種数
Ⅰ高木層	15～20	80	アカマツ	22	1
Ⅱ亜高木層	6～8	10	ネジキ	5	3
Ⅲ低木層	0.5～3	100	コバノミツバツツジ		12
Ⅳ草本層	～0.3	30	コシダ		12
Ⅴコケ層					

	D·S	Ⅴ	Ⅰ	D·S	Ⅴ	Ⅱ	D·S	Ⅴ	Ⅲ	D·S	Ⅴ	Ⅳ
1	5·5		アカマツ	4·4		ネジキ	3·3		コバノミツバツツジ	3·3		コシダ
2				+		ソヨゴ	3·3		ネジキ	+		シュンラン
3				+		クロキ	3·3		ヒサカキ	+		ネザサ
4							1·1		ミヤマガマズミ	+		ススキ
5							1·1		サルトリイバラ	+		アキノキリンソウ
6							1·1		スノキ	+		コウヤボウキ
7							+		ヤマウルシ	+		コクラン
8							+		クチナシ	+		オオバノトンボソウ
9							+		クロキ	+·2		ヤマウルシ(K)
10							+		フジツツジ	+		シロダモ(K)
11							+		イヌツゲ	+		マンリョウ(K)
12							+		シャシャンボ	+		イヌツゲ(K)
13												
14												
15												
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29												
30												

群落名　整理番号 No.

植生調査票

19　年　月　日　調査者

No. 4　調査地

図幅 1:5万　上右 下左

(地形) 山頂・尾根・斜面(上・中・(下)・凸・凹)・台地・扇状地・平地・谷　(風当) 強・(中)・弱　海抜 m

(群系) (森)・低・植林：草・湿原：海(岸・浜・中)：河(岸・中)：池(岸・中)：路・水田・畑・堤：砂・岩・樹上　(日当) 陽・(中陰)・陰　方位 W

(土壌) ボド性・(褐色)・赤・黄・黄褐色・アンド・グライ・礫グライ・泥沢 沖積・高湿草・非固岩屑・固岩屑・水面下　(土湿) 乾・(適)・湿・過湿　傾斜 30

(母岩)　面積 15×15 m

(露岩) %　出現種類 34

階層	高さ m	植被率(%)	優占種	胸径 cm	種数
Ⅰ高木層	20～25	80	アカマツ	30	1
Ⅰ亜高木層	3～6	80	ネジキ		6
Ⅱ低木層	0.5～2	50	コバノミツバツツジ		8
Ⅳ草本層	～0.5	20	ヤブコウジ		19
Ⅴコケ層					

	D·S	Ⅴ	Ⅰ	D·S	Ⅴ	Ⅱ	D·S	Ⅴ	Ⅲ	D·S	Ⅴ	Ⅳ
1	5·5		アカマツ	4·4		ネジキ	3·3		コバノミツバツツジ	1·1		ヤブコウジ
2				2·2		イヌツゲ	2·3		ヒサカキ	1·1		ヒサカキ
3				1·2		ヤマウルシ	+		ヤブツバキ	1·1		コウヤボウキ
4				+		ヤマザクラ	+		カクレミノ	+		アラカシ
5				+		カクレミノ	+		スノキ	+		ヤブツバキ
6				+		ヒサカキ	+		ヤマウルシ	+		シュンラン
7							+		アセビ	+		シャシャンボ
8							+		ソヨゴ	+		ネザサ
9										+		フジツツジ
10										+		ヤマモミジ
11										+		サルトリイバラ
12										+		コシダ
13										+		ミヤマガマズミ
14										+		マンリョウ
15										+		クロキ(K)
16										+		カクレミノ(K)
17										+		ヤマウルシ(K)
18										+		ヤブニッケイ(K)
19										+		アオハダ(K)
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												

群落名　整理番号 No.

植生調査票

19　年　月　日　調査者

No. 5　調査地

図幅 1:5万　上古 下生

(地形) 山頂・尾根・斜面(上・中・(下)・凸・凹)・台地・扇状地・平地・谷　(風当) 強・中・(弱)　海抜 m

(群系) (高)・低・植林：耳・原野：道(岸・浜・中)：河(岸・中)：池　(日当) 陽・(中陰)・陰　方位 E

(岸・中)：路・水田・畑・堤：砂・岩・樹上　(土湿) 乾・(適)・湿・過湿　傾斜 30

(土壌) ポド性・(褐色)・赤・黄・黄褐森・アンド・グライ・岩グライ・泥沢　(母岩)　面積 10×10 m

沖積・高湿草・非固岩屑・固岩屑・水面下　(露岩) %　出現種類 58

階層	高さ m	植被率(%)	優占種	胸径 cm	種数
Ⅰ高木層	~20	80	シイノキ	43	6
Ⅱ亜高木層	5~10	50	ネズミモチ	5	15
Ⅲ低木層	1~2	50	ヒサカキ		18
	~				
Ⅳ草本層	~0.3	50	テイカカズラ		19
	~				
Ⅴコケ層	~				

	D·S:V	Ⅰ	D·S:V	Ⅱ	D·S:V	Ⅲ	D·S:V	Ⅳ
1	3·3	シイノキ	1·1	ネズミモチ	2·2	ヒサカキ	3·3	テイカカズラ
2	2·1	アラカシ	1·1	ヤブニッケイ	2·2	ヤブツバキ	1·2	ジャノヒゲ
3	2·1	クスギ	1·1	アラカシ	1·1	シイノキ	1·2	ヤブコウジ
4	1·1	ヤマザクラ	+	ヤブツバキ	1·1	アラカシ	1·1	サンヨウアオイ
5	1·1	スギ	+	ヤマザクラ	1·1	スノキ	1·1	シシガシラ
6	1·1	エゴノキ	+	ヤマウルシ	+	クロキ	1·1	シイノキ (K)
7			+	ソヨゴ	+	スギ	+	シュンラン
8			+	エゴノキ	+	カクレミノ	+	マンリョウ
9			+	タブノキ	+	ネジキ	+	アセビ
10			+	カクレミノ	+	ネズミモチ	+	ヘクソカズラ
11			+	スギ	+	アセビ	+	ナルコユリ
12			+	ネジキ	+	タブノキ	+	ベニシダ
13			+	シイノキ	+	コガクウツギ	+	クズ
14			+	ヤマモミジ	+	ソルゴミ	+	ヤマウルシ
15			+	テイカカズラ	+	クチナシ	+	コウヤボウキ
16					+	ヤマウルシ	+	フユズタ
17					+	クズ	+	アラカシ (K)
18					+	テイカカズラ	+	カクレミノ (K)
19							+	スギ (K)
20								
21								
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25								
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29								
30								

群落名　　受理番号 No.

植生調査票

19　年　月　日　調査者

No. 6　調査地

図幅 1:5万　上古 下生

(地形) 山頂・尾根・斜面(上・中・下・凸・凹)・台地・扇状地・(平地)・谷　(風当) 強・(中)・弱　海抜 m

(群系) 高・低・植林：(耳)・原野：道(岸・浜・中)：河(岸・中)：池　(日当) (陽)・中陰・陰　方位

(岸・中)：路・水田・畑・堤：砂・岩・樹上　(土湿) 乾・(適)・(湿)・過湿　傾斜 0

(土壌) ポド性・褐森・赤・黄・黄褐森・アンド・グライ・岩グライ・泥沢　(母岩)　面積 1×1 m

沖積・高湿草・非固岩屑・固岩屑・水面下　(露岩) %　出現種類 10

階層	高さ m	植被率(%)	優占種	胸径 cm	種数
Ⅰ高木層	~				
Ⅱ亜高木層	~				
Ⅲ低木層	~				
	~				
Ⅳ草本層	~0.5	100	アメリカセンダングサ		10
	~				
Ⅴコケ層	~				

	D·S:V		D·S:V		D·S:V		D·S:V	Ⅳ
1							4·4	アメリカセンダングサ
2							4·4	ヨモギ
3							3·3	シシバリ
4							1·1	キクイモ
5							1·1	ノシバ
6							1·1	オオアレチノギク
7							+	ヒメムカシヨウ
8							+	シロツメクサ
9							+	タネツケバナ
10							+	メヒシバ
11								
12								
13								
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29								
30								

群落名　　受理番号 No.

植生調査票

19　年　月　日　調査者

No. 7　調査地

図幅 1:5万　上百 下左

(地形) 山頂・尾根・斜面(上・中・下・凸・凹)・台地・草状地・平地・谷　(風当)　強・中・弱

(群落) 高・低・植林：草・湿原：海（岸・浜・中）：河（岸・中）：池（岸・中）：路・水田・畑・堤：砂・岩・崩上　(日当)　強・中陰・陰　(土壌) 乾・適・湿

(土壌) ポド性・褐森・赤・黄・黄褐森・アンド・グライ・半グライ・泥沢　(母岩)

沖積　高原草・非固岩屑・固岩屑・水面下　(露岩)　%

海抜 m　方位　傾斜 0　面積 3×3 m　出現種類 14

階層	高さ m	植被率(%)	優占種	胸径 cm	株数
I 高木層	~				
II 亜高木層	~				
III 低木層	~ 1	80	ネコヤナギ		3
IV 草本層	~ 0.5	100	チゴザサ		11
V コケ層	~				

	D·S	V	D·S	V	D·S	V	III	D·S	V	IV
1					4·4		ネコヤナギ	4·4		チゴザサ
2					+		スイカズラ	3·3		サワヒヨドリ
3					+		スズキ	1·1		コブナグサ
4								1·1		イグサ
5								1·1		スギナ
6								+		ヒメシロネ
7								+		オトギリソウ
8								+		ヤマフジ
9								+		アキノウナギツカミ
10								+		アカバナ
11								+		イネ科の1種
12										
13										
14										
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群落名　　整理番号 No.

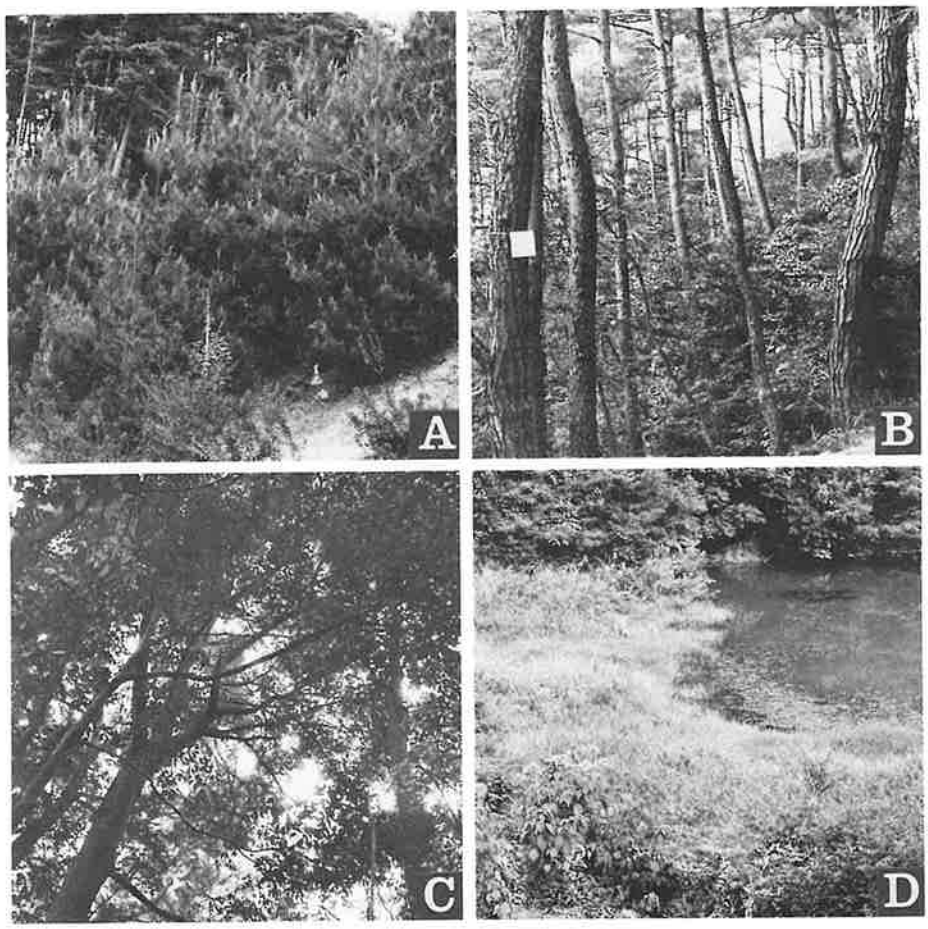

Fig. 2 Some views of natural vegetations.
A: Initial forest dominated by *Pinus densiflora*.
B: Secondary forest dominated by *Pinus densiflora*.
C: Secondary forest dominated by *Castanopsis cuspidata*.
D: Aquatic plants community.

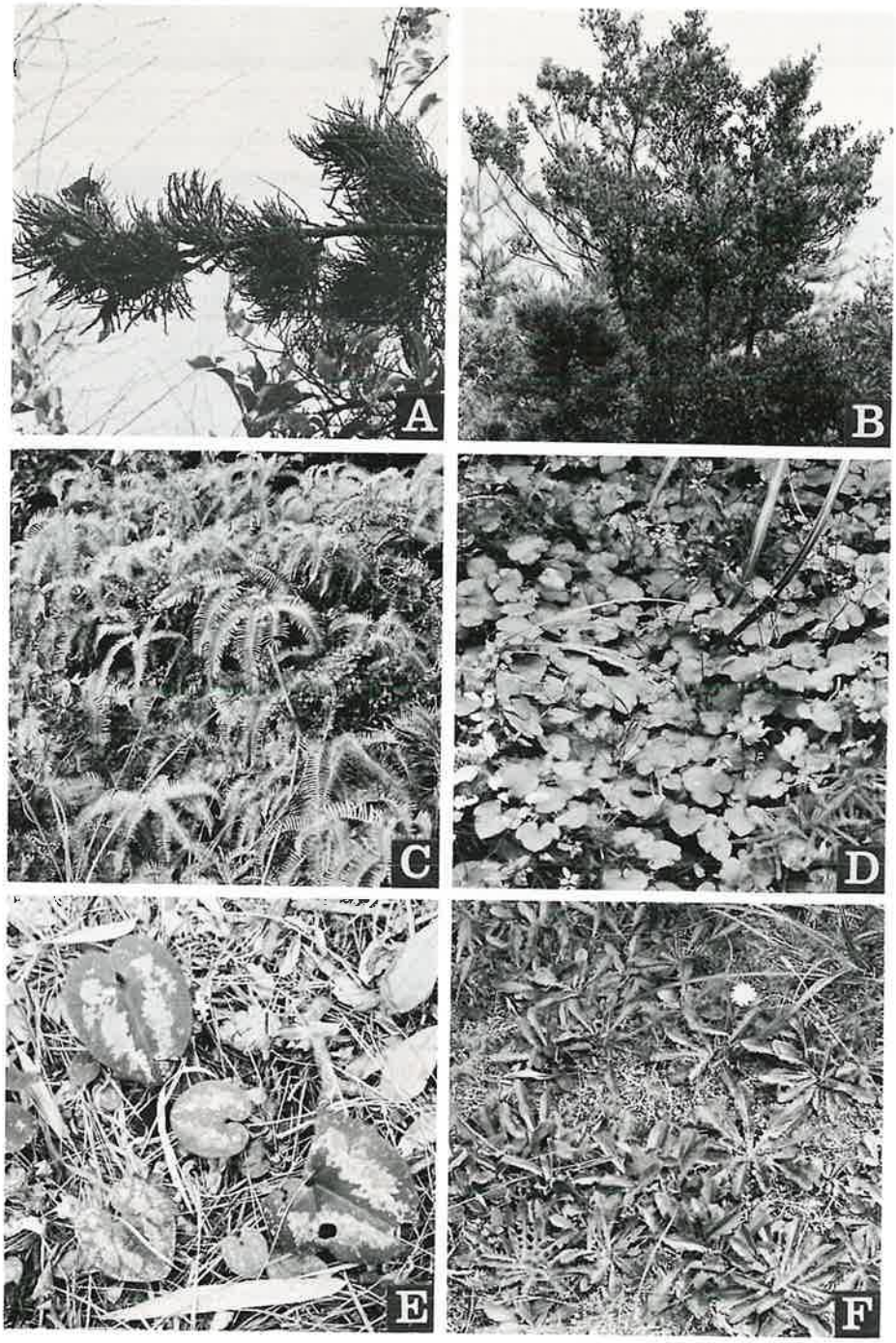

Fig. 3 Photographs of some wild plants.
A: *Korthalsella japonica* (Thunb.) Engler ヤノキバヤドリギ
B: *Symplocos lucida* Sieb. et Zucc. クロキ
C: *Dicranopteris dichotoma* Thunb.) Bernh. コシダ
D: *Rubus buergeri* Miq. フユイチゴ
E: *Asarum hexalobum* (F. Maekawa) F. Maekawa サンヨウアオイ
F: *Hypochoeris radicata* L. ブタナ

広島市植物公園内における自生植物目録

A list of native plants in The Hiroshima Botanical Garden

シ ダ 植 物 Pteridophyta

Lycopodiaceae	**ヒカゲノカズラ科**	
Lycopodium serratum Thunb.	トウゲシバ	167*
L. clavatum L. var. nipponicum Nakai	ヒカゲノカズラ	158
Equisetaceae	**トクサ科**	
Equisetum arvense L.	スギナ	131
Osmundaceae	**ゼンマイ科**	
Osmunda japonica Thunb.	ゼンマイ	2274
Schizaeaceae	**フサシダ科**	
Lygodium japonicum (Thunb.) Sw.	カニクサ	2276
Gleicheniaceae	**ウラジロ科**	
Dicranopteris dichotoma (Thunb.) Bernh.	コシダ	148
Gleichenia japonica Spr.	ウラジロ	2275
Pteridaceae	**イノモトソウ科**	
Sphenomeris chusana (L.) Copel.	ホラシノブ	150
Hypolepis punctata (Thunb.) Mett.	イワヒメワラビ	156
Pteridium aquilinum (L.) Kuhn. var. latiusculum (Desv.) Und.	ワラビ	129
Pteris multifida Poir.	イノモトソウ	151
Coniogramme japonica (Thunb.) Diels	イワガネソウ	152
Onychium japonicum (Thunb.) Kuntze	タチシノブ	165
Aspidiaceae	**オシダ科**	
Polystichum polyblepharum (Roem.) Pr.	イノデ	166
Cyrtomium fortunei J. Sm.	ヤブソテツ	169
Polystichopsis simplicior (Makino) Tagawa var. major (T.) Tagawa	オニカナワラビ	168
P. standishii (Moore) Tagawa	リョウメンシダ	162
Dryopteris pacifica (Nakai) Tagawa	オオイタチシダ	161
D. bissetiana (Bak.) C. Chr.	ヤマイタチシダ	159
D. erythrosora (Eat.) O. Kuntze	ベニシダ	160
Phegopteris decursive-pinnata (van Hall) Fée	ゲジゲジシダ	1235
Lastrea glanduligera (Kuntze) Moore	ハシゴシダ	163

* 標本番号 specimen number

L. japonica (Bak.) Copel.	ハリガネワラビ	170
Leptogramma mollissima (Fisch.) Ching	ミゾシダ	146
Athyrium otophorum (Miq.) Koidz.	タニイヌワラビ	153
A. japonicum (Thunb.) Copel.	シケシダ	154
Blechnaceae	**シシガシラ科**	
Struthiopteris niponica (Kuntze) Nakai	シシガシラ	149
Polypodiaceae	**ウラボシ科**	
Crypsinus hastatus (Thunb.) Copel.	ミツデウラボシ	155

種 子 植 物 Spermatophyta
裸 子 植 物 Gymnospermae

Pinaceae	**マツ科**	
Pinus densiflora Sieb. et Zucc.	アカマツ	
Taxodiaceae	**スギ科**	
Cryptomeria japonica (L.) D. Don	スギ	
Cupressaceae	**ヒノキ科**	
Chamaecyparis obtusa (Sieb. et Zucc.) Endl.	ヒノキ	
Juniperus rigida Sieb. et Zucc.	ネズ	118

被 子 植 物 Angiospermae
単 子 葉 植 物 Monocotyledoneae

Potamogetonaceae	**ヒルムシロ科**	
Potamogeton distinctus A. Benn.	ヒルムシロ	712
Graminae	**イネ科**	
Phyllostachys heterocycla (Carr.) Mitf. var. pubescens (Mazel) Ohwi	モウソウチク	
Arundinaria pygmaea (Miq.) Mitf.	ケネザサ	2019
Alopecurus japonicus Steud.	セトガヤ	780
A. aequalis Sobol. var. amurensis (Komar.) Ohwi	スズメノテッポウ	
Agrostis clavata Trin. var. nukabo Ohwi	ヌカボ	36
A. nipponensis Honda	ヒメコヌカグサ	292
Polypogon fugax Steud.	ヒエガエリ	282
Trisetum bifidum (Thunb.) Ohwi	カニツリグサ	274
Holcus lanatus L.	シラゲガヤ	43
Phalaris arundinaceae L.	クサヨシ	273
Agropyron ciliare (Trin.) Franch. var. minus (Miq.) Ohwi	アオカモジグサ	279
A. tsukusiense (Honda) Ohwi	カモジグサ	260

var. transiens (Hack.) Ohwi		
Festuca elatior L.	ヒロハノウシノケグサ	291
F. arundinaceae Schreb.	オニウシノケグサ	283
F. myuros L.	ナギナタガヤ	42
Poa annua L.	スズメノカタビラ	1020
Phragmites japonica Steud.	ツルヨシ	2020
Eragrostis multicaulis Steud.	ニワホコリ	1212
Eleusine indica (L.) Gaertn.	オヒシバ	1209
Sporobolus indicus (L.) R. Br.	ネズミノオ	703
Zoysia japonica Steud.	シバ	
Pennisetum alopecuroides (L.) Spreng.	チカラシバ	785
Setaria viridis (L.) Beauv.	エノコログサ	717
Panicum bisulcatum Thunb.	ヌカキビ	94
Digitaria adscendens (H. B. K.) Henr.	メヒシバ	723
Oplismenus undulatifolius (Ard.) Roem. et Schult.	チヂミザサ	264
Echinochloa crus-galli (L.) Beauv.	イヌビエ	718
Isachne globosa (Thunb.) O. Kuntze	チゴザサ	
Imperata cylindrica (L.) Beauv.	チガヤ	35
var. koenigii (Retz.) Durand et Schinz		
Miscanthus sinensis Anderss.	ススキ	2254
Spodiopogon sibiricus Trin.	オオアブラススキ	1316
Microstegium vimineum (Trin.) A. Camus	ヒメアシボソ	
Arthraxon hispidus (Thunb.) Makino	コブナグサ	744
Cymbopogon tortilis (Presl) Hitchc.	オガルカヤ	
var. goeringii (Steud.) Hand.-Mazz.		2273
Andropogon virginicus L.	メリケンカルカヤ	749
Paspalum notatum Flugge	アメリカスズメノヒエ	1238
Briza minor L.	ヒメコバンソウ	281
Coix lacryma-jobi L.	ジュズダマ	2272
Eragrostis curvula (Schrad.) Nees	シナダレスズメガヤ	
Cyperaceae	**カヤツリグサ科**	
Cyperus brevifolius (Rottb.) Hassk.	ヒメクグ	211
var. leiolepis (Fr. et Sav.) T. Koyama		
C. sanguinolentus Vahl.	カワラスガナ	214
C. globosus All.	アゼガヤツリ	106
C. rotundus L.	ハマスゲ	
C. iria L.	コゴメガヤツリ	101
C. microiria Steud.	カヤツリグサ	98
C. compressus L.	クグガヤツリ	523
C. difformis L.	タマガヤツリ	105
C. nipponicus Fr. et Sav.	アオガヤツリ	99
Lipocarpha microcephala (R. Br.) Kunth	ヒンジガヤツリ	107
Scirpus wichurae Böcher.	アブラガヤ	746
Fimbristylis miliacea (L.) Vahl.	ヒデリコ	103
F. dichotoma (L.) Vahl.	テンツキ	1240

Carex thunbergii Steud.	アゼスゲ	145
C. maximowiczii Miq.	ゴウソ	267
C. breviculmis R. Br.	アオスゲ	342
C. humilis Leyss. var. nana (Lév. et Van.) Ohwi	ホソバノヒカゲスゲ	126
C. lenta D. Don	ナキリスゲ	2026
C. dispalata Boott	カサスゲ	1595
Araceae	**サトイモ科**	
Pinellia ternata (Thunb.) Breitenb.	カラスビシャク	
Arisaema tosaense Makino	アオテンナンショウ	1572
Acorus gramineus Soland.	セキショウ	2271
Commelinaceae	**ツユクサ科**	
Commelina communis L.	ツユクサ	716
Aneilema keisak Hassk.	イボクサ	1274
Pontederiaceae	**ミズアオイ科**	
Monochoria vaginalis (Burm. f.) Presl var. plantaginea Solms-Laub.	コナギ	2249
Juncaceae	**イグサ科**	
Luzula multiflora Lejeume	ヤマヌカボ	341
Juncus effusus L. var. decipiens Buchen.	イ	285
Liliaceae	**ユリ科**	
Metanarthecium luteo-viride Maxim.	ノギラン	568
Heloniopsis orientalis (Thunb.) C. Tanaka	ショウジョウバカマ	
Lilium japonicum Thunb.	ササユリ	1038
Scilla scilloides (Lindl.) Druce	ツルボ	2040
Polygonatum odoratum (Mill.) Druce var. pluriflorum (Miq.) Ohwi	アマドコロ	1035
Liriope platyphylla Wang et Tang	ヤブラン	2017
Ophiopogon japonicus (L. f.) Ker.-Gawl.	ジャノヒゲ	762
Smilax china L.	サルトリイバラ	18
Dioscoreaceae	**ヤマノイモ科**	
Dioscorea japonica Thunb.	ヤマノイモ	2340
D. quinqueloba Thunb.	カエデドコロ	2339
Iridaceae	**アヤメ科**	
Sisyrinchium atlanticum Bickn.	ニワゼキショウ	1016
S. iridifolium Humb. Bonpl. et Kunth. var. laxum Maekawa	オオニワゼキショウ	1675

Orchidaceae	**ラン科**	
Platanthera minor (Miq.) Rchb. f.	オオバノトンボソウ	573
Epipactis thunbergii A. Gray	カキラン	555
Spiranthes sinensis (Pers.) Ames	ネジバナ	572
Goodyera schlechtendaliana Rchb. f.	ミヤマウズラ	
Liparis nervosa (Thunb.) Lindl.	コクラン	551
L. krameri Fr. et Sav.	ジガバチソウ	2594
Cymbidium goeringii (Rchb. f.) Rchb. f.	シュンラン	495

双子葉植物 Dicotyledoneae

Saururaceae	**ドクダミ科**	
Houttuynia cordata Thunb.	ドクダミ	1105
Chloranthaceae	**センリョウ科**	
Chloranthus glaber (Thunb.) Makino	センリョウ	
Salicaceae	**ヤナギ科**	
Salix gracilistyla Miq.	ネコヤナギ	50
Myricaceae	**ヤマモモ科**	
Myrica rubra Sieb. et Zucc.	ヤマモモ	2443
Betulaceae	**カバノキ科**	
Alnus sieboldiana Matsum.	オオバヤシャブシ	379
A. firma Sieb. et Zucc.	ヤシャブシ	294
A. pendula Matsum.	ヒメヤシャブシ	20
Fagaceae	**ブナ科**	
Quercus glauca Thunb.	アラカシ	121
Q. serrata Thunb.	コナラ	976
Q. variabilis Blume	アベマキ	219
Q. acutissima Carruth.	クヌギ	2077
Castanea crenata Sieb. et Zucc.	クリ	293
Castanopsis cuspidata (Thunb.) Schōttky	ツブラジイ	117
Ulmaceae	**ニレ科**	
Celtis sinensis Pers. var. japonica (Planch.) Nakai	エノキ	2345
Moraceae	**クワ科**	
Fatoua villosa (Thunb.) Nakai	クワクサ	1321
Morus bombycis Koidz.	ヤマグワ	258
Broussonetia kazinoki Sieb.	コウゾ	1672
Ficus nipponica Fr. et Sav.	イタビカズラ	2331

F. erecta Thunb.

Urticaceae
Boehmeria nipononivea Koidz.
B. spicata (Thunb.) Thunb.

Santalaceae
Thesium chinense Turcz.

Loranthaceae
Taxillus kaempferi (DC.) Danser
Korthalsella japonica (Thunb.) Engler

Aristolochiaceae
Asarum hexalobum (F. Maek.) F. Maekawa

Polygonaceae
Rumex acetosella L.
R. acetosa L.
R. crispus L.
Polygonum filiforme Thunb.
P. aviculare L.
P. perfoliatum L.
P. senticosum (Meisner) Fr. et Sav.
P. thunbergii Sieb. et Zucc.
P. hastato-auriculatum Makino
P. persicaria L.
P. longisetum De Bruyn
P. erecto-minus Makino
P. cuspidatum Sieb. et Zucc.

Chenopodiaceae
Chenopodium album L.
var. centrorubrum Makino
Kochia scoparia (L.) Schrad.

Amaranthaceae
Amaranthus lividus L.
A. viridis L.
Achyranthes fauriei Lév. et Van.

Phytolaccaceae
Phytolacca americana L.

Aizoaceae

イヌビワ 270

イラクサ科
カラムシ 2268
コアカソ 46

ビャクダン科
カナビキソウ 340

ヤドリギ科
マツグミ 87
ヒノキバヤドリギ

ウマノスズクサ科
サンヨウアオイ 110

タデ科
ヒメスイバ 1021
スイバ 887
ナガバギシギシ 276
ミズヒキ 2078
ミチヤナギ
イシミカワ 1229
ママコノシリヌグイ 2318
ミゾソバ 705
ホソバノウナギツカミ 707
ハルタデ 33
イヌタデ 1226
ヒメタデ 41
イタドリ 257

アカザ科
アカザ 721

ホウキギ 1214

ヒユ科
イヌビユ 715
ホナガイヌビユ
ヒナタイノコズチ 1231

ヤマゴボウ科
ヨウシュヤマゴボウ 570

ツルナ科

Mollugo verticillata L.	クルマバザクロソウ	1210
Portulacaceae	**スベリヒユ科**	
Portulaca oleracea L.	スベリヒユ	
P. pilosa L.	ヒメマツバボタン	
Caryophyllaceae	**ナデシコ科**	
Sagina japonica (Sw.) Ohwi	ツメクサ	
Cerastium glomeratum Thuill.	オランダミミナグサ	132
C. holosteoides Fries var. hallaisanense (Nakai) Mizushima	ミミナグサ	
Stellaria media (L.) Villars	コハコベ	695
S. uchiyamana Makino	ヤマハコベ	1634
S. alsine Grimm var. undulata (Thunb.) Ohwi	ノミノフスマ	1589
Dianthus superbus L. var. longicalycinus (Maxim.) Williams	カワラナデシコ	
D. armeria L.	ノハラナデシコ	2583
Ranunculaceae	**キンポウゲ科**	
Clematis apiifolia DC.	ボタンヅル	2073
C. terniflora DC.	センニンソウ	782
Ranunculus japonicus Thunb.	ウマノアシガタ	24
R. cantoniensis DC.	ケキツネノボタン	
Aquilegia adoxoides (DC.) Ohwi	ヒメウズ	259
Lardizabalaceae	**アケビ科**	
Akebia trifoliata (Thunb.) Koidz.	ミツバアケビ	973
Menispermaceae	**ツヅラフジ科**	
Cocculus trilobus (Thunb.) DC.	アオツヅラフジ	284
Magnoliaceae	**モクレン科**	
Illicium religiosum Sieb. et Zucc.	シキミ	2332
Kadsura japonica (Thunb.) Dunal	サネカズラ	2025
Lauraceae	**クスノキ科**	
Cinnamomum camphora (L.) Sieb.	クスノキ	2444
C. japonicum Sieb., ex Nakai	ヤブニッケイ	377
Machilus thunbergii Sieb. et Zucc.	タブノキ	972
Lindera umbellata Thunb.	クロモジ	125
Neolitsea sericea (Blume) Koidz.	シロダモ	116
Papaveraceae	**ケシ科**	
Macleaya cordata (Willd.) R. Br.	タケニグサ	

Corydalis incisa (Thunb.) Pers.	ムラサキケマン	
Crucifera	**アブラナ科**	
Lepidium virginicum L.	マメグンバイナズナ	1111
Cardamine flexuosa With.	タネツケバナ	327
Nasturtium officinale R. Br.	オランダガラシ	1023
Rorippa indica (L.) Hochr.	イヌガラシ	1635
R. islandica (Oeder) Borbás	スカシタゴボウ	32
Capsella bursa-pastoris (L.) Medik.	ナズナ	799
Coronopus didymus (L.) Smith	カラクサナズナ	1678
Droseraceae	**モウセンゴケ科**	
Drosera rotundifolia L.	モウセンゴケ	
Saxifragaceae	**ユキノシタ科**	
Schizophragma hydrangeoides Sieb. et Zucc.	イワガラミ	220
Hydrangea hirta (Thunb.) Sieb.	コアジサイ	433
H. luteo-venosa Koidz.	コガクウツギ	28
Deutzia crenata Sieb. et Zucc.	ウツギ	276
Rosaceae	**バラ科**	
Potentilla kleiniana Wight et Arnott	オヘビイチゴ	261
Rubus buergeri Miq.	フユイチゴ	271
R. microphyllus L. f.	ニガイチゴ	2319
R. crataegifolius Bunge	クマイチゴ	416
R. corchorifolius L. f.	ビロードイチゴ	2343
R. palmatus Thunb.	ナガバモミジイチゴ	65
R. hirsutus Thunb.	クサイチゴ	13
R. parvifolius L.	ナワシロイチゴ	272
Sanguisorba officinalis L.	ワレモコウ	2255
Agrimonia pilosa Ledeb.	キンミズヒキ	1221
Rosa multiflora Thunb.	ノイバラ	1107
Prunus jamasakura Sieb., ex Koidz.	ヤマザクラ	123
Amelanchier asiatica (Sieb. et Zucc.) Endl.	ザイフリボク	16
Sorbus japonica (Decne.) Hedl.	ウラジロノキ	1116
Leguminosae	**マメ科**	
Albizia julibrissin Durazz.	ネムノキ	552
Cassia nomame (Sieb.) Honda	カワラケツメイ	1266
Lespedeza cyrtobotrya Miq.	マルバハギ	791
L. bicolor Turcz.	ヤマハギ	792
L. cuneata (DuMont. d. Cours.) G. Don	メドハギ	725
L. pilosa (Thunb.) Sieb. et Zucc.	ネコハギ	1222
Kummerovia striata (Thunb.) Schindler	ヤハズソウ	700
Desmodium oxyphyllum DC.	ヌスビトハギ	750

D. paniculatum (L.) DC.	アレチヌスビトハギ	
Vicia sepium L.	カラスノエンドウ	134
V. tetrasperma (L.) Schreb.	カスマグサ	
V. hirsuta (L.) S. F. Gray	スズメノエンドウ	2445
Dunbaria villosa (Thunb.) Makino	ノアズキ	1223
Rhynchosia acuminatifolia Makino	トキリマメ	1270
Dumasia truncata Sieb. et Zucc.	ノササゲ	286
Pueraria lobata (Willd.) Ohwi	クズ	
Glycine soja Sieb. et Zucc.	ツルマメ	1244
Indigofera pseudo-tinctoria Matsum.	コマツナギ	553
Wisteria brachybotrys Sieb. et Zucc.	ヤマフジ	290
Lotus corniculatus L. var. japonicus Regel	ミヤコグサ	402
Astragalus sinicus L.	ゲンゲ	924
Trifolium repens L.	シロツメクサ	278
T. dubium Sibth.	コメツブツメクサ	962
Geraniaceae	**フウロソウ科**	
Geranium thunbergii Sieb. et Zucc.	ゲンノショウコ	
G. carolinianum L.	アメリカフウロ	67
Oxalidaceae	**カタバミ科**	
Oxalis corniculata L.	カタバミ	2467
O. stricta L.	オッタチカタバミ	
O. martiana L.	ムラサキカタバミ	
Rutaceae	**ミカン科**	
Zanthoxylum schinifolium Sieb. et Zucc.	イヌザンショウ	256
Boenninghausenia japonica Nakai	マツカゼソウ	2016
Polygalaceae	**ヒメハギ科**	
Polygala japonica Houtt.	ヒメハギ	561
Euphorbiaceae	**トウダイグサ科**	
Phyllanthus matsumurae Hayata	ヒメミカンソウ	85
P. amarus Schum. et Th. Kongl.	キダチコミカンソウ	1320
Acalypha australis L.	エノキグサ	699
Mallotus japonicus (Thunb.) Muell.	アカメガシワ	298
Euphorbia pseudochamaesyce Fisch. Mey. et Lallem.	ニシキソウ	2267
E. supina Rafin.	コニシキソウ	720
E. hirta L.	シマニシキソウ	
Anacardiaceae	**ウルシ科**	
Rhus trichocarpa Miq.	ヤマウルシ	966
R. javanica L.	ヌルデ	2263

Aquifoliaceae		
Ilex macropoda Miq.	モチノキ科	
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I. pedunculosa Miq.	イヌツゲ	139
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E. pungens Thunb.	ナワシログミ	2264
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Lythrum anceps (Koehne) Makino	ミソハギ	710
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O. biennis L.	アレチマツヨイグサ	1250
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Haloragaceae	アリノトウグサ科	
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Solanaceae	**ナス科**	
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広島市植物公園紀要

第6号

昭和58年12月31日　印刷発行

編集兼発行　広島市植物公園
〒731-51 広島県佐伯郡五日市町倉重495
(0829)22 － 3600

印　刷　株式会社ニシキプリント
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(082)277 － 6954

広島市植物公園 紀要

第 6 号

1983

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