ムシャリンドウ(シソ科) の核型

Norihito Miura[1] and Yoshikane Iwatsubo[2]: **Karyotype of *Dracocephalum argunense* (Labiatae)**

三浦憲人[1]・岩坪美兼[2]：ムシャリンドウ（シソ科）の核型

The genus *Dracocephalum* L. (Labiatae) comprises approximately 70 species, distributed primarily in Eurasia. North Africa and north America, on the other hand, have only one species each (Budantsev 2004), and Japan also has only one species, *D. argunense* Fisch. ex Link, which occurs in Hokkaido and in northern to central Honshu (Murata and Yamazaki 1993). As shown in the Appendix, this genus has a variety of chromosome numbers : 2n=10 in *D. moldavica* L., *D. nutans* L. and *D. stamineum* Kar. et Kir. ; 2n=10 and 14 in *D. imberbe* Bunge ; 2n=12 in *D. bipinnatum* Rupr., *D. botryoides* Steven, *D. discolor* Bunge, *D. diversifolium* Rupr., *D. komarovi* Lipsky, *D. multicolor* Kom., *D. palmatum* Stephan ex Willd., *D. peregrinum* L. and *D. scrobiculatum* Regel ; 2n=12 and 24 in *D. nodulosum* Rupr. ; 2n=14 in *D. altaiense* Hiltebr., *D. argunense*, *D. austriacum* L., *D. grandiflorum* L., *D. nuttallii* Britton, *D. oblongifolium* Regel, *D. parviflorum* Nutt., *D. ruyschiana* L., *D. speciosum* Benth. (as n=7) and *D. virginianum* L. ; 2n=14 and 20 in *D. thymiflorum* L. ; 2n=20 in *D. canariense* L. (as n=10) and *D. fruticuluosum* Stephan ex Willd. (as n=10) ; 2n=20, 21, 22 and 24 in *D. origanoides* Stephan ex Willd. ; 2n=20 and 24 in *D. subcapitatum* (Kuntze) Lipsky ; 2n=24 in *D. heterophyllum* Benth., *D. integrifolium* Bunge, *D. multicaule* Montbret et Aucher and *D. stellerriianum* Hiltehbr. ; 2n=36 in *D. karataviense* Lipsh. et Pavlov ; 2n=70 and 72 in *D. fragile* Turcz. ex Benth. The basic chromosome numbers of *Dracocephalum* are considered to be x=6, 7 and 8 (Darlington and Wylie 1955 ; Singh 1995). An elucidation of the karyotypes of *Dracocephalum* plants with different basic chromosome numbers is useful to understand the course of divergence in basic chromosome numbers in this genus. The present study reports on the karyotype of *D. argunense*.

Materials and methods

For this study, we used two specimens of *D. argunense* collected from Hamataiki, Taiki-cho, Hiroo-gun, Hokkaido in Japan by Ms Chikako Miyoshi on June 27, 2008 and cultivated these in the experimental garden at the Faculty of Science, University of Toyama. We determined the karyotype of each specimen using a meristematic cell obtained from a root tip subjected to the squash technique. Root tips that sprouted from the two plants were collected, pretreated in 2.1 mM 8-hydroxyquinoline at room temperature (ca. 25℃) for 1 h, and then incubated at 5℃ for 15 h. Root tips were fixed with a mixture of glacial acetic acid and ethyl alcohol (1 : 3) for 1 h, soaked in 1 N hydrochloric acid at room temperature for 1 h, macerated in 1 N hydrochloric acid at 60℃ for 10 minutes, washed in tap water, and stained in a drop of 2% lacto-propionic-orcein on a slide glass. We described the chromosome forms based on nomenclature developed by Levan et al. (1964).

Results and discussion

The two specimens had 2n=14 chromosomes in their somatic cells (Fig. 1 A). Karyotypes of the two specimens exhibited no marked differences and these counts agreed with all previous reports for this species (Sokolovskaya 1966 ; Taylor 1967 ; Sokolovskaya et al. 1986 ; Nishikawa 1989). As shown in Fig. 1 B and listed in Table 1, one pair of this chromosome complement was larger than the others. Therefore, the basic chromosome number of this species appeared to be x=7. The length and form of each of the chromosomes of this somatic complement are shown in Fig. 1 B and Table 1. Chromosome length of the somatic chromosome complement was 1.5–2.8 μm and the arm ratio was 1.1–5.0. In the complement, three pairs were metacentric, two pairs were submetacentric and the other two pairs were subtelocentric (Table 1). Results showed that *D. argunense* is a diploid plant with x=7 and has a karyotype represented by the equation 2n=14=6m+4sm+4st.

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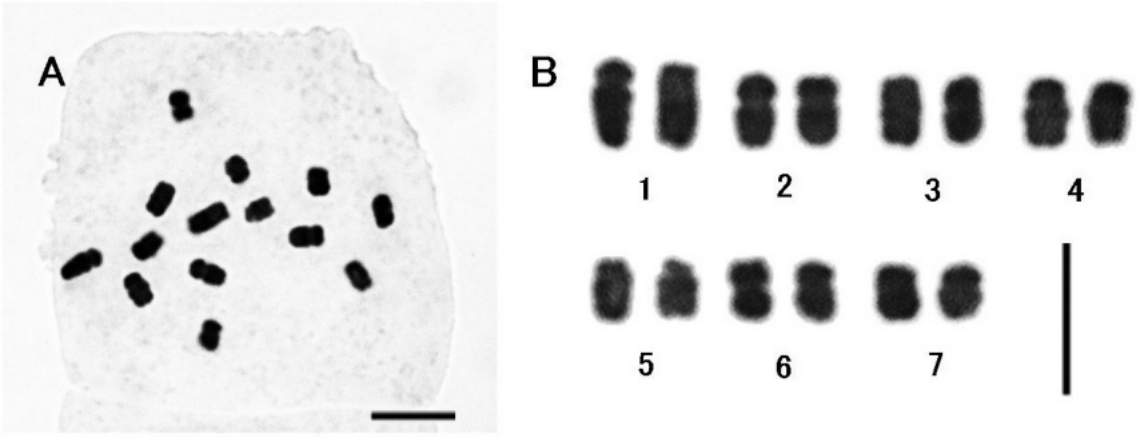

Fig. 1. Photograph (A) and karyotype (B) of somatic metaphase chromosomes of *Dracocephalum argunense*. Bars indicate 5 μm.

Table 1. Measurements of somatic metaphase chromosomes of *Dracocephalum arguense*

Chromosome pair	Length (μm)	Arm ratio	Form
1	0.6+2.2=2.8	3.7	st
2	0.7+1.5=2.2	2.1	sm
3	1.0+1.1=2.1	1.1	m
4	0.6+1.4=2.0	2.3	sm
5	0.3+1.5=1.8	5.0	st
6	0.8+0.9=1.7	1.1	m
7	0.6+0.9=1.5	1.5	m

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摘要

ムシャリンドウ属(*Dracocephalum*)は約 70 種が知られており，主にユーラシア大陸に，そして，北アフリカと北アメリカにそれぞれ 1 種が分布している(Budantsev 2004)。日本ではムシャリンドウ(*D. argunense*)のみが，北海道および本州中北部に分布している(Murata and Yamazaki 1993)。ムシャリンドウ属の染色体数は 2n=10, 12, 14, 20, 21, 22, 24, 36, 70, 72 と多様であることが知られており(Appendix)，染色体基本数は x=6, 7, 8 とされている(Darlington and Wylie 1955 ; Singh 1995)。核型を明らかにすることは基本数の多様性を理解するのに有用である。今回，ムシャリンドウの核型分析を行った。

材料は北海道広尾郡大樹町浜大樹産の 2 個体を用いた。その結果，染色体数は，2n=14 であり，過去の報告(Sokolovskaya 1966 ; Taylor 1967 ; Sokolovskaya et al. 1986 ; Nishikawa 1989)と一致した。14 本の染色体のうち，2 本の染色体は特に長かったことから，染色体基本数が，x=7 の二倍体であると考えられた。染色体長は 1.5–2.8 μm，腕比は 1.1–5.0 であり，核型は 2n=14=6m+4sm+4st で表された。

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Appendix

Chromosome reports of *Dracocephalum*.

Taxon	Chromosome number		Reference (locality)
	n	2n	
D. altaiense		14	Sokolovskaja and Strelkova 1938 (Russia) ; Rostovtseva 1977 (Russia)
D. argunense		14	Sokolovskaya 1966 (Russia) ; Taylor 1967 (Japan) ; Sokolovskaya et al. 1986 (Rassia) ; Nishikawa 1989 (Japan)
D. austriacum		14	Baksay 1958 (Hungary) ; Májovský et al. 1978 (Slovakia) ; Magulaev 1984 (Russia)
D. bipinnatum		12	Budantzev 1986 (Kazakhstan)
D. botryoides		12	Vakar and Leshukova 1970 (Russia) ; Gukasyan and Safaryan 1990 (Armenia)
D. canariense	10		Linder and Lambert 1965 (Canary Islands)
D. discolor		12	Krasnoborov and Rostovtseva 1975 (Russia) ; Budantzev 1986 (Kazakhstan)
D. diversifolium		12	Budantzev 1986 (Kazakhstan)
D. fragile		70	Murín et al. 1984 (Mongolia)
		72	Měsíček and Soják 1995 (Mongolia)
D. fruticuluosum	10		Rostovtseva 1977 (Russia)
D. grandiflorum		14	Murín et al. 1980 (Mongolia)
D. heterophyllum		24	Astanova 1981 (Tajikistan) ; Gu et al. 1993 (China)
D. imberbe	7		Krasnoborov et al. 1980. (as n=7 and ca.7, Russia)
		10	Sokolovskaja and Strelkova 1938 (Russia)
		14	Budantzev 1986 (Kazakhstan)
D. integrifolium		24	Budantzev 1986 (Kazakhstan)
D. karataviense		36	Budantzev 1986 (Kazakhstan)
D. komarovi		12	Astanova 1981 (Tajikistan)
D. moldavica		10	Vakar and Leshukova 1970 (Russia) ; Ma et al. 1984 (China) ; Zhang 1994 (China) ; Yan et al. 2000 (China)
D. multicaule		24	Budantzev 1986 (Kazakhstan)
D. multicolor		12	Gurzenkov 1973 (Russia)
D. nodulosum		12	Astanova 1981 (Tajikistan)
		24	Budantzev 1986 (Kazakhstan)
D. nutans		10	Vakar and Leshukova 1970 (Russia) ; Belaeva and Siplivinsky 1981 (Russia) ; Budantzev 1986 (Kazakhstan) ; Zakirova and Nafanailova 1988 (Kazakhstan) ; Rudyka 1990 (Kazakhstan)
D. nuttallii		14	Löve and Löve 1982 (Canada)
D. oblongifolium		14	Budantzev 1986 (Kyrgyzstan)
D. origanoides	10		Krasnoborov et al. 1980 (as n=ca.10, Russia)
		20–22	Rostovtseva 1977 (as 2n=ca.20–22, Russia)
		24	Budantzev 1986 (Kyrgyzstan)
D. palmatum		12	Zhukova 1967 (Russia), 1980 (Russia) ; Zhukova and Petrovsky 1976 (Russia) ; Yurtsev and Zhukova 1982 (Russia)
D. parviflorum		14	Mulligan 1957 (Canada)
D. peregrinum		12	Budantzev 1986 (Kazakhstan) ; Zakirova and Nafanailova 1988 (Kazakhstan)
D. ruyschiana		14	Löve and Löve 1944 (Sweden) ; Semerenko 1985 (Byelorussia), 1990 (Byelrussia)
D. scrobiculatum		12	Budantzev 1986 (Tajikistan)
D. speciosum	7		Gill 1969 (India), 1984 (India)
D. stamineum		10	Budantzev 1986 (Kyrgyzstan)
D. stellerriianum		24	Yurtsev and Zhukova 1982 (Russia)
D. subcapitatum		20	Chuksanova and Kaplanbekoba 1971 (Turkmenistan)
		24	Budantzev 1986 (Turkmenistan)
D. thymiflorum		14	Probatova et al. 1991 (Russia) ; Sorsa 1962 (as 2n=ca.14, Finland)
		20	Mulligan 1961 (Canada)
D. virginianum		14	Löve and Löve 1982 (Canada)