

# Yoshikane Iwatsubo and Yuya Hayase: **Chromosome study of *Chamaele decumbens* (Umbelliferae)**

岩坪美兼・早瀬裕也：セントウソウ（セリ科）の染色体研究

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*Chamaele decumbens* (Thunb.) Makino is a species in *Chamaele*, a monotypic genus occurring in Hokkaido, Honshu, Shikoku, and Kyushu in Japan (Ohwi and Kitagawa 1992). The chromosome number of this species has been reported as  $n = 11$  on the basis of bivalent chromosome numbers in meiotic pollen mother cells (Bell and Constance 1957).

The present study was conducted to clarify the karyotype and meiotic chromosome behavior at metaphase I, in order to obtain information on seed formation of this species and underlying information on the karyotypic evolution of this genus in the family Umbelliferae.

## Materials and methods

Twenty-two individuals of *C. decumbens* collected from either the forest floor or the forest edge of 13 localities (Table 1) were used for determination of somatic chromosome numbers. Plants were grown in plastic pots at the experimental garden of the University of Toyama. Chromosome counts of these plants were investigated in somatic cells with fully spread metaphase chromosomes in the root tip meristem cells. To examine the somatic chromosome numbers, root tips from the cultivated plants were excised to approximately 1 cm, pretreated in a 2.1 mM 8-hydroxyquinoline solution at room temperature (about 25°C) for 1 h and then kept at ca. 5°C for 15 h. Root tips were fixed in a mixture of glacial acetic acid and absolute ethyl alcohol (1:3) at room temperature for 1 h, macerated in 1 N hydrochloric acid at 60°C for 10 minutes, and then washed in tap water. They were then stained and squashed in 1% lacto-propionic orcein. Fully spread metaphase chromosomes were examined.

To study meiotic chromosome behavior, young flower buds of three plants were fixed and preserved in Newcomer's fluid until use. Flower buds were macerated using the same procedures used for root tips and stained and squashed in a drop of 1.5% lacto-propionic orcein. We reported our findings concerning chromosome number of *C. decumbens* plants collected from 13 localities. The karyotype and meiotic chromosome behavior of the *C. decumbens* plants were examined in the plants collected at Joyama (Toyama City, Toyama Prefecture, Japan).

Table 1. Collection localities, number of individuals examined and chromosome number (2n) of *Chamaele decumbens*

Collection locality	Number of plants examined	Chromosome number (2n)
Unazukimachiurayama, Kurobe City, Toyama Pref.	1	22
Inamura, Kamiichi-machi, Nakaniikawa-gun, Toyama Pref.	1	22
Oiwa, Kamiichi-machi, Nakaniikawa-gun, Toyama Pref.	1	22
Tajimano, Kamiichi-machi, Nakaniikawa-gun, Toyama Pref.	1	22
Anyobo, Toyama City, Toyama Pref.	1	22
Joyama, Toyama City, Toyama Pref.	3	11II
	6	22
Suguzaka, Toyama City, Toyama Pref.	1	22
Otani, Toyama City, Toyama Pref.	1	22
Katakake, Toyama City, Toyama Pref.	1	22
Yatsuomachihirabayashi, Toyama City, Toyama Pref.	1	22
Yamadakodani, Toyama City, Toyama Pref.	2	22
Miyagawachoutsubo, Hida City, Gifu Pref.	1	22
Miyagawacho, Hida City, Hida Pref.	1	22
Total	22	

### Results and discussion

All *C. decumbens* individuals examined in the present study had  $2n = 22$  chromosomes in the somatic cells (Fig. 1A). Chromosome pairing was examined in 109 pollen mother cells. All of the cells had 11 bivalents (Fig. 1B). This was consistent with the meiotic chromosome number of this species reported by Bell and Constance (1957).

Somatic chromosomes at metaphase ranged from  $1.9 \mu\text{m}$  to  $2.5 \mu\text{m}$  in length and 1.2 to 2.3 in arm ratio. Total length of the somatic complement was  $47.7 \mu\text{m}$  and the longest to shortest chromosome ratio was 1.32. The chromosome complement in somatic cells was composed of 20 metacentric chromo-

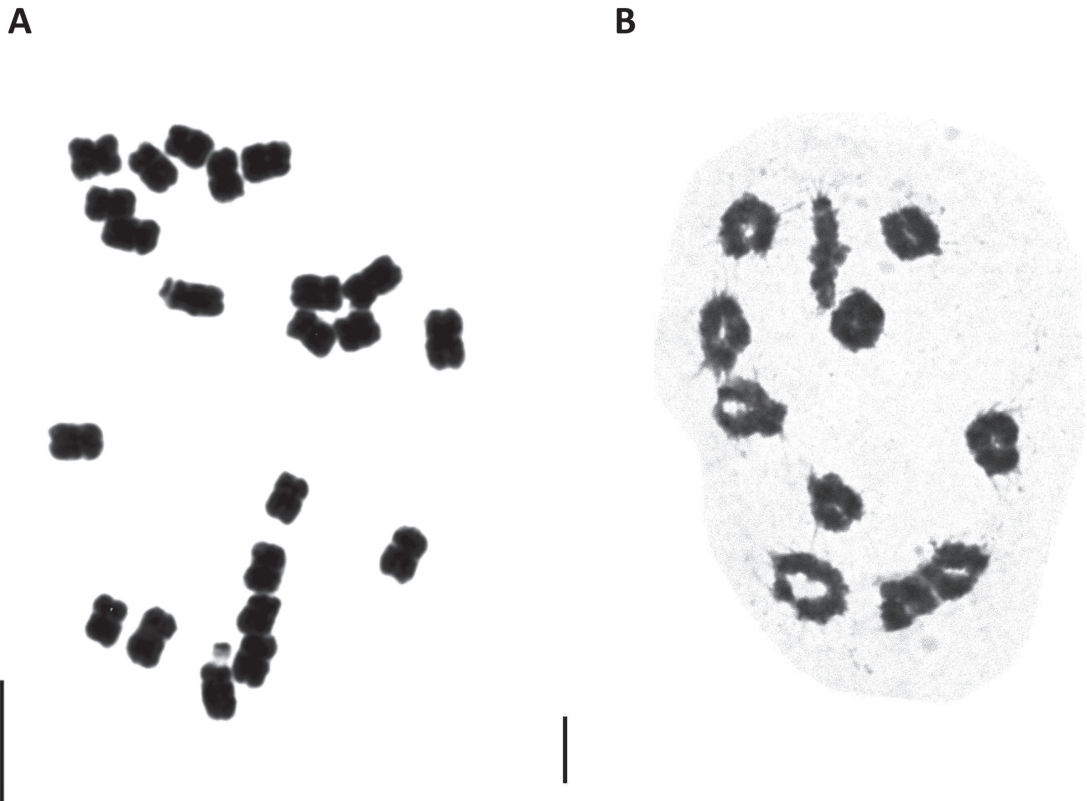


Fig. 1. Somatic metaphase chromosomes (A) in root tip cell, and meiotic chromosomes at metaphase I (B) in pollen mother cell of *Chamaele decumbens*. Bars:  $5 \mu\text{m}$ .

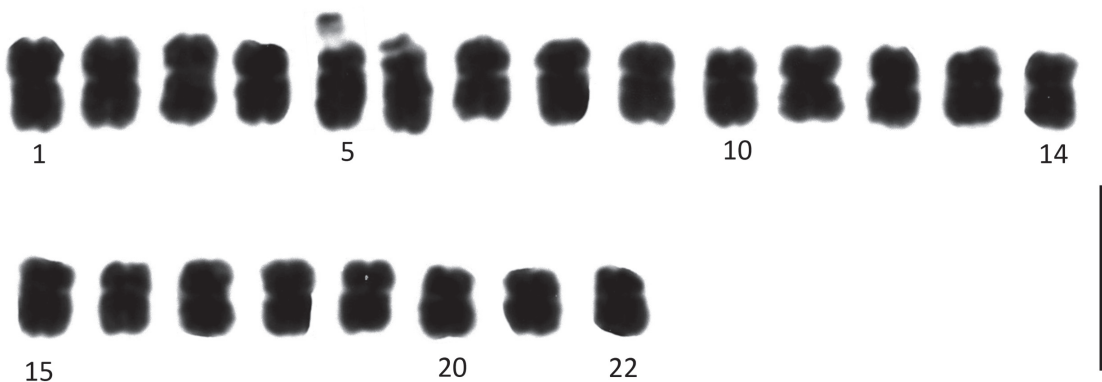


Fig. 2. Karyogram of *Chamaele decumbens*. Bar:  $5 \mu\text{m}$ .

somes and 2 submetacentric chromosomes. In the somatic chromosome complement, 2 submetacentric chromosomes had a satellite in each of the distal parts of their short arms. The somatic chromosome complement was formulated as  $2n = 22 = 20m+2^t\text{sm}$ . Our findings demonstrate that *C. decumbens* has a monomodal karyotype. The 11 bivalents in PMCs supported a basic chromosome number of  $x = 11$  of this genus, as reported by Bell and Constance (1957). As this plant performs regular meiosis, seed formation in *C. decumbens* presumably occurs through normal sexual reproduction.

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### References

Bell, C. R. and Constance, L. 1957. Chromosome numbers in Umbelliferae. *American Journal of Botany* **44**: 567-572.

Ohwi, J. and Kitagawa, M. 1992. *New flora of Japan*, p. 1107. Shibundo, Tokyo. (in Japanese)

### 摘 要

セントウソウ属 (*Chamaele*) はセントウソウのみからなる単型属植物である。セントウソウの染色体数は  $n = 11$  が報告されている (Bell and Constance 1957)。核型と正常な減数分裂が行われているかどうかを明らかにするために、染色体の観察を行った。その結果、体細胞には 22本の染色体 ( $2n = 22$ )、減数分裂第一中期では 11個のII価染色体が観察され、正常な減数分裂を行っていることが判った。体細胞の染色体の長さは  $1.9 \mu\text{m} \sim 2.5 \mu\text{m}$ 、腕比は  $1.2 \sim 2.3$  であった。20本の中中部動原体型染色体と2本の次中部動原体型染色体からなり、次中部動原体型染色体の短腕にはサテライトが存在した。セントウソウは  $2n = 22 = 20m + 2^t\text{sm}$  の対称的勾配的核型を持つことが判った。

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Table 2. Measurements at somatic metaphase chromosomes of *Chamaele decumbens*

No.	Length ( $\mu\text{m}$ )	Total ( $\mu\text{m}$ )	Arm ratio	Form
1	1.1 + 1.4	2.5	1.3	m
2	1.1 + 1.3	2.4	1.2	m
3	1.0 + 1.3	2.3	1.3	m
4	1.0 + 1.3	2.3	1.3	m
5	t - 0.7 + 1.6	2.3	2.3	sm
6	t - 0.7 + 1.6	2.3	2.3	sm
7	1.0 + 1.3	2.3	1.3	m
8	0.9 + 1.4	2.3	1.6	m
9	0.9 + 1.4	2.3	1.6	m
10	0.9 + 1.4	2.3	1.6	m
11	1.0 + 1.2	2.2	1.2	m
12	1.0 + 1.2	2.2	1.2	m
13	1.0 + 1.2	2.2	1.2	m
14	0.8 + 1.2	2.0	1.5	m
15	0.8 + 1.2	2.0	1.5	m
16	0.8 + 1.2	2.0	1.5	m
17	0.9 + 1.1	2.0	1.2	m
18	0.9 + 1.1	2.0	1.2	m
19	0.9 + 1.1	2.0	1.2	m
20	0.9 + 1.1	2.0	1.2	m
21	0.8 + 1.1	1.9	1.4	m
22	0.8 + 1.1	1.9	1.4	m

t: satellite.