

Chromosome Numbers on Japanese Slender Bamboos of Two Genera *Sasa* and *Sasamorpha* (Bambusaceae)

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ササ属とスズタケ属 8 種の染色体数

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Metaphase chromosomes of eight Japanese slender bamboos of two genera *Sasa* and *Sasamorpha* were studied with the root-tip squash method. All species possessed the same number of diploid chromosomes ($2n=48$), and two species, *Sasa kurilensis* and *Sasamorpha borealis*, showed an intraspecific variation of chromosome numbers ranging from 48 to 51. These results indicate that all Japanese species of these two genera are the tetraploids which are characterized by the basic number of 12.

Slender bamboos of the family Bambusaceae widely occupy forest-floors in almost all districts of Japan. The chromosomal knowledge of Japanese slender bamboos is scanty, although some species were studied cytologically with the classical paraffin method. Further, the taxonomy of Bambusaceae, especially on the genus *Sasa* and its allied genera, is still open to question (Suzuki 1978, Murata 1989). We have studied metaphase configurations of eight species of the two genera *Sasa* and *Sasamorpha* distributed in Japan.

Materials and methods

The species and varieties used were as follows: *Sasa chartacea* Nakai, *S. samaniana* Nakai, *S. senanensis* (Fr. et Sav.) Rehder, *S. megalophylla*

Makino et Uchida, *S. pubiculmis* Makino var. *chitosensis* (Nakai) S. Suzuki, *S. takizawana* Makino et Uchida var. *lasioclada* (Makino et Nakai) S. Suzuki, *S. kurilensis* (Rupr.) Makino et Shibata, and *Sasamorpha borealis* (Hack.) Nakai. This nomenclature is made according to Suzuki (1978).

Living plants were collected from six localities in central Hokkaido, northern Japan, in May, 1990 (Fig. 1) and transplanted to the University Botanical Garden, Hokkaido University of Education. Preparations of mitotic chromosomes were made with root-tips treated with 5% pectinase and 5% aqueous cellulase, and then stained with 2% acetic orcein (Kawano 1965).

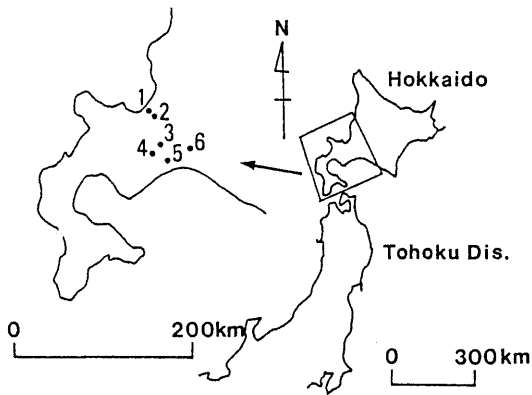


Fig. 1. Localities of the plants collected. 1: Oyafuru (*Sasa kurilensis*). 2: Ainosato (*S. senanensis*). 3: Rankoshi (*S. takizawana* var. *lasioclada* and *S. pubiculmis* var. *chitosensis*). 4: Lake Shikotsu (*S. megalophylla*). 5: Tomakomai Experimental Forest of Hokkaido University (*Sasamorpha borealis*). 6: Hayakita (*S. chartacea* and *S. samaniana*).

Results and discussion

Figures 2A, 2B, 3A and 3B show metaphase configurations of *Sasa pubiculmis* var. *chitosensis*, *S. takizawana* var. *lasioclada*, *S. megalophylla* and *S. samaniana*, respectively. All of the root-tip preparations possessed exactly 48 chromosomes, most of which were meta- or submetacentric. The chromosomes were quite variable in size, ranging from ca. $8.0\ \mu\text{m}$ to ca. $1.4\ \mu\text{m}$ in length. Of four species, the chromosome size of *S. megalophylla* was characteristically small, and even the largest chromosome was less than ca. $3.0\ \mu\text{m}$ in length

(Fig. 3A).

In addition, a revised observation on the metaphase chromosome was made in the following four species, *Sasa chartacea*, *S. senanensis*, *S. kurilensis* and *Sasamorpha borealis*. In the former two species, the mitotic metaphases contained 48 chromosomes, and most of the chromosomes were meta- or submetacentric. These results are consistent with those of Yamaura (1933), Uchikawa (1935) and Janaki Ammal (1959). The root-tip slides of *S. kurilensis* showed a chromosomal variation of $2n=48$ and $2n=49$ (Fig. 3C), in addition to a few dot-like chromosomes, probably B-chromosomes. The chromosome number of *S. kurilensis* ($2n=48$) was obtained in its variety and form, *S. kurilensis* var. *gigantea* and f. *Uchidai* (Yamaura 1933). The metaphase plates of *Sasamorpha borealis* comprised 48 chromosomes excluding a few of micro-chromosomes (Fig. 3D), and this number is identical to that of Yamaura (1933).

The diploid chromosome number of the members belonging to *Sasa* and *Sasamorpha* is listed in Table 1, together with their taxonomic positions in the two genera. All species have the same number of chromosomes ($2n=48$), with chromosomal variations of *S. kurilensis* and *Sasamorpha borealis*. This shows that all species

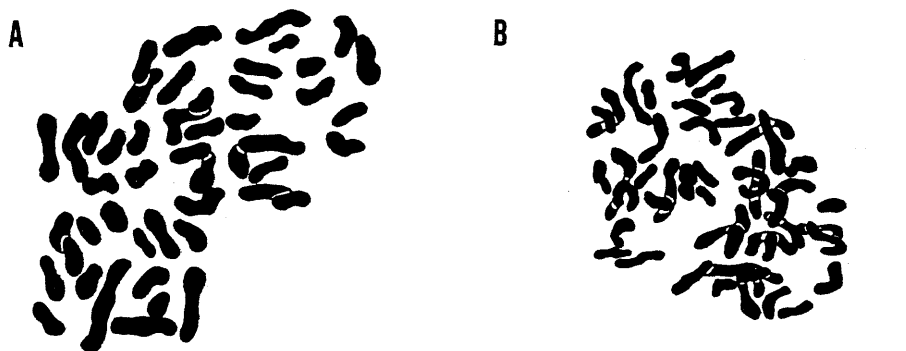


Fig. 2. Mitotic metaphase chromosomes of Japanese slender bamboos. A: *Sasa pubiculmis* var. *chitosensis*. B: *S. takizawana* var. *lasioclada*. Scale line = $10\ \mu\text{m}$.

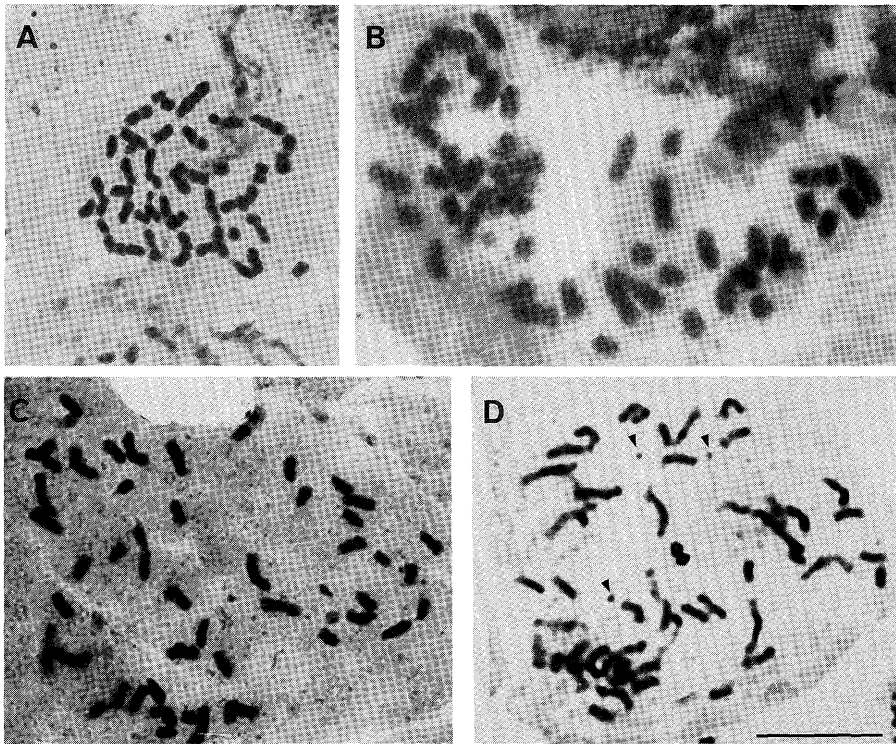


Fig. 3. Mitotic metaphase chromosomes of Japanese slender bamboos. A: *Sasa megalophylla*. B: *S. samaniana*. C: *S. kurilensis* with $2n=49$. D: *Sasamorpha borealis* with B-chromosomes (arrows). Scale line = 10 μm .

are the tetraploids whose basic numbers are $x=12$ (cf. Yamaura 1933, Janaki Ammal 1959).

The taxonomy of Bambusaceae, especially on the genus *Sasa*, remains to be in confusion. Suzuki (1978) considers that this genus consists of 35 species, while Murata (1989) recognizes only six species. Further, the sect. *Lasioderma*, which consists of eight species (Suzuki 1978), is supposed to have derived from natural hybridization between the sect. *Sasa* and the genus *Sasamorpha*, based on the morphological observation (Tatewaki 1940) and the geographical distribution (Suzuki 1961). Since all plants studied are the tetraploids, we also can conclude that the sect. *Lasioderma* has originated from natural hybridization. Therefore, further karyomorphological studies including banding patterns are indispensable for the

establishment of interspecific relationships in the genus *Sasa* and its related groups.

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References

- *Gurzenkov N. N. 1973. Studies of chromosome numbers of plants from the south of the Soviet Far East. Komarov Lectures 20: 47–61 (in Russian).
- Janaki Ammal E. K. 1959. A cytosystematic survey of Bambuseae, I. The slender bamboos of Asia and S. America. Bull. Bot. Surv. India 1: 78–84.
- Kawano S. 1965. Application of pectinase and cellulase in an orcein squash method. Bot. Mag. Tokyo 78: 36–42.
- Murata G. 1989. Poaceae. In Y. Satake *et al.*, ed., Wild flowers of Japan, Woody plants 2: 254–261. Heibonsha Ltd., Tokyo (in Japanese).

Table 1. Chromosome numbers of slender bamboos in the genus *Sasa* and *Sasamorpha* from Japan.

Taxon and Species	Chromosome numbers (2n)	References
Genus <i>Sasa</i>		
sect. Macrochlamys		
<i>S. kurilensis</i>	2n = 48 + 1~2*	**
	2n = 49	**
<i>S. kurilensis</i> var. <i>gigantea</i>	2n = 48	Yamaura (1933)
<i>S. kurilensis</i> f. <i>Uchidai</i>	2n = 48	Gurzenkov (1973)
<i>S. cernua</i> f. <i>nebulosa</i>	2n = 48	Uchikawa (1935)
sect. Lasioderma		
<i>S. pubiculmis</i> var. <i>chitosensis</i>	2n = 48	**
<i>S. takizawana</i> var. <i>lasioclada</i>	2n = 48	**
sect. Sasa		
<i>S. senanensis</i>	2n = 48	Yamaura (1933) Janaki Ammal (1959) **
<i>S. Veitchii</i>	2n = 48	Janaki Ammal (1959)
<i>S. Veitchii</i> f. <i>persimilis</i>	2n = 48	Gurzenkov (1973)
<i>S. megalophylla</i>	2n = 48	**
sect. Crassinodi		
<i>S. nipponica</i>	2n = 48	Tateoka (1954)
<i>S. samaniana</i>	2n = 48	**
<i>S. chartacea</i>	2n = 48	Yamaura (1933) **
Genus <i>Sasamorpha</i>		
<i>S. borealis</i>	2n = 48	Yamaura (1933)
	2n = 48 + 1~3*	**
<i>S. purpurascens</i>	2n = 48	Tateoka (1954)

*: B-chromosomes. **: The present results.

Suzuki S. 1961. Ecology of the Bambusaceae genera *Sasa* and *Sasamorpha* in the Kanto and Tohoku Districts of Japan, with special reference of their geographical distributions. *Ecol. Rev.* **15**: 131-147.

— 1978. Index to Japanese Bambusaceae. 384pp. Gakken, Co. Ltd., Tokyo (in Japanese with English key for identification).

Tateoka T. 1954. Karyotaxonomic studies in Poaceae. II. *Ann. Rept. Natl. Inst. Genet. (Japan)* **5**: 68-69.

Tatewaki M. 1940. Studies on *Sasa* in Hokkaido. *Hokkaido Ringyo-Kaiho* **38**: 1-56 (in Japanese).

Uchikawa I. 1933. Karyological studies in Japanese bamboo I. The chromosome number of several species. *Mem. Coll. Agri. Kyoto Imp. Univ.* **25**: 11-20.

— 1935. Karyological studies in Japanese bamboo. II. Further studies on chromosome numbers. *Jpn. J. Genet.* **11**: 308-312.

Yamaura A. 1933. Karyologische und Embryologische Studien über einige Bambus-Arten. *Bot. Mag. Tokyo* **47**: 551-555 (in Japanese with German synopsis).

*) Indirect citation.

要 旨

ササ属 (*Sasa*) とスズタケ属 (*Sasamorpha*) 植物 8 種について、根端を用いた体細胞分裂中期像の観察を行った。8 種は全て染色体数が $2n=48$ であることが観察されたが、チシマザサとスズタケに種内変異が見られた。得られた結果から、ササ属とスズタケ属の種は基本数を12とする4倍体であると考えられる。