

**Karyomorphological observations on *Phragmipedium besseae* Dodson
& Khun, Orchidaceae ***

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フラグミペディウム ベセアエの核形態学的観察*

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An exact karyomorphological studies on *Phragmipedium*, a genus including about 20 species native to tropical America, have been made for 14 species and one variety by Karasawa (1980). He (1980) reported that the increase in chromosome number resulted from Robertsonian centromeric fission and the subsequent structural changes of chromosomes have occurred same as in the genus *Paphiopedilum*, an Asian genus closely allied to *Phragmipedium*.

Phragmipedium besseae was discovered by Mrs. E. Besse in northern part of Peru, and described by C.H. Dodson & J. Khun (1981), and subsequently found also in Ecuador. In this paper, karyomorphological observations on *Phrag. besseae*, which have not yet been made, were reported.

Material and Method

For observation of chromosomes one plant (obtained from Peru) was used. Method for observation of chromosomes and terminology for description of karyotype followed Karasawa (1980).

Observations

External morphology: medium to large plants with several distichous leaves. Leaves conduplicate at the base, oblong, 8–22 cm long, coriaceous, acute at the apex. Inflorescence terminal, erect, 15–20 cm long, carrying several flowers. Flowers (Fig. 1A) opening one by one, 6–7.5 cm in diameter, vermilion to bluish red, velvety. Dorsal sepal oblong. Lateral sepals united into a synsepal. Petals oblong-lanceolate, well opening, 3–3.5 cm long. Lip calceolate, ovoid, incurved along the margin. Staminodes transversely elliptic-cordate.

* Contribution from the Hiroshima Botanical Garden No. 37

** The Hiroshima Botanical Garden

Bulletin of the Hiroshima Botanical Garden, No. 10: 47–50, 1988.

The chromosome number of $2n=26$ was counted in cells at mitotic metaphase, which is the first time record for the present species. The measurements of metaphase chromosomes are shown in Table 1.

Resting chromosomes (Fig. 1B) formed chromonemata and chromomeres, which were scattered in the nuclear space, and also many chromocenters, which were darkly stained. Chromocenters varied in size and shape, and most of them were aggregated and united. Morphology of resting chromosomes of the present species was referable as the complex chromocenter type of Tanaka (1971), being the same category as the other species of the genus reported by Karasawa (1980).

Mitotic prophase chromosomes (Fig. 1C) contained both early and late condensed segments. Early condensed segments were located at the proximal regions of both arms, and made a sudden transition to late condensed segments which were situated at the distal regions of arms.

At mitotic metaphase (Fig. 1D,E), $2n=26$ chromosomes ranged $4.9-1.9 \mu\text{m}$ and varied gradually their length from the longest to the shortest chromosomes. Of $2n=26$ chromosomes, eight (nos. 1-4, 7, 8, 11, 12) were metacentric with the arm ratio from 1.0 to 1.5, two (nos. 5, 6) were submetacentric with the arm ratio of 3.0 and 1.8, respectively, and the other 16 were telocentric with centromere situated at the terminal region of the arm. Two chromosomes (nos. 9, 10) possessed secondary constriction at the terminal region of the long arm, and the length of satellites were 0.6 and $0.5 \mu\text{m}$ long, respectively. Thus, the karyotype of the present species were monomodal and gradual in length, and composed of both symmetrical and asymmetrical members.

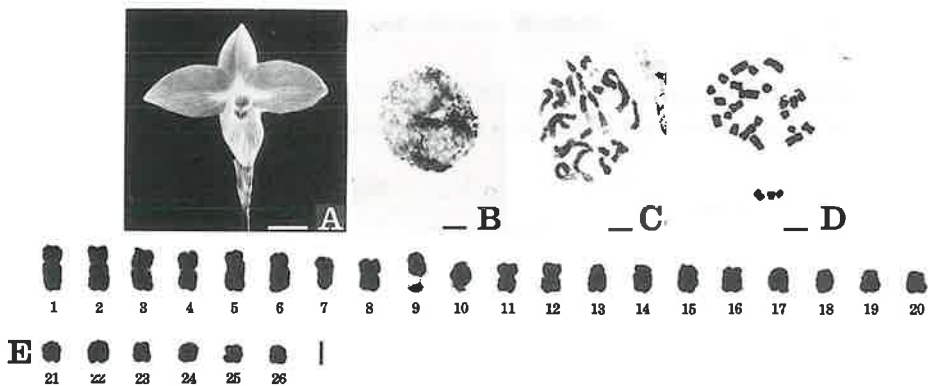


Fig. 1. *Phragmipedium besseae* $2n=26$. A, a flower. B, chromosomes at resting stage. C, chromosomes at mitotic prophase. D and E, chromosomes at mitotic metaphase. Bar indicates 15 mm for A, $5 \mu\text{m}$ for B-D and $2.5 \mu\text{m}$ for E.

Discussion

In the genus *Phragmipedium*, a series of chromosome numbers of $2n=18, 20, 21, 22, 23, 28, 30, 40$ has been counted and the variation in chromosome number (except for the cases of $2n=21, 23$ and 40) has been considered to be derived from Robertsonian centromeric fission on the increase by Karasawa (1980).

When the chromosomes with two and one arms are designated as V- and I-shaped, respectively, the basic form of $2n=18=18V$ and the derivative forms of $2n=20=16V+4I$, $2n=22=14V+8I$, $2n=28=8V+20I$ and $2n=30=6V+24I$ are recognized in the genus. The chromosome number of $2n=26$ of the present species is newly recorded in the genus, however, it can be designated as $2n=26=10V+16I$, being consistent with the other species in total number of arms within the complements. The present species can be regarded as being derived from ancestral species with $2n=18V$ via Robertsonian centromeric fission same as the other species of the genus *Phragmipedium*.

Summary

1. Karyomorphological observation of *Phragmipedium besseae* showed that resting chromosomes were the complex chromocenter type, mitotic metaphase chromosomes were monomodal and gradual in length, and composed of both symmetrical and asymmetrical members.
2. The chromosome number of $2n=26$ was reported for the species for the first time. The chromosome complements comprised $2n=26=10V+16I=18V$. The present species was regarded as being derived from ancestral stock with $2n=18=18V$ via Robertsonian centromeric fission same as the other species of the genus *Phragmipedium* which have already been reported by Karasawa (1980).

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Table 1. Measurements of somatic chromosomes of *Phragmipedium besseae*, $2n=26$ at metaphase

chromosome	Length(μ m)	Relative length	Arm ratio	Form
1	1.9+3.0=4.9	6.1	1.5	m
2	1.9+2.9=4.8	6.0	1.5	m
3	2.2+2.3=4.5	5.6	1.0	m
4	2.1+2.2=4.3	5.3	1.0	m
5	1.1+3.3=4.4	5.5	3.0	sm
6	1.5+2.8=4.3	5.3	1.8	sm
7	1.4+2.1=3.5	4.3	1.5	m
8	1.6+1.8=3.4	4.2	1.1	m
9	d +2.6+0.6=3.2*	4.0	—	t
10	d +2.6+0.5=3.1*	3.8	—	t
11	1.5+1.6=3.1	3.8	1.0	m
12	1.5+1.6=3.1	3.8	1.0	m
13	d +2.9=2.9	3.6	—	t
14	d +2.9=2.9	3.6	—	t
15	d +2.9=2.9	3.6	—	t
16	d +2.8=2.8	3.5	—	t
17	d +2.7=2.7	3.3	—	t
18	d +2.6=2.6	3.2	—	t
19	d +2.5=2.5	3.1	—	t
20	d +2.4=2.4	3.0	—	t
21	d +2.2=2.2	2.7	—	t
22	d +2.2=2.2	2.7	—	t
23	d +2.1=2.1	2.6	—	t
24	d +2.0=2.0	2.5	—	t
25	d +1.9=1.9	2.4	—	t
26	d +1.9=1.9	2.4	—	t

* Chromosome with secondary constriction

d: dot