日本産ナガボノワレモコウの種内倍数性

三島美佐子*/***・岩坪美兼*・堀井雄治郎**・鳴橋直弘*：日本産ナガボノワレモコウ****の種内倍数性

Misako Mishima*/***, Yoshikane Iwatsubo*, Yujiro Horii** and Naohiro Naruhashi* : Intraspecific Polyploidy of *Sanguisorba tenuifolia* Fisch. (Rosaceae) in Japan

Sanguisorba tenuifolia Fisch. (Rosaceae), a herbaceous perennial, is widely spread in the meadows and wet places of lowland and mountain area in northeastern China, eastern Siberia, Kamchatka, Sakhalin, the Kuriles, northern Korea and Japan (Ohwi 1965). This species shows highly variable morphology. Ohwi (1965) recognized four varieties in Japanese plants: *S. tenuifolia* var. *alba* Trautv. et. Mey., var. *grandiflora* Maxim. var. *parviflora* Maxim., and var. *purpurea* Trautv et. Mey. In the present paper, however, we did not recognize intraspecific taxa, and all samples were referred to *S. tenuifolia*.

The basic chromosome number of *Sanguisorba* is supposed to be x=7 (Darlington and Wylie 1955). Chromosome number hitherto known in *S. tenuifolia* is as follows: $2n$=28 (tetraploid) in Primorsk Kray, southeastern Russia (Gurzenkov 1973) ; $2n$=56 (octoploid) in Hiroshima and Kochi Prefectures, Japan (Oginuma 1990) ; $2n$=56 cultivated in the Botanical garden of Copenhagen (Larsen 1959) ; $2n$=ca. 80 in Sakhalin, southeastern Russia (Sokolovskaya 1966).

The purpose of the present study is to ascertain whether Japanese *S. tenuifolia* includes additional polyploids other than the octoploid.

Materials and Methods

We collected 177 plants from the 114 localities of *Sanguisorba tenuifolia*, one to four plants in each populations, throughout Kyushu to Hokkaido, covering the whole range of distribution of this species in Japan. Their localities are listed in Appendix.

For observation of somatic chromosomes, the root tips were pretreated in 0.002 M 8-hydroxiquinoline solution for one hour at room temperature and then for 15 hours at 4℃. After fixation in the solution of ethyl alcohol and acetic acid (3 : 1) for one hour at room temperature, the root tips were macerated in 1 N HCl for one hour at room temperature and 11.5 minutes at 60℃, and then rinsed in tap water. The root tips were squashed after staining with 1.5% lactopropionic orcein.

All the living specimens were maintained in the experimental fields of Tokyo Metropolitan University and of Toyama University. Voucher specimens are kept in MAK.

Results and Discussion

Out of 177 specimens collected from 114 localities, 39 specimens from 69 localities of the eastern part of Honshu, Shikoku and Kyushu were octoploid with $2n$=56 (Figs. 1 A, 2), is the same count as reported by Larsen (1969) and Oginuma (1990). However, 108 specimens from 75 localities of the northern part of Honshu (including Kanto District) and Hokkaido were dodecaploid with $2n$=84 (Figs. 1 B, 2). Sokolovskaya (1966) has reported $2n$=ca. 80 from *S. tenuifolia* in Sakhalin, which is presumed to be dodecaploid. We found no tetraploid plants, although Gurzenkov (1973) reported $2n$=28 of *S. tenuifolia* in Primorsk Kray, the Far East Russia.

Geographical distributions of intraspecific

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****本種は、変種にそれぞれ個別の和名がつけられているが（大井1965）、種全体としての和名が存在しない。よって本研究では総称としてナガボノワレモコウを用いる

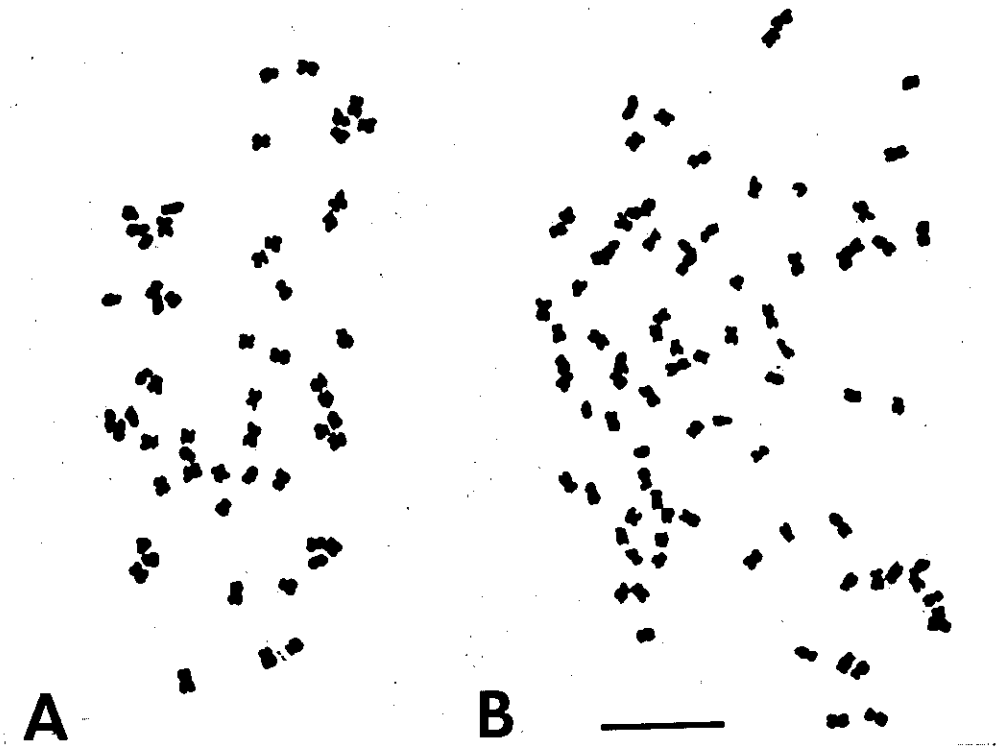

Fig. 1. Somatic metaphase chromosomes of *Sanguisorba tenuifolia* Fisch. A, 2 n=56. B, 2 n=84. Bar represents 10 μm.

polyploids are sometimes known to differ in each polyploid level in higher plants: e.g. *Hedyotis caerulea* (L.) Hook. (Rubiaceae) (Lewis and Terrell 1962) and *Tolmiea menziesii* (Pursh) T. &G. (Saxifragaceae) (Soltis 1984). In *Sanguisorba*, Nordborg (1963) also mentioned that the two cytotypes (tetraploid and octoploid) of *S. officinalis* L. in Gotland, Norway, are well separated in their distributions. In many cases, it is inferred that the higher polyploid plants derived from the lower ploypoid would be ecologically or physiologically dominant, so that the higher polyploid could expand to severe environments and/or frontier (Lewis 1980; Soltis 1984). The northern part of Japan in which dodecaploid plants of *S. tenuifolia* occur is colder and has more snow fall in most places in winter than the area of octoploid plants. The differences of geographical distribution between the octoploids and the dodecaploids in Japan may also have resulted from their adaptation to such different environments.

Ohwi (1965) described four variaties, var. *alba* in whole area, var. *parviflora* in Western part, var. *purpurea* in Honshu (centr. distr.) and Kyushu, and var. *grandiflora* in Northern and alpine region, of Japan. Thus, var. *parviflora* and var. *purpurea* are seems to be octoploid. There is, however, several opinion of the taxonomic treatment of intraspecific variations of *S. tenuifolia* (Hara 1978; Kitakawa 1958; Yamanaka 1995). Present result is one of characteristics to help solving these taxonomic confusions.

We wish to acknowledge our indebtedness to F. Aiba, M. Arakane, S. Gonda, T. Goto, S. Hamashima, K. Imai, N. Kato, Y. Komine, O. Kume, Y. Kuranari, H. Masaki, K. Nishi, M. Ohta, H. Ogura, M. Sugimoto, Y. Sugita, C. Suyama, H. Tabata, S. Tomiyama, S. Tsutsui, T. Wake, T. Wakasugi, M. Watanabe, T. Watanabe and T. Yamanaka for their assistance with sampling in the field, and to J. Murata, T. Asami, and H. Fukuda for their critical reading of this manuscript (cutting out prefixes). This work was partly supported by a grant from Fujiwara

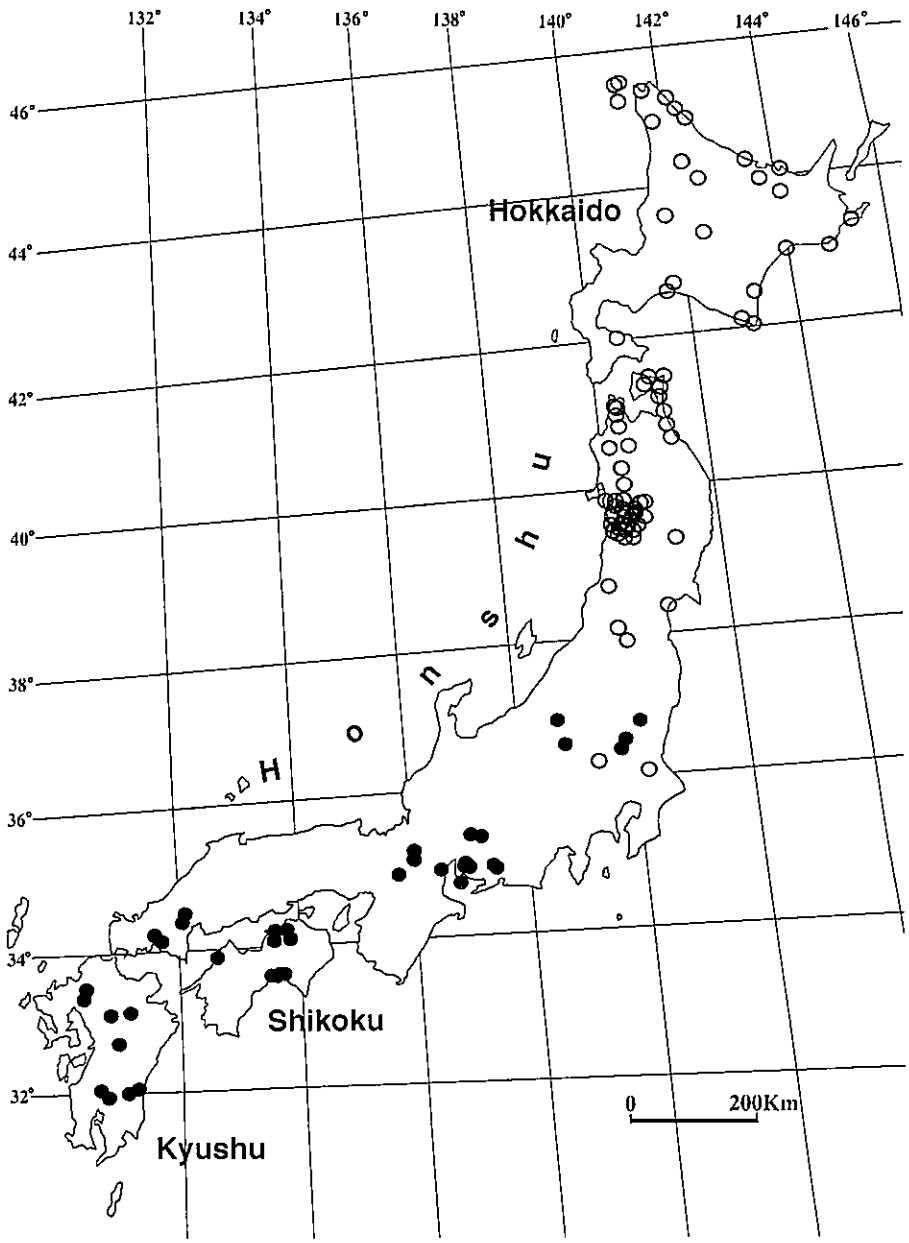

Fig. 2. Collection localities of *Sanguisorba tenuifolia* Fisch. used for this study. Solid circles, 2 n=56. Open circles, 2 *n*=84.

Natural History Foundation to Y. Iwatsubo (No. 39).

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摘　要

ナガボノワレモコウには種内倍数性が知られ、これまでにロシア沿海州から4倍体（2*n*=28）が、広島県と高知県から8倍体（2*n*=56）が、サハリンから2*n*=ca. 80が報告されている。今回の調査の結果、日本には、従来知られていた8倍体に加え12倍体も存在し、8倍体は関東地方以西に、12倍体は関東地方以北に分布することが明らかになった。

Appendix.

Collection localities and collection numbers of *Sanguisorba tenuifolia* for the present study. Number in parentheses is number of plants observed.

2*n*=84

Hokkaido Pref.: Kutsugata, Higashirishiri-cho, Rishiri-gun, 930819 A, B, C, D (4) ; Hamanaka, Rebun-cho, Rebun-gun, 930820 (1) ; Funadomari, Rebun-cho, Rebun-gun, M 950808 (1) ; Wakkanai-koen, Wakkanai City, 930818 I (1) ; Souyanameshi-kawa, Wakkanai City, 940803 B (1) ; Sarobetsu-genya, Toyotomi-cho, Teshio-gun, 940801 (1) ; Esashi, Esashi-cho, Esashi-gun, M 950810 A, B (2) ; Beniya-genseikaen, Hamatonbetsu-cho, Esashi-gun, 940803 C (1) ; Komuke-ko, Monbetsu City, 940804 B (1) ; Jitsutoyo, Koshimizu-cho, Shari-gun, 930818 (1) ; Notoro, Abashiri City, 940804 A (1) ; Bihoro-toge, Bihoro-cho, Abashiri-gun, 950916 (1) ; Ochiishi, Nemuro City, M 940608 (1) ; Yufutsu-misaki, Hamanaka-cho, Atsukeshi-gun, 930818 E (1) ; Syoro, Shiranuka-cho, Kushiro-gun, 930818 D (2) ; Rusan, Kimobetsu-cho, Abuta-gun, 930818 M (1) ; Toyoni, Hiroo-cho, Hiroo-gun, 930818 C (1) ; Kitasakae, Furen-cho, Kamikawa-gun, 930818 K (1) ; Pippu, Pippu-machi, Kamikawa-gun, 930818 G, H (2) ; Uryu-cho, Uryu-gun, M 950805–1, –2 (2) ; Yamabe, Furano City, 930818 (1) ; Erimo-misaki, Erimo-cho, Horoizumi-gun, 950810 (1) ; Horoman, Samani-cho, Samani-gun, M 950812–1, –2 (2) ; Numanohata, Tomakomai City, 930818 A (1) ; Syokubyou, Tomakomai City, 940802 (1) ; Hakamagoshi-yama, Hakodate City, 930818 N, O (2). **Aomori Pref.**: Futamatazawa, Mutsu City, 940913 (1) ; Kamikawa-cho, Mutsu City, M 951117 A, B, C (3) ; Odauchi-numa, Misawa City, 940909 (1) ; Kouya, Goshogawara City, 921022 F (1) ; Iwaki-machi, Nakatsugaru-gun, 950815–1, –2 (2) ; Chojakubo, Higashidori-mura, Shimokita-gun, 930929 B (1) ; Noushi, Higashidori-mura, Shimokita-gun, 940911 (1) ; Sarugamori, Higashidori-mura, Shimokita-gun, 931008 (1) ; Shiriyazaki, Higashidori-mura, Shimokita-gun, 940912 (1) ; Obuchinuma, Rokkasho-mura, Kamikita-gun, 940910 (1) ; Hanaoka, Namioka-machi, Kitatsugaru-gun, 941014 B (1) ; Jyusan-ko, Nakasato-machi, Kitatsugaru-gun, 940821 (1) ; Kanagi, Kanagi-machi, Kitatsugaru-gun, 941014 D (1) ; Jyusan-ko, Shiura-mura, Kitatsugaru-gun, 941014 C (1). **Akita Pref.**: Goshono, Akita City, 921022 F, G (2) ; Nakazawa, Omagari City, 920903 A, 920529 (2) ; Shiroyama, Yokote City, 921021 A, B (2) ; Rendaiji, Yuzawa City, 921024 (1) ; Onodai, Takanosu-machi, Kitaakita-gun, 921020 A, B (2) ; Okashinai, Ani-machi, Kitaakita-gun, 930928 B (1) ; Mukaino, Yuuwa-machi, Kawabe-gun, 921001 A (1) ; Hansen, Kyowa-machi, Senboku-gun, 921008 A (1) ; Yunotai, Kamioka-machi, Senboku-gun, 920903 B (1) ; Kaibetto, Nishisenboku-machi, Senboku-gun, 921001 B (1) ; Kowakubi, Nishisenboku-machi, Senboku-

gun, 921001 C (1) ; Yamamoto, Sennan-mura, Senboku-gun, 921021 D, E (2) ; Hotta, Senboku -machi, Senboku-gun, 921031 A, B, C, D (4) ; Hotokesawa, Senhata-mura, Senboku-gun, 921008 B (1) ; Nashikida, Nangai-mura, Senboku-gun, 921002 A (1) ; Tsukuriyama, Rokugou-machi, Senboku-gun, 931010 (1) ; Niida, Jumonji-machi, Hiraka-gun, 921022 C, D, E (3) ; Sakaida, Omori-machi, Hiraka-gun, 921002 B (1) ; Yagawashi, Taiyu-mura, Hiraka-gun, 921027 B (1) ; Makura, Hiraka-machi, Hiraka-gun, 931104 (1) ; Yagami, Omonogawa-machi, Hiraka-gun, 921027 A (1) ; Deto, Nishime-machi, Yuri-gun, 921103 B, C (2) ; Jojino, Ouchi-machi, Yuri-gun, 921029 B (1) ; Kubo, Higashiyuri-machi, Yuri-gun, 921029 A (1) ; Gorinzaka, Ugo -machi, Ogachi-gun, 921101 A, B, C (3). **Iwate Pref.**: Marutani-ike, Shizukuishi-cho, Iwate-gun, 930929 A (1) ; Ugai, Takizawa-mura, Iwate -gun, 930909 C (1) ; Kanegasaki, Kanegasaki-cho, Isawa-gun, 951118 (1). **Yamagata Pref.**: Nakamurakannondo, Iide-machi, Nishiokitama-gun, 930804 (1) ; Otani, Tsuruoka City, 930904 (1) ; Kawanishi-machi, Higashiokitama-gun, 930920 (1) ; Karikawa, Tachikawa-cho, Higashiokitama -gun, 930925 (1). **Miyagi Pref.**: Nakanonitta, Okada-machi, Miyagino-ku, Sendai City, M 940523 A, B, C, D (4). **Gunma Pref.**: Morinji, Tatebayashi City, M 940510 A, B, C, D, E (5). **Ibaragi Pref.**: Myogino-hana, Sakurakawa-mura, Inashiki-gun, M 941001 A, B (2)

2 n=56.

Tochigi Pref.: Shima, Maoka City, 930926 (1) ; Igashira-koen, Kagotani, Maoka City, 930926 B, C (2) ; Togo-dame, Minaminasu-machi, Nasu-gun, 931005 A, B, C (3). **Gunma Pref.**: Nozori-ko, Kuni-mura, Agatsuma-gun, M 940810 A, B, C (3). **Nagano Pref.**: Minami-karuizawa, Karuizawa-machi, Kitasaku-gun, M 950601 A, B, C (2). **Aichi Pref.**: Naganoyama, Tsukude-mura, Minamishitara-gun, 930829 A, B (2) ; Igatani-cho, Kariya City, 941004 A (1) ; Aikyo, Kariya City, 941003 A (1) ; Kozutsumi-nishi, Kariya City, 941003 B, C, D (3) ; Onogahara, Tsukude-mura, Minamishitara-gun, 941004 C (1) ; Ichimachida, Taketoyo-cho, Chita-gun, 941003 (1). **Gifu Pref.**: Hiraga, Nagamine, Tomika-cho, Kamo-gun, 930918 A, B, C (3) ; Hino, Gifu City, 931006 A, B (2). **Mie Pref.**: Yokkaichi City, M 941107 (1). **Shiga Pref.**: Kibogaoka-koen, Yasu-cho, Yasu-gun, 931002 E (1) ; Kitazakura, Yasu-cho, Yasu-gun, 931002 A, B (2). **Kyoto Pref.**: Tanabe, Tanabe-cho, Tsuzuki-gun, 940420 (1). **Hiroshima Pref.**: Hachimanbara, Geihoku-cho, Higashiagata-gun, 931027 C, H 1, H 2 (3) ; Chojabara, Geihoku-cho, Higashiagata-gun, 931027 L 1, L 2, K 3 (3). **Yamaguchi Pref.**: Nagasawa, Suzenji-cho, Yamaguchi City, 921207 A-1, -2 (2) ; Kokedani, Heda -cho, Yamaguchi City, 921207 B (1). **Kagawa Pref.**: Nishishiroyama, kurikuma, Ayauta-cho, Ayauta-gun, 930930 R (1) ; Minamimarui, Onohara-cho, Mitoyo-gun, 921004 A, B (2) ; Tsuji, Yamamoto-cho, Mitoyo-gun, 921025 B, C (2) ; Genji-ike, Manno-cho, Nakatado-gun, 931007 A (1). **Ehime Pref.**: Matsuyama City, M 950901 A, B (2). **Kochi Pref.**: Kamohara, Nangoku City, 950723 A, B (2) ; Myoken, Nangoku City, 950725 A (1) ; Takami-yama, Kochi City, 950724 A, B, C, D (4) ; Sakaigawa, Tosayamada-cho, Kami-gun, 950720 A, B (2). **Fukuoka Pref.**: Dazaifu City, 951017 A, B (2). **Saga Pref.**: Asahiyama-koen, Harakoga-machi, Tosu City, 931007 (1) ; Nozoe, Yado-machi, Tosu City, 931007 (1). **Oita Pref.**: Yamashita-ike, Yufuin -cho, Oita-gun, 931026 A, B, C (3). **Kumamoto Pref.**: Otohime, Aso-cho, Aso-gun, 921020 (1). **Miyazaki Pref.**: Kobayashi City, 931025 A, B (2) ; Onigakubo, Kawaminami-cho, Koyu-gun, 941126 C (1). **Kagoshima Pref.**: Miyahito, Okuchi City, 920923 A, B, C (3) ; Sawahara, Yoshimatsu-cho, Aira-gun, 930927 (1).

(received October 18, 1996)