ヒユ科イノコズチ属3 分類群の染色体数

Kyoko Sato[1], Tomoki Yoshida[2, 3], Norihito Miura[4] and Yoshikane Iwatsubo[2]:
Chromosome numbers of three taxa of *Achyranthes* (Amaranthaceae) in Japan
佐藤杏子[1]・吉田知樹[2, 3]・三浦憲人[4]・岩坪美兼[1]：ヒユ科イノコズチ属 3 分類群の染色体数

Achyranthes L. (Amaranthaceae), distributed in the tropics and subtropics of the Old World, is a small genus with six to eight species (Mabberley 1997). In Japan, this genus comprises the following three species and three varieties: *A. aspera* L. var. *indica* L., *A. bidentata* Blume var. *bidentata*, *A. bidentata* var. *hachijoensis* (Honda) H. Hara, *A. bidentata* var. *japonica* Miq., *A. bidentata* var. *tomentosa* (Honda) H. Hara, and *A. longifolia* (Makino) Makino (Momiyama 1982). Of these, both *A. bidentata* var. *bidentata* and *A. aspera* var. *indica* are found naturally in the Ryukyu Islands. The chromosome number for *A. bidentata* has been variously reported as n=21 chromosomes (Pal 1964), 2n=42 (Sugiura 1931, 1936; Morton 1993), and 84 chromosomes (Roy and Thakur 1962; Ge et al. 1988, sec. Goldblatt and Johnson 1991). Kurosawa (1971) reported 2n=24 chromosomes for *A. bidentata*. In her paper, however, she includes a figure for this taxon showing 42 somatic metaphase chromosomes, which indicates that the 2n=24 chromosomes is simply a misprint of 2n=42 chromosomes. *Achyranthes aspera* var. *indica* has been reported to have n=14 chromosomes (Hsu 1968, as *A. obtusifolia* Lam.).

We present here chromosome numbers of the following three Japanese *Achyranthes* taxa: *A. bidentata* var. *tomentosa*, *A. bidentata* var. *japonica* and *A. longifolia*.

Materials and methods

Chromosome numbers were examined in the root tip cells of 71 individuals of *Achyranthes bidentata* var. *tomentosa* collected from 28 localities, 18 individuals of *A. bidentata* var. *japonica* collected from 10 localities, and 27 individuals of *A. longifolia* collected from 4 localities in Japan (Table 1). Their newly formed root tips were pretreated in a 2 mM 8–hydroxyquinoline solution for 1 h at 25℃ and subsequently kept for 15 h at 6℃. The root tips were fixed in freshly mixed Farmer's fixative (3 : 1 ethyl alcohol : acetic acid) for 1 h, soaked in 1 N HCl for 2–3 h, and then macerated in 1 N HCl at 60℃ for 10 minutes. After being immersed in tap water, their meristems were stained with a drop of 1.5% lactopropionic orcein on a glass slide and the squash technique was applied for the examination of chromosome numbers in their somatic cells. Voucher specimens of the plants examined have been deposited in the Toyama Science Museum (TOYA).

Results and discussion

Chromosome counts of the three *Achyranthes* taxa studied were as follows:

(1) *A. bidentata* var. *tomentosa* (Fig. 1 A).

All the 71 plants used in this study showed 2n=42 chromosomes. This is the first time a chromosome number for this taxon has been reported.

(2) *A. bidentata* var. *japonica* (Fig. 1 B).

All the 18 plants studied had 2n=42 chromosomes. This is the first time a chromosome number for this taxon has been reported.

(3) *A. longifolia* (Fig. 1 C).

All of the 27 plants examined had 2n=42 chromosomes. This is the first report of chromosome number for this taxon.

Chromosome number in *Achyranthes bidentata* is known to be variable. Chromosome numbers of n=21, 2n=42 and 84 chromosomes have been reported (Pal 1964; Sugiura 1931, 1936; Roy and Thakur 1962; Ge et al. 1988, sec. Goldblatt and Johnson 1991; Morton 1993). However, the present study revealed 2n=42 chromosomes in all individuals of both Japanese *A. bidentata* var. *japonica* and var. *tomentosa* examined (Fig. 1). *Achyranthes* is known to have a basic number of x=7 (Darlington and Wylie 1955). Thus the chromosome counts of 2n=42 found in this study show that *A. longifolia* and

Table 1. Chromosome number, collection locality and number of individuals of three taxa of *Achyranthes*

Collection locality	Number of individuals observed
A. bidentata var. *tomentosa*（2n=42）	
Ichijo, Sakata City, Yamagata Pref.	3
Yokoyama, Mikawa-machi, Higashitagawa-gun, Yamagata Pref.	2
Ohdawa, Fujioka-cho, Shimotsuga-gun, Tochigi Pref.	1
Sakai-cho, Sashima-gun, Ibaraki Pref.	1
Hitoichi, Niigata City, Niigata Pref.	2
Niino, Anan-cho, Shimoina-gun, Nagano Pref.	2
Miyagase, Kiyokawa-mura, Aiko-gun, Kanagawa Pref.	2
Nagatsuka, Odawara City, Kanagawa Pref.	1
Nariki, Oume City, Tokyo Metr.	1
Nagasawa, Takane-cho, Hokuto City, Yamanashi Pref.	1
Kokubu, Ichinomiya-cho, Fuefuki City, Yamanashi Pref.	1
Hajikano, Yamato-cho, Koshu City, Yamanashi Pref.	2
Iwabuchi, Fujikawa-cho, Ihara-gun, Shizuoka Pref.	1
Utsunoya, Shizuoka City, Shizuoka Pref.	1
Inami, Nanto City, Toyama Pref.	1
Sumiyoshi, Uozu City, Toyama Pref.	1
Ishida, Kurobe City, Toyama Pref.	2
Gofuku, Toyama City, Toyama Pref.	4
Chayamachi, Toyama City, Toyama Pref.	16
Teramachi, Toyama City, Toyama Pref.	12
Kamikoizumi, Namerikawa City, Toyama Pref.	2
Kurakawa, Himi City Toyama Pref.	2
Kozakai, Himi City, Toyama Pref.	1
Hayahoshi, Fuchu-machi, Toyama City, Toyama Pref.	1
Furukawacho, Hida City, Gifu Pref.	1
Imakatata, Otsu City, Shiga Pref.	2
Ohgi, Otsu City, Shiga Pref.	3
Nishino, Minamitane-cho, Kumage-gun, Kagoshima Pref.	2
A. bidentata var. *japonica*（2n=42）	
Kojo, Takaoka City, Toyama Pref.	1
Chayamachi, Toyama City, Toyama Pref.	5
Teramachi, Toyama City, Toyama Pref.	4
Kamikoizumi, Namerikawa City, Toyama Pref.	1
Suwamachi, Yatsuo-machi, Toyama City, Toyama Pref.	1
Kurakawa, Himi City Toyama Pref.	1
Furukawacho, Hida City, Gifu Pref.	1
Imakatata, Otsu City, Shiga Pref.	1
Tsukinose, Kozagawa-cho, Higashimuro-gun, Wakayama Pref.	2
Nishino, Minamitane-cho, Kumage-gun, Kagoshima Pref.	1
A. longifolia（2n=42）	
Chayamachi, Toyama City, Toyama Pref.	8
Teramachi, Toyama City, Toyama Pref.	13
Kamikoizumi, Namerikawa City, Toyama Pref.	4
Suwamachi, Fuchu-machi, Toyama City, Toyama Pref.	2

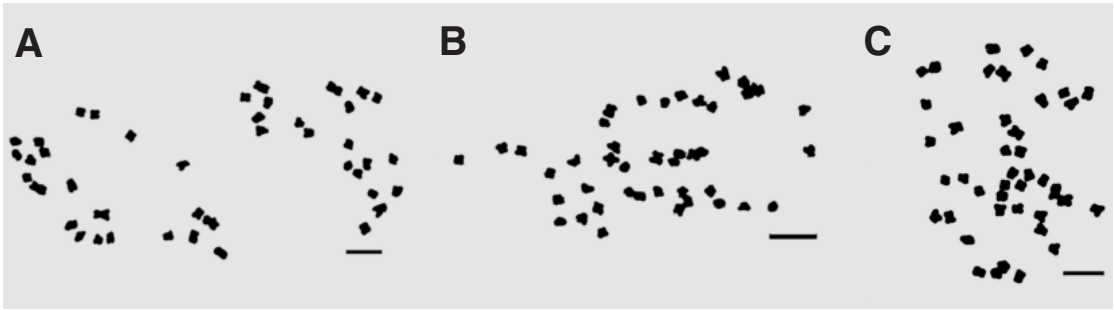

Fig. 1. Photographs of somatic metaphase chromosomes of three taxa of *Achyranthes* collected from Chayamachi, Toyama City, Toyama Pref. A, *A. bidentata* var. *tomentosa* (2n=42) ; B, *A. bidentata* var. *japonica* (2n=42) ; C, *A. longifolia* (2n=42). Bar=5 μm.

both var. *tomentosa* and var. *japonica* of *A. bidentata* are hexaploid plants.

References

Darlington, C. D. and Wylie, A. P. 1955. Chromosome atlas of flowering plants, 2nd ed. p. 77. George Allen and Unwin, London.

Goldblatt, P. and Johnson, D. E. 1991. Index to plant chromosome numbers 1988–1989. p.28. Missouri Botanical Garden, St. Louis.

Hsu, C.-C. 1968. Preliminary chromosome studies on the vascular plants of Taiwan (II). Taiwania **14** : 11–27.

Kurosawa, S. 1971. Cytological studies on some eastern Himalayan plants and their related species. Hara, H. (ed.). The flora of eastern Himalaya. Second report, pp. 355–364. University of Tokyo Press, Tokyo.

Mabberley, D. J. 1997. The plant-book, 2nd ed. p. 7. Cambridge University Press, Cambridge.

Momiyama, Y. 1982. Amaranthaceae. Satake, Y., Ohwi, J., Kitamura, S., Watari, S. and Tominari, T. (eds.). Wild flowers of Japan. Herbaceous plants II, pp. 54–55, pl. 53. Heibonsha, Tokyo. (in Japanese)

Morton, J. K. 1993. Chromosome numbers and polyploidy in the flora of Cameroons Mountain. Opera Bot. **121** : 159–172.

Pal, M. 1964. Chromosome numbers in some Indian angiosperms. I. Proc. Ind. Acad. Sci., B. **60** : 347–350.

Roy, R. P. and Thakur, V. 1962. On a polyploid *Achyranthes bidentata* Blume (2n=84) in nature. Proc. Ind. Congr. **49** (3, VI) : 335–336.

Sugiura, T. 1931. A list of chromosome numbers in angiospermous plants. Bot. Mag, Tokyo **45** : 353–355.

Sugiura, T. 1936. Studies on the chromosome numbers in higher plants, with special reference to cytokinesis. I. Cytologia **7** : 544–595.

摘要

わが国に生育するイノコズチ属（ヒユ科）3 分類群（ヒナタイノコズチ *Achyranthes bidentata* var. *tomentosa*，ヒカゲイノコズチ *A. bidentata* var. *japonica*，ヤナギイノコズチ *A. longifolia*）について染色体数を明らかにした。本研究によりこれら 3 分類群はいずれも 2n=42 であることが初めて明らかとなった。イノコズチ属の基本数は x=7（Darlington and Wylie 1955）とされていることから，これら 3 分類群は六倍体であると考えられる。

([1]Graduate School of Science and Engineering, University of Toyama, Gofuku 3190, Toyama 930–8555, Japan ; [2]Department of Biology, Faculty of Science, University of Toyama, Gofuku 3190, Toyama 930–8555, Japan ; [3]Present address : Honkatata 3–21–15, Otsu 520–0242, Japan ; [4]Nikko Museum of Natural History, Chugushi 2480–1, Nikko 321–1661, Japan [1]〒930-8555 富山市五福 3190 富山大学大学院理

工学研究科；[2]〒930-8555　富山市五福 3190　富山大学理学部生物学科；[3] 現住所　〒520-0242　大津市本堅田 3-21-15；[4]〒321-1661　日光市中宮祠 2480-1　日光自然博物館）