

バラ科フユイチゴとミヤマフユイチゴの染色体数とその分布

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Naohiro Naruhashi¹, Minoru Aoki^{1,2}, Yoshikane Iwatsubo¹,
Osamu Kume³ and Hiroshi Masaki⁴ : **Chromosome Numbers and
Distributions of *Rubus buergeri* and *R. hakonensis*
(Rosaceae) in Japan**

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Abstract

Chromosome counts of *Rubus buergeri* Miq. and *R. hakonensis* Franch. et Sav. collected in seven areas of Japan showed $2n=42$ and $2n=56$ cytotypes in both species. The chromosome number of $2n=42$ is the first record for *R. buergeri*. The two cytotypes of both species are widely distributed, but $2n=56$ is of higher frequency in some areas and is especially more abundant in the northern part of distribution than $2n=42$.

Key words : chromosome number, distribution, polyploidy, *Rubus buergeri*, *Rubus hakonensis*.

Rubus buergeri Miq. and *R. hakonensis* Franch. et Sav. belong to sect. *Moluccani* of the subgen. *Malachobatus*. These plants are evergreen shrubs with slender creeping stems growing along the margin of evergreen broad-leaved forests and in light floor of thickets (Naruhashi 1980). Other *Malachobatus* species are distributed in subtropical and warm-temperate regions in East Asia. The present two species which are found in China (Lu 1985), Taiwan (Hsieh and Ohashi 1993), Korea (Lee 1979) and Japan (Ohwi 1965), occur in the most northern parts of distribution of the other *Malachobatus* species.

In Japan, the species studied are distributed from Yaku Island of Kyushu at the southern limits northward to Niigata Prefecture-Ibaraki Prefecture at the northern limits (Naruhashi and Satomi 1972, 1973).

The chromosome number of *R. buergeri* was reported by Jinno (1951 a, 1958) as $2n=56$ and he reported both $2n=42$ and 56 for *R. hakonensis* (Jinno 1951 b, 1958).

The purpose of the present research is to clarify the chromosome numbers of both species and the distributions of their cytotypes.

Materials and methods

The present two species reproduce vegetatively by means of rooting at the apex and at nodes of creeping stems. Thus, a population often consists of individuals possessing the same genotype. The plants used in this study were collected as single plants random sampling from natural populations and then cultivated at Toyama University. Collection localities are mainly seven areas, i. e. southern and central part of Kyushu, Shikoku, west part of Chugoku District, southern part of Kinki District, Shiga Prefecture and south of Fukui Prefecture, Toyama Prefecture and Noto Peninsula, and east part of Kanto District. Many intermediate forms between *R. buergeri* and *R. hakonensis* which were described as a natural hybrid by Sugimoto (1961) were found in the field. Only typical forms of each species, according to Naruhashi's identification, were used in this study. Two hundred and eighty eight plants of *R. buergeri* and one hundred and fourteen plants of *R. hakonensis* were observed. The species and collection localities are shown in Figs. 3 and 4, and in the appendix.

For observation of chromosomes, root tips collected from potted plants were pretreated in a 2 mM 8-hydroxyquinoline solution for 1 h at room

temperature, and subsequently held at 5°C for 15 h. They were fixed in a glacial acetic acid and absolute ethanol mixture (1:3) for 1 h, and then soaked in 1 N HCl at room temperature for a few hours. After being hydrolyzed in 1 N HCl at 60°C for 11.5 min, each sample was immersed in distilled water. Meristematic cells were stained in 1.5% lacto-propionic orcein, and the usual squashing method was applied for the examination of somatic chromosomes.

Voucher specimens are kept in the herbarium of the Toyama University.

Results and discussion

In both species, two different chromosome numbers, $2n=42$ and 56, were observed (Figs. 1 and 2). The chromosome number of $2n=42$ for *R. buergeri* is the first record.

Twenty one (7.3%) of the 288 plants examined of *R. buergeri* had a chromosome number of $2n=42$. According to each area, there was 15.5% in the south and central part of Kyushu, 6.8% in

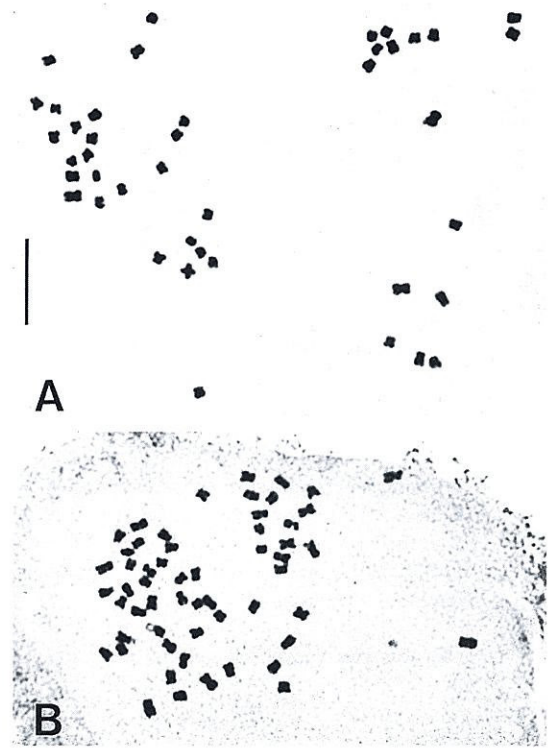


Fig. 2. Somatic metaphase chromosomes of *Rubus hakonensis*. A: $2n=42$; B: $2n=56$. Bar: 7 μm .

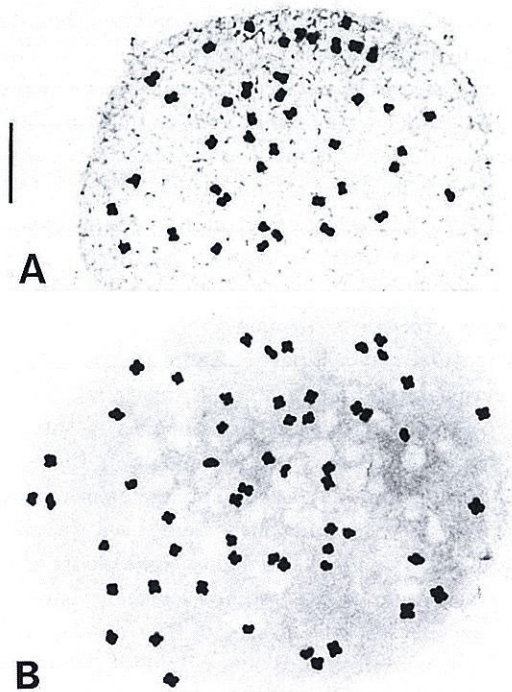


Fig. 1. Somatic metaphase chromosomes of *Rubus buergeri*. A: $2n=42$; B: $2n=56$. Bar: 7 μm .

Shikoku, 4.0% in west part of Chugoku District, 4.9% in south of Kinki District and 0% in other areas. Thus, ratio of $2n=42$ to $2n=56$ decreased from southern areas to northern areas. This phenomenon is notably shown at the northern limits of its geographical distribution, i. e. no plants with $2n=42$ were found in Niigata, Toyama, Ishikawa, Chiba and Ibaraki Prefectures. Thirty two (28.1%) of the 114 plants examined of *R. hakonensis* had a chromosome number of $2n=42$, while eighty two plants (71.9%) possessed $2n=56$ chromosome number. The frequency of $2n=42$ plants was 87.5% in Shikoku, 30.8% in west part of Chugoku District, 75.0% in the south part of Kinki District and 8.8% in Toyama and Noto Peninsula. This species also showed relatively abundant distribution of $2n=42$ plants in higher latitude regions, i. e. most of the plants from Niigata, Toyama and Ishikawa Prefectures were $2n=42$. Collection sites and chromosome numbers are listed in the appendix.

All sampling sites of *R. buergeri* and *R. hakonensis* and their respective cytotypes are illus-

trated in Fig. 3 and Fig. 4, respectively.

Fedorov (1969) reported infraspecific variations of chromosome number in *Rubus*: $2n=14, 28, 42$ in *R. idaeus* L. (Hara 1952), $2n=28, 35, 42$ in *R. rosanthus* Lindeb. (Gustafsson 1939, 1942, 1943), and $2n=42, 56, 63, 70, 77, 84$ in *R. ursinus*, Cham. et Schltr. (Gustafsson 1942, Brown 1943, Vaarama 1953). In *R. ursinus*, Brown (1943) found increase in chromosome number with increase in latitude; more northern sites of western North America have $12x$ whereas more southern sites have mostly $8x$, and a few $6x$.

In our study, both species showed higher ratio of $2n=56$ plants to $2n=42$ with increasing latitude, coinciding with the reports of Hagerup (1932), Tischler (1935) and Brown (1943). This is explained by Hagerup that formation of higher polyploidy is promoted by stimulus of colder tem-

peratures. Furthermore, Löve and Löve (1949, 1967) and Löve (1953) proposed the idea of easy adaptation of plants to winter hardness by polyploidization. Levin (1983) wrote that polyploidy often alters tolerance to cold and polyploidy may influence the temperature optima for various physiological processes, photosynthesis being the most notable. *Rubus buergeri* and *R. hakonensis* show similar geographical distributions. However, the former may be more adapted to warmer places than the latter. Thus, *R. buergeri* represents more clearly the relationship between polyploidy and cold tolerance.

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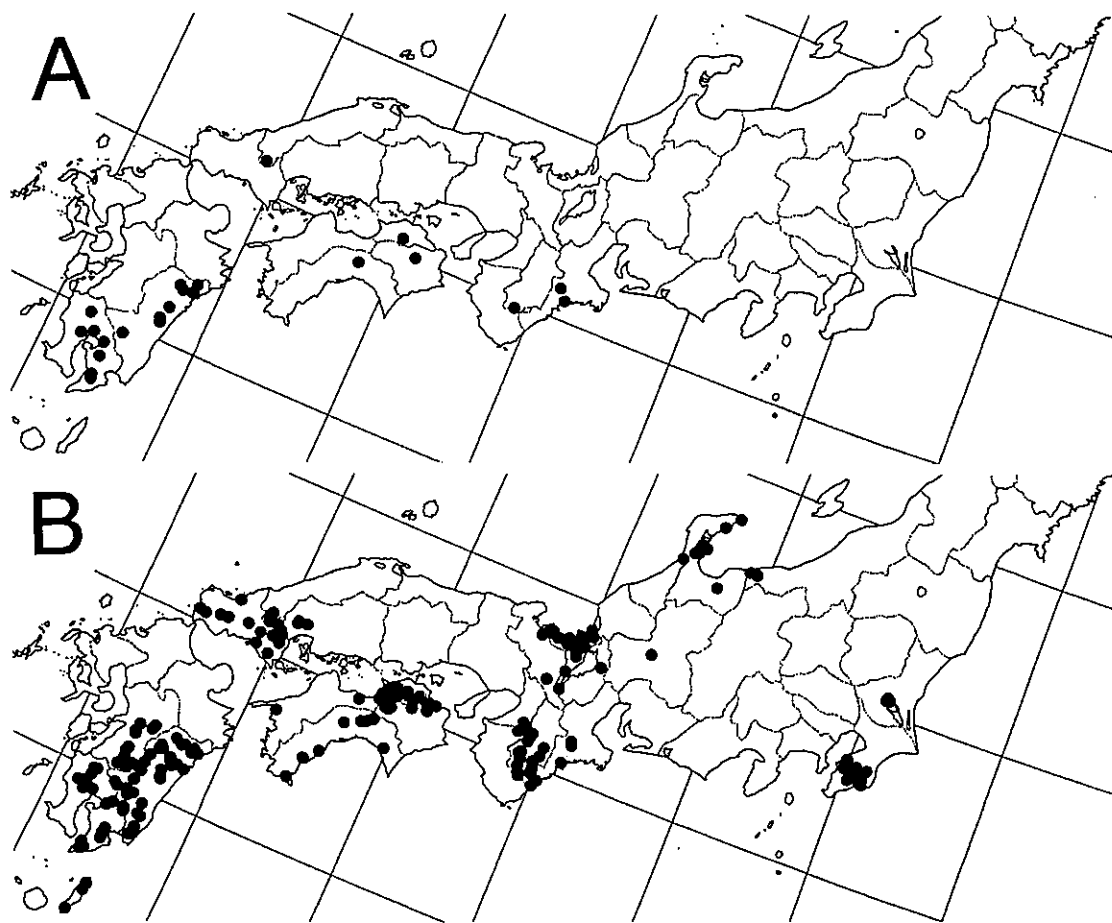


Fig. 3. Geographical distribution of two cytotypes of *Rubus buergeri* collected in seven areas in Japan. A: $2n=42$; B: $2n=56$.

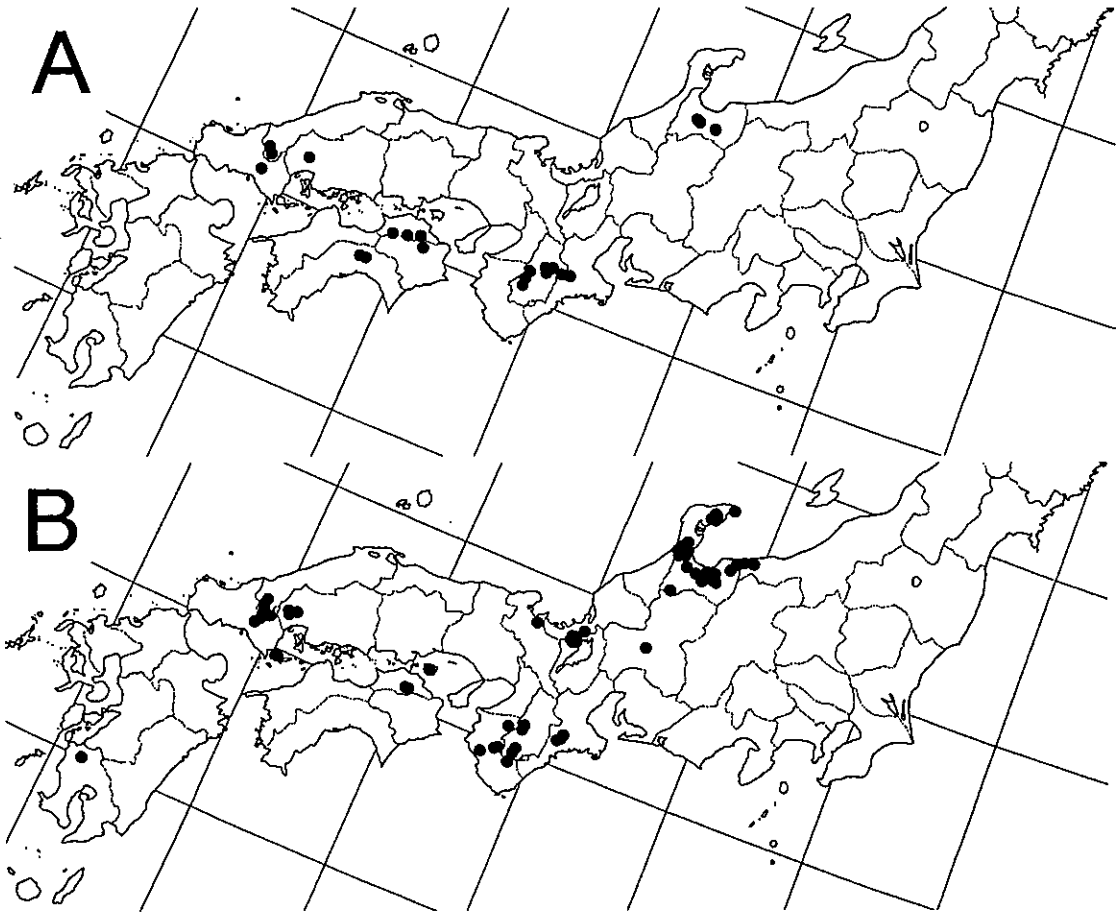


Fig. 4. Geographical distribution of two cytotypes of *Rubus hakonensis* collected in seven areas in Japan. A: $2n=42$; B: $2n=56$.

reading the manuscript.

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Appendix

Collection localities, collectors and number of voucher specimens. Collectors are symbolized as CS : Chika Suyama ; HM : Hiroshi Masaki ; MA : Minoru Aoki ; MS : Mamoru Sugimoto ; NN : Naohiro Naruhashi ; OK : Osamu Kume ; TI : Tokiyasu Iwatsubo ; TW : Toshiro Wake ; YA : Yoshimasa Araki ; YI : Yoshikane Iwatsubo.

Rubus buergeri

2n=42

Mie Pref. : Tonose, Kiinagashima-cho, Kitamuro-gun, YA. **Nara Pref.** : Nanairo, Shimokitayama-mura, Yoshino-gun, NN & MA, 92100831. **Shimane Pref.** : Noda, Muikaichi-cho, Kanoashi-gun, HM, 90111629. **Tokushima Pref.** : Okunoi, Yamakawa-cho, Oe-gun, OK, K 1596. **Kagawa Pref.** : Amakawajinja, Kotonami-cho, Nakatado-gun, OK, K 1293. **Kochi Pref.** : Sameura, Tosa-cho, Tosa-gun, OK, K 1613. **Miyazaki Pref.** : Hirata, Nobeoka-shi, MA, 92004 ; Fukase, Kitagawa-cho, Higashiusuki-gun, MA, 92003 ; Takabatake, Kitakata-cho, Higashiusuki-gun, MA, 92008 ; Kamahei, Togo-cho, Higashiusuki-gun, MA, 92050 ; Hoshiyama, Hinokage-cho, Nishiusuki-gun, MA, 92012 ; Tobara, Takahara-cho, Nishimorokata-gun, NN, 91101474 ; Matsuo, Kijo-cho, Koyu-gun, MA, 92056 ; Ishikawauchi, Kijo-cho, Koyu-gun, MA, 92060. **Kagoshima Pref.** : Makigami, Kokubu-shi, NN, 91101480 ; Miyazono, Kihoku-cho, Soe-gun, NN, 91101128 ; Oyamada, Kajiki-cho, Aira-gun, NN, 91100902 ; Makihara, Oonejime-cho, Kimotsuki-gun, NN, 91101237 ; Ookubo, Oonejime-cho, Kimotsuki-gun, NN, 91101238 ; Hangeseki, Oonejime-cho, Kimotsuki-gun, NN, 91101240 & 91101240 A ; Sayama, Yoshida-cho, Kagoshima-gun, NN, 91101003.

2n=56

Ibaraki Pref. : Fudo-toge, Tsukuba-shi, MA, 92069 ; Busshoji, Yasato-cho, Niihari-gun, MA, 92068 ; Nakayama, Yasato-cho, Niihari-gun, MA, 92070 ; Asahi-toge, Yasato-cho, Niihari-gun, MA, 92071 ; Kazekaeri-toge, Yasato-cho, Niihari-gun, MA, 92072 ; Yamane, Yasato-cho, Niihari-gun, MA, 92073. **Chiba Pref.** : Kushihamashinden, Katsuura-shi, MA, 92074 ; Nakatani, Katsuura-shi, MA, 92075 ; Yukudo, Katsuura-shi, MA, 92076 ; Kubo, Katsuura-shi, MA, 92077 ; Sano, Katsuura-shi, MA, 92078 ; Yonehara, Ichihara-shi, MA, 92081 ; Kubo, chihara-shi, MA, 92083 ; Hayashi, Sodegaura-shi, MA, 92084 ; Yamamoto, Kimitsu-shi, MA, 92085 ; Nakago, Kimitsu-shi, MA, 92086 ; Koichibe, Kimitsu-shi, MA, 92087 ; Ooyamada, Kimitsu-shi, MA, 92088 ; Kuratama, Kimitsu-shi, MA, 92089 ; Hata, Kimitsu-shi, MA, 92090 ; Kurohara, Ootaki-cho, Isumi-gun, MA, 92079 ; Buta, Ootaki-cho, Isumi-gun, MA, 92080 ; Miba, Ootaki-cho, Isumi-gun, MA, 92091 ; Nakano, Ootaki-cho, Isumi-gun, MA, 92092 ; Hotta, Chonan-cho, Chosei-gun, MA, 92082. **Niigata Pref.** : Atamayama, Itoigawa-shi, NN & MA, 92111902 ; Takabatake, Ohmi-machi, Nishi-kubiki-gun, NN & MA, 92111901. **Toyama Pref.** : Kaitani, Kamiichi-machi, Nakanikawa-gun, MA, 92106. **Ishikawa Pref.** : Awazu, Misaki-cho, Suzu-shi, NN & MS, 93111430 ; Hatta, Nanao-shi, MA,

92121; Chino, Nanao-shi, MA, 92122; Tono, Nanao-shi, MA, 92123; Shiratori, Nanao-shi, YA; Takaseyama, Uchiura-cho, Suzu-gun, NN & MS, 93111538; Misuna, Shio-cho, Hakui-gun, MA, 92114; Serikawa, Kashima-cho, Kashima-gun, MA, 92120. **Fukui Pref.:** Tsunemiya, Tsuruga-shi, NN & MS, 93100432; Ike, Kochi, Obama-shi, NN, 92102304; Myotsuji, Obama-shi, NN, 92102305; Takaya, Obama-shi, NN & MS, 93100317; Shiseki, Obama-shi, NN & MS, 93100318; Uchisotomi, Obama-shi, NN & MS, 93100319; Tarasho, Obama-shi, NN & MS, 93100320; Miyakawa, Obama-shi, NN & MS, 93100421; Tanino, Obama-shi, NN & MS, 93100424; Miyao, Takahama-cho, Ooi-gun, NN & MS, 93100311; Yamanaka, Takahama-cho, Ooi-gun, NN & MS, 93100312; Kasahara, Takahama-cho, Ooi-gun, NN & MS, 93100314 & 93100315; Nishimura, Ooi-cho, Ooi-gun, NN & MS, 93100316; Inokuchi, Kaminaka-cho, Onyu-gun, NN, 92102301; Tentokuji, Kaminaka-cho, Onyu-gun, NN, 92102302, NN & MS, 93100308; Mochida, Kaminaka-cho, Onyu-gun, NN & MS, 93100422; Asaoino, Kaminaka-cho, Onyu-gun, NN & MS, 93100423; Sekumi, Mikata-cho, Mikata-gun, NN & MS, 93100425; Narude, Mikata-cho, Mikata-gun, NN & MS, 93100426; Mikata, Mikata-cho, Mikata-gun, NN & MS, 93100427; Kanayama, Mihama-cho, Mikata-gun, NN & MS, 93100428; Iikiryama, Mihama-cho, Mikata-gun, NN & MS, 93100429; Sakajiri, Mihama-cho, Mikata-gun, NN & MS, 93100430. **Gifu Pref.:** Nabishingu, Hachiman-cho, Gujo-gun, NN. **Mie Pref.:** Ooidani, Kumano-shi, NN & MA, 92100845; Shimooi, Kumano-shi, NN & MA, 92100840; Tonose, Kiinagashima-cho, Kitamuro-gun, YA; Shimazu, Kiwa-cho, Minamimuro-gun, NN & MA, 92100836; Kuwabara, Mihama-cho, Minamimuro-gun, NN & MA, 92100837; Akagi, Mihama-cho, Minamimuro-gun, NN & MA, 92100838; Hiratani, Mihama-cho, Minamimuro-gun, NN & MA, 92100839; Komori, Mihama-cho, Minamimuro-gun, NN & MA, 92100841; Tochitani, Iitaka-cho, Iinan-gun, NN & MA, 92101062; Inukai, Iitaka-cho, Iinan-gun, NN & MA, 92101065; Miyadaira, Miyakawa-mura, Taki-gun, NN & MA, 92101070; Unmo, Miyakawa-mura, Taki-gun, NN & MA, 92101074. **Shiga Pref.:** Nagoshicho, Nagahama-shi, YA; Yamagamicho, Otsu-shi, NN, 900406 g; Mizusaka-toge, Imazu-cho, Takashima-gun, NN, 92120401; Amasugawa, Imazu-cho, Takashima-gun, NN, 92120402; Furukawa, Kutsuki-mura, Takashima-gun, NN & MS, 93100304; Horai, Shiga-cho, Shiga-gun, NN, 900406 i. **Kyoto Pref.:** Dodoikecho, Sakyo-ku, Kyoto-shi, NN, 900406 b; Nakayama, Tsuruga-shi, NN & MS, 93100309 a; Sugiyama, Tsuruga-shi, NN & MS, 93100310. **Osaka Pref.:** Shimizu, Kawachinagano-shi, NN. **Nara Pref.:** Oino, Nishiyoshino-mura, Yoshino-gun, NN & MA, 92100601; Kamino, Nishiyoshino-mura, Yoshino-gun, NN & MA, 92100602; Nasho, Nishiyoshino-mura, Yoshino-gun, NN & MA, 92100603; Kurobuchi, Nishiyoshino-mura, Yoshino-gun, NN & MA, 92100604; Joto, Nishiyoshino-mura, Yoshino-gun, NN & MA, 92100605; Sakamaki, Nishiyoshino-mura, Yoshino-gun, NN & MA, 92100708; Ichihara, Nishiyoshino-mura, Yoshino-gun, NN & MA, 92100709; Tanise, Totsukawa-mura, Yoshino-gun, NN & MA, 92100718; Kawazudani, Totsukawa-mura, Yoshino-gun, NN & MA, 92100719; Kotsu, Totsukawa-mura, Yoshino-gun, NN & MA, 92100720; Tsukohise, Totsukawa-mura, Yoshino-gun, NN & MA, 92100723; Nojiri, Totsukawa-mura, Yoshino-gun, NN & MA, 92100724; Otsuro, Totsukawa-mura, Yoshino-gun, NN & MA, 92100726; Wadamukai, Totsukawa-mura, Yoshino-gun, NN & MA, 92100729; Tanigakiuchi, Totsukawa-mura, Yoshino-gun, NN & MA, 92100730; Kamiikehara, Shimokitayama-mura, Yoshino-gun, NN & MA, 92100846; Mizujiri, Kamikitayama-mura, Yoshino-gun, NN & MA, 92100947; Kashiwaki, Kawakami-mura, Yoshino-gun, NN & MA, 92100948. **Wakayama Pref.:** Atagosan, Hashimoto-shi, NN; Kamimachi, Hongu-cho, Higashimuro-gun, NN & MA, 92100832; Higashishikiya, Kumanogawa-cho, Higashimuro-gun, NN & MA, 92100834; Kokonoe, Kumanogawa-cho, Higashimuro-gun, NN & MA, 92100835; Shinogo, Kitayama-mura, Higashimuro-gun, NN & MA, 92100842; Amedani, Kitayama-mura, Higashimuro-gun, NN & MA, 92100843; Takehara, Kitayama-mura, Higashimuro-gun, NN & MA, 92100844. **Shimane Pref.:** Kabadani, Kakinoki-mura, Kanoashi-gun, HM, 90120769; Noda, Muikaichi-cho, Kanoashi-gun, HM, 90120771 & 90120772; Soniwa, Nichihara-cho, Kanoashi-gun, HM, 90120773; Itani, Nichihara-cho, Kanoashi-gun, HM, 90120774 a. **Hiroshima Pref.:** Uga-damu, Asakita-ku, Hiroshima-shi, HM, 90112451, 90112452, 90121881 b & 90121883 a; Akezudani, Yuki-cho, Saeki-gun, HM, 90112428 a; Fushidani, Yuki-cho, Saeki-gun, HM, 90112449 a. **Yamaguchi Pref.:** Ohura, Tokuyama-shi, HM, 90111112 a; Datoko, Tokuyama-shi, HM, 90111621; Mitakesan, Tokuyama-shi, HM, 90120460, 90120462 & 90120464; Myojinyabu, Tokuyama-shi, HM, 90110604; Kwaradani, Iwakuni-shi, HM, 90112658; Toragasaki, Kasayama, Hagi-shi, HM, 90111216; Mukatao, Nishiki-cho, Kuga-gun, HM, 90111110; Ohnoshimo, Nishiki-cho, Kuga-gun, HM, 90111622 a; Sainomotohashi, Mikawa-cho, Kuga-gun, HM, 90111623; Kakinokibara, Miwa-cho, Kuga-gun, HM, 90112143 a; Kamidatoko, Miwa-cho, Kuga-gun, HM, 90112144 a; Nakamura, Miwa-cho, Kuga-gun, HM, 90112145 a; Notani, Tokuji-cho, Saba-gun, HM, 90110403 a; Ohda, Mitoh-cho, Mine-gun, HM, 90111731; Okuhata, Ohmine-cho, Mine-shi, HM, 90111732 a; Nishiichi, Toyota-cho, Toyoura-gun, HM, 90111733; Tabe, Kikugawa-cho, Toyoura-gun, HM, 90111734; Nojiri, Yamato-cho, Kumage-gun, HM, 90111941. **Tokushima Pref.:** Unotouge, Donari-cho, Itano-gun, OK, K 1577; Aiguri, Waki-cho, Mima-gun, OK, K 1598; Koge, Ikeda-cho, Miyoshi-gun, OK, K 1601 & K 1602; Funato, Ikeda-cho, Miyoshi-gun, OK, K 1603; Kamiumaji, Ikeda-cho, Miyoshi-gun, OK, K 1604; Inokubo, Ikeda-cho, Miyoshi-gun, OK, K 1605; Mizutani, Ikeda-cho, Miyoshi-gun, OK, K 1606; Norouchishimo, Ikeda-cho, Miyoshi-gun, OK, K 1607; Shimono-rouchi, Ikeda-cho, Miyoshi-gun, OK, K1608. **Kagawa Pref.:** Sakase, Kanonji-shi, OK, K 1405, K 1406 & K 1407; Sakamoto, Hiketa-cho, Ookawa-gun, YA, 901021 n; Kawamata-damu, Hiketa-cho, Ookawa-gun, OK, K 1334; Gomyo-damu, Shirotori-cho, Ookawa-gun, OK, K 1297; Ootawa, Nago-cho, Ookawa-gun, OK, K 1388; Mojikura, Kotonami-cho,

Nakatado-gun, OK, 1368; Katsuura, Kotonami-cho, Nakatado-gun, OK, K 1369 & K 1408; Kotohirasano, Kotohira-cho, Nakatado-gun, TW; Ooguchi, Chunan-cho, Nakatado-gun, OK, K 1586; Sanda, Chunan-cho, Nakatado-gun, OK, K 1587; Noguchi-damu, Chunan-cho, Nakatado-gun, OK, K 1591; Shioiri, Chunan-cho, Nakatado-gun, OK, K 1592 & K 1593; Ikenotani, Shionoe-cho, Kagawa-gun, OK, K 1353; Ashikawa, Shionoe-cho, Kagawa-gun, OK, K 1401; Ono, Ayagami-cho, Ayauta-gun, OK, K 1359; Shimoshinmyo, Ayagami-cho, Ayauta-gun, OK, K 1362; Hanaore, Miki-cho, Kita-gun, OK, K 1391; Ebisuku, Oonohara-cho, Mitoyo-gun, OK, K 1383 b; Takamaru, Oonohara-cho, Mitoyo-gun, OK, K 1582; Nagano, Yamamoto-cho, Mitoyo-gun, OK, K 1403; Donoo, Yamamoto-cho, Mitoyo-gun, OK, K 1404. **Ehime Pref.:** Takinomiya, Niihama-shi, YA, 901018 a; Yamagoshi, Yawatahama-shi, YA, 901018 j. **Kochi Pref.:** Kotobuki, Tosashimizu-shi, YA, 901020 d; Shimoyama, Aki-shi, YA, 9010211; Gonomine-toge, Gohoku-mura, Agawa-gun, OK, K 1610; Gonomine-toge, Tosa-cho, Tosa-gun, OK, K 1611; Sameura, Tosa-cho, Tosa-gun, OK, K 1612; Komano, Tosa-cho, Tosa-gun, OK, K 1615; Tai, Tosa-cho, Tosa-gun, OK, K 1616; Suketo, Motoyama-cho, Nagaoka-gun, OK, K 1619; Tsuge, Ootoyo-cho, Nagaoka-gun, OK, K 1620; Rokutanji, Kubokawa-cho, Takaoka-gun, YA, 901018 j; Ariigawa, Ookata-cho, Hata-gun, YA, 901018 k; Shirahama, Ookata-cho, Hata-gun, YA, 9010181. **Kumamoto Pref.:** Yanase, Hitoyoshi-shi, MA, 92034; Kawano, Yabe-cho, Kamimashiki-gun, MA, 92020; Nojiri, Yabe-cho, Kamimashiki-gun, MA, 92021; Shiroono, Yabe-cho, Kamimashiki-gun, MA, 92022; Kanagi, Tomochi-cho, Shimomashiki-gun, MA, 92023; Shimizu, Tomochi-cho, Shimomashiki-gun, MA, 92024; Abe, Tomochi-cho, Shimomashiki-gun, MA, 92025; Hayagusu, Tomochi-cho, Shimomashiki-gun, MA, 92026; Hagi, Izumi-mura, Yatsushiro-gun, MA, 92027; Shiiba, Izumi-mura, Yatsushiro-gun, MA, 92028; Yae, Itsuki-mura, Kuma-gun, MA, 92029; Takenokawa, Itsuki-mura, Kuma-gun, MA, 92030; Oohira, Itsuki-mura, Kuma-gun, MA, 92031; Fujita, Aira-cho, Kuma-gun, MA, 92032; Haruyama, Aira-cho, Kuma-gun, MA, 92033; Kakui, Nishiki-cho, Kuma-gun, MA, 92035; Nagamine, Fukada-cho, Kuma-gun, MA, 92036; Kakui, Sue-mura, Kuma-gun, MA, 92037; Satonoshiro, Taragi-cho, Kuma-gun, MA, 92038; Iwano, Mizukami-mura, Kuma-gun, MA, 92039; Yuyama, Mizukami-mura, Kuma-gun, MA, 92040. **Miyazaki Pref.:** Kaihatacho, Nobeoka-shi, MA, 92005; Kawakami, Nichinan-shi, NN, 91101356; Yokoi, Miyakonojo-shi, NN, 91101467; Kamikawauchi, Miyakonojo-shi, NN, 91101468; Shimoaraso, Miyakonojo-shi, NN, 91101469; Toshimacho, Miyakonojo-shi, NN, 91101476; Ikomakogen, Kobayashi-shi, NN, 91101470; Iwase, Kobayashi-shi, NN, 91101471; Kiridori, Hyuga-shi, MA, 92051; Heigen, Saito-shi, MA, 92061; Naryu, Kushima-shi, NN, 91101354; Abumi, Kitagawa-cho, Higashiusuki-gun, MA, 92001 & 92002; Kawamizunagare, Kitakata-cho, Higashiusuki-gun, MA, 92006; Sogi, Kitakata-cho, Higashiusuki-gun, MA, 92007; Shimowatari, Kitakata-cho, Higashiusuki-gun, MA, 92009; Hayahiwatari, Kitakata-cho, Higashiusuki-gun, MA, 92010; Tsuna, Kitakata-cho, Higashiusuki-gun, MA, 92011; Yatate, Shiiba-mura, Higashiusuki-gun, MA, 92041; Shiro, Shiiba-mura, Higashiusuki-gun, MA, 92042; Ozaki, Shiiba-mura, Higashiusuki-gun, MA, 92043 & 92044; Nakayama, Shiiba-mura, Higashiusuki-gun, MA, 92045; Ushishita, Nango-mura, Higashiusuki-gun, MA, 92046; Komekame, Nango-mura, Higashiusuki-gun, MA, 92047; Kome, Nango-mura, Higashiusuki-gun, MA, 92048; Kakasuiryu, Togo-cho, Higashiusuki-gun, MA, 92049; Higamichi, Togo-cho, Higashiusuki-gun, MA, 92052; Tsubotani, Togo-cho, Higashiusuki-gun, MA, 92053; Togo-cho, Higashiusuki-gun, MA, 92054 & 92055; Miyamizu, Hinokage-cho, Nishiusuki-gun, MA, 92014; Fukatsuno, Hinokage-cho, Nishiusuki-gun, MA, 92015; Otani, Takachiho-cho, Nishiusuki-gun, MA, 92016; Oshikata, Takachiho-cho, Nishiusuki-gun, MA, 92017; Enokihara, Nango-cho, Minaminaka-gun, NN, 91101355; Uchinoda, Kitago-cho, Minaminaka-gun, NN, 91101358; Gonohara, Kitago-cho, Minaminaka-gun, NN, 91101359; Taniai, Kitago-cho, Minaminaka-gun, NN, 91101360; Tashiro, Kitago-cho, Minaminaka-gun, NN, 91101361; Onsui, Takasaki-cho, Kitamorokata-gun, NN, 91101475; Miyasuiryu, Takaoka-cho, Higashimorokata-gun, NN, 91101463; Yuzunokizaki, Takaoka-cho, Higashimorokata-gun, NN, 91101464; Kamiya, Nojiri-cho, Nishimorokata-gun, NN, 91101472; Nojiri, Nojiri-cho, Nishimorokata-gun, NN, 91101473; Yae, Sunoki-mura, Nishimorokata-gun, MA, 92067; Tozaki, Kijo-cho, Koyu-gun, MA, 92057; Haruyama, Kijo-cho, Koyu-gun, MA, 92058; Ishikawauchi, Kijo-cho, Koyu-gun, MA, 92059; Uchinohata, Nishimera-mura, Koyu-gun, MA, 92063; Itatani, Nishimera-mura, Koyu-gun, MA, 92064. **Kagoshima Pref.:** Kuginono, Ookuchi-shi, NN, 91101016; Monzen, Ookuchi-shi, NN, 91101017; Nishinoyama, Ookuchi-shi, NN, 91101020; Mannami, Nishinootomote-shi, YI, 91102501; Furuta, Nishinootomote-shi, YI, 91102502; Kitamata, Takarabe-cho, Soo-gun, NN, 91101477; Masabu, Takarabe-cho, Soo-gun, NN, 91101478; Noda, Kirishima-cho, Aira-gun, NN, 91101479; Hashinokuchi, Mizobe-cho, Aira-gun, NN, 91100901; Fukuzawa, Fukuyama-cho, Aira-gun, NN, 91101127; Kamou-cho, Aira-gun, NN, 91101007; Akiyama, Kamou-cho, Aira-gun, NN, 91101009; Kuroki, Kedoin-cho, Satsuma-gun, NN, 91101011; Nanpo, Kedoin-cho, Satsuma-gun, NN, 91101012; Hirohashi, Satsuma-cho, Satsuma-gun, NN, 91101013; Tsuruda, Tsuruda-cho, Satsuma-gun, NN, 91101022; Tsuruda-damu, Tsuruda-cho, Satsuma-gun, NN, 91101021; Yamashita, Iriki-cho, Satsuma-gun, NN, 91101023; Fukuda, Iriki-cho, Satsuma-gun, NN, 9110102 i; Yamanokuchi, Iriki-cho, Satsuma-gun, NN, 91101025; Ronji, Aira-cho, Kimotsuki-gun, NN, 91101134; Nakayama, Kushira-cho, Kimotsuki-gun, NN, 91101135; Ootakeno, Oonejime-cho, Kimotsuki-gun, NN, 91101245; Shoei, Sata-cho, Kimotsuki-gun, NN, 91101246; Gyomine, Sata-cho, Kimotsuki-gun, NN, 91101247; Setoguchi, Tashiro-cho, Kimotsuki-gun, NN, 91101249; Oowaki, Kouyama-cho, Kimotsuki-gun, NN, 91101253; Tashiro, Minamitane-cho, Kumage-gun, TI, 92101901.

Rubus hakonensis

2n=42

Toyama Pref.: Nishikomata, Ooyama-machi, Kami-niikawa-gun, MA, 92101; Aone, Yatsuo-machi, Nei-gun, MA, 92093; Kuritani, Yamada-mura, Nei-gun, CS, 92101801. **Mie Pref.:** Takami-toge, Iitaka-cho, Inan-gun, NN & MA, 92101061; Kusashikano, Iitaka-cho, Inan-gun, NN & MA, 92101063. **Nara Pref.:** Jyoto, Nishiyoshino-mura, Yoshino-gun, NN & MA, 92100706; Nakaguro, Higashiyoshino-mura, Yoshino-gun, NN & MA, 92100953; Kajiya, Higashiyoshino-mura, Yoshino-gun, NN & MA, 92100954; Sannose, Higashiyoshino-mura, Yoshino-gun, NN & MA, 92100955; Nomi, Higashiyoshino-mura, Yoshino-gun, NN & MA, 92101056; Izuo, Higashiyoshino-mura, Yoshino-gun, NN & MA, 92101057; Kizu, Higashiyoshino-mura, Yoshino-gun, NN & MA, 92101058; Hiranoshita, Higashiyoshino-mura, Yoshino-gun, NN & MA, 92101059; Sugitani, Higashiyoshino-mura, Yoshino-gun, NN & MA, 92101060; Shimekimi, Ooto-mura, Yoshino-gun, NN & MA, 92100714; Nagadono, Totsukawa-mura, Yoshino-gun, NN & MA, 92100716; Tanise, Totsukawa-mura, Yoshino-gun, NN & MA, 92100717; Kamitako, Kawakami-mura, Yoshino-gun, NN & MA, 92100949; Shimotako, Kawakami-mura, Yoshino-gun, NN & MA, 92100950; Ido, Kawakami-mura, Yoshino-gun, NN & MA, 92100951; Ootaki, Kawakami-mura, Yoshino-gun, NN & MA, 92100952. **Hiroshima Pref.:** Uga-damu, Asakita-ku, Hiroshima-shi, HM, 90112450 & 90121885. **Shimane Pref.:** Kabatani, Kakinoki-mura, Kanoashi-gun, HM, 90120767; Irie, Kakinoki-mura, Kanoashi-gun, HM, 90120768; Noda, Muikaichi-cho, Kanoashi-gun, HM, 90120770. **Yamaguchi Pref.:** Mitakesan, Tokuyama-shi, HM, 90120463; Myojinyabu, Mitakesan, Tokuyama-shi, HM, 90110607. **Tokushima Pref.:** Ouchi, Yamakawa-cho, Oe-gun, OK, K 1597. **Kagawa Pref.:** Katsuura, Kotonami-cho, Nakatado-gun, OK, K 1366 a & K 1366 b; Inohana-toge, Saita-cho, Mitoyo-gun, OK, K 1371 a & K 1371 b; Otawa, Nagao-cho, Okawa-gun, OK, K 1387 & K 1389. **Kochi Pref.:** Sameura, Tosa-cho, Tosa-gun, OK, K 1614; Tai, Tosa-cho, Tosa-gun, OK, K 1617; Suketo, Motoyama-cho, Nagaoka-gun, OK, K 1618.

2n=56

Niigata Pref.: Takahata, Ohmi-cho, Nishikubiki-gun, NN & MA, 92111904; Atamayama, Itoigawa-shi, NN & MA, 92111903. **Toyama Pref.:** Hachi, Uozu-shi, YA; Shimono, Namerikawa-shi, YA; Sarukurayama, Oosawano-machi, Kaminiikawa-gun, MA, 92098; Ishibuchi, Ooyama-machi, Kaminiikawa-gun, NN, 900409 c; Iori, Kamiichi-machi, Nakaniikawa-gun, MA, 92105; Goio, Kamiichi-machi, Nakaniikawa-gun, MA, 92107; Honehara, Kamiichi-machi, Nakaniikawa-gun, YA; Yomogisawa, Kamiichi-machi, Nakaniikawa-gun, YA; Orido, Kamiichi-machi, Nakaniikawa-gun, YA; Sakai, Asahi-machi, Shimoniikawa-gun, YA; Aimoto, Unazuki-machi, Shimoniikawa-gun, YA; Mikuma, Toyama-shi, YA; Hiraoka, Toyama-shi, YA; Kojirakawa, Kamitaira-mura, Higashi-tonami-gun, YA; Ookubo, Daimon-machi, Imizu-gun, YA; Sanbi, Himi-shi, MA, 92112; Tokonabe, Himi-shi, MA, 92113; Isodani, Himi-shi, MA, 92116; Jyoto, Himi-shi, MA, 92117; Kunimi, Himi-shi, MA, 92118; Hayakari, Himi-shi, MA, 92108; Hizume, Himi-shi, MA, 92109. **Ishikawa Pref.:** Yoshigaura, Suzu-shi, NN & MS, 93111431; Sugaik, Hakui-shi, MA, 92110; Komaioi, Yanagida-mura, Fugeshi-gun, NN & MS, 93111432 a; Seianji, Noto-cho, Fugeshi-gun, NN & MS, 93111533; Shimosakeo, Noto-cho, Fugeshi-gun, NN & MS, 93111534; Choryuji, Noto-cho, Fugeshi-gun, NN & MS, 93111535; Mizuho, Noto-cho, Fugeshi-gun, NN & MS, 93111536 a; Kakioi, Noto-cho, Fugeshi-gun, NN & MS, 93111537; Harayama, Kashima-cho, Kashima-gun, MA, 92119; Shimizuhara, Shio-cho, Hakui-gun, MA, 92111. **Fukui Pref.:** Daguchi, Tsuruga-shi, NN, 900406 p. **Gifu Pref.:** Nahishingu, Hachiman-cho, Gujo-gun, NN. **Mie Pref.:** Kusakano, Iitaka-cho, Inan-gun, NN & MA, 92101064; Oosugi, Miyakawa-mura, Taki-gun, NN & MA, 92101066; Iwaiguchi, Miyakawa-mura, Taki-gun, NN & MA, 92101068; Hongo, Miyakawa-mura, Taki-gun, NN & MA, 92101072; Banya, Miyakawa-mura, Taki-gun, NN & MA, 92101073. **Shiga Pref.:** Kuzukawa-hosokawacho, Otsu-shi, NN & MS, 93100302; Hosaka, Imazu-cho, Takashima-gun, NN, 92120403; Amasugawa, Imazu-cho, Takashima-gun, NN & MS, 93100307; Furukawa, Kutsuki-mura, Takashima-gun, NN & MS, 93100303; Migifuchidaira, Kutsuki-mura, Takashima-gun, NN & MS, 93100305; Ueno, Kutsuki-mura, Takashima-gun, NN & MS, 93100306. **Kyoto Pref.:** Nakayama, Maizuru-shi, NN & MS, 93100309 a. **Nara Pref.:** Ichihara, Nishiyoshino-mura, Yoshino-gun, NN & MA, 92100710; Sakamoto, Nishiyoshino-mura, Yoshino-gun, NN & MA, 92100712; Amatsuji, Oto-mura, Yoshino-gun, NN & MA, 92100711; Kazeya, Totsukawa-mura, Yoshino-gun, NN & MA, 92100722; Shimoban, Totsukawa-mura, Yoshino-gun, NN & MA, 92100725; Imado, Totsukawa-mura, Yoshino-gun, NN & MA, 92100727. **Wakayama Pref.:** Uemachi, Hongu-cho, Higashimuro-gun, NN & MA, 92100833; Katakura, Minabegawa-mura, Hidaka-gun, NN; Tochtitani, Ryujin-mura, Hidaka-gun, NN; Tatsu, Ryujin-mura, Hidaka-gun, NN; Ookuma, Ryujin-mura, Hidaka-gun, NN; Yatate, Koya-cho, Ito-gun, NN. **Hiroshima Pref.:** Uga-damu, Asakita-ku, Hiroshima-shi, HM, 90121882 & 90121884; Nunohara, Tsutsugamura, Yamagata-gun, HM, 90112453; Inomata-touge, Yuki-cho, Saeki-gun, HM, 90112456 a. **Shimane Pref.:** Izushi, Kakinoki-mura, Kanoashi-gun, HM, 90111628 a; Noda, Muikaichi-cho, Kanoashi-gun, HM, 90111627; Sutegohchi, Muikaichi-cho, Kanoashi-gun, HM, 90111630; Itani, Nichihara-cho, Kanoashi-gun, HM, 90120774 b. **Yamaguchi Pref.:** Mitakesan, Tokuyama-shi, HM, 90120461; Myojinyabu, Mitakesan, Tokuyama-shi, HM, 90110606; Komeyama, Kano-cho, Tsuno-gun, HM, 90111626; Usagou, Nishiki-cho, Kuga-gun, HM, 90111936 & 90111938 a; Kanousan, Kuka-cho, Ohshima-gun, HM, 90120976. **Kagawa Pref.:** Koidegawa, Shionoe-cho, Kagawa-gun, OK, K 1348; Shitagiri, Shionoe-cho, Kagawa-

gun, OK, K 1354; Takahashi, Shionoe-cho, Kagawa-gun, OK, K 1355; Okuno, Shionoe-cho, Kagawa-gun, OK, K 1356; Yasuyuki, Shionoe-cho, Kagawa-gun, OK, K 1357; Ashikawa, Shionoe-cho, Kagawa-gun, OK, K 1399, K 1400 & K 1402; Manda-toge, Oonohara-cho, Mitoyo-gun, OK, K 1378 a; Kensosan, Ikeda-cho, Shozu-gun, OK, K 1594. Kagoshima Pref.: Nishinoyama, Ookuchi-shi, NN, 91101019.

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鳴橋直弘¹・青木実^{1,2}・岩坪美兼¹・久米修³・真崎博⁴：バラ科フユイチゴとミヤマフユイチゴの染色体数とその分布

バラ科キイチゴ属のフユイチゴとミヤマフユイチゴの染色体数を、日本の7つの地域（九州南部、四国、中国地方西部、近畿南部、滋賀県と福井県南部、富山県と能登半島、および、関東東部）から無作為に採集した植物で調査した。両種は九州、四国、本州に広く分布し、新潟県と茨城県が北限である。

その結果、フユイチゴとミヤマフユイチゴとも $2n=42$ と $2n=56$ のサイトタイプが見られた。このうち、フユイチゴの $2n=42$ は新発見である。これ

ら2つのサイトタイプの採集地点を調べたところ、分布の北限に近いところでは、 $2n=56$ が多く見られた。このことは、Löve and Löve (1949, 1967) や Löve (1953) も言っているように、高次の倍数体によって耐寒性を増した結果と考えられる。特にフユイチゴにおいてはそのように推測される。

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