Chromosome numbers of 11 species in Japanese Rumex subg. Rumex (Polygonaceae)

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Chromosome numbers of 11 species in Japanese *Rumex* subg. *Rumex* (Polygonaceae)

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Abstract

Chromosome numbers are reported for 867 individuals of 11 species in *Rumex* subg. *Rumex* (Polygonaceae) collected from 111 localities in Japan. The counts for *R. longifolius* (2n=80) and *R. madaio* (2n=100) are different from previously published counts. The count of 2n=60 made on one plant of the *R. obtusifolius* collections is a new count for this species, but the other collections of this species had 2n=40, being consistent with the counts previously reported. The counts for *R. conglomeratus* (2n=20) , *R. gmelinii* (2n=40) , *R. nepalensis* (2n=120) , and *R. pulcher* (2n=20) support one of the previous counts where two or three different counts were reported. Previously published counts for the four species of *R. crispus* (2n=60) , *R. japonicus* (2n=100) , *R. maritimus* (2n =40) and *R. nipponicus* (2n=40) are verified.

Key words : chromosome number, Japan, meiosis, Polygonaceae, *Rumex* subg. *Rumex*.

Introduction

The *Rumex* subg. *Rumex* (Polygonaceae) , distributed widely throughout the world, is composed of about 150 species (Datta 1952). In Japan 15 species including naturalized ones occur (Ohwi 1965 ; Osada 1972 ; Sugimoto 1978). This subgenus is known to show a polyploid series, based on x=10 (Kihara and Ono 1926 ; Darlington and Wylie 1955) , from diploid to 20-ploid (Löve and Kapoor 1967 ; Fedorov 1969 ; Ichikawa et al. 1971). Moreover, infraspecific polyploidy is also known in some species (Fedorov 1969). However, the chromosome studies in Japanese plants of this subgenus are still insufficient and not reliable, because they were based on one or a few plants. This article records the chromosome numbers of 867 individuals of 11 species in Japanese *Rumex* subg. *Rumex* collected from 111 localities, and is the first step in our study for the elucidation of the chromosome evolution of this subgenus.

Materials and methods

Somatic chromosome numbers were examined in the root tip cells of 867 individuals of 11 species in *Rumex* subg. *Rumex* collected from 111 localities in Japan. The species studied were *R. conglomeratus* Murray, *R. crispus* L., *R. gmelinii* Turcz., *R. japonicus* Houtt., *R. longifolius* DC., *R. madaio* Makino, *R. maritimus* L., *R. nepalensis* Spreng., *R. nipponicus* Franch. et Sav., *R. obtusifolius* L., and *R. pulcher* L. Their collection localities are shown in the appendix. Plants from all localities were grown in the experimental garden of Toyama University. Newly formed root tips collected from potted plants were pretreated in 2 mM 8-hydroxyquinoline solution at room temperature for 1 h and kept at ca. 5℃ for 15 h. These root tips 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℃ for 10 minutes, and then washed in tap water. They were then stained and squashed in 1.5% lacto-propionic orcein and fully spread metaphase chromosomes were studied. For studies of meiotic chromosomes, young flower buds were fixed in Newcomer's fluid at 17 ℃ for 3 h and macerated with the same proce-

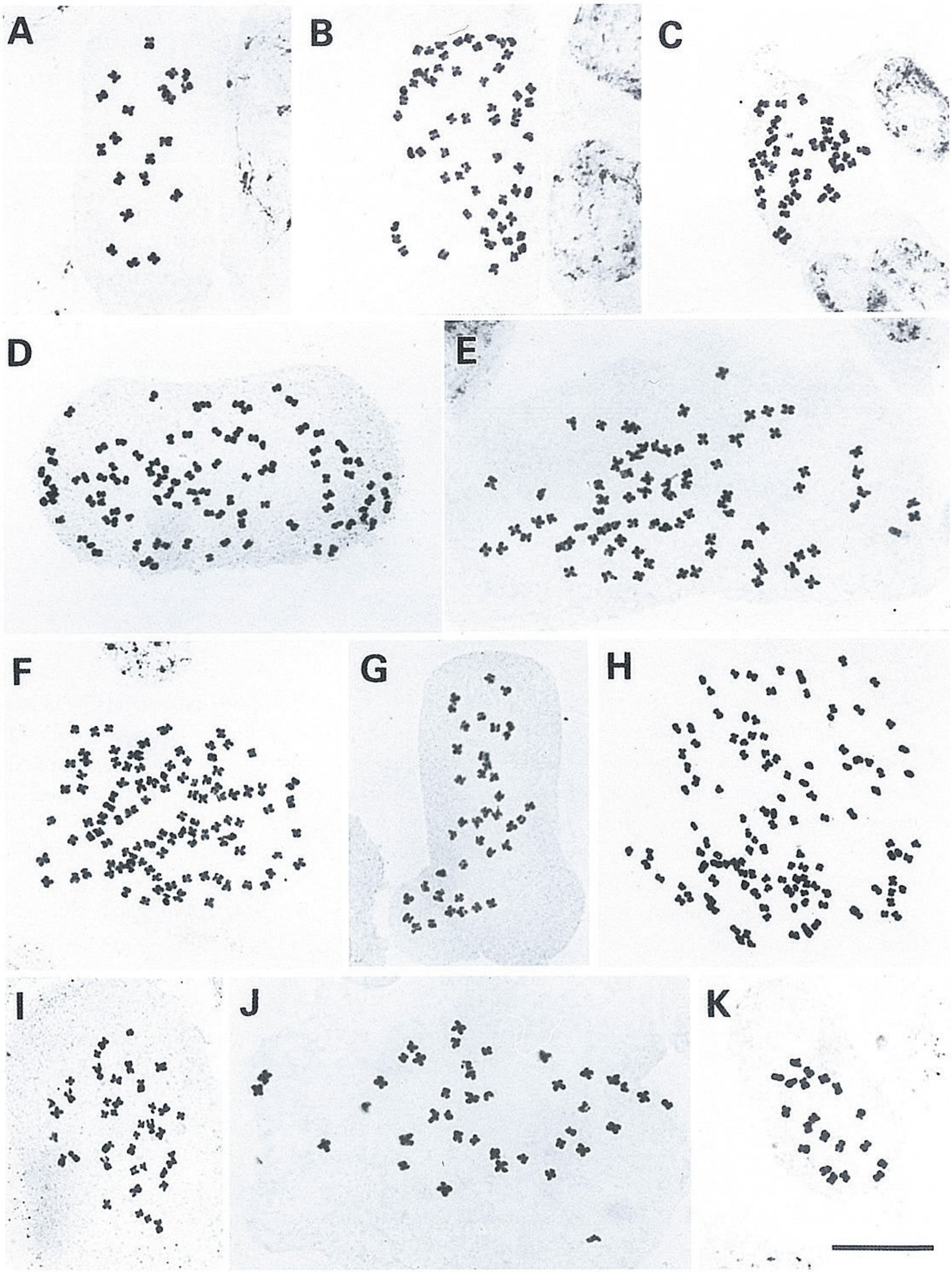

Fig. 1. Somatic metaphase chromosomes of 11 species in Japanese *Rumex* subg. *Rumex*. A: *R. conglomeratus* (2n=20) ; B: *R. crispus* (2n=60) ; C: *R. gmelinii* (2n=40) ; D: *R. japonicus* (2n=100) ; E: *R. longifolius* (2n=80) ; F: *R. madaio* (2n=100) ; G: *R. maritimus* (2n=40) ; H: *R. nepalensis* (2n=120) ; I: *R. nipponicus* (2n=40) ; J: *R. obtusifolius* (2n=40) ; K: *R. pulcher* (2n=20). Scale bar shows 15 μm.

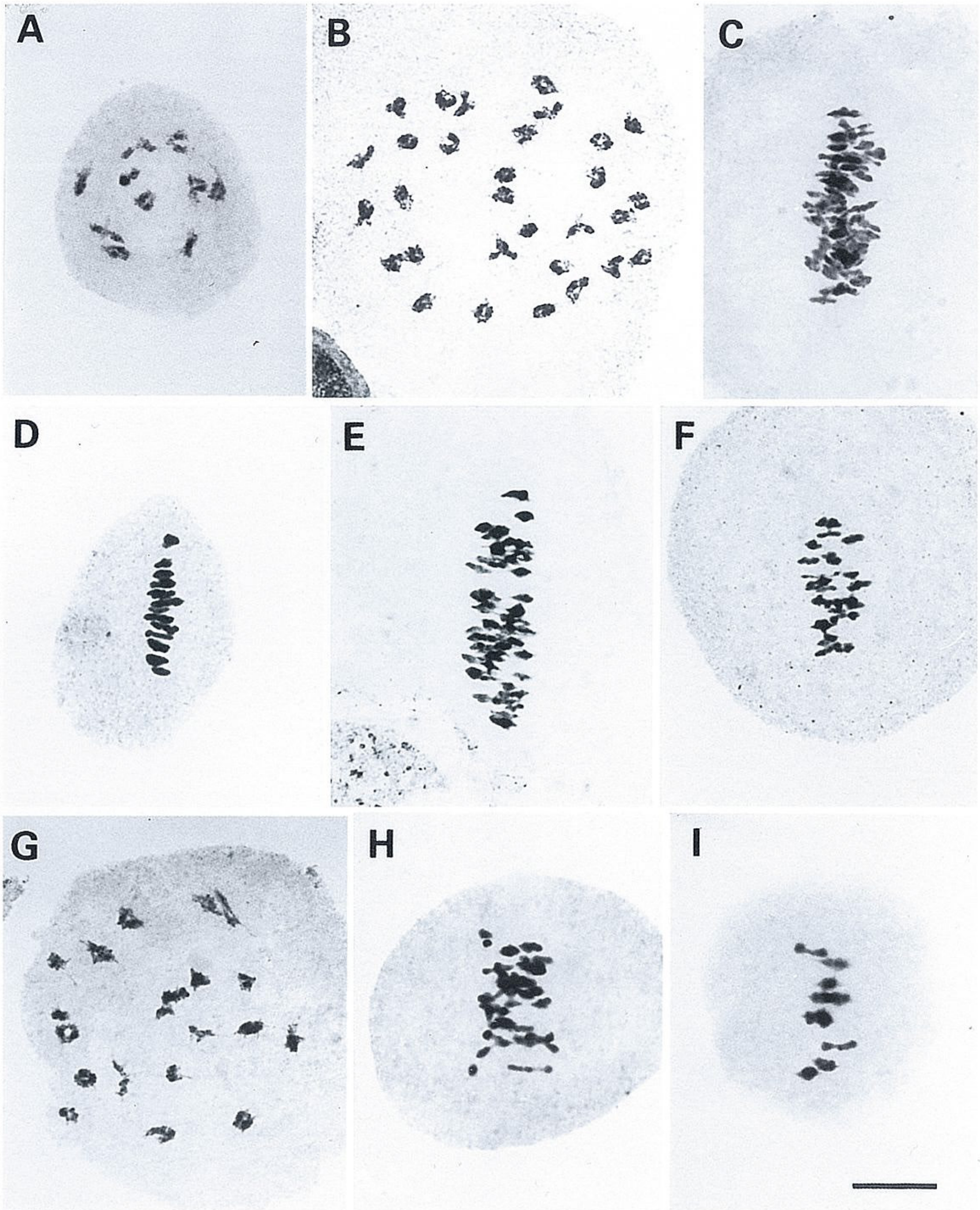

Fig. 2. Meiotic chromosomes in pollen mother cells of Japanese *Rumex* subg. *Rumex*.
A : *R. conglomeratus* (10Ⅱ) ; B : *R. crispus* (30Ⅱ) ; C : *R. japonicus* (50Ⅱ) ; D : *R. maritimus* (20Ⅱ) ; E : *R. nepalensis* (60Ⅱ) ; F : *R. nipponicus* (20Ⅱ) ; G : *R. obtusifolius* with 2n=40 (20Ⅱ) ; H : *R. obtusifolius* with 2n=60 showing irregular pairing ; I : *R. pulcher* (10Ⅱ). Scale bar shows 10 μm.

Table 1. Chromosome numbers of the *Rumex* subg. *Rumex* species discussed

Taxon	Present count		Previous report		Reference
	PMCs	(2n)	(n)	(2n)	
R. conglomeratus	10 II	20	9*		Sugiura (1936)
			10		Jaretzky (1928)
				20	Jaretzky (1928), Löve (1967, 1986), Ichikawa et al. (1971), Degraeve (1975), Váchová (1976), Queirós (1983)
R. crispus	30 II	60	30*		Kihara and Ono (1926), Kihara (1927)
				60	Heiser and Whitaker (1948), Löve and Löve (1956), Mulligan (1959), Löve (1967, 1986), Váchová (1976), Ichikawa et al. (1971), Strid (1981), Degraeve (1975), Rychlewski (1976), Queirós (1983), Strid and Franzén (1983), Baltisberger (1991)
R. gmelinii	—	40		10	Zhukova (1967)
				40*	Nishikawa (1991)
R. japonicus	50 II	100	50*		Kihara and Ono (1926)
				100*	Ichikawa et al. (1971)
R. longifolius	40 II	80	30		Kihara and Ono (1926), Laane (1971)
			40*		Kihara and Ono (1926)
				40	Hamet-ahti and Virrankoski (1970), Jalas and Lindholm (1975)
				60	Löve and Löve (1956), Mulligan (1959), Löve (1967, 1986), Ichikawa et al. (1971), Degraeve (1975), Jalas and Lindholm (1975)
R. madaio	—	100		60	Jaretzky (1928)
R. maritimus	20 II	40	20		Kihara and Ono (1926), Jaretzky (1928), Datta (1952)
				40	Mulligan (1959), Ichikawa et al. (1971), Feráková (1970), Degraeve (1975), Javůrková (1980), Löve (1942, 1986), Löve and Löve (1982)
R. nepalensis	60 II	120	27*		Sugiura (1936)
			60*		Kihara and Ono (1926)
				120*	Ichikawa et al. (1971)
				120	Löve (1967), Degraeve (1975)
R. nipponicus	20 II	40		40*	Kurosawa (1981)
R. obtusifolius	20 II	40	20*		Kihara and Ono (1926), Kihara (1927)
	irregular	60		40	Löve and Löve (1956), Mulligan (1959), Löve (1967, 1986), Váchová (1976), Ichikawa et al. (1971), Degraeve (1975)
				ca. 40	Strid (1981)
R. pulcher	10 II	20	10		Jaretzky (1928), Shimamura (1929), Queirós (1983)
				20	Jaretzky (1928), Heiser and Whitaker (1948), Löve (1967, 1986), Ichikawa et al. (1971), Van Loon et al. (1971)
					Degraeve (1975), Strid (1981), Queiros (1983)
				40	Dahlgren et al. (1971)

* : Chromosome number reported for Japanese plant.

dure as for the root tips. The anthers were stained and squashed in 1.5% lacto-propionic orcein. Chromosome pairing at diakinesis stage and / or first meiotic metaphase stage was examined in pollen mother cells (PMCs). Voucher specimens are deposited in the Herbarium of the Toyama University.

Results and discussion

Somatic chromosome counts of the *Rumex* subg. *Rumex* plants studied were the following: 2n=20 in *R. conglomeratus* and *R. pulcher* ; 2n=40 in *R. gmelinii, R. maritimus* and *R. nipponicus* ; 2n=40, 60 in *R. obtusifolius* ; 2n=60 in *R. crispus* ; 2n=80 in *R. longifolius* ; 2n=100 in *R. japonicus* and *R. madaio* ; 2n=120 in *R. nepalensis* (Fig. 1, Table 1). In *R. obtusifolius* one plant had 2n=60, while the others showed 2n=40. Meiotic chromosome configurations found in PMCs were: 10 II in *R. conglomeratus* and *R. pulcher* ; 20 II in *R. maritimus, R. nipponicus* and *R. obtusifolius* with 2n=40 ; 30 II in *R. crispus* ; 40 II in *R. longifolius* ; 50 II in *R. japonicus* ; 60 II in *R. nepalensis* (Fig. 2, Table 1). These showed regular bivalent formation. The plant of *R. obtusifolius* with 2n=60, however, showed irregular pairing having univalent, bivalents and trivalents. This plant seems to be produced by fusion between a haploid gamete and an unreduced gamete arisen spontaneously in this species.

As shown in Table 1, the counts for *R. longifolius* (2n=80 ; 40 II) and *R. madaio* (2n=100) are different from the chromosome counts previously reported. The count of 2n=60 made on one plant of the *R. obtusifolius* collections is a new count for this species, but the count of 2n=40 in the other collections were consistent with the counts previously reported. The counts for *R. conglomeratus* (2n=20 ; 10 II), *R. gmelinii* (2n=40), *R. nepalensis* (2n=120 ; 60 II) and *R. pulcher* (2n=40 ; 20 II) support one of the previous counts where two or three counts were reported, and the counts for *R. crispus* (2n=60 ; 30 II), *R. japonicus* (2n=100 ; 50 II), *R. maritimus* (2n=40 ; 20 II) and *R. nipponicus* (2n=40 ; 20 II) substantiate the counts previously reported.

The chromosome counts for the *Rumex* subg. *Rumex*, confirmed by the present study, showed an euploid series of diploid (2n=20), teraploid (2n=40), hexaploid (2n=60), octaploid (2n=80), decaploid (2n=100) and dodecaploid (2n=120) plants, and aneuploid plants has not found in any species. The unusual counts of n=9 for *R. conglomeratus* and n=27 for *R. nepalensis* given by Sugiura (1936), and 2n=10 for *R. gmelinii* given by Zhukova (1967) may be due to miscounts caused by the technical difficulties of several decades ago.

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氷見栄成[1,2]・岩坪美兼[1]・鳴橋直弘[1]：日本産ギシギシ属ギシギシ亜属11種の染色体数

本邦産ギシギシ属ギシギシ亜属の11種について，北海道，秋田県，東京都（小笠原群島父島），新潟県，長野県，富山県，愛知県，滋賀県，京都府，兵庫県，山口県，それに香川県から採集した合計867株の体細胞の染色体数を調べた。一部の株については減数分裂第一分裂移動期，中期の観察も合わせて行った。

染色体数は，アレチギシギシ *R. conglomeratus* (2n=20, 10Ⅱ)，ナガバギシギシ *R. crispus* (2n=60, 30Ⅱ)，カラフトダイオウ *R. gmelinii* (2n=40)，ギシギシ *R. japonicus* (2n=100, 50Ⅱ)，ノダイオウ *R. longifolius* (2n=80, 40Ⅱ)，マダイオウ *R. madaio* (2n=100)，コガネギシギシ *R. maritimus* (2n=40, 20Ⅱ)，キブネダイオウ *R. nepalensis* (2n=120, 60Ⅱ)，コギシギシ *R. nipponicus* (2n=40, 20Ⅱ)，エゾノギシギシ *R. obtusifolius* (2n=40, 20Ⅱ；2n=60)，ヒョウタンギシギシ *R. pulcher* (2n=20, 10Ⅱ) であった。ノダイオウでは2n=40, 60の報告があるが，今回，北海道，秋田県，長野県，そして富山県より採集したノダイオウはすべて2n=80であった。マダイオウは富山県産と山口県産の8個体すべてが2n=100であり，Jaretzky (1928) の報告 (2n=60) とは異なっていた。またエゾノギシギシは1株 (2n=60) を除き，他はすべて2n=40であった。2n=60の1株は，減数分裂において二価染色体の他に，一価と三価染色体が見られた。この株は2n=40の株に生じた非還元配偶子 (n=40) と正常な還元配偶子 (n=20) との受精によって生まれた植物であると思われる。

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Appendix

Chromosome numbers, collection localities, and number of individuals examined (in parentheses) of studied taxa in Japanese *Rumex* subg. *Rumex*.

R. conglomeratus

2n=20, 10Ⅱ

Kyoto Pref., Shizuhara-cho, Sakyo-ku, Kyoto City, (1).

2n=20

Toyama Pref., Ao, Himi City, (1) ; Shimao, Himi City, (3) ; Gofuku, Toyama City, (1) ; Washiduka, Kosugi-machi, Imizu-gun, (1) ; **Aichi Pref.**, Shimotoda, Sakusima, Isshiki-cho, Hazu-gun, (2) ; **Kyoto Pref.**, Keshiyama, Kita-ku, Kyoto City, (24) ; Miyagawa-cho, Sakyo-ku, Kyoto City, (1) ; Nakaragi-cho, Sakyo-ku, Kyoto City, (2) ; Shizuhara-cho, Sakyo-ku, Kyoto City, (32) ; **Hyogo Pref.**, Anase, Shikama-ku, Himeji City, (7) ; Nishiwaki, Himeji City, (1) ; **Yamaguchi Pref.**, Imori, Tokuyama City, (1) ; Susumaoku, Tokuyama City, (1) ; Fukamizokarahi, Yamaguchi City, (1) ; Asa, Sanyo-cho, Asa-gun, (1).

R. crispus

2n=60, 30Ⅱ

Hyogo Pref., Nishiwaki, Himeji City, (1) ; Anase, Shikama-ku, Himeji City, (1).

2n=60

Hokkaido Pref., Yayoi, Kushiro City, (2) ; Nishinijo, Obihiro City, (2) ; Obira-cho, Rumoi-gun, (2) ; Bashukuru, Onbetsu-cho, Shiranuka-gun, (4) ; Koitoi, Shiranuka-cho, Shiranuka-gun, (2) ; Shiranuka, Shiranuka-cho, Shiranuka-gun, (1) ; Urahoro, Urahoro-cho, Tokachi-gun, (1) ; **Tokyo Pref.**, Chichijima Island, Ogasawara-mura, (3) ; **Niigata Pref.**, Himesaki, Ryotsu City, (1) ; **Toyama Pref.**, Ikuji, Kurobe City, (1) ; Horiokamyoujinsin, Shinminato City, (1) ; Kamimakino, Takaoka City, (3) ; Arisawa, Toyama City, (1) ; Gofuku, Toyama City, (30) ; Hiyodorijima, Toyama City, (1) ; Tabata, Toyama City, (1) ; Yokogoshi, Toyama City, (1) ; Washiduka, Kosugi-machi, Imizu-gun, (1) ; Iwakuraji, Tateyama-machi, Nakaniikawa-gun, (1) ; **Nagano Pref.**, Kawanakajima, Nagano City, (2) ; **Aichi Pref.**, Akemi-cho, Toyohashi City, (6) ; Nishitakashi-cho, Toyohashi City, (4) ; Hiroyama, Minamichita-cho, Chita-gun, (4) ; **Shiga Pref.**, Ikadachi, Otsu City, (1) ; **Kyoto Pref.**, Keshiyama, Kamigamo, Kita-ku, Kyoto City, (8) ; Maeda-cho, Kamigamo, Kita-ku, Kyoto City (2) ; **Hyogo Pref.**, Nishiwaki, Himeji City, (14) ; Anase, Shikama-ku, Himeji City, (15) ; **Yamaguchi Pref.**, Kasayama, Hagi City, (1) ; Nakazuminami, Kudamatsu City, (1) ; Higashikiwa, Ube City, (2) ; Asa, Sanyo-cho, Asa-gun, (1) ; Kurusonzan,Toyota-cho, Toyoura-gun, (3) ; **Kagawa Pref.**, Sanbonmatsu, Ouchi-cho, Okawa-gun, (3).

R. gmelinii

2n=40

Hokkaido Pref., Takanegahara, Higashikawa-cho, Kamikawa-gun, (3).

R. japonicus

2n=100, 50 II

Niigata Pref., Himesaki, Ryotsu City, (1) ; **Toyama Pref.**, Shimooiko, Fukuoka-machi, Nishitonami-gun, (1) ; **Yamaguchi Pref.**, Yotsutsuji, Ogori-cho , Yoshiki-gun, (1).

2n=100

Hokkaido Pref., Yayoi, Kushiro City, (2) ; Harutachi, Shizunai-cho, Shizunai-gun, (3) ; **Tokyo Pref.**, Chichijima Island, Ogasawara-mura, (6) ; **Niigata Pref.**, Himesaki, Ryotsu City, (3) ; **Toyama Pref.**, Ao, Himi City, (2) ; Sassaki, Himi City, (1) ; Kamikoizumi, Namerikawa City, (6) ; Minowa, Namerikawa City, (2) ; Ota, Takaoka City, (1) ; Arisawa, Toyama City, (2) ; Gofuku, Toyama City, (3) ; Hiyodorijima, Toyama City, (2) ; Iwasekoshimachi, Toyama City, (5) ; Tabata, Toyama City, (1) ; Yokogoshi, Toyama City, (1) ; Inashiro, Osawano-machi, Kaminiikawa-gun, (2) ; Ashikuraji, Tateyama-machi, Nakaniikawa-gun, (12) ; Nagasawa, Fuchu-machi, Nei-gun, (1) ; Sotowano, Fuchu-machi, Nei-gun, (1) ; Syozu, Yatsuo-machi, Nei-gun, (1) ; Fukatani, Yatsuo-machi, Nei-gun, (6) ; Kamisasahara, Yatsuo-machi, Nei-gun, (1) ; Onagadani, Yatsuo-machi, Nei-gun, (5) ; Douko, Nyuzen-machi, Shimoniikawa-gun, (2) ; **Aichi Pref.**, Nishitakashi-cho, Toyohashi City, (3) ; Akaishi, Minamichita-cho, Chita-gun, (4) ; Ena, Isshiki-cho, Hazu-gun, (5) ; Shimotoda, Isshiki-cho, Hazu-gun, (2) ; **Shiga Pref.**, Ikadachi, Otsu City, (30) ; **Kyoto Pref.**, Keshiyama, Kita-ku, Kyoto City, (2) ; Maeda-cho, Kita-ku, Kyoto City, (6) ; Honmachi, Sakyo-ku, Kyoto City, (1) ; Miyagawa-cho, Sakyo-ku, Kyoto City, (1) ; Nakaragi-cho, Sakyo-ku, Kyoto City, (2) ; Nonaka-cho, Sakyo-ku, Kyoto City, (6) ; Shizuhara-cho, Sakyo-ku, Kyoto City, (6) ; **Hyogo Pref.**, Anase, Shikama-ku, Himeji City, (2) ; **Yamaguchi Pref.**, Kikugahama, Hagi City, (1) ; Nakamura, Tokuyama City, (2) ; Omukaidake, Tokuyama City, (1) ; Higashikiwa, Ube City, (1) ; Okiubenohara, Ube City, (1) ; Yanaiminato, Yanai City, (14) ; Kaneshita, Ato-cho, Abu-gun, (1) ; Asa, Sanyo-cho, Asa-gun, (1) ; Kurusonzan, Toyota-cho, Toyoura-gun, (1) ; Yotsutsuji, Ogori-cho, Yoshiki-gun, (3) ; **Kagawa Pref.**, Sanbonmatsu, Ouchi-cho, Okawa-gun, (3).

R. longifolius

2n=80, 40 II

Toyama Pref., Arisawa, Toyama City, (1).

2n=80

Hokkaido Pref., Bashukuru, Onbetsu-cho, Shiranuka-gun, (2) ; Chokubetsu, Onbetsu-cho, Shiranuka-gun, (1) ; Koitoi, Shiranuka-cho, Shiranuka-gun, (3) ; **Akita Pref.**, Sugao, Ani-machi, Kitaakita-gun, (1) ; Takinosawa, Moriyosi-machi, Kitaakita-gun, (2) ; Sawanai, Kyowa-machi, Senboku-gun, (1) ; Ashizawa, Nishisenboku-machi, Senboku-gun, (1) ; Maki, Ota-machi, Senboku-gun, (1) ; Hotokezawa, Senhata-machi, Senboku-gun, (1) ; Tochinoki, Nishiki-mura, Senboku-gun, (1) ; **Nagano Pref.**, Kirigamine, Suwa City, (2) ; **Toyama Pref.**, Iguridani, Tonami City, (2) ; Arisawa, Toyama City, (2) ; Oki, Inami-machi, Higashitonami-gun, (1) ; Abetto, Toga-mura, Higashitonami-gun, (9) ; Momosegawa, Toga-mura, Higashitonami-gun, (5) ; Sotowano, Fuchu-machi, Nei-gun, (3) ; Kamisasahara, Yatsuo-machi, Nei-gun, (11).

R. madaio

2n=100

Toyama Pref., Oiwa, Kamiichi-machi, Kaminiikawa-gun, (4) ; **Yamaguchi Pref.**, Omukaidake, Tokuyama City, (2) ; Kaneshita, Ato-cho, Abu-gun, (1) ; Yadomishitaoyobidani, Susa-cho, Asa-gun, (1).

R. maritimus

2n=40, 20 II

Hokkaido Pref., Shiranuka, Shiranuka-cho, Shiranuka-gun, (1).

2n=40

Hokkaido Pref., Shiranuka, Shiranuka-cho, Shiranuka-gun, (26).

R. nepalensis

2n=120, 60 II

Kyoto Pref., Nonaka-cho, Sakyo-ku, Kyoto City, (1).

2n=120

Kyoto Pref., Honmachi, Sakyo-ku, Kyoto City, (1) ; Kibune-cho, Sakyo-ku, Kyoto City, (68) ; Nonaka-cho, Sakyo-ku, Kyoto City, (16).

R. nipponicus

2n=40, 20 II

Kagawa Pref., Kawanishi-cho, Marugame City, (2).

2n=40

Kagawa Pref., Kawanishi-cho, Marugame City, (7).

R. obtusifolius

2n=40, 20 II

Toyama Pref., Gofuku, Toyama City, (1).

2n=40

Hokkaido Pref., Yayoi, Kushiro City, (2) ; Nishinijo, Obihiro City, (2) ; Tarumae, Tomakomai City, (2) ; Shintoku, Shintoku-cho, Kamikawa-gun, (2) ; Obira-cho, Rumoi-gun, (2) ; Bashukuru, Onbetsu-cho, Shiranuka-gun, (1) ; Koitoi, Shiranuka-cho, Shiranuka-gun, (1) ; Harutachi, Shizunai-cho, Shizunai-gun, (1) ; Urahoro, Urahoro-cho, Tokachi-gun, (2) ; **Akita Pref.**, Sunagobuchi, Kawabe-machi, Kawabe-gun, (1) ; Sugao, Ani-machi, Kitaakita-gun, (1) ; Takinosawa, Moriyosi-machi, Kitaakita-gun, (1) ; Sawanai, Kyowa-machi, Senboku-gun, (1) ; Tochinoki, Nishiki-mura, Senboku-gun, (1) ; Ashizawa, Nishisenboku-machi, Senboku-gun, (1) ; Maki, Ota-machi, Senboku-gun, (1) ; Hotokezawa, Senhata-machi, Senboku-gun, (1) ; **Niigata Pref.**, Oumi, Oumi-machi, Kubiki-gun, (3) ; **Toyama Pref.**, Ao, Himi City, (2) ; Sassaki, Himi City, (4) ; Ikuji, Kurobe City, (1) ; Kamikoizumi, Namerikawa City, (2) ; Minowa, Namerikawa City, (7) ; Besshodaki, Oyabe City, (3) ; Kamimakino, Takaoka City, (2) ; Ota, Takaoka City, (8) ; Iguridani, Tonami City, (3) ; Arisawa, Toyama City, (8) ; Gofuku, Toyama City, (42) ; Iwasekoshimachi, Toyama City, (2) ; Tabata, Toyama City, (2) ; Yokogoshi, Toyama City, (1) ; Inami, Inami-machi, Higashitonami-gun, (2) ; Komaki, Syogawa-machi, Higashitonami-gun, (2) ; Inokuchi, Inokuchi-mura, Higashitonami-gun, (4) ; Shimode, Taira-mura, Higashitonami-gun, (3) ; Abetto, Toga-mura, Higashitonami-gun, (1) ; Momosegawa, Toga-mura, Higashitonami-gun, (1) ; Kasuga, Osawano-machi, Kaminiikawa-gun, (2) ; Manganji, Osawano-machi, Kaminiikawa-gun, (2) ; Matsuno, Osawano-machi, Kaminiikawa-gun, (2) ; Arimine, Oyama-machi, Kaminiikawa-gun, (9) ; Omi, Oyama-machi, Kaminiikawa-gun, (9) ; Hirono, Kamiichi-machi, Nakaniikawa-gun, (1) ; Ashikuraji,Tateyama-machi, Nakaniikawa-gun, (14) ; Iwakuraji, Tateyama-machi, Nakaniikawa-gun, (3) ; Yokoe, Tateyama-machi, Nakaniikawa-gun, (3) ; Nagasawa, Fuchu-machi, Nei-gun, (2) ; Nirehara, Hosoiri-mura, Nei-gun, (4) ; Syozu, Yamada-mura, Nei-gun, (4) ; Fukatani, Yatsuo-machi, Nei-gun, (5) ; Kamisasahara, Yatsuo-machi, Nei-gun, (3) ; Koinami, Yatsuo-machi, Nei-gun, (2) ; Onagadani, Yatsuo-machi, Nei-gun, (2) ; Kawanishi, Fukumitsu-machi, Nishitonami-gun, (2) ; Hanao, Fukuoka-machi, Nishitonami-gun, (2) ; Shimooiko, Fukuoka-machi, Nishitonami-gun, (1) ; Funakawashin, Asahi-machi, Shimoniikawa-gun, (3) ; Miyazaki, Asahi-machi, Shimoniikawa-gun, (3) ; Douko, Nyuzen-machi, Shimoniikawa-gun, (2) ; **Shiga Pref.**, Ikadachi, Otsu City, (4) ; **Kyoto Pref.**, Keshiyama, Kamigamo, Kita-ku, Kyoto City, (11) ; Maeda-cho, Kamigamo, Kita-ku, Kyoto City, (9) ; Honmachi, Sakyo-ku, Kyoto City, (1) ; Kibune-cho, Sakyo-ku, Kyoto City, (13) ; Miyagawa-cho, Sakyo-ku, Kyoto City, (1) ; Nakaragi-cho, Sakyo-ku, Kyoto City, (2) ; Nonaka-cho, Sakyo-ku, Kyoto City, (9) ; Shizuhara-cho, Sakyo-ku, Kyoto City, (4) ; **Hyogo Pref.**, Anase, Shikama-ku, Himeji City, (2) ; Nishiwaki, Himeji City, (1) ; **Yamaguchi Pref.**, Okiubenohara, Ube City, Yamaguchi Pref. (1) ; Kaneshita, Ato-cho, Abu-gun, (1).

2n=60

Toyama Pref., Koinami, Yatsuo-machi, Nei-gun, (1).

R. pulcher

2n=20, 10 II

Kyoto Pref., Keshiyama, Kita-ku, Kyoto City, (1).

2n=20

Kyoto Pref., Keshiyama, Kita-ku, Kyoto City, (35).