

研究資料 (Research material)

Pollen diameter of *Sasa cernua* MAKINO and *S. senanensis* (FRANCH. & SAVAT.) REHD. in small-scale flowering at Sapporo, central Hokkaido

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Abstract

A small-scale flowering of *Sasa cernua* and *S. senanensis* was observed at the Experimental Forest of Hokkaido Research Center in May 2006. Pollen grains were collected and measured diameter. The average diameter of *S. cernua* pollen was 43 μ m, and that of *S. senanensis* was 37 μ m. These results indicate that the size of the pollen grains is within the range of the Poaceae. The diameter of *S. cernua* varied in size, however, all pollen grains were sound. This evidence would not be a possible reason to support the hybrid origin of *S. cernua*.

Key words : acetocarmine, Poaceae, pollen diameter, pollen fertility, *Sasa*

Introduction

Dwarf bamboo species are monocarpic and take several decades to flower. However, the cause of flowering is not yet known and the flowering phenomenon cannot be predicted. Another issue regarding the dwarf bamboo flowering is that they often produce natural hybrids (Namikawa & Imakita, 1992; Watanabe et al., 1994; Ishii et al., 2003). For example, *Sasa cernua*, one of the study species in this report, is regarded to be a hybrid origin of any species between Section *Sasa*, which includes *S. veitchii* and Section *Macrochlamys*, which includes *S. kurilensis* (Mikio Kobayashi personal communication). Irregularity and size variation of pollen grains might indicate a hybrid origin of the species (Kawahara et al., 1989).

In May 2006, a small-scale flowering of *S. cernua* and *S. senanensis* in the Experimental Forest of Hokkaido Research Center was observed. I took advantage of this flowering to measure the pollen diameter of the pollen of these two species. This is the first report on the pollen diameter of *S. cernua* and *S. senanensis*.

Materials and Methods

I observed small-scale flowering of *S. cernua* and *S. senanensis* at the Experimental Forest of Hokkaido Research Center, Forestry and Forest Products Research Institute, Sapporo, in mid-May 2006.

I collected fresh mature inflorescences with yellow anthers from five individual culms of *S. cernua* and four individual culms of *S. senanensis*. Pollens were extracted from the anthers immediately after collection and were stained with acetocarmine solution. The diameter of 30 pollen grains from each culm was measured under a microscope (Olympus Co. Ltd.).

Results and Discussion

Pollen fecundity was 100% for all culms. The pollen for both species was in the form of round ulcerate grains of 3A^a type (Fig. 1), which is typical for anemochore Poaceae plants (Shimakura, 1973; Ikuse, 2001). The average diameter of *S. cernua* pollen was 43 μ m (ranging from 31 to 55 μ m), and the diameter of *S. senanensis* was 37 μ m (ranging from 24 to 50 μ m) (Fig. 2). These results indicate that the size of *S. cernua* and *S. senanensis* pollen grains are within the range of the Poaceae, 23–54 μ m (Ito & Shiotani, 2006). The result for *S. cernua* is larger than that previously reported for *S. kurilensis*, which is 37–42 μ m, and the result for *S. senanensis* is the same as previously reported for *S. veitchii* 30–40 μ m (Ikuse, 2001). The pollen size difference between *S. cernua* and *S. senanensis* (Fig. 2) was highly significant in Student t-test ($p < 0.01$).

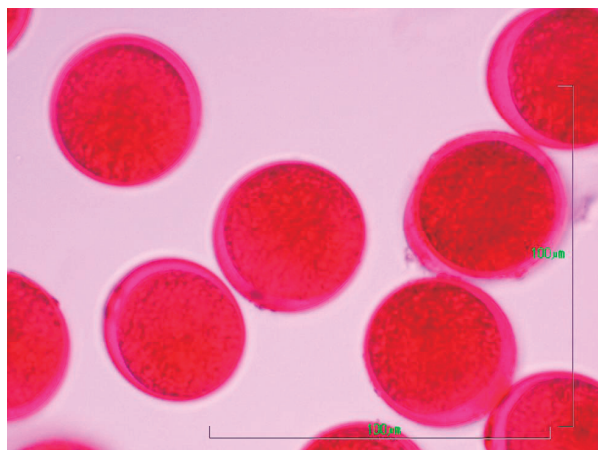
S. cernua, having culm sheaths and leaf sheaths with minute hairs, is identified as a putative hybrid origin group between any species from Section

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a)



b)

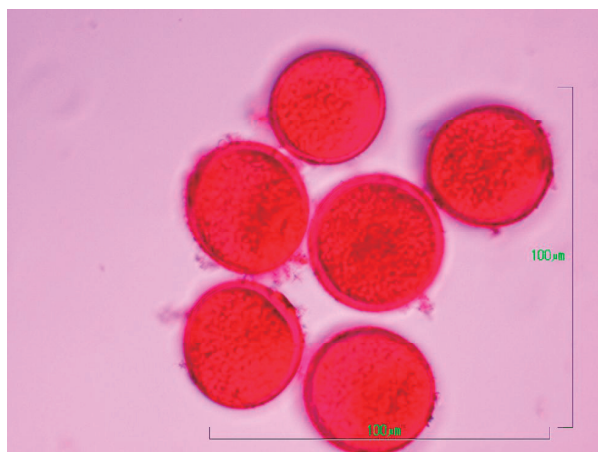


Fig. 1. Pollen grains stained with acetocarmine for *S. cernua* (a) and *S. senanensis* (b). 20 \times .

Macrochlamys \times Section Sasa (Mikio Kobayashi, personal communication). If the studied plant has a hybrid origin, its pollen might have a poor shape or be empty (Kawahara et al. 1989). However, in the present study of *S. cernua*, the shape of the pollen was round and substantial. No empty pollen grains were observed. In addition, the size range of *S. cernua* was greater than that of *S. senanensis*.

Makita et al. (2004) reported that no fruits were produced in the small-scale flowering of *S. kurilensis*. In contrast, I collected sound seeds from the adjacent culms of *S. cernua* and *S. senanensis* in July 2006. These seeds germinated successfully in the laboratory and naturally germinated seedlings were found in 2008 at these study sites (Kitamura personal observation 2006, 2008 and in preparation). This shows that even a small-scale flowering can contribute to sexual reproduction in these dwarf bamboo species.

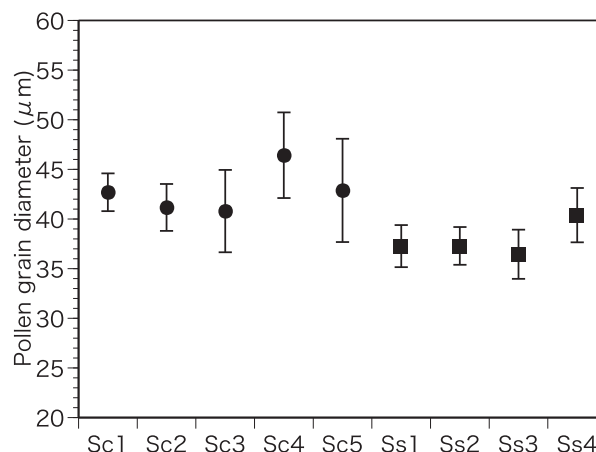


Fig. 2. Average pollen diameter of each culm for *S. cernua* and *S. senanensis*. Standard errors are given by bars. Sc1–5: *S. cernua*, Ss1–4: *S. senanensis*.

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References

- Ikuse, M. (2001) Pollen Grains of Japan [Second Edition]. Hirokawa Publishing Co. Tokyo. 369pp. (in Japanese)
- Ishii, A., Miyata, S. and Hosoyama, Y. (2003) The maternal species of Hannouzasa (*Sasaella ramosa*) Bamboo Journal **20**, 12-18. (in Japanese with English summary)
- Ito, Y. and Shiotani, I. (2006) A variety of Gramineae airborne pollens in the middle area in Mie Prefecture. (2) The sources of grass pollen during spring and early summer. Japanese Journal of Palynology **52**, 5-13. (in Japanese with English summary)
- Kawahara, T., Yahara, T., and Watanabe, K. (1989) Distribution of sexual and agamospermous populations of *Eupatorium* (Compositae) in Asia. Plant Species Biology **4**, 37-46.
- Makita, A., Abe, M., Miguchi, H. and Nakashizuka, T. (2004) Population dynamics of *Sasa kurilensis* for 8 years after mass flowering to the south of Lake Towada, with special reference to the non-flowered populations. Bamboo Journal **21**, 57-65. (in Japanese with English summary)

- Namikawa, K. and Imakita, S. (1992) Chromosome numbers on Japanese slender bamboos of two genera *Sasa* and *Sasamorpha* (Bambusaceae). *Journal of Japanese Botany* **67**, 31-34.
- Shimakura, M. (1973) Palynomorphs of Japanese Plants. Special Publications from the Osaka Museum of Natural History 5. Osaka Museum of Natural History, Osaka, Japan. 60 pp, 122 plates. (in Japanese with English summary)
- Watanabe, M., Ito, M. and Kurita, S. (1994) Chloroplast DNA Phylogeny of Asian bamboos (Bambusoideae, Poaceae) and its systematic implication. *Journal of Plant Research* **107**, 253-261.

オクヤマザサおよびクマイザサの小面積開花における花粉直径

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要旨

2006年5月に北海道支所実験林内でオクヤマザサ (*Sasa cernua*) およびクマイザサ (*S. senanensis*) の小面積開花が観察された。花粉を採取し直径を測定した結果、オクヤマザサでは平均 $43\ \mu\text{m}$ 、クマイザサでは平均 $37\ \mu\text{m}$ であった。この値は他のイネ科植物とほぼ同等であった。オクヤマザサの花粉は大きさがさまざまであったが、すべて健全な花粉であり、雑種性を疑う証拠とはなり得なかった。

キーワード：イネ科、花粉充実率、花粉直径、酢酸カーミン、ササ

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