

Chromosome study of *Cryptotaenia japonica* (Umbelliferae) in Japan

メタデータ	言語: English 出版者: 公開日: 2017-10-03 キーワード: 作成者: Iwatsubo, Yoshikane, Ito, Kazuyuki, Naruhashi, Naohiro メールアドレス: 所属:
URL	http://hdl.handle.net/2297/47984

Yoshikane Iwatsubo¹, Kazuyuki Ito^{1,2} and Naohiro Naruhashi¹ : **Chromosome study of *Cryptotaenia japonica* (Umbelliferae) in Japan**

¹Department of Biology, Faculty of Science, Toyama University, Gofuku 3190, Toyama 930-8555, Japan ;

²Present address : Gifu Shotoku Gakuen University Senior High School, Takakuwa 2078, Yanaizu-cho, Hashima-gun, Gifu 501-6122, Japan

Cryptotaenia DC. (Umbelliferae) containing six species occurs in the temperate zone of the Northern Hemisphere and tropic mountains in Africa (Mabberley 1997). Chromosome numbers of the genus were reported on the following three species: *C. africana* (2n=22: Auquier and Renard 1975; Morton 1993), *C. canadensis* (n=10: Bell and Constance 1957; Constance et al. 1976. 2n=22: Löve and Löve 1982), and *C. japonica* (n=11: Bell and Constance 1957. 2n=18: Mitsukuri and Kurahori 1959. 2n=20: Nakajima 1936; Gorzenkov and Gorovoy 1971; Provatoba et al. 1989. 2n=22: Yamashita 1931; Pan et al. 1985, 1987).

Cryptotaenia japonica, a perennial plant distributed in Japan, Korea, the southern Kuril islands and Sakhalin in Russia, and the Northeast in China (Ohwi and Kitagawa 1983; Ohba 1999), is used as a traditional vegetable in Japan. This is because the plant has a good scent. Earlier cytological data so far known on *C. japonica* seems to indicate that the variation of chromosome numbers was accompanied by dysploid changes from x=9 to 11. We studied the chromosome number and karyotype of *C. japonica* in Japan, in order to ascertain this interesting fact.

Materials and methods

A total of 110 individuals of *C. japonica* Hassk., collected from 72 localities in Honshu and Kyushu of Japan, were used for the study. The collection localities and the numbers of individuals observed are presented in the appendix. To observe the chromosomes, actively growing roots were collected and pretreated in a 1 mM 8-

hydroxyquinoline solution for an hour at 25°C and subsequently kept for 15 h at 6°C. The root tips were fixed in a mixture of glacial acetic acid and absolute ethyl alcohol (1 : 3) for 1 hr, and then soaked in 1 N HCl for a few hours. After being macerated in 1 N HCl at 60°C for 10 min, they were immersed in tap water. Their root tips of 1 mm long were stained and squashed in 1.5% lacto-propionic orcein. Karyotype was examined in a plant collected at Katagake, Hosoiri Village, Toyama Pref. The nomenclature of chromosome form follows Levan et al. (1964). Herbarium specimens made from the plants are cultivated now in the experimental garden of Toyama University will be deposited in the Toyama Science Museum (TOYA).

Results and discussion

All the 110 individuals studied had 2n=20 chromosomes (Fig. 1A), which were consistent with the counts of Nakajima (1936), Gorzenkov and Gorovoy (1971) and Provatoba et al. (1989), and we found no plants with 2n=18 chromosomes reported by Mitsukuri and Kurahori (1959), and with 2n=22 chromosomes by Yamashita (1931, under the name of *C. canadensis* var. *japonica*), Pan et al. (1985, 1989) and Bell and Constance (1957, as n=11).

As shown in Fig. 1B, the 20 chromosomes were consisted of eight large chromosomes (pairs 1 to 4) and 12 small chromosomes (pairs 5 to 10). At metaphase, the eight large chromosomes ranged from 1.9 µm to 2.3 µm in length and 2.1 to 8.5 in arm ratio, while the 12 small chromosomes ranged from 0.7 µm to 1.1 µm in length

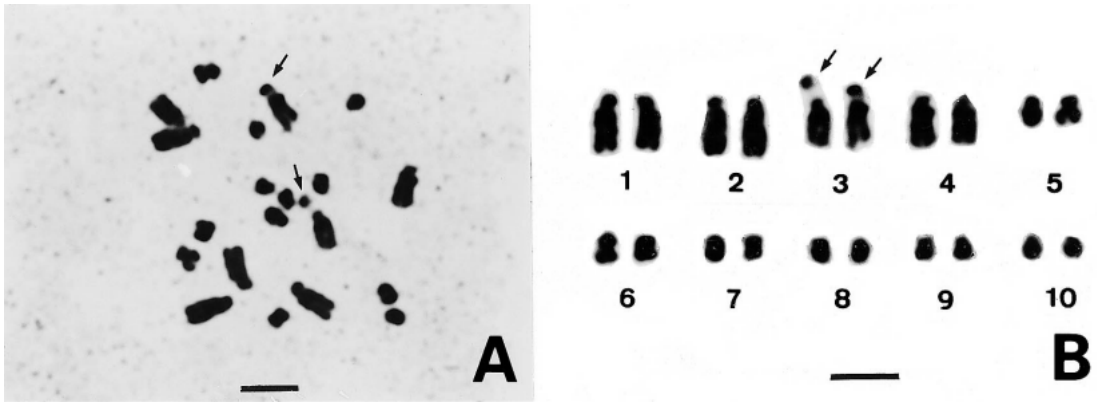


Fig. 1. Somatic metaphase chromosomes ($2n=20$) (A) and their arrangement in pair showing chromosome complement (B) of *Cryptotaenia japonica*. Arrows indicate satellites. Bars = 3 μm .

Table 1. Measurements of somatic metaphase chromosomes of *Cryptotaenia japonica*

Chromosome pair	Length (μm)	Total length (μm)	Arm ratio	Form
1	0.4 + 1.9	2.3	4.8	st
2	0.3 + 2.0	2.3	6.7	st
3	*0.4-0.3 + 1.5	2.2	2.1	sm
4	0.2 + 1.7	1.9	8.5	t
5	0.4 + 0.7	1.1	1.8	sm
6	0.5 + 0.5	1.0	1.0	M
7	0.4 + 0.5	0.9	1.3	m
8	0.3 + 0.6	0.9	2.0	sm
9	0.2 + 0.5	0.7	2.5	sm
10	0.1 + 0.6	0.7	6.0	st

*: satellite.

and 1.0 to 2.5 in arm ratio (Table 1). Thus the chromosome length of the somatic complement of *C. japonica* showed bimodal variation. In the complement the third longest chromosome pair had a satellite on the short arm. The length of the satellite was 0.4 μm , that was a half size of the shortest pair in the chromosome complement. The karyotype was formulated as $2n=20=2M+2m+6sm+2^*sm+6st+2t$.

The present result shows that $2n=20$ *C. japonica* is prevalent in Japan and its karyotype is bimodal. The earlier literature counts in Japanese *C. japonica* of $2n=18$ reported by Mitsukuri and Kurahori (1959), and of $2n=22$ reported by Yamashita (1931) and Bell and Constance (1957, as $n=11$) seem to originate from heteroploid plants that occurred accidentally from $2n=20$

plants, or they represent rare chromosome races of the species.

We wish to express our thanks to Kiyoo Ogino, Satoshi Ohta, Miki Matsuda, and Miyuki Takashima for providing the plant materials.

References

- Auquier, P. and Renard, R. 1975. Goldblatt, P. (ed.). 1981. Index to plant chromosome numbers 1975-1978, p. 45. Missouri Botanical Garden, St. Louis.
- Bell, C. R. and Constance, L. 1957. Chromosome numbers in Umbelliferae. *Ame. J. Bot.* **44**: 565-572.
- Constance, L., Chuang, T. -I. and Bell, C. R. 1976. Chromosome numbers in Umbelliferae. *V. Amer. J. Bot.* **63**: 608-625.

- Gorzenkov, N. N. and Gorovoy, P. G. 1971. Chromosome numbers of Umbelliferae of the Far East. *Bot. Zhurn.* **56**: 1805–1815. (in Russian)
- Levan, A., Fredga, K. and Sandberg, A. A. 1964. Nomenclature for centromeric position on chromosomes. *Hereditas* **52**: 201–220.
- Löve, A. and Löve, D. 1982. Löve, A. (ed.). IOPB chromosome number reports LXXV. *Taxon* **31**: 342–368.
- Mabberley, D. J. 1997. The plant book, 2nd ed. p.197. Cambridge University Press, Cambridge.
- Mitsukuri, Y. and Kurahori, Y. 1959. Cytological studies in Umbelliferae. II. The chromosome numbers and karyotypes of some Japanese species. *La Kromosomo* **40**: 1354–1361.
- Morton, J. K. 1993. Chromosome number and polyploidy in the flora Cameroon Mountain. *Opera Bot.* **121**: 159–172.
- Nakajima, G. 1936. Chromosome numbers in some crops and wild angiosperms. *Jap. J. Genet.* **12**: 211–218.
- Ohba, H. 1999. *Cryptotaenia* DC. Iwatsuki, K., Boufford, D.E. and Ohba, H. (eds.). *Flora of Japan II C*, pp. 273–274. Kodansha, Tokyo.
- Ohwi, J. and Kitagawa, M. 1992. *New Flora of Japan*. pp. 1102–1103. Shibundo, Tokyo. (in Japanese)
- Pan, Z.-H., Chin, Z., Wu, Z., Yuan, C. and Liou, S. 1985. A report on the chromosome numbers of Chinese Umbelliferae. *Acta Phytotax. Sin.* **23**: 97–102. (in Chinese)
- Pan, Z.-H., Su, P. and Wu, Z.-J. 1987. Cytological observation on *Cryptotaenia japonica* in relation to its taxonomical significance. *Bull. Nanjing Bot. Gard. Mem. Sum Yat Sen* **1984–1985**: 14–18.
- Provato, N. S., Sokolovskaya, A. P. and Rudyka, E. G. 1989. Chromosome numbers in some species of vascular plants from Kunashir Islands (the Kuril Islands). *Bot. Zhurn.* **74**: 1675–1678. (in Russian)
- Yamashita, K. 1931. Kihara, H., Yamamoto, Y. and Hosono, S. (eds.). A list of chromosome numbers of plants cultivated in Japan. *Shokubutsu Senshokutaisu no kenkyu* [Studies on chromosome numbers of plants]. p. 298. Yokendo, Tokyo. (in Japanese)
- (Received August 30, 2002; accepted September 21, 2002)
- 岩坪美兼¹・伊藤和幸^{1,2}・鳴橋直弘¹：日本産ミツバの染色体
- ミツバの染色体数は、 $n=11$, $2n=18$, 20 , 22 が報告されている。興味深い報告であることから、わが国のミツバを対象にして染色体の観察を行った。材料には、宮城県、神奈川県、新潟県、富山県、石川県、福井県、岐阜県、静岡県、鹿児島県の72か所で採集した110個体を用いた。
- 観察の結果、それら110個体の染色体数は、すべて $2n=20$ であり、過去に報告された $2n=18$, 22 の個体は見つからなかった。わが国のミツバは、通常、 $2n=20$ であることがわかった。ミツバの体細胞中期の染色体組は $1.9\sim 2.3\ \mu\text{m}$ の長さの8本と、 $0.7\sim 1.1\ \mu\text{m}$ の12本の、2群に分けられる染色体から構成されていた。
- ¹〒930-8555 富山市五福3190 富山大学理学部生物学科；²現住所 〒501-6122 岐阜県羽島郡柳津町高桑2078 岐阜聖徳学園大学附属中高等学校)

Appendix

Collection localities and number of individuals examined (in parentheses) of *Cryptotaenia japonica*.

Miyagi Pref., Aoba-ku, Sendai City, (2); Taihaku-ku, Sendai City, (1); Shiroishi City, (3); **Kanagawa Pref.**, Ougigadani, Kamakura City, (3); Naka-ku, Yokohama City, (1); **Niigata Pref.**, Mizuho, Itoigawa City, (1); Gochi, Joetsu City, (1); **Toyama Pref.**, Nanbo, Asahi Town, (1); Sakai, Asahi Town, (2); Sasagawa, Asahi Town, (2); Miyagatani, Fuchu Town, (2); Shimoze, Fuchu Town, (1); Takatsuka, Fuchu Town, (2); Akage, Himi City, (1); Ao, Himi City, (1); Busshoji, Himi City, (1); Hitohane, Himi City, (1); Isobe, Himi City, (1); Kuwanoin, Himi City, (1); Shichibuichi, Himi City, (1); Shiragawa, Himi City, (1); Yoshiike, Himi City, (1); Katagake, Hosoiri Village, (1); Kakizawa, Kamiichi Town, (2); Onagawa, Kamiichi Town, (2); Sunabayashibiraki, Kamiichi Town, (1); Tajimano, Kamiichi Town, (1); Kuridera, Kurobe City, (1); Motono, Kurobe City, (1); Komori, Namerikawa City, (2); Ooura, Namerikawa City, (1); Funato, Ohsawano Town, (1); Manganji, Ohsawano Town, (1); Nankawara, Ohsawano Town, (1); Suguzaka, Ohsawano Town, (1); Awasuno, Ohshima Town, (1); Hara, Ohshima Town, (1); Higashifukusawa, Ohshima Town, (1); Nakadaki, Ohshima Town, (1); Wada, Ohshima Town, (1); Miza, Taira Village, (1); Sugio, Taira Village, (1); Nanahimetaira,

Tateyama Town, (1); Shibayama, Tateyama Town, (2); Anyobo, Toyama City, (2); Gofuku, Toyama City, (2); Kumano, Unazuki Town, (1); Ariyama, Uozu City, (1); Kakuma, Uozu City, (1); Kawamukai, Uozu City, (1); Hirabayashi, Yatsuo Town, (1); Iguridani, Yatsuo Town, (1); **Ishikawa Pref.**, Yakushimachi, Kanazawa City, (1); Futatsunashimachi, Komatsu City, (1); Korogimachi, Yamanaka Town, (1); **Fukui Pref.**, Iwagomoriyama, Tsuruga City, (1); **Gifu Pref.**, Kamiaso, Hichiso Town, (8); Nakagiri, Kanayama Town, (2); Hikumi, Kawabe Town, (1); Miwacho, Minokamo City, (5); Mizano, Mitake Town, (2); Todani, Miyagawa Village, (1); Tokicho, Mizunami City, (3); Akou, Shirakawa Village, (2); Kutami, Yaotsu Town, (6); Somasawa, Yaotsu Town, (1); **Shizuoka Pref.**, Sugio, Honkawane Town, (1); Miyajima, Okabe Town, (1); Kitanumagami, Shizuoka City, (1); **Kagoshima Pref.**, Shiroyama, Kagoshima City, (2); Uenodan, Kokubu City, (1); Nishinotashiro, Minamitane Town, (2).