

## 種子島産セイヨウタンポポ (キク科)の染色体数

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## Kyoko Sato, Yoshikane Iwatsubo and Naohiro Naruhashi : **Distribution pattern of *Taraxacum officinale* (Asteraceae) polyploid forms on Tanegashima Island, Japan**

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The perennial herb *Taraxacum officinale* Weber is an invasive cosmopolitan species that thrives on the plains and mountains of Japan. Natural hybrids between naturalized triploid *T. officinale* and native diploid *Taraxacum* of the section *Mongolica* have also been reported in Japan (Morita 1988 ; Watanabe, Maruyama et al. 1997; Watanabe, Ogawa, Naito et al. 1997; Watanabe, Ogawa, Serizawa et al. 1997 ; Hamaguchi et al. 2000 ; Yamano et al. 2002 ; Shibaike and Morita 2002 ; Shibaike et al. 2005). These hybrid plants are very similar morphologically to *T. officinale*, making it difficult to distinguish between the two types (Watanabe et al. 1997 a ; Shibaike and Morita 2002). Because we are unable to distinguish between *T. officinale* and hybrids in the field, we have not attempted to discriminate between *T. officinale* and hybrids in this study, as well as in our previous cytological studies of the common dandelion (Sato et al. 2004, 2007).

The genus *Taraxacum* has a basic chromosome number of  $x=8$  (Darlington and Wylie 1955) ; the *T. officinale* species exists in di-, tri-, tetra-, penta-, and hexaploid forms, as well as in several aneuploid forms (Table 1). In previous surveys, the triploid form was found in many sites throughout Japan (Miyaji 1932 ; Okabe 1951 ; Takemoto 1954, 1956, 1961 ; Sato et al. 2004, 2007), whereas the tetraploid form was restricted to Toyama Prefecture in central Honshu (Sato et al. 2004, 2007). Although *T. officinale* has been extensively studied cytologically, little is known about the distribution of the triploid and tetraploid forms throughout Japan.

In this study, we focused on the distribution pattern of triploid and tetraploid *T. officinale* on

Tanegashima Island, located in the south of Kyushu in southern Japan.

### Materials and methods

We collected a total of 56 *T. officinale* plants from 13 sites on Tanegashima Island (Table 2) and cultivated them in plastic pots in the experimental garden of the University of Toyama. Newly formed root tips were collected from the plants and pretreated with a 2.2 mM 8-hydroxyquinoline solution at room temperature for 1 to 1.5 h, then stored at approximately 5°C for 15 h. They 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. Meristems of the root tips were stained in one drop of 1.5% lacto-propionic orcein on a glass slide and a common squash technique was applied to examine the chromosomes. Well-squashed cells were used for chromosome counts.

### Results and discussion

Chromosome numbers observed in the present study of *T. officinale* on Tanegashima Island are summarized in Table 2. We found only the triploid ( $2n=24$  chromosomes) and the tetraploid ( $2n=32$  chromosomes) forms of the plant (Fig. 1). Of 56 specimens examined, 50 plants (89.3%) were of the triploid form, which was found at every site, whereas 6 plants (10.7%) were of the tetraploid form, which was found at only three sites (Fig. 2). These chromosome numbers are consistent with results reported in our previous studies of Japanese *T. officinale* distributed in Toyama Prefecture, central Honshu (Sato et al.

Table 1. The chromosome numbers reported previously of *Taraxacum officinale*

n	2n	Previous reports	
	24-26	Juel	1905
	22-24	Heitz	1926
	24	Miyaji	1932
	24	Poddubnaja-Arnoldi and Dianowa	1934
12, 16		Tischler	1934
	24	Poddubnaja-Arnoldi and Dianowa (sec. Fedorov 1969)	1937
12, 16		Rohweder	1937
12		Tischler	1937
	24	Pólya	1950
	24	Okabe	1951
	24, 24+2B	Takemoto	1954
	24, 26	Takemoto	1956
	24	Malecka	1958, 1962, 1968, 1971
	24	Mulligan	1959
	16, 18, 24, 32, 34, 36, 37	Fürnkranz	1960
4	8, 9	Panigrahi and Kamathy	1960
	24	Takemoto	1961
	8	Sharma and Chatterjee	1961
	24	Koul (as 8 II+ 8 I and 24)	1963
12	24	Koul	1964
	24, 27, 32	Mehra et al.	1965
	16, 21-23, 24	Fürnkranz	1966
	24	Sharma and Sarkar (sec. Moore 1973)	1967-68
	24	Chuhsanova et al.	1968
	24	Taylor and Mulligan	1968
	24, 32	Chatterjee and Sharma	1969
	24, 26, 27, 32, 40, 44, 48	Gill	1969
	40	Mehra and Remanandan	1969
	24	Arevshatian	1970, 1973
	24	Lee	1970
	24	Lee and Oh	1970
	24	Murín and Váchová	1970
24		Sharma (sec. Goldblatt 1981)	1970
	24, 26, 40	Fernandes and Queirós	1971
	24	Lovka et al.	1971
	24	Kartashova et al.	1974
	24	Kartashova et al. (sec. Goldblatt 1988)	1974
	22	Belaeva and Siplivinsky	1975
	24	Magulaev (sec. Goldblatt 1981)	1976
	24	Peng and Hsu	1977, 1978
	24	van Loon and de Jong	1978
	24	Kliphuis and Wieffering	1979
	24	Mulligan (as 24 I to 16 I +1 II+2 III)	1984
	24+2B	Dmitrieva and Parfenov	1985
	24	Krasnikov	1986
	26	Gupta and Garg	1987
	24, 32	Lavrenko and Serditov	1987
	24+2B	Parfenov and Dmitrieva	1987
	32	Lavrenko et al.	1988
	26	Gupta et al.	1989
	24+1B	Krasnikov (sec. Goldblatt and Johnson 1996)	1990
	24	Luque and Díaz Lifante	1991
	24, 32	Zhai and An	1996
	24, 32	Zhai et al.	1997
	24, 24+2B	Dmitrieva (sec. Goldblatt and Johnson 2006)	2000
	16, 24, 32	Kashin et al.	2003
	24, 32	Sato et al.	2004, 2007

Modified from Sato et al. (2007)

Table 2. Chromosome numbers and collection data of *Taraxacum officinale* in Tanegashima Island

Site number*	Locality	Number of individuals		
		2n=24	2n=32	Total
Nishinoomote City				
1	Kunigami (1)	3	3	6
2	Kunigami (2)	5		5
3	Kunigami (3)	3		3
4	Nishinoomote (1)	2	1	3
5	Nishinoomote (2)	2		2
6	Sumiyoshi	2	2	4
Nakatane-cho, Kumage-gun				
7	Noma	3		3
8	Sakai	4		4
Minamitane-cho, Kumage-gun				
9	Shimama	7		7
10	Nakanokami (1)	4		4
11	Nakanokami (2)	6		6
12	Nishino	3		3
13	Nakanoshimo	6		6
Total		50	6	56

\*Site number is in accord with that in Fig. 2.

2007). In this study, the triploid form of *T. officinale* was found at every site examined, whereas the tetraploid form was restricted to sites in the northern part of Tanegashima Island (Fig. 2). In contrast, both triploid and tetraploid forms of *T. officinale* are distributed throughout the plains of Toyama Prefecture (Sato et al. 2007). These distinct distribution patterns suggest that the triploid form was introduced first and spread throughout the entire island the tetraploid plant naturalized in the northern part of Tanegashima Island at a later time.

Triploid *T. officinale* has been reported in many localities throughout Japan, whereas the tetraploid form, along with the triploid form, had been observed only in Toyama Prefecture. In the present study we identify Tanegashima Island as another locality for both triploid and tetraploid forms of *T. officinale*. Since tetraploid plants were found in Toyama Prefecture and Tanegashima Island, there is a possibility that tetraploid plants are distributed between the two regions. Additional cytological studies are clearly necessary to more thoroughly character-

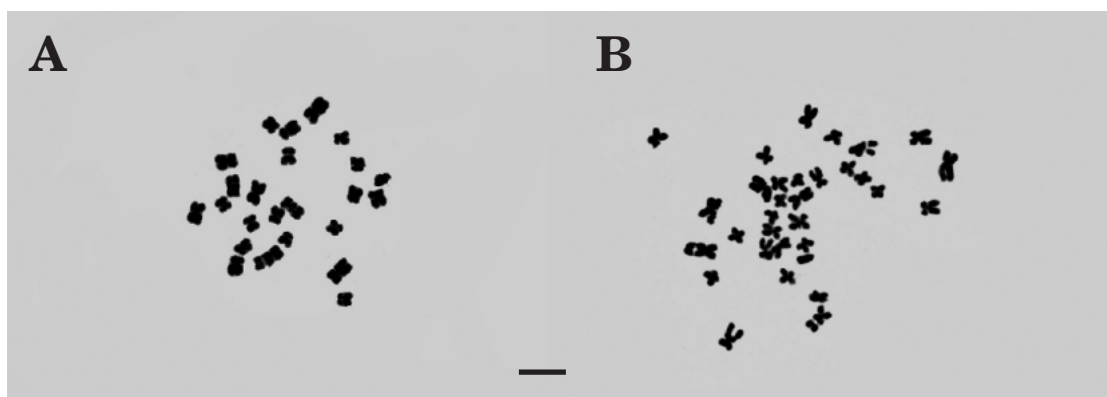


Fig. 1. Photographs of somatic metaphase chromosomes of *Taraxacum officinale* collected from Tanegashima Island. A: 2n=24 (triploid). B: 2n=32 (tetraploid). Bar indicates 5  $\mu$ m.

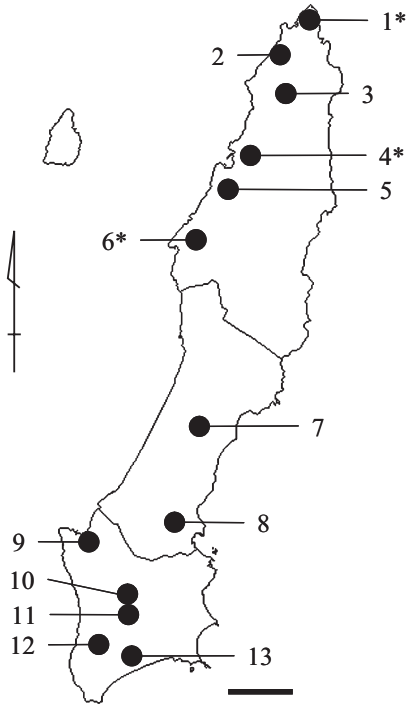


Fig. 2. Distribution of *Taraxacum officinale* in Tanegashima Island. 1\*: Kunigami (1). 2: Kunigami (2). 3: Kunigami (3). 4\*: Nishinoomote (1). 5: Nishinoomote (2). 6\*: Sumiyoshi. 7: Noma. 8: Sakai. 9: Shimama. 10: Nakanokami (1). 11: Nakanokami (2). 12: Nishino. 13: Nakanoshimo. \* Sites found tetraploid plants. Bar indicates 5 km.

ize the distribution patterns of *T. officinale* polyploid forms throughout western Japan.

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佐藤杏子・岩坪美兼・鳴橋直弘：種子島産セイヨウタンポポ（キク科）の染色体数

種子島内13ヵ所より採集したセイヨウタンポポ (*Taraxacum officinale*) 56個体を対象に染色体数を明らかにした。2n=24の三倍体と2n=32の四倍体が存在した。56個体中50個体(89.3%)は2n=24の三倍体セイヨウタンポポであり、採集したすべての場所から見つかったことから種子島全体に分布することが判った。6個体(10.7%)は2n=32の四倍体セイヨウタンポポであり、種子島北部(西之表市)の3ヵ所にのみ観察された。わが国では四倍体セイヨウタンポポは富山県から報告されている(Sato et al. 2004, 2007)。今回の研究により種子島にも分布することが判明したことから、四倍体セイヨウタンポポは富山と種子島の間地域にも分布している可能性がある。

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