Karyomorphological observations on some Aroids cultivated in the Hiroshima Botanical Garden l. *Alocasia.**

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広島市植物公園で栽培のサトイモ科植物の核形態学的観察１．

アロカシア属*

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Introduction

The family Araceae, which consists of 106 genera and 2,950 species (Huxley 1997), is widely distributed mostly in the tropics, subtropics and a few in the Temperate zone. Aroid is important as one of the ornamental and food plants.

They have been collected approximately 49 genera and 192 species at the Hiroshima Botanical Garden. It enhances value of the specimen to examine the karyotype of these aroids cultivated in the Hiroshima Botanical Garden. The cytological information is believed to be useful for the botanical and horticultural purposes in the future.

For the first report of this observation series, the chromosome morphology is studied 14 taxa of *Alocasia* cultivated in the Hiroshima Botanical Garden.

The genus *Alocasia*, which is known as one of the ornamental aroids with about 70 species, is widely distributed in tropical and eastern Asia, and Oceania.

Much general information regarding the chromosome numbers of *Alocasia* has been reported by various workers including Ito (1942), Pfitzer (1957), Sharm (1970), Marchant (1971), Hsu (1972), Bhattacharya (1974) and Ankei (1987). However, morphological study of the somatic chromosome is poorly made in most of the standard references.

Materials and Methods

All materials studied in this work were cultivated in the Hiroshima Botanical Garden, Hiroshima City, Japan (Table 1).

Cytological observations were made in somatic chromosome of root tip cells. Chromosomes were observed by an aceto-orcein squash method as follows : Growing root tips were cut into small pieces

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Table 1. Sources, numbers of plants and chromosome numbers of the species *Alocasia* studied

Species	Source	No. of plants observed	Chromosome number (2n) present count	Chromosome number (2n) previous count
A. cucullata (Lour.) G. Don f.	China, Taiwan	2	28	28
A. cuprea (Koch & Bouche) Koch.	Borneo	1	28	28
A. gageana Engl. & K. Krause	Borneo	1	28	
A. 'Green Shield' hort.	Philippine	1	28	
A. lowii Hook. f	Malaysia	2	28	28
		1	70	70
A. macrorrhiza (L) G. Don.	Thailand	2	28	28
A. micholitziana Sander	Philippine	1	28	28
A. odora (Lodd.) Spach.	Japan, Kagoshima, Okinawa Pref.	3	28	28
A. plumbea (K.Koch) Van Houtte.	Java	1	28	
A. porphyroneura H.G. Hallier ex Engl.	Borneo	1	28	
A. portei Schott.	Philippine	1	28	
A. sanderana Bull.	Philippine	2	28	28
A. wentii Engl & Kurt Krause.	Philippine	1	42	
A. zebrina C. Koch & Veitch.	Philippine	1	28	28

1.0-2.0mm long and were immersed in 0.002M 8-hydroxyquinoline for four hours at 18 ℃. They were then fixed in 45% acetic acid for 10 minutes at 5 ℃; They were macerated in the mixture of one part of 45% acetic acid and two parts of 1N hydrochloric acid for about one minute at 60℃; Then, they were stained and squashed in 1% aceto-orcein.

The results of the observations in the resting nuclei and somatic prophase chromosomes and the karyotype formulas at mitotic metaphase were described and classified according to Tanaka (1971, 1977, 1980).

The chromosomes at mitotic metaphase were measured by lengths of the long and short arms. Arm ratio was calculated by the long arm length / the short arm length, and expressed by the value of arm ratio 1.0 to 1.7 as "median cetromere", 1.8 to 3.0 as "submedian centromere", 3.1 to 7.0 as "subterminal centromere" according to Levan *et al.* (1964). The chromosomes were basically aligned in descending order from the longest to the shortest chromosomes and were given numbers 1, 2, 3,..., respectively.

Observations

1) *Alocasia cucullata* (Lour.) G. Don f., 2n=28, Tables 1 and 2, Fig. 1.
Validated specimen No. 167, NF5301.

Two plants were obtained from China, Taiwan. External morphological characteristics of the plants were similar to those of this species described by Leedy *et al.* (1984).

The chromosome number of two plants was 2n=28 at mitotic metaphase and confirmed the previous reports (Ito 1942, Marchant 1971, Ankei 1987).

The chromosomes at resting stage were observed as chromomeric granules, fibrous threads and chromatin blocks scattered throughout the nucleus. Many small chromatin blocks were round-, rod-, and string-shaped and varied from 0.6-2.0 μm in diameter and showed irregular shape with rough surface. Some of the blocks aggregated into large blocks as the chromocentral aggregation.

Thus, the description of the karyotype at the resting stage was considered to belong to the category of the complex chromocenter type proposed by Tanaka (1971).

At prophase the chromosomes formed early condensed segments located in the proximal and interstitial regions of both arms. Late condensed segments were observed in the distal regions of the chromosomes.

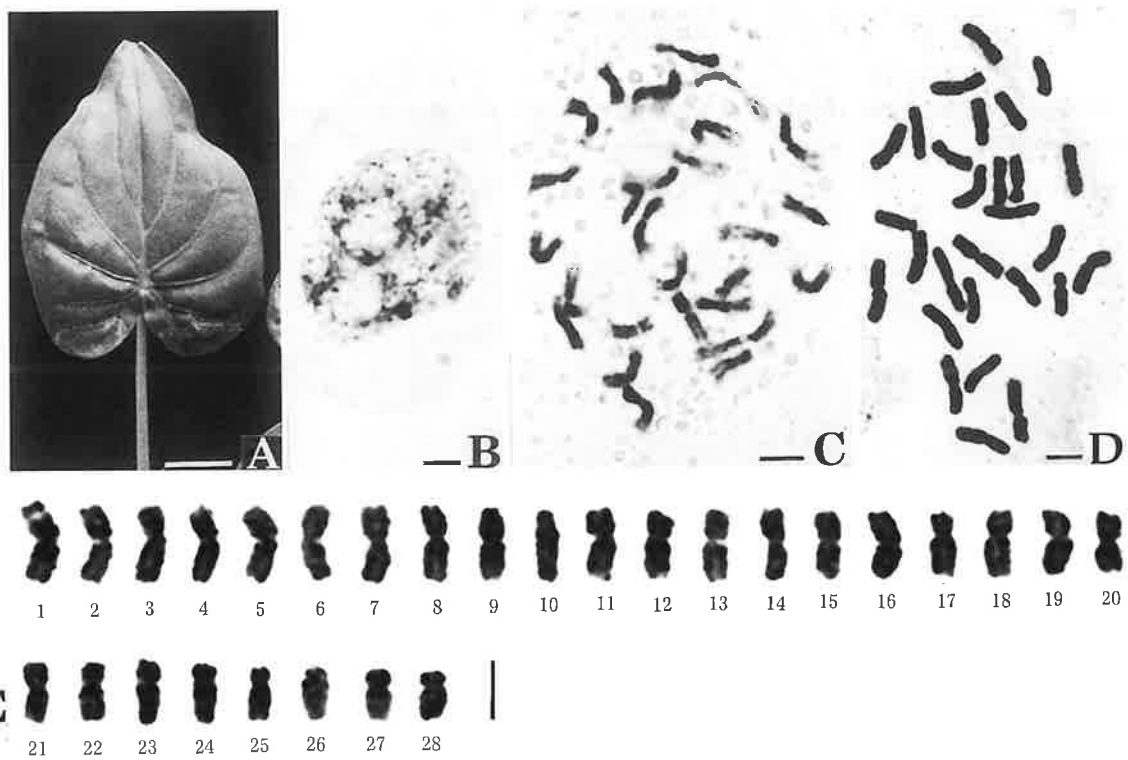

Fig.1. *Alocasia cucullata*, 2n=28. A, a leaf. B, chromosomes at resting stage. C, chromosomes at mitotic prophase. D and E, chromosomes at mitotic metaphase. Bars indicate 5 cm in A and 3μm in B-E.

Thus, the karyotype at mitotic prophase was found to be the interstitial type as proposed by Tanaka (1977).

The chromosomes at mitotic metaphase showed a gradual decrease in length ranging from the longest one of 4.3 μm to the shortest one of 2.7 μm, and the positions of the chromocenters were either median or submedian. Among the 28 chromosomes 22 were median, while the other six (Nos. 23-28) were submedian. One chromosome (No. 26) had secondary constriction in the short arm.

According to the definition of the karyotype proposed by Tanaka (1980), this species showed a homogeneous and gradual karyotype due to chromosome length and a symmetric karyotype due to arm ratio.

2) *Alocasia cuprea* (Koch & Bouche) Koch., 2n=28, Tables 1 and 3, Fig. 2. Validated specimen No. 166.

One plant was obtained from Borneo. External morphological characteristics of leaves were similar to those of this species described by Leedy *et al.* (1984).

The chromosome number of the plant was 2n=28 at mitotic metaphase and confirmed the previous

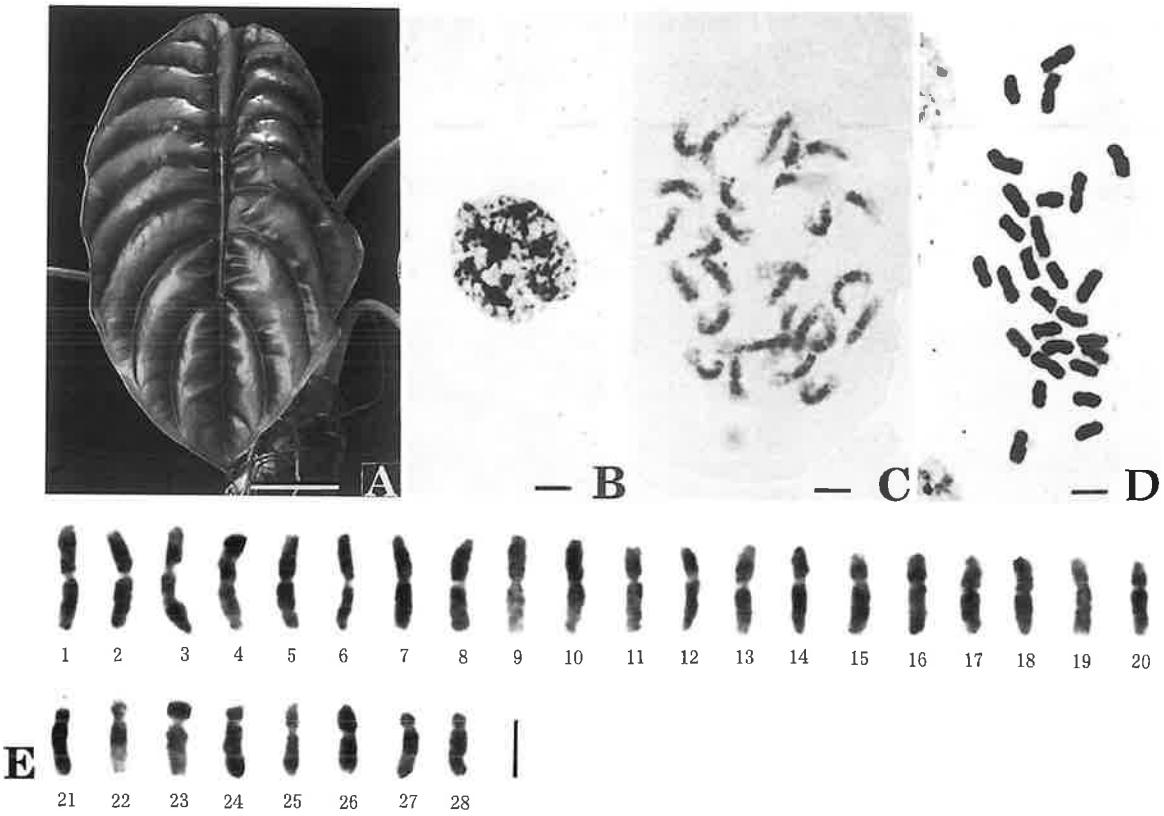

Fig.2. *Alocasia cuprea*, 2n=28. A, a leaf. B, chromosomes at resting stage. C, chromosomes at mitotic prophase. D and E, chromosomes at mitotic metaphase. Bars indicate 5 cm in A and 3μm in B-E.

reports (Jones 1957. Pfitzer 1957, Marchant 1971).

The chromosomes at resting stage and mitotic prophase were morphologically similar to those of *A. cucullata* described above. The chromosome features at resting stage were of the complex chromocenter type.

The chromosomes at mitotic metaphase showed a gradual decrease in length ranging from the longest one of 5.7 μ m to the shortest one of 3.6 μ m, and the positions of the chromocenters were either median or submedian. Among the 28 chromosomes 18 were median, while the other ten (Nos. 19-28) were submedian. Two chromosomes (Nos. 21, 22) had secondary constrictions in their short arms, and eight chromosomes (Nos.1, 4-6, 9-11,17) had secondary constrictions in their long arms.

This species showed a homogeneous, gradual and symmetric karyotype.

3) *Alocasia gageana* Engl. & K. Krause, 2n=28, Tables 1 and 4, Fig.3.
Validated specimen No. 85038.

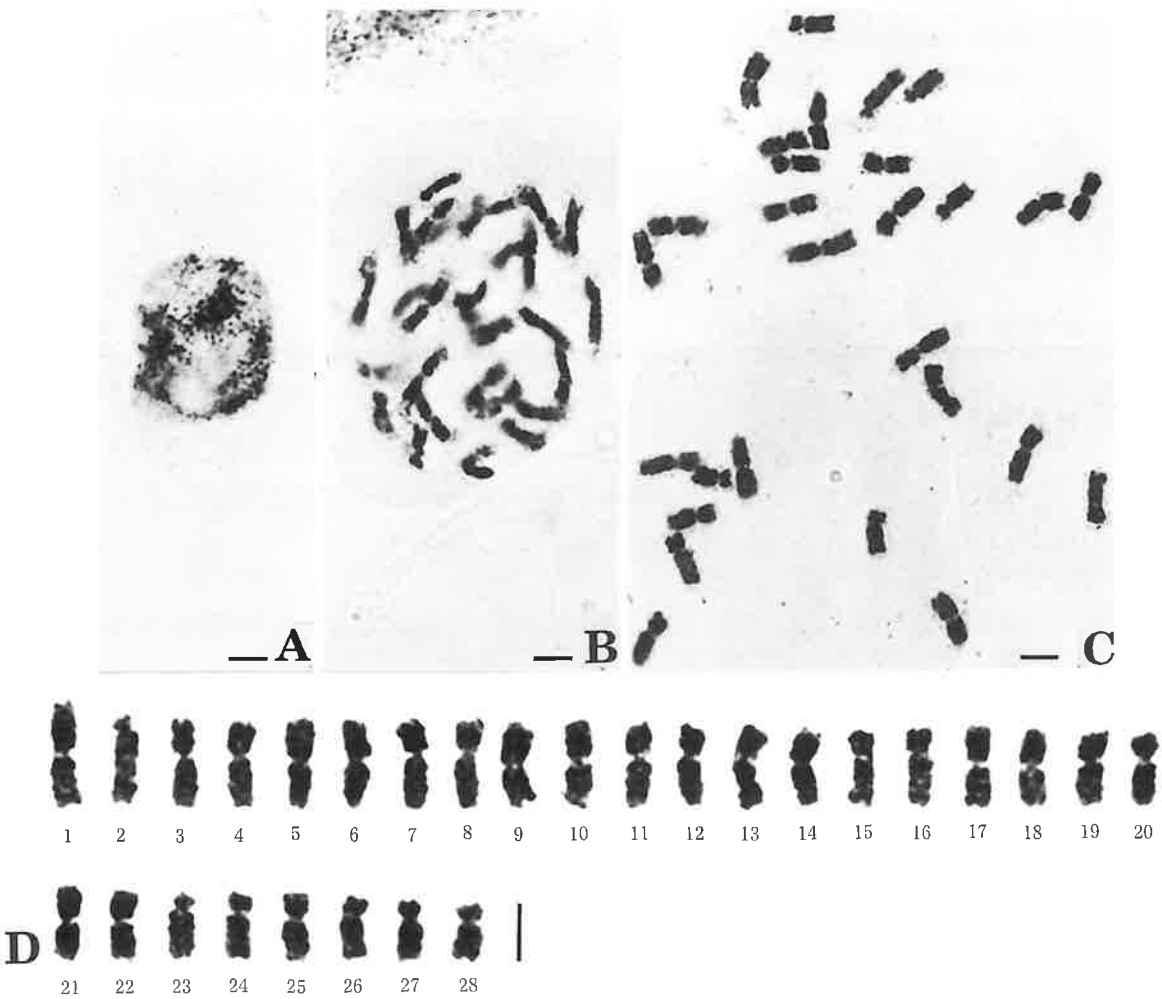

Fig.3. *Alocasia gageana*, 2n=28. A, choromosomes at resting stage. B, chromosomes at mitotic prophase. C and D, chromosomes at mitotic metaphase. Bars indicate 3μm in A-D.

One plant was obtained from Borneo. External morphological characteristics of leaves were similar to those of this species described by Leedy *et al.* (1984).

The chromosome number of the plant at mitotic metaphase was 2n=28, which was reported here for the first time for this species.

The chromosomes at resting stage and mitotic prophase were morphologically similar to those of *A. cucullata* described above. The chromosome features at resting stage were of the complex chromocenter type.

The chromosomes at mitotic metaphase showed a gradual decrease in length ranging from the longest one of 5.0 μ m to the shortest one of 2.9 μ m, and the positions of the chromocenters were either median or submedian. Among the 28 chromosomes 20 were median, while the other eight (Nos. 13, 14, 23-28) were submedian.

This species showed a homogeneous, gradual and symmetric karyotype.

4) *Alocasia* 'Green Shield' hort., 2n=28, Tables 1 and 5, Fig. 4.
Validated specimen No. 85026.

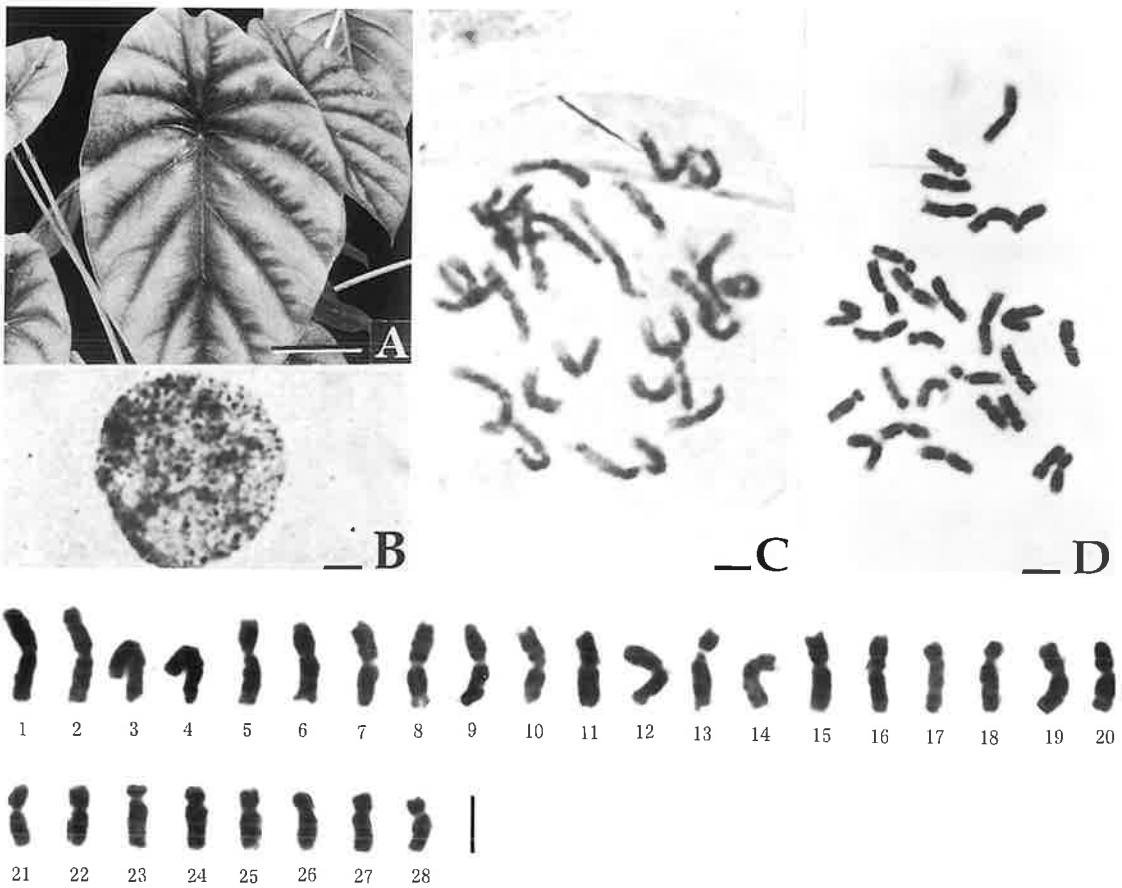

Fig.4. *Alocasia* 'Green Shield', 2n=28. A, leaves. B, chromosomes at resting stage. C, chromosomes at mitotic prophase. D and E, chromosomes at mitotic metaphase. Bars indicate 5 cm in A and 3μm in B-E.

This plant is not given a scientific name, but this aroid is known as 'Green Cuprea' in horticulture.

One plant was obtained from Philippine. External morphological characteristics of leaves were similar to those of this species described by Leedy *et al.* (1984).

The chromosome number of the plant at mitotic metaphase was 2n=28, which was reported here for the first time for this species.

The chromosomes at resting stage and mitotic prophase were morphologically similar to those of *A. cucullata* described above. The chromosome features at resting stage were of the complex chromocenter type.

The chromosomes at mitotic metaphase showed a gradual decrease in length ranging from the longest one of 5.1 μ m to the shortest one of 3.0 μ m. Among the 28 chromosomes 18 were median, six (Nos. 13, 14, 25-28) were submedian and four (Nos. 19, 20, 23, 24) were subterminal.

Five chromosomes (Nos.8, 9, 12, 19, 20) had small constrictions in their long arms.

This species showed a homogeneous, gradual and symmetric karyotype.

5) *Alocasia lowii* Hook.f., 2n=28 and 2n=70, Tables 1 and 6, Figures. 5 and 6. Validated specimen No. 158, 159, 160.

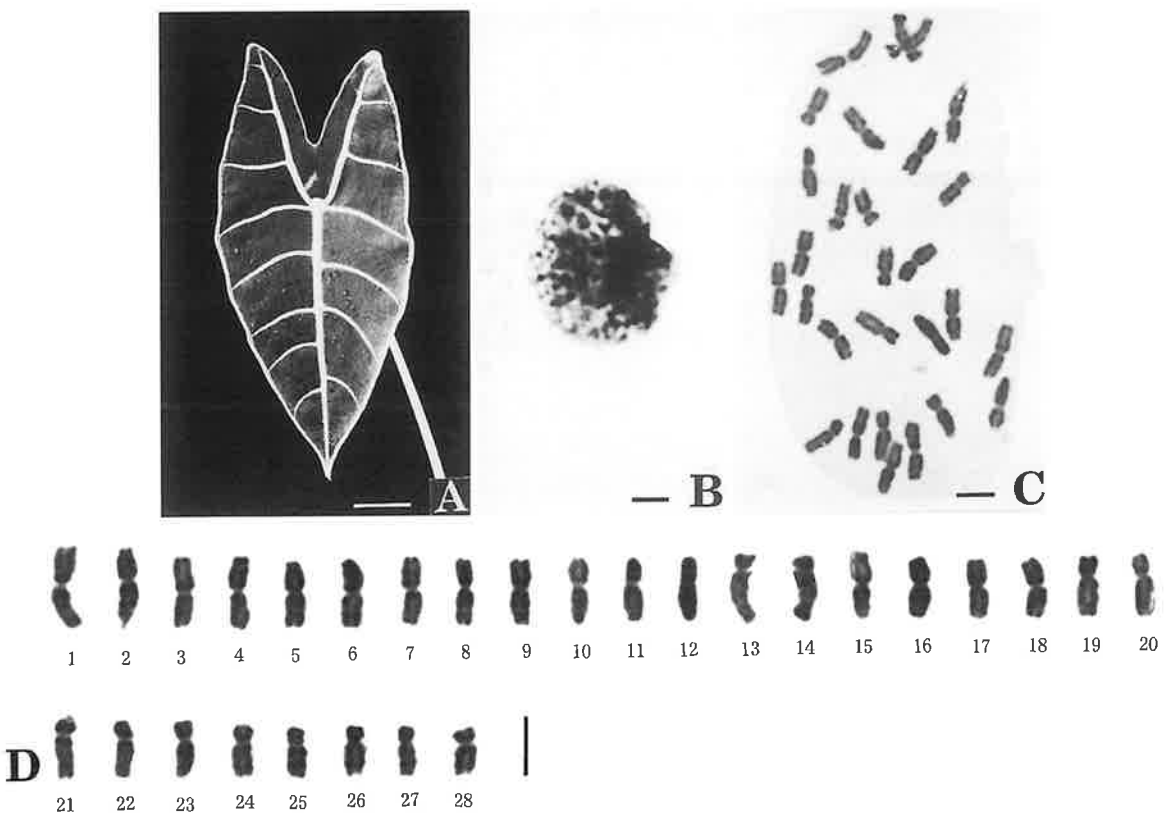

Fig.5. *Alocasia lowii*, 2n=28. A, a leaf. B, chromosomes at resting stage. C and D, chromosomes at mitotic metaphase. Bars indicate 5 cm in A and 3μm in B-D.

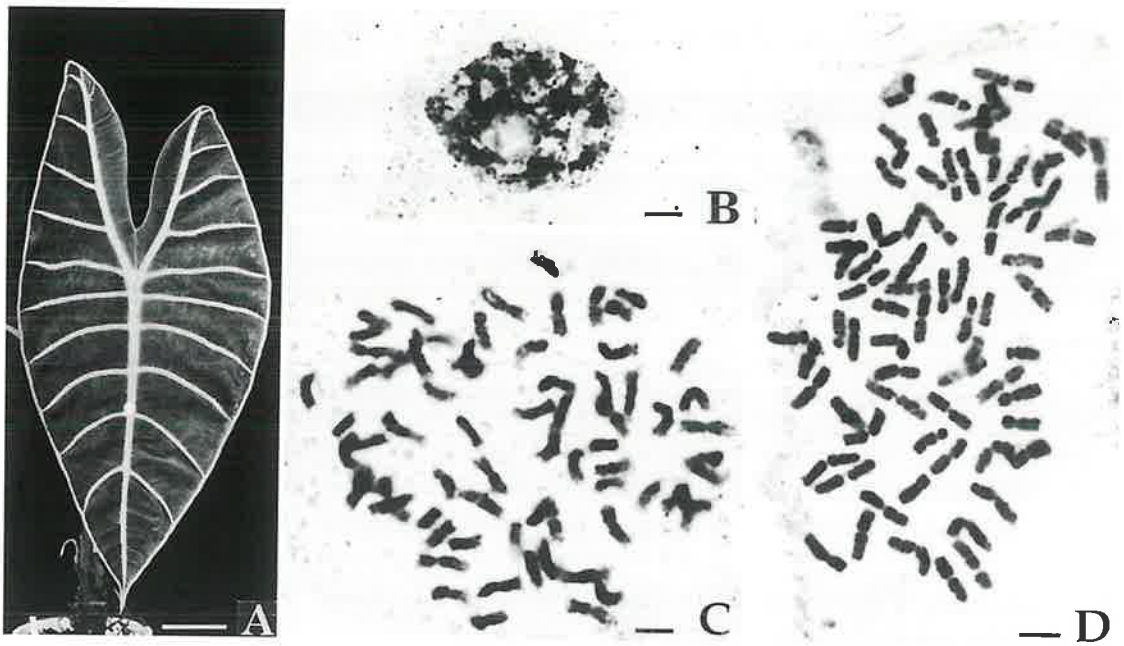

Fig.6. *Alocasia lowii*, 2n=70. A, a leaf. B, chromosomes at resting stage. C, chromosomes at mitotic prophase. D, chromosomes at mitotic metaphase. Bars indicate 5 cm in A and 3μm in B-D.

Three plants were obtained from Malaysia. External morphological characteristics of leaves were similar to those of this species described by Leedy *et al.* (1984).

The chromosome number of two plants of them was 2n=28 at mitotic metaphase and confirmed the previous report (Jones 1957, Marchant 1971,).

The chromosomes at resting stage were morphologically similar to those of *A. cucullata* described above. The chromosome features at resting stage were of the complex chromocenter type.

The chromosomes of 2n=28 showed a gradual decrease in length ranging from the longest one of 4.2 μm to the shortest one of 2.7 μm, and the positions of the chromocenters were either median or submedian. Among the 28 the chromosomes 20 were median, while the other eight (Nos. 13, 14, 19-24) were submedian. One chromosome (No.21) had secondary constriction in the short arm.

This species showed a homogeneous, gradual and symmetric karyotype.

The chromosome number of the other plant was 2n=70 at mitotic metaphase and confirmed the previous report (Marchant 1971).

6) *Alocasia macrorrhiza* (L.) G. Don., 2n=28, Table 1 and 7, Fig. 7.
Validated specimen No. 85033, 170.

Two plants were obtained from Thailand. External morphological characteristics of leaves were similar to those of this species described by Leedy *et al.* (1984).

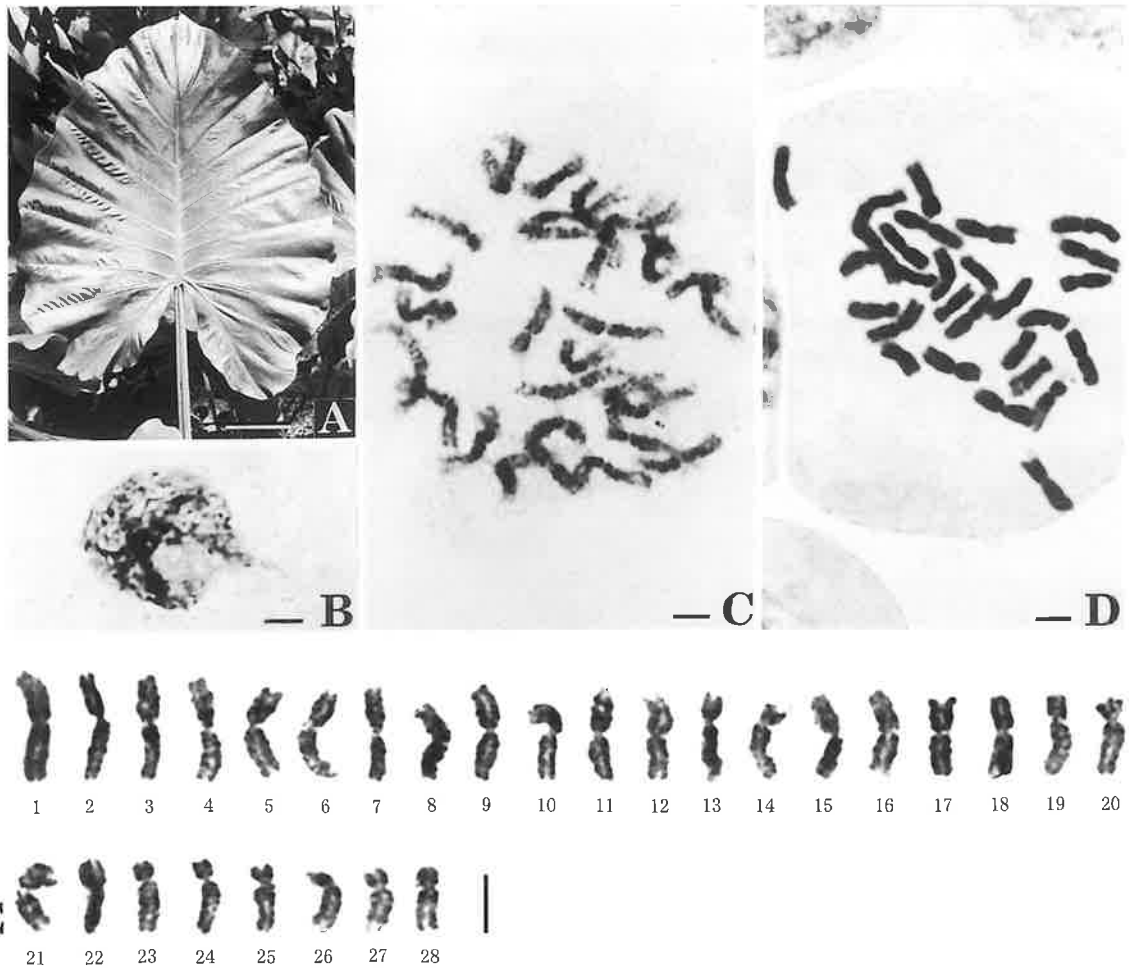

Fig.7. *Alocasia macrorrhiza*, 2n=28. A, a leaf. B, chomosomes at resting stage. C, chomosomes at mitotic metaphase. Bars indicate 10 cm in A and 3μm in B-E.

The chromosome number of two plants was 2n=28 at mitotic metaphase and confirmed the previous reports (Ito 1942, Sharma 1970, Hsu 1972).

The chromosomes at resting stage and mitotic prophase were morphologically similar to those of *A. cucullata* described above. The chromosome features at resting stage were of the complex chromocenter type.

The chromosomes at mitotic metaphase showed a gradual decrease in length ranging from the longest one of 6.0μm to the shortest one of 3.3μm, and the positions of the chromocenters were either median or submedian. Among the 28 chromosomes 18 were median, while the other ten (Nos. 13, 14, 18, 19, 23-28) were submedian. Five chromosomes (Nos.9, 13-15, 21) had small constrictions

in their long arms.

This species showed a homogeneous, gradual and symmetric karyotype.

7) *Alocasia micholitziana* Sander., 2n=28, Table 1 and 8, Fig. 8. Validated specimen No. 154.

One plant was obtained from Philippine. External morphological characteristics of leaves were similar to those of this species described by Leedy *et al.* (1984).

The chromosome number of the plant was 2n=28 at mitotic metaphase and confirmed the previous report (Marchant 1971).

The chromosomes at resting stage and mitotic prophase were morphologically similar to those of *A. cucullata* described above. The chromosome features at resting stage were of the complex chromocenter type.

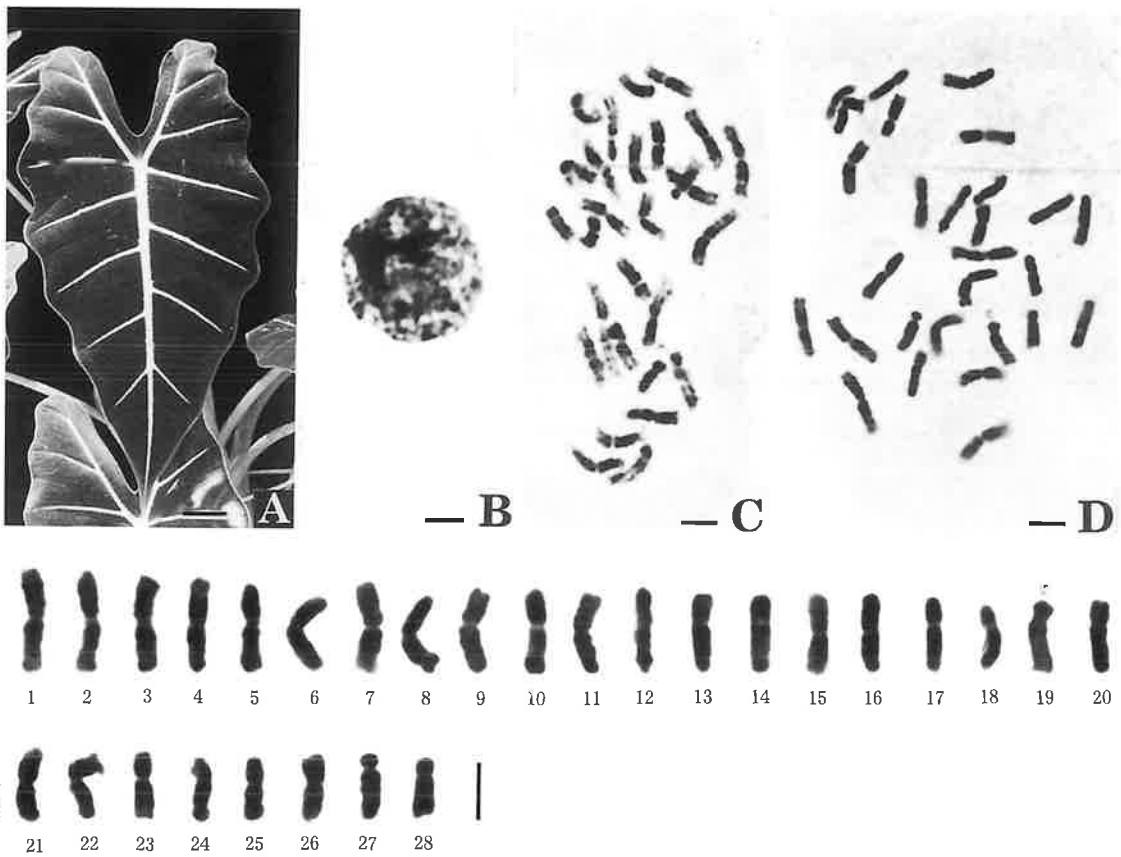

Fig.8. *Alocasia micholitziana*, 2n=28. A, leaves. B, chromosomes at resting stage. C, chromosomes at mitotic prophase. D and E, chromosomes at mitotic metaphase. Bars indicate 5 cm in A and 3μm in B-E.

The chromosomes at mitotic metaphase showed a gradual decrease in length ranging from the longest one of 5.7 μ m to the shortest one of 3.1 μ m, and the positions of the chromocenters were either median or submedian. Among the 28 chromosomes 22 were median, while the other six (Nos. 13, 14, 19, 20, 27, 28) were submedian. One chromosome (No. 19) had secondary constriction in the short arm, and five (Nos. 1, 2, 8, 24, 25) had small constrictions in their long arms.

This species showed a homogeneous, gradual and symmetric karyotype.

8) *Alocasia odora* (Lodd.) Spach., 2n=28, Table 1 and 9, Fig. 9.
Validated specimen No. 171, 172, 185.

Three plants were obtained from Kagoshima Pref. and Okinawa pref., Japan. External morphological characteristics of leaves were similar to those of this species described by Leedy *et al.* (1984)

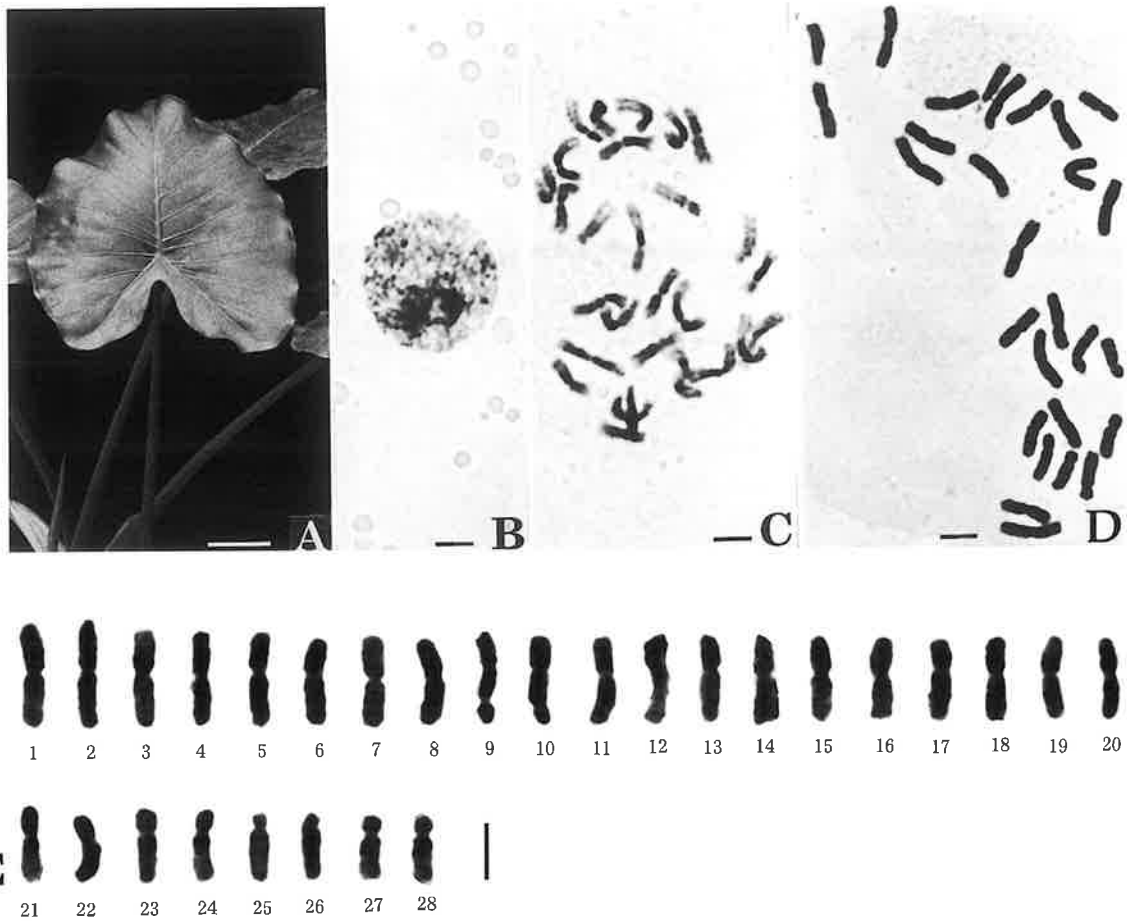

Fig.9. *Alocasia odora*, 2n=28. A, leaves. B, chromosomes at resting stage. C, chromosomes at mitotic prophase. D and E, chromosomes at mitotic metaphase. Bars indicate 10 cm in A and 3μm in B-E.

The chromosome number of three plants was 2n=28 at mitotic metaphase and confirmed the previous reports (Marchant 1971, Bhattacharya 1974, Ankei 1987.).

The chromosomes at resting stage and mitotic prophase were morphologically similar to those of *A. cucullata* described above. The chromosome features at resting stage were of the complex chromocenter type.

The chromosomes at mitotic metaphase showed a gradual decrease in length ranging from the longest one of 5.6 μ m to the shortest one of 3.4 μ m. Among the 28 chromosomes 24 were median, four (Nos. 23, 24, 27, 28) were submedian and two (Nos. 25, 26) were subterminal.

Two chromosomes (Nos.9, 10) had small constrictions in their long arms.

This species showed a homogeneous, gradual and symmetric karyotype.

9) *Alocasia plumbea* (K. Koch) Van Houtte., 2n=28, Table 1 and 10, Fig. 10. Validated specimen No. 85035.

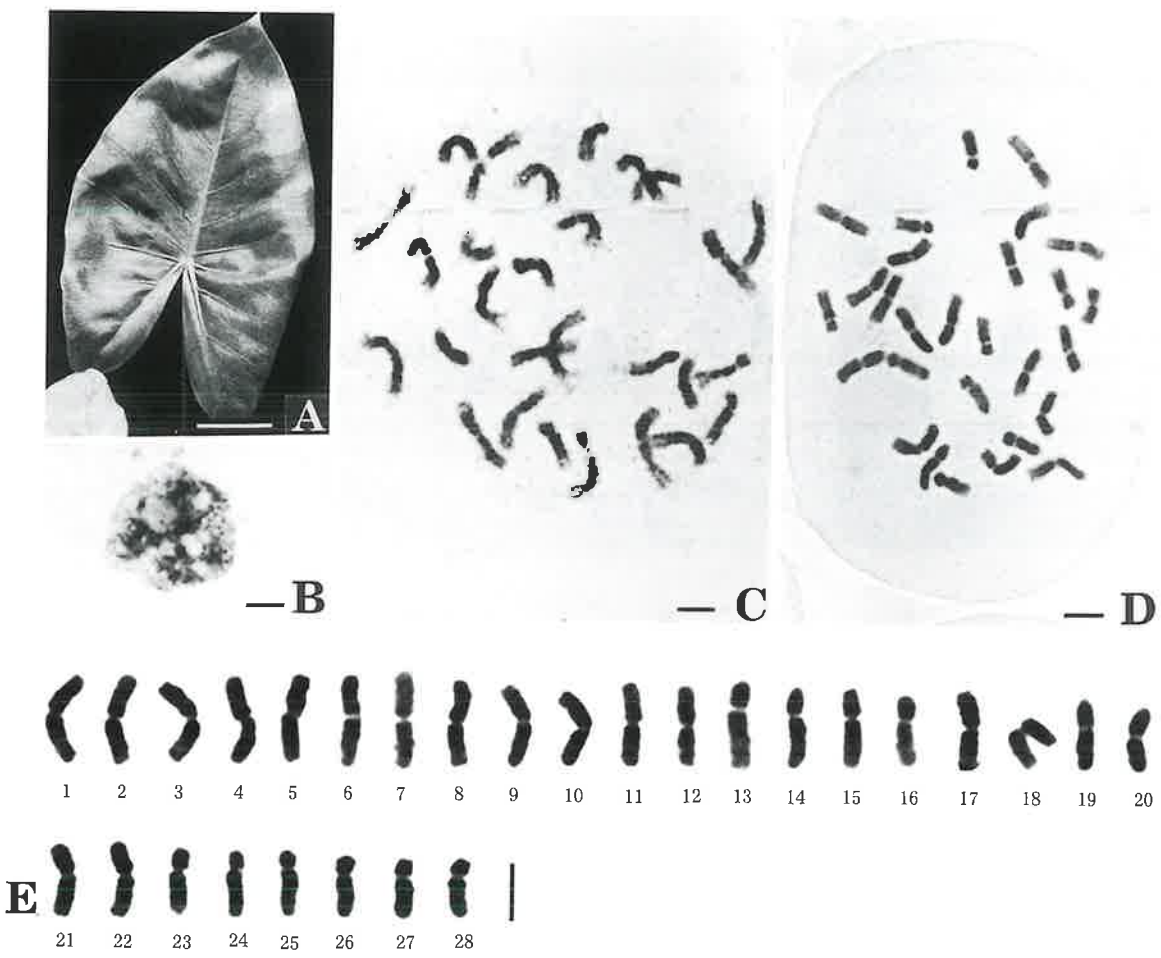

Fig.10. *Alocasia plumbea*, 2n=28. A, a leaf. B, chromosomes at resting stage. C, chromosomes at mitotic prophase. D and E, chromosomes at mitotic metaphase. Bars indicate 5 cm in A and 3μm in B-E.

One plant was obtained from Java. External morphological characteristics of leaves were similar to those of this species described by Leedy *et al.* (1984).

The chromosome number of the plant at mitotic metaphase was 2n=28, which was reported here for the first time for this species.

The chromosomes at resting stage and mitotic prophase were morphologically similar to those of *A. cucullata* described above. The chromosome features at resting stage were of the complex chromocenter type.

The chromosomes at mitotic metaphase showed a gradual decrease in length ranging from the longest one of 4.8 μ m to the shortest one of 3.7 μ m, and the positions of the chromocenters were either median or submedian. Among the 28 chromosomes 18 were median, while the other ten (Nos. 13, 14, 19, 20, 23-28) were submedian. Three chromosomes (Nos. 3, 6, 8) had small constrictions in their long arms.

This species showed a homogeneous, gradual and symmetric karyotype.

10) *Alocasia porphyroneura* H. G. Hallier ex Engl., 2n=28, Table 1 and 11, Fig.11. Validated specimen No. 157.

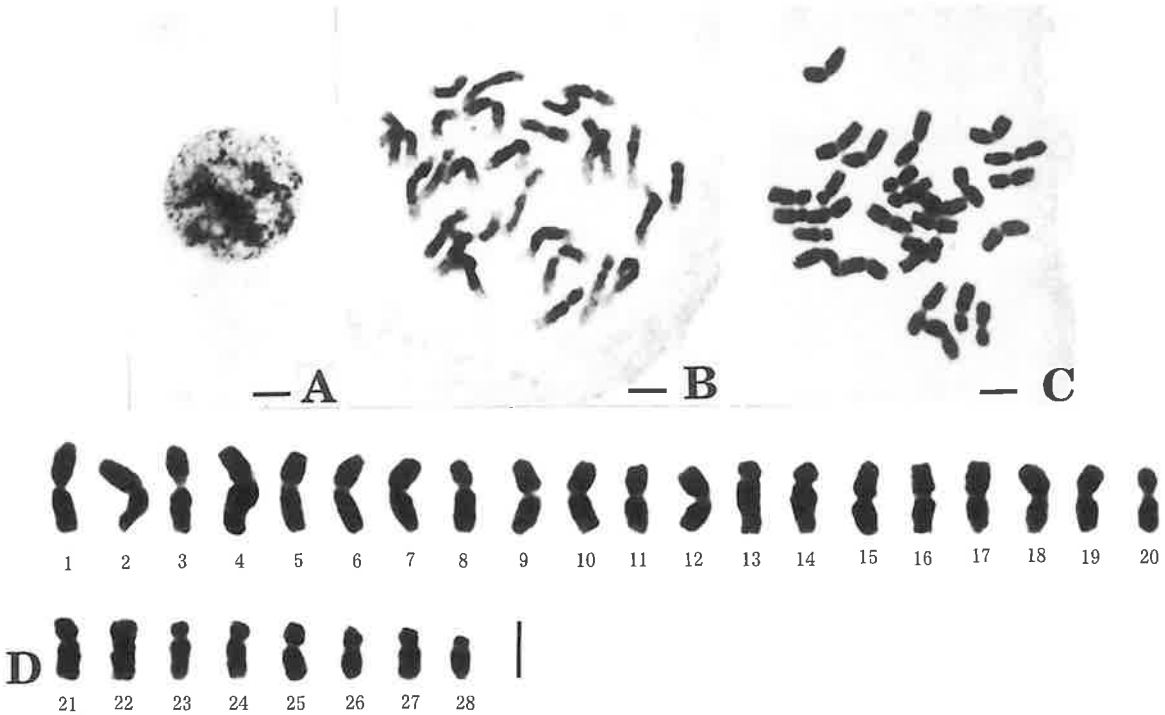

Fig.11. *Alocasia porphyroneura*, 2n=28. A, chromosomes at resting stage. B, chromosomes at mitotic prophase. C and D, chromosomes at mitotic metaphase. Bars indicate 3μm in A-D.

One plant was obtained from Borneo. External morphological characteristics of leaves were similar to those of this species described by Leedy *et al.* (1984).

The chromosome number of the plant at mitotic metaphase was 2n=28, which was reported here for the first time for this species.

The chromosomes at resting stage and mitotic prophase were morphologically similar to those of *A. cucullata* described above. The chromosome features at resting stage were of the complex chromocenter type.

The chromosomes at mitotic metaphase showed a gradual decrease in length ranging from the longest one of 4.6 μ m to the shortest one of 2.5 μ m, and the positions of the chromocenters were either median or submedian. Among the 28 chromosomes 22 were median, while the other six (Nos. 13, 14, 23, 24, 27, 28) were submedian.

This species showed a homogeneous, gradual and symmetric karyotype.

11) *Alocasia portei* Schott., 2n=28 , Table 1 and 12, Fig. 12.
Validated specimen No. 177.

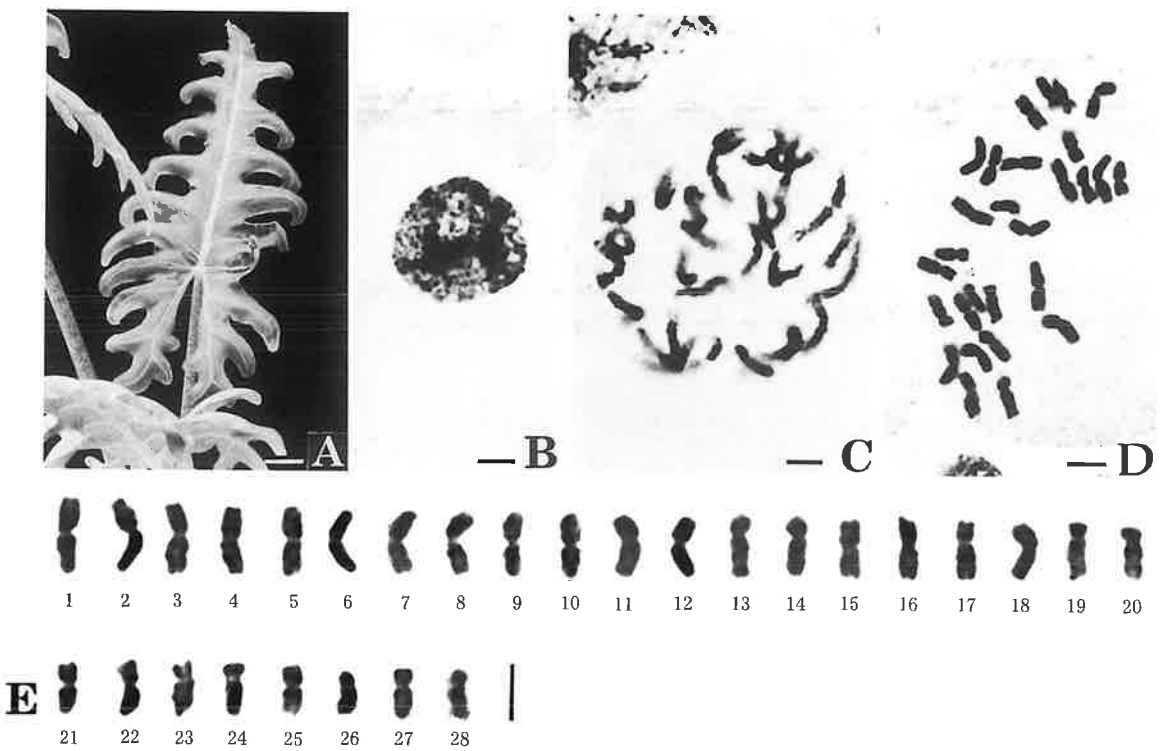

Fig.12. *Alocasia portei*, 2n=28. A, leaves. B, chromosomes at resting stage. C, chromosomes at mitotic prophase. D and E, chromosomomes at mitotic metaphase. Bars indicate 5 cm in A and 3μm in B-E.

One plant was obtained from Philippine. External morphological characteristics of leaves were similar to those of this species described by Leedy *et al.* (1984).

The chromosome number of the plant at mitotic metaphase was 2n=28, which was reported here for the first time for this species.

The chromosomes at resting stage and mitotic prophase were morphologically similar to those of *A. cucullata* described above. The chromosome features at resting stage were of the complex chromocenter type.

The chromosomes at mitotic metaphase showed a gradual decrease in length ranging from the longest one of 4.1 μ m to the shortest one of 2.5 μ m, and the positions of the chromocenters were either median or submedian. Among the 28 chromosomes 20 were median, while the other eight (Nos. 13, 14, 19, 20, 23, 24, 27, 28) were submedian. One chromosome (No.2) had secondary constriction in the short arm.

This species showed a homogeneous, gradual and symmetric karyotype.

12) *Alocasia sanderana* Bull., 2n=28, Table 1 and 13, Fig. 13.
Validated specimen No. 85023, 20001.

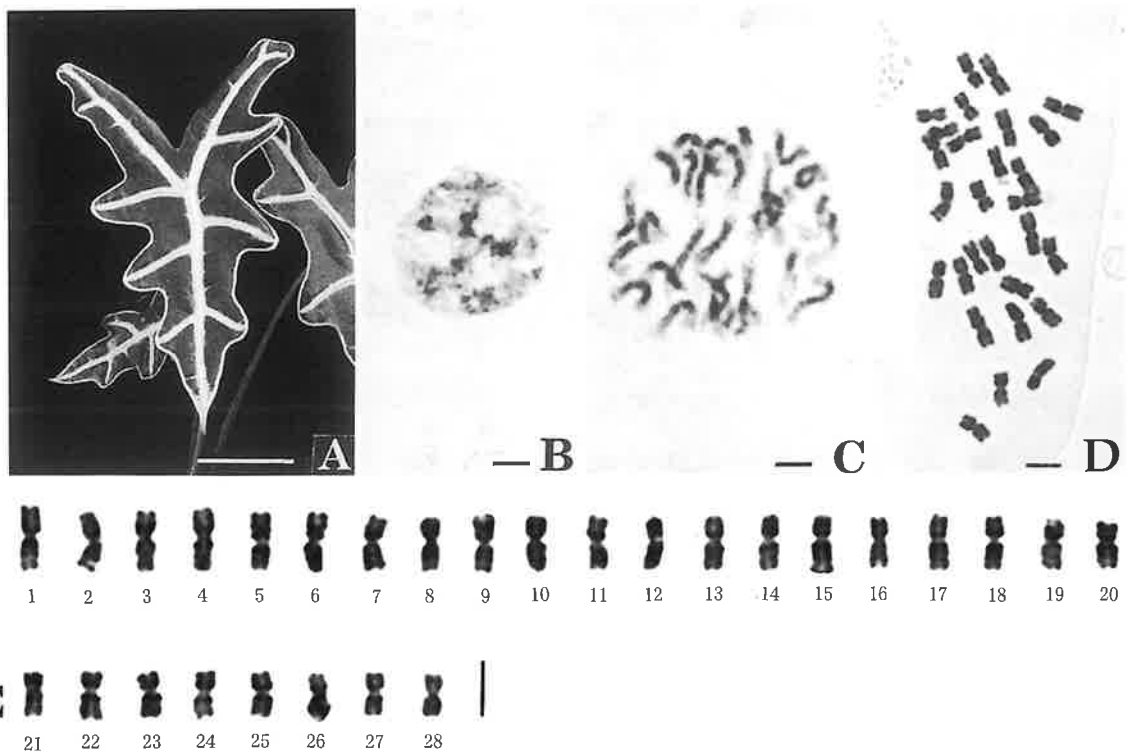

Fig.13. *Alocasia sanderana*, 2n=28. A, leaves. B, chromosomes at resting stage. C, chromosomes at mitotic prophase. D and E, chromosomes at mitotic metaphase. Bars indicate 5 cm in A and 3μm in B-E.

Two plants were obtained from Philippine. External morphological characteristics of leaves were similar to those of this species described by Leedy *et al.* (1984).

The chromosome number of two plants was 2n=28 at mitotic metaphase and confirmed the previous report (Pfitzer 1957).

The chromosomes at resting stage and mitotic prophase were morphologically similar to those of *A. cucullata* described above. The chromosome features at resting stage were of the complex

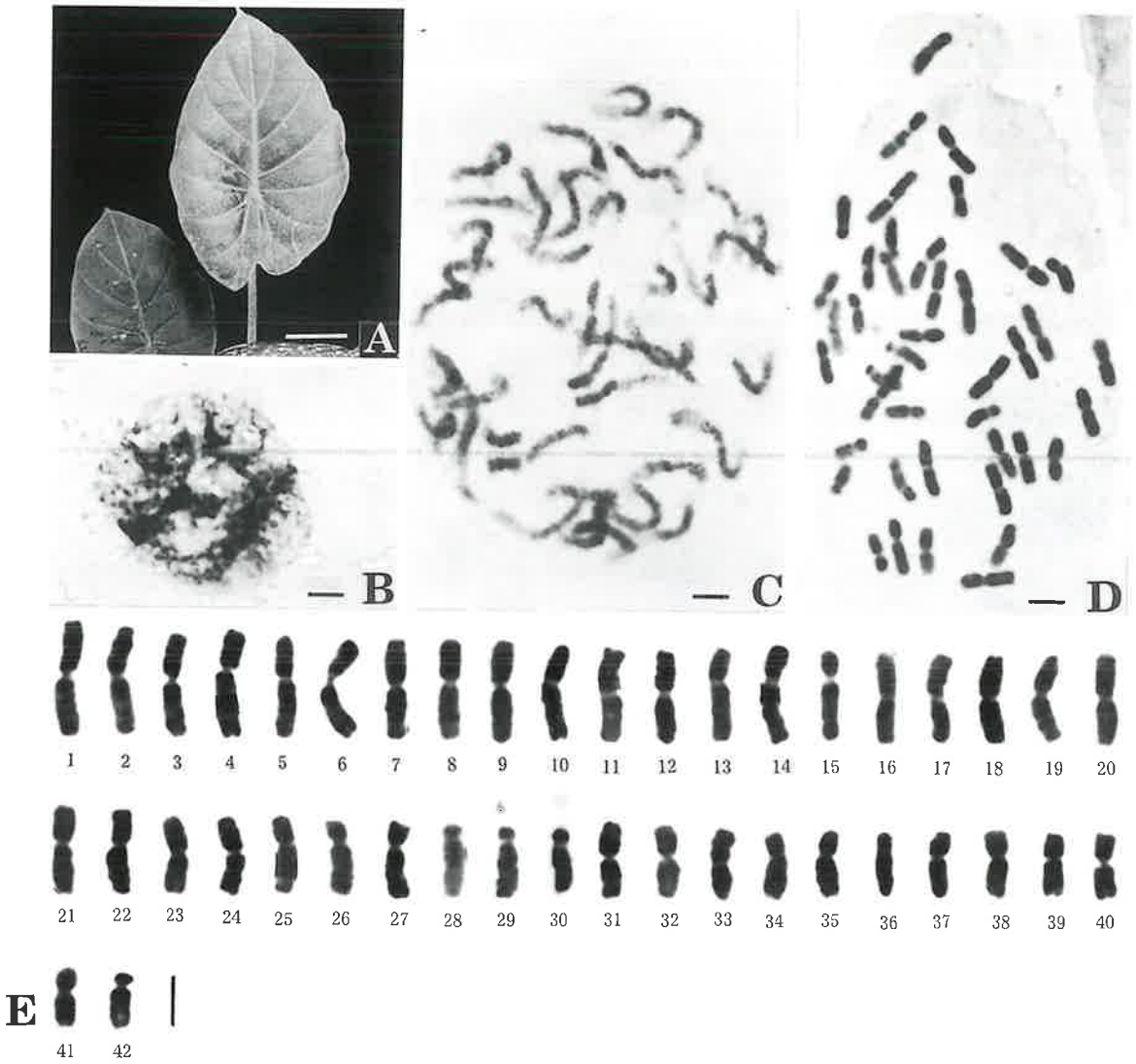

Fig.14. *Alocasia wentii*, 2n=42. A, leaves. B, chromosomes at resting stage. C, chromosomes at mitotic prophase. D and E, chromosomes at mitotic metaphase. Bars indicate 5 cm in A and 3μm in B-E.

chromocenter type.

The chromosomes at mitotic metaphase showed a gradual decrease in length ranging from the longest one of 3.6 μ m to the shortest one of 2.5 μ m. Centromeres were median in all the 28 chromosomes. One chromosome (No.21) had secondary constriction in the short arm, and two (No.1, 2) had small constrictions in their long arms.

This species showed a homogeneous, gradual and symmetric karyotype.

13) *Alocasia wentii* Engl. & Kurt Krause, 2n=42, Table 1 and 14, Fig.14.
Validated specimen No. 85032.

One plant was obtained from Philippine. External morphological characteristics of leaves were similar to those of this species described by Leedy *et al.* (1984) .

The chromosome number of the plant at mitotic metaphase was 2n=28, which was reported here for the first time for this species.

The chromosomes at resting stage and mitotic prophase were morphologically similar to those of *A. cucullata* described above. The chromosome features at resting stage were of the complex chromocenter type.

The chromosomes at mitotic metaphase showed a gradual decrease in length ranging from the longest one of 6.2 μ m to the shortest one of 3.1 μ m, and the positions of the chromocenters were either median or submedian. Among the 42 chromosomes 34 were median, while the other 8 (Nos. 15, 26-30, 36, 42) were submedian. Two chromosomes (Nos. 29, 30) had secondary constrictions in their short arms, and four (Nos. 7, 8, 14, 15) had small constrictions in their long arms.

This species showed a homogeneous, gradual and symmetric karyotype.

14) *Alocasia zebrina* C. Koch & Veitch., 2n=28, Table 1 and 15, Fig. 15.
Validated specimen No. 155.

One plant was obtained from Philippine. External morphological characteristics of leaves and petioles were similar to those of this species described by Leedy *et al.* (1984) .

The chromosome number of the plant was 2n=28 at mitotic metaphase and confirmed the previous report (Sharma 1970) .

The chromosomes at resting stage and mitotic prophase were morphologically similar to those of *A. cucullata* described above. The chromosome features at resting stage were of the complex chromocenter type.

The chromosomes at mitotic metaphase showed a gradual decrease in length ranging from the longest one of 4.2 μ m to the shortest one of 3.0 μ m, and the positions of the chromocenters were either median or submedian. Among the 28 chromosomes 20 were median, while the other eight (Nos. 21-28) were submedian. Three chromosomes (Nos. 21, 22, 26) had secondary constrictions in their short arms.

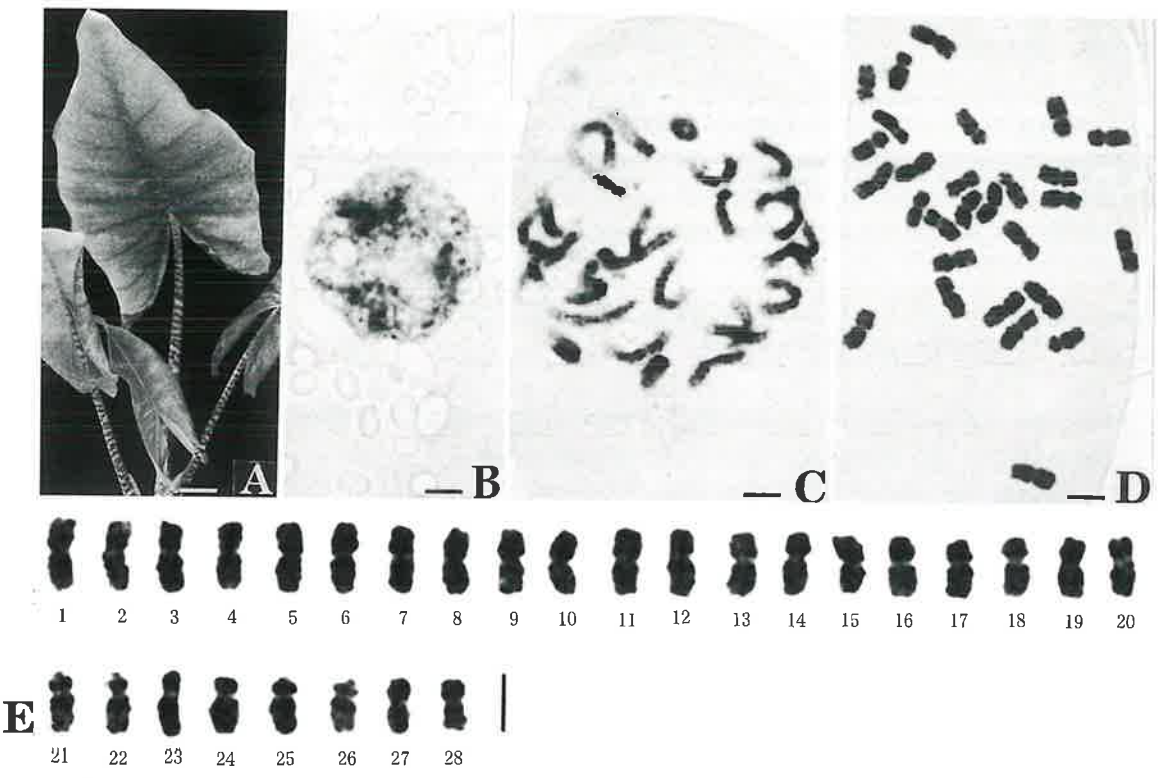

Fig.15. *Alocasia zebrina*, 2n=28. A, leaves. B, chromosomes at resting stage. C, chromosomes at mitotic prophase. D and E, chromosomes at mitotic metaphase. Bars indicate 5 cm in A and 3μm in B-E.

This species showed a homogeneous, gradual and symmetric karyotype.

Summary

1. Karyomorphological observations were carried out on 14 taxa in the genus *Alocasia* cultivated in the Hiroshima Botanical Garden.
2. Chromosome numbers of the 14 taxa were found to be either 2n=28, 42 or 70.
3. Chromosome numbers of six taxa, *A. gageana* (2n=28), *A.* 'Green Shield' (2n=28), *A. plumbea* (2n=28), *A. porphyroneura* (2n=28), *A. portei* (2n=28) and *A. wentii* (2n=42) were reported for the first time and eight species, *A. cucullata* (2n=28), *A. cuprea* (2n=28), *A. lowii* (2n=28 and 2n=70), *A. macrorrhiza* (2n=28), *A. micholitziana* (2n=28), *A. odora* (2n=28), *A. sanderana*

(2n=28) and *A. zebrina* (2n=28) were redocumented.

4. Chromosome numbers of 13 taxa of the genus *Alocasia* observed were 2n=28, and each chromosome complement was consisted of 14 pairs of chromosomes. Thus, the basic chromosome number of the genus *Alocasia* could be x=14. *Alocasia wentii* with the chromosome number of 2n=42 could be recognized to be triploid, and *A. lowii* with 2n=70 to be pentaploid.

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Table 2. Measurements of somatic chromosomes of *Alocasia cucullata* at mitotic metaphase, 2n=28

Chromosome	Length(μ m)	Relative length	Arm ratio	Form
1	2.0+2.3=4.3	4.3	1.2	m
2	2.0+2.3=4.3	4.3	1.2	m
3	1.7+2.5=4.2	4.2	1.5	m
4	1.7+2.5=4.2	4.2	1.5	m
5	1.9+2.3=4.1	4.1	1.2	m
6	1.9+2.3=4.1	4.1	1.2	m
7	1.8+2.3=4.1	4.1	1.3	m
8	1.8+2.3=4.1	4.1	1.3	m
9	1.8+2.0=3.8	3.8	1.1	m
10	1.8+2.0=3.8	3.8	1.1	m
11	1.5+2.3=3.8	3.8	1.5	m
12	1.5+2.3=3.8	3.8	1.5	m
13	1.7+2.0=3.7	3.7	1.2	m
14	1.7+2.0=3.7	3.7	1.2	m
15	1.7+2.0=3.7	3.7	1.2	m
16	1.7+2.0=3.7	3.7	1.2	m
17	1.3+2.0=3.3	3.3	1.5	m
18	1.3+2.0=3.3	3.3	1.5	m
19	1.4+1.8=3.2	3.2	1.3	m
20	1.4+1.8=3.2	3.2	1.3	m
21	1.4+1.8=3.2	3.2	1.3	m
22	1.4+1.8=3.2	3.2	1.3	m
23	1.0+2.2=3.2	3.2	2.2	sm
24	1.0+2.2=3.2	3.2	2.2	sm
25	1.0+1.9=2.9	2.9	1.9	sm
26	0.2+0.8+1.9=2.9*	2.9	2.4	sm
27	0.8+1.9=2.7	2.7	2.4	sm
28	0.8+1.9=2.7	2.7	2.4	sm

*Chromosome with secondary constriction

Table 3. Measurements of somatic chromosomes of *Alocasia cuprea* at mitotic metaphase, 2n=28

Chromosome	Length(μ m)	Relative length	Arm ratio	Form
1	2.7+3.0=5.7	4.4	1.1	m
2	2.7+3.0=5.7	4.4	1.1	m
3	2.2+3.3=5.5	4.3	1.5	m
4	2.2+3.3=5.5	4.3	1.5	m
5	2.6+2.7=5.3	4.1	1.0	m
6	2.6+2.7=5.3	4.1	1.0	m
7	2.5+2.7=5.2	4.0	1.1	m
8	2.5+2.7=5.2	4.0	1.1	m
9	2.3+2.8=5.1	4.0	1.2	m
10	2.3+2.8=5.1	4.0	1.2	m
11	1.8+3.0=4.8	3.7	1.7	m
12	1.8+3.0=4.8	3.7	1.7	m
13	2.0+2.7=4.7	3.7	1.4	m
14	2.0+2.7=4.7	3.7	1.4	m
15	1.7+2.9=4.6	3.6	1.7	m
16	1.7+2.9=4.6	3.6	1.7	m
17	2.0+2.3=4.3	3.3	1.2	m
18	2.0+2.3=4.3	3.3	1.2	m
19	1.3+2.7=4.0	3.1	2.1	sm
20	1.3+2.7=4.0	3.1	2.1	sm
21	0.3+0.7+3.0=4.0*	3.1	3.0	sm
22	0.3+0.7+3.0=4.0*	3.1	3.0	sm
23	1.0+2.9=3.9	3.0	2.9	sm
24	1.0+2.9=3.9	3.0	2.9	sm
25	1.3+2.3=3.6	2.8	1.8	sm
26	1.3+2.3=3.6	2.8	1.8	sm
27	0.9+2.7=3.6	2.8	3.0	sm
28	0.9+2.7=3.6	2.8	3.0	sm

*Chromosome with secondary constriction

Table 4. Measurements of somatic chromosomes of *Alocasia gageana* at mitotic metaphase, 2n=28

Chromosome	Length (μ m)	Relative length	Arm ratio	Form
1	2.5+2.5=5.0	4.4	1.0	m
2	2.3+2.5=4.8	4.3	1.1	m
3	2.0+2.7=4.7	4.2	1.4	m
4	2.0+2.7=4.7	4.2	1.4	m
5	2.2+2.4=4.6	4.1	1.1	m
6	2.2+2.4=4.6	4.1	1.1	m
7	1.7+2.7=4.4	3.9	1.6	m
8	1.7+2.7=4.4	3.9	1.6	m
9	2.1+2.3=4.4	3.9	1.1	m
10	2.1+2.3=4.4	3.9	1.1	m
11	1.6+2.5=4.1	3.6	1.6	m
12	1.6+2.5=4.1	3.6	1.6	m
13	1.3+2.7=4.0	3.6	2.1	sm
14	1.3+2.7=4.0	3.6	2.1	sm
15	1.7+2.3=4.0	3.6	1.4	m
16	1.7+2.3=4.0	3.6	1.4	m
17	1.8+2.1=3.9	3.5	1.2	m
18	1.8+2.1=3.9	3.5	1.2	m
19	1.5+2.2=3.7	3.3	1.5	m
20	1.5+2.2=3.7	3.3	1.5	m
21	1.7+2.0=3.7	3.3	1.2	m
22	1.7+2.0=3.7	3.3	1.2	m
23	1.0+2.4=3.4	3.0	2.4	sm
24	1.0+2.4=3.4	3.0	2.4	sm
25	1.2+2.2=3.4	3.0	1.8	sm
26	1.2+2.2=3.4	3.0	1.8	sm
27	1.0+2.1=3.1	2.8	2.1	sm
28	1.0+1.9=2.9	2.6	1.9	sm

Table 5. Measurements of somatic chromosomes of *Alocasia* 'Green Shield' at mitotic metaphase, 2n=28

Chromosome	Length(μ m)	Relative length	Arm ratio	Form
1	2.4+2.7=5.1	4.6	1.1	m
2	2.4+2.7=5.1	4.6	1.1	m
3	2.0+2.7=4.7	4.3	1.4	m
4	2.0+2.7=4.7	4.3	1.4	m
5	1.8+2.7=4.5	4.1	1.5	m
6	1.8+2.7=4.5	4.1	1.5	m
7	2.2+2.3=4.5	4.1	1.0	m
8	2.2+2.3=4.5	4.1	1.0	m
9	2.1+2.2=4.3	3.9	1.0	m
10	2.1+2.2=4.3	3.9	1.0	m
11	1.9+2.3=4.2	3.8	1.2	m
12	1.9+2.3=4.2	3.8	1.2	m
13	1.1+2.9=4.0	3.6	2.6	sm
14	1.1+2.9=4.0	3.6	2.6	sm
15	1.7+2.3=4.0	3.6	1.4	m
16	1.7+2.3=4.0	3.6	1.4	m
17	1.5+2.1=3.6	3.3	1.4	m
18	1.5+2.1=3.6	3.3	1.4	m
19	0.9+2.7=3.6	3.3	3.0	sm
20	0.9+2.7=3.6	3.3	3.0	sm
21	1.3+2.0=3.3	3.0	1.5	m
22	1.3+2.0=3.3	3.0	1.5	m
23	0.7+2.5=3.2	2.9	3.6	st
24	0.7+2.5=3.2	2.9	3.6	st
25	1.0+2.0=3.0	2.7	2.0	sm
26	1.0+2.0=3.0	2.7	2.0	sm
27	1.0+2.0=3.0	2.7	2.0	sm
28	1.0+2.0=3.0	2.7	2.0	sm

Table 6. Measurements of somatic choromosomes of *Alocasia lowii* at mitotic metaphase, 2n=28

Chromosome	Length (μ m)	Relative length	Arm ratio	Form
1	1.9+2.3=4.2	4.5	1.2	m
2	1.9+2.3=4.2	4.5	1.2	m
3	1.9+2.0=3.9	4.2	1.1	m
4	1.9+2.0=3.9	4.2	1.1	m
5	1.7+2.0=3.7	4.0	1.2	m
6	1.7+2.0=3.7	4.0	1.2	m
7	1.7+2.0=3.7	4.0	1.2	m
8	1.7+2.0=3.7	4.0	1.2	m
9	1.6+2.0=3.6	3.8	1.3	m
10	1.6+2.0=3.6	3.8	1.3	m
11	1.3+2.1=3.4	3.6	1.6	m
12	1.3+2.1=3.4	3.6	1.6	m
13	0.8+2.6=3.4	3.6	3.3	st
14	0.8+2.6=3.4	3.6	3.3	st
15	1.5+1.8=3.3	3.5	1.2	m
16	1.5+1.8=3.3	3.5	1.2	m
17	1.4+1.7=3.1	3.3	1.2	m
18	1.4+1.7=3.1	3.3	1.2	m
19	1.1+2.0=3.1	3.3	1.8	sm
20	1.1+2.0=3.1	3.3	1.8	sm
21	0.3+0.7+2.1=3.1*	3.3	2.1	sm
22	1.0+2.1=3.1	3.3	2.1	sm
23	1.0+1.9=2.9	3.1	1.9	sm
24	1.0+1.9=2.9	3.1	1.9	sm
25	1.0+1.7=2.7	2.9	1.7	m
26	1.0+1.7=2.7	2.9	1.7	m
27	1.0+1.7=2.7	2.9	1.7	m
28	1.0+1.7=2.7	2.9	1.7	m

*Chromosome with secondary constriction

Table 7. Measurements of somatic chromosomes of *Alocasia macrorrhiza* at mitotic metaphase, 2n=28

Chromosome	Length (μ m)	Relative length	Arm ratio	Form
1	2.7+3.3=6.0	4.7	1.2	m
2	2.7+3.3=6.0	4.7	1.2	m
3	2.7+2.9=5.6	4.4	1.1	m
4	2.7+2.9=5.6	4.4	1.1	m
5	2.3+2.8=5.1	4.0	1.2	m
6	2.3+2.8=5.1	4.0	1.2	m
7	2.5+2.6=5.1	4.0	1.0	m
8	2.5+2.6=5.1	4.0	1.0	m
9	2.3+2.6=4.9	3.9	1.1	m
10	2.3+2.6=4.9	3.9	1.1	m
11	2.3+2.4=4.7	3.7	1.0	m
12	2.3+2.4=4.7	3.7	1.0	m
13	1.5+3.0=4.5	3.6	2.0	sm
14	1.5+3.0=4.5	3.6	2.0	sm
15	2.1+2.3=4.4	3.5	1.1	m
16	2.1+2.3=4.4	3.5	1.1	m
17	2.0+2.3=4.3	3.4	1.2	m
18	2.0+2.3=4.3	3.4	1.2	m
19	1.3+2.8=4.1	3.2	2.2	sm
20	1.3+2.8=4.1	3.2	2.2	sm
21	1.8+2.2=4.0	3.2	1.2	m
22	1.8+2.2=4.0	3.2	1.2	m
23	1.0+2.8=3.8	3.0	2.8	sm
24	1.0+2.8=3.8	3.0	2.8	sm
25	1.0+2.5=3.5	2.8	2.5	sm
26	1.0+2.5=3.5	2.8	2.5	sm
27	1.0+2.3=3.3	2.6	2.3	sm
28	1.0+2.3=3.3	2.6	2.3	sm

Table 8. Measurements of somatic chromosomes of *Alocasia micholitziana* at mitotic metaphase, 2n=28

Chromosome	Length (μ m)	Rclativc length	Arm ratio	Form
1	2.7+3.0=5.7	4.8	1.1	m
2	2.7+3.0=5.7	4.8	1.1	m
3	2.5+2.8=5.3	4.4	1.1	m
4	2.5+2.8=5.3	4.4	1.1	m
5	2.1+2.7=4.8	4.0	1.3	m
6	2.1+2.7=4.8	4.0	1.3	m
7	2.3+2.3=4.6	3.8	1.0	m
8	2.3+2.3=4.6	3.8	1.0	m
9	2.0+2.6=4.6	3.8	1.3	m
10	2.0+2.6=4.6	3.8	1.3	m
11	2.1+2.3=4.4	3.7	1.1	m
12	2.1+2.3=4.4	3.7	1.1	m
13	1.5+2.7=4.2	3.5	1.8	sm
14	1.5+2.7=4.2	3.5	1.8	sm
15	2.0+2.1=4.1	3.4	1.1	m
16	2.0+2.1=4.1	3.4	1.1	m
17	1.5+2.6=4.1	3.4	1.7	m
18	1.5+2.6=4.1	3.4	1.7	m
19	0.6+0.8+2.7=4.1*	3.4	1.9	sm
20	1.2+2.7=3.9	3.3	2.3	sm
21	1.9+2.0=3.9	3.3	1.1	m
22	1.9+2.0=3.9	3.3	1.1	m
23	1.5+2.1=3.6	3.0	1.4	m
24	1.5+2.1=3.6	3.0	1.4	m
25	1.5+2.0=3.5	2.9	1.3	m
26	1.5+2.0=3.5	2.9	1.3	m
27	0.9+2.3=3.2	2.7	2.6	sm
28	0.8+2.3=3.1	2.6	2.9	sm

*Chromosome with secondary constriction

Table 9. Measurements of somatic chromosomes of *Alocasia odora* at mitotic metaphase, 2n=28

Chromosome	Length (μ m)	Relative length	Arm ratio	Form
1	2.7+2.9=5.6	4.5	1.1	m
2	2.7+2.9=5.6	4.5	1.1	m
3	2.3+2.8=5.1	4.1	1.2	m
4	2.3+2.8=5.1	4.1	1.2	m
5	2.1+2.8=4.9	3.9	1.3	m
6	2.1+2.8=4.9	3.9	1.3	m
7	2.0+2.7=4.7	3.8	1.4	m
8	2.0+2.7=4.7	3.8	1.4	m
9	1.7+2.9=4.6	3.7	1.7	m
10	1.7+2.9=4.6	3.7	1.7	m
11	2.3+2.3=4.6	3.7	1.0	m
12	2.3+2.3=4.6	3.7	1.0	m
13	1.9+2.7=4.6	3.7	1.4	m
14	1.9+2.7=4.6	3.7	1.4	m
15	2.0+2.4=4.4	3.5	1.2	m
16	2.0+2.4=4.4	3.5	1.2	m
17	1.8+2.6=4.4	3.5	1.4	m
18	1.8+2.6=4.4	3.5	1.4	m
19	2.0+2.3=4.3	3.5	1.2	m
20	2.0+2.3=4.3	3.5	1.2	m
21	1.7+2.3=4.0	3.2	1.4	m
22	1.7+2.3=4.0	3.2	1.4	m
23	1.3+2.7=4.0	3.2	2.1	sm
24	1.3+2.7=4.0	3.2	2.1	sm
25	0.9+2.8=3.7	3.0	3.1	st
26	0.9+2.8=3.7	3.0	3.1	st
27	1.0+2.4=3.4	2.7	2.4	sm
28	1.0+2.4=3.4	2.7	2.4	sm

Table 10. Measurements of somatic chromosomes of *Alocasia plumbea* at mitotic metaphase, 2n=28

Chromosome	Length (μ m)	Relative length	Arm ratio	Form
1	2.3+2.5=4.8	4.1	1.1	m
2	2.3+2.5=4.8	4.1	1.1	m
3	2.3+2.5=4.8	4.1	1.1	m
4	2.3+2.5=4.8	4.1	1.1	m
5	2.2+2.6=4.8	4.1	1.2	m
6	2.2+2.6=4.8	4.1	1.2	m
7	2.3+2.3=4.6	3.9	1.0	m
8	2.3+2.3=4.6	3.9	1.0	m
9	2.0+2.3=4.3	3.7	1.2	m
10	2.0+2.3=4.3	3.7	1.2	m
11	2.1+2.2=4.3	3.7	1.0	m
12	2.1+2.2=4.3	3.7	1.0	m
13	1.4+2.7=4.1	3.5	1.9	sm
14	1.4+2.7=4.1	3.5	1.9	sm
15	1.7+2.2=3.9	3.3	1.3	m
16	1.7+2.2=3.9	3.3	1.3	m
17	1.7+2.2=3.9	3.3	1.3	m
18	1.7+2.2=3.9	3.3	1.3	m
19	1.4+2.5=3.9	3.3	1.8	sm
20	1.4+2.5=3.9	3.3	1.8	sm
21	1.5+2.3=3.8	3.3	1.5	m
22	1.5+2.3=3.8	3.3	1.5	m
23	1.3+2.4=3.7	3.2	1.8	sm
24	1.3+2.4=3.7	3.2	1.8	sm
25	1.0+2.7=3.7	3.2	2.7	sm
26	1.0+2.7=3.7	3.2	2.7	sm
27	1.0+2.7=3.7	3.2	2.7	sm
28	1.0+2.7=3.7	3.2	2.7	sm

Table 11. Measurements of somatic chromosomes of *Alocasia porphyroneura* at mitotic metaphase, 2n=28

Chromosome	Length(μ m)	Relative length	Arm ratio	Form
1	2.3+2.3=4.6	4.5	1.0	m
2	2.3+2.3=4.6	4.5	1.0	m
3	2.0+2.3=4.3	4.2	1.2	m
4	2.0+2.3=4.3	4.2	1.2	m
5	1.7+2.4=4.1	4.0	1.4	m
6	1.7+2.4=4.1	4.0	1.4	m
7	1.7+2.3=4.0	3.9	1.4	m
8	1.7+2.3=4.0	3.9	1.4	m
9	1.7+2.3=4.0	3.9	1.4	m
10	1.7+2.3=4.0	3.9	1.4	m
11	1.7+2.0=3.7	3.6	1.2	m
12	1.7+2.0=3.7	3.6	1.2	m
13	1.0+2.7=3.7	3.6	2.7	sm
14	1.0+2.7=3.7	3.6	2.7	sm
15	1.7+2.0=3.7	3.6	1.2	m
16	1.7+2.0=3.7	3.6	1.2	m
17	1.7+2.0=3.7	3.6	1.2	m
18	1.7+2.0=3.7	3.6	1.2	m
19	1.5+2.0=3.5	3.4	1.3	m
20	1.5+2.0=3.5	3.4	1.3	m
21	1.3+2.0=3.3	3.2	1.5	m
22	1.3+2.0=3.3	3.2	1.5	m
23	0.8+2.2=3.0	2.9	2.8	sm
24	0.8+2.2=3.0	2.9	2.8	sm
25	1.2+1.7=2.9	2.8	1.4	m
26	1.2+1.7=2.9	2.8	1.4	m
27	0.9+1.7=2.6	2.5	1.9	sm
28	0.8+1.7=2.5	2.4	2.1	sm

Table 12. Measurements of somatic chromosomes of *Alocasia portei* at mitotic metaphase, 2n=28

Chromosome	Length (μ m)	Relative length	Arm ratio	Form
1	1.9+2.2=4.1	4.6	1.2	m
2	1.9+2.2=4.1	4.6	1.2	m
3	1.7+2.0=3.7	4.1	1.2	m
4	1.7+2.0=3.7	4.1	1.2	m
5	1.7+2.0=3.7	4.1	1.2	m
6	1.7+2.0=3.7	4.1	1.2	m
7	1.7+1.8=3.5	3.9	1.1	m
8	1.7+1.8=3.5	3.9	1.1	m
9	1.7+1.7=3.4	3.8	1.0	m
10	1.7+1.7=3.4	3.8	1.0	m
11	1.3+2.0=3.3	3.7	1.5	m
12	1.3+2.0=3.3	3.7	1.5	m
13	1.0+2.2=3.2	3.6	2.2	sm
14	1.0+2.2=3.2	3.6	2.2	sm
15	1.5+1.7=3.2	3.6	1.1	m
16	1.5+1.7=3.2	3.6	1.1	m
17	1.2+1.8=3.0	3.4	1.5	m
18	1.2+1.8=3.0	3.4	1.5	m
19	0.9+2.0=2.9	3.2	2.2	sm
20	0.9+2.0=2.9	3.2	2.2	sm
21	1.2+1.7=2.9	3.2	1.4	m
22	1.2+1.7=2.9	3.2	1.4	m
23	0.8+1.9=2.7	3.0	2.4	sm
24	0.8+1.9=2.7	3.0	2.4	sm
25	1.0+1.6=2.6	2.9	1.6	m
26	1.0+1.6=2.6	2.9	1.6	m
27	0.8+1.7=2.5	2.8	2.1	sm
28	0.8+1.7=2.5	2.8	2.1	sm

Table 13. Measurements of somatic chromosomes of *Alocasia sanderana* at mitotic metaphase, 2n=28

Chromosome	Length (μ m)	Relative length	Arm ratio	Form
1	1.7+1.9=3.6	4.4	1.1	m
2	1.7+1.9=3.6	4.4	1.1	m
3	1.5+1.8=3.3	4.0	1.2	m
4	1.5+1.8=3.3	4.0	1.2	m
5	1.5+1.7=3.2	3.9	1.1	m
6	1.5+1.7=3.2	3.9	1.1	m
7	1.5+1.7=3.2	3.9	1.1	m
8	1.5+1.7=3.2	3.9	1.1	m
9	1.3+1.7=3.0	3.7	1.3	m
10	1.3+1.7=3.0	3.7	1.3	m
11	1.3+1.7=3.0	3.7	1.3	m
12	1.3+1.7=3.0	3.7	1.3	m
13	1.3+1.7=3.0	3.7	1.3	m
14	1.3+1.7=3.0	3.7	1.3	m
15	1.4+1.6=3.0	3.7	1.1	m
16	1.4+1.6=3.0	3.7	1.1	m
17	1.3+1.6=2.9	3.5	1.2	m
18	1.3+1.6=2.9	3.5	1.2	m
19	1.0+1.7=2.7	3.3	1.7	m
20	1.0+1.7=2.7	3.3	1.7	m
21	0.3+0.8+1.6=2.7*	3.3	1.5	m
22	1.1+1.6=2.7	3.3	1.5	m
23	1.0+1.5=2.5	3.0	1.5	m
24	1.0+1.5=2.5	3.0	1.5	m
25	1.2+1.3=2.5	3.0	1.1	m
26	1.2+1.3=2.5	3.0	1.1	m
27	1.2+1.3=2.5	3.0	1.1	m
28	1.2+1.3=2.5	3.0	1.1	m

*Chromosome with secondary constriction

Table 14. Measurements of somatic chromosomes of *Alocasia wentii* at mitotic metaphase, 2n=42

Chromosome	Length (μ m)	Relative length	Arm ratio	Form
1	2.9+3.3=6.2	3.2	1.1	m
2	2.7+3.3=6.0	3.1	1.2	m
3	2.7+3.3=6.0	3.1	1.2	m
4	2.2+3.7=5.9	3.0	1.7	m
5	2.4+3.3=5.7	2.9	1.4	m
6	2.4+3.3=5.7	2.9	1.4	m
7	2.6+3.1=5.7	2.9	1.2	m
8	2.3+3.2=5.5	2.8	1.4	m
9	2.3+3.2=5.5	2.8	1.4	m
10	2.2+3.2=5.4	2.7	1.5	m
11	2.4+3.0=5.4	2.7	1.3	m
12	2.4+3.0=5.4	2.7	1.3	m
13	2.0+3.3=5.3	2.7	1.7	m
14	2.0+3.3=5.3	2.7	1.7	m
15	1.7+3.3=5.0	2.5	1.9	sm
16	2.5+2.5=5.0	2.5	1.0	m
17	2.5+2.5=5.0	2.5	1.0	m
18	2.4+2.5=4.9	2.5	1.0	m
19	2.3+2.6=4.9	2.5	1.1	m
20	2.3+2.6=4.9	2.5	1.1	m
21	2.1+2.7=4.8	2.4	1.3	m
22	2.0+2.7=4.7	2.4	1.4	m
23	2.2+2.3=4.5	2.3	1.0	m
24	2.2+2.3=4.5	2.3	1.0	m
25	1.7+2.7=4.4	2.2	1.6	m
26	1.4+2.9=4.3	2.2	2.1	sm
27	1.4+2.9=4.3	2.2	2.1	sm
28	0.4+0.6+3.3=4.3*	2.2	3.3	st
29	0.4+0.6+3.3=4.3*	2.2	3.3	st
30	0.4+0.6+3.3=4.3*	2.2	3.3	st
31	1.8+2.2=4.0	2.0	1.2	m
32	1.8+2.2=4.0	2.0	1.2	m
33	2.0+2.0=4.0	2.0	1.0	m
34	1.4+2.3=3.7	1.9	1.6	m
35	1.4+2.3=3.7	1.9	1.6	m
36	1.2+2.5=3.7	1.9	2.1	sm
37	1.5+2.2=3.7	1.9	1.5	m
38	1.5+2.2=3.7	1.9	1.5	m
39	1.5+2.1=3.6	1.8	1.4	m
40	1.5+2.0=3.5	1.8	1.3	m
41	1.5+2.0=3.5	1.8	1.3	m
42	0.8+2.3=3.1	1.6	2.9	sm

*Chromosome with secondary constriction

Table 15. Measurements of somatic chromosomes of *Alocasia zebrina* at mitotic metaphase, 2n=28

Chromosome	Length(μ m)	Relative length	Arm ratio	Form
1	2.0+2.2=4.2	4.4	1.1	m
2	2.0+2.2=4.2	4.4	1.1	m
3	1.7+2.2=3.9	4.1	1.3	m
4	1.7+2.2=3.9	4.1	1.3	m
5	1.7+2.0=3.7	3.9	1.2	m
6	1.7+2.0=3.7	3.9	1.2	m
7	1.7+2.0=3.7	3.9	1.2	m
8	1.7+2.0=3.7	3.9	1.2	m
9	1.7+1.9=3.6	3.8	1.1	m
10	1.7+1.9=3.6	3.8	1.1	m
11	1.5+2.0=3.5	3.7	1.3	m
12	1.5+2.0=3.5	3.7	1.3	m
13	1.4+2.0=3.4	3.6	1.4	m
14	1.4+2.0=3.4	3.6	1.4	m
15	1.6+1.7=3.3	3.5	1.1	m
16	1.6+1.7=3.3	3.5	1.1	m
17	1.3+1.8=3.1	3.3	1.4	m
18	1.3+1.8=3.1	3.3	1.4	m
19	1.3+1.8=3.1	3.3	1.4	m
20	1.3+1.8=3.1	3.3	1.4	m
21	0.3+0.6+2.2=3.1*	3.3	2.4	sm
22	0.3+0.6+2.2=3.1*	3.3	2.4	sm
23	1.0+2.0=3.0	3.2	2.0	sm
24	1.0+2.0=3.0	3.2	2.0	sm
25	1.0+2.0=3.0	3.2	2.0	sm
26	0.3+0.7+2.0=3.0*	3.2	2.0	sm
27	1.0+2.0=3.0	3.2	2.0	sm
28	1.0+2.0=3.0	3.2	2.0	sm

*Chromosome with secondary constriction