Chromosome Numbers of Impatiens hypophylla var. hypophylla and var. microhypophylla

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Chromosome Numbers of *Impatiens hypophylla* var. *hypophylla* and var. *microhypophylla*

太川浩平[*,**]・荒木弘人[*]・牧雅之[*,***]：ハガクレツリフネソウとエンシュウツリフネソウの染色体数

The genus *Impatiens* includes over 600 species. Most of the species occur in India, Burma and Africa, and with a small number in southeast Asia, northern Asia, Europe and North America (Satake 1982). Chromosome numbers of about 190 of them have been reported and an aneuploid series of chromosome numbers has been ascertained in them, ranging from n=3 to n=33, of which n=7, 8 and 10 are most common (Winge 1925; Tischler 1935; Khoshoo 1957; Ishikawa 1960; Packer 1964; Lee 1967; Laane 1971; Arisumi 1973; Chinnappa and Gill 1974; Gill and Chinnappa 1977; Satake 1982; Shimizu 1984; Zinov'eva-Stahevitch and Grant 1984; Govindarajan and Subramanian 1986; Rao *et al.* 1986; Nishikawa 1990; Akiyama *et al.* 1992; Sugawara *et al.* 1994).

In Japan, three species and one variety of the genus *Impatiens* are known to occur, i.e., *I. noli-tangere* L., *I. textori* Miq., *I. hypophylla* Makino and *I. hypophylla* var. *microhypophylla* Hara (Satake 1982). We observed cytologically the latter two. The 2n = 20 chromosome numbers are reported here for the first time.

Materials and Methods

The plant materials for cytological observation were collected in 1995 and 1996 in 4 localities in Fukuoka and Oita Prefectures in Japan (Table 1). The root-tips were fixed in the filed. Pretreatment and fixation were made in the field; the root tips were soaked in 0.002 M 8-hydroxyquinoline at 20℃ for 3 h, fixed with 45 % acetic acid at 20℃ for 25-30 min, and then preserved in 70 % ethanol at 5℃ until use. The fixed root tips were macerated with 1 N HCl at 60℃ for 30 sec and stained in 2 % aceto-orcein solution for 15 h and then squashed on slide grasses. Voucher specimens are deposited in the herbarium of Kanazawa University, Japan (KANA).

Results and Discussion

All 22 plants of *I. hypophylla* collected in

Table 1. Chromosome numbers of *Impatiens hypophylla* var. *hypophylla* and var. *microhypophylla*

Taxon	Locality	No. of plants observed	Chromosome number (2n)
I. hypophylla var. *hypophylla*	Mt. Hikosan, Soeda-cho, Tagawa-gun, Fukuoka Pref.	11	20
	Nishiohara, Syonai-cho, Oita-gun, Oita Pref.	8	20
	Tano, Kokonoe-machi, Kusu-gun, Oita Pref.	3	20
I. hypophylla var. *microhypophylla*	Mt. Haneyama, Yamada, Kusu-machi, Kusu-gun, Oita Pref.	12	20

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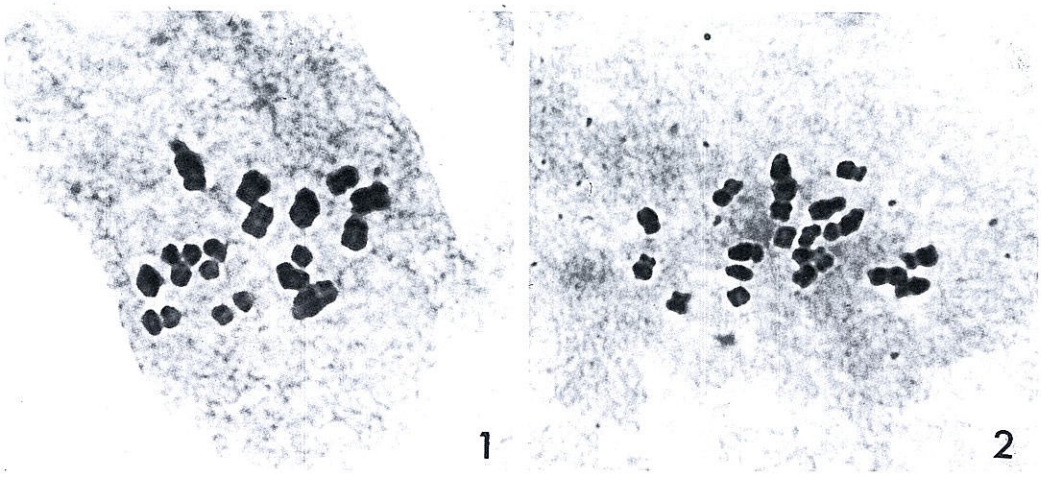
three different localities, Mt. Hikosan, Nishiohara and Tano, had the same chromosome number, 2 n = 20 (Table 1). The 2 n = 20 chromosome number were also observed in 12 plants of *I. hypophylla* var. *microhypophylla* from Mt. Haneyama (Table 1). These chromosome numbers, 2 n = 20, are equivalent to two other Japanese *Impatiens* examined previously, *I. textori* and *I. noli-tangere* (Ishikawa 1960; Nishikawa 1990).

The 20 chromosomes of var. *hypophylla* varied in size, 1.0–2.9 μm long. They were clearly distinguished into two groups of 5 pairs of comparatively large chromosomes (1.6–2.9 μm in length) and 5 pairs of small ones (1.0–1.2 μm in length) (Fig. 1). Thus, the karyotype is bimodal. One pair of the largest metacentric chromosomes (r=1.60) (cf. Levan *et al.* 1964) had a satellite on each long arm. The 10 pairs of chromosomes of var. *microhypophylla* were 1.1–2.6 μm long in size, with 5 pairs of chromosomes (1.6–2.6 μm in length) distinctly larger than the other 5 pairs (1.1–1.4 μm in length) (Fig. 2). Thus, the karyotype is bimodal. One pair of the largest metacentric (r=1.41) (cf. Levan *et al.* 1964) chromosomes were satellited on each long arm.

As far as analyzed previously in the genus *Impatiens*, most of the species are known to have monomodal karyotypes. More recently, of 27 species of *Impatiens* from central and east Nepal, southwest Yunnan of China and north Nyanza of Kenya, only 6 species were reported to have monomodal karyotypes and the remaining 21 species to have bimodal karyotypes (Oginuma and Tobe 1991; Akiyama *et al.* 1992; Sugawara *et al.* 1994). Except for a species, each of the species with bimodal karyotypes involves one pair of distinctly larger chromosomes than the others in spite of the chromosome numbers of 2 n=12, 16 or 18. An exception is found in *I. rubrostriata* with 2 n=20, of which the karyotype consists of 2 pairs of comparatively larger chromosomes and 8 pairs of small ones (cf. Sugawara *et al.* 1994). As described above, two varieties *hypophylla* and *microhypophylla* had similar bimodal karyotypes with the 5 large and the 5 small pairs of the chromosomes. This kind of bimodal karyotype is peculiar in the species of *Impatiens* examined so far, but very similar to those well known in a group of *Aloe*, *Gasteria* and *Haworthia* belonging to the Liliales, in which all species are 2 n=14 with 4 pairs of large chromosomes and 3 pairs of small chromosomes (cf. Stebbins 1971). The explanation of polyploid origin in the cases of *Aloe*, *Gasteria* and *Haworthia* may be applicable to the new bimodal karyotype of *Impatiens*, though it is not yet substantiated.



Figs. 1–2. Somatic chromosomes in root-tip cells of two Japanese *Impatiens*, ×1500. Note one pair of the largest chromosomes with a satellite. (1) *I. hypophylla* var. *hypophylla*, 2 n=20. (2) *I. hypophylla* var. *microhypophylla*, 2 n=20.

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摘　要

日本産ツリフネソウ属の1種1変種（ハガクレツリフネ，エンシュウツリフネソウ）の染色体数を，根端分裂細胞を用いて算定した。いずれにおいても体細胞染色体数は2n = 20であり，これはこれまでに調べられてきた日本産の他の2種（ツリフネソウ，キツリフネ）と同じ数である。ハガクレツリフネ，エンシュウツリフネソウともに5対の大きい染色体と5対の小さい染色体をもつ2相的な核型をもっていた。このようなタイプの2相的な核型は，少なくともこれまでに調べられてきたアジア産のツリフネソウ属植物の核型とはかなり異なるものである

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