Narumi NAKATO* & Kunio MITUI**: **Chromosome numbers of Japanese species in the genus *Plagiogyria***

中藤成実*・三井邦男**: 日本産キジノオシダ属の染色体数

The family Plagiogyriaceae is represented by the single genus *Plagiogyria* which is distributed disjunctively in south-eastern Asia and in tropical America (Copeland 1947). This family is considered to be rather primitive among leptosporangiate ferns because of some morphological characters, but its systematic position still remains uncertain.

There are several cytological studies on *Plagiogyria* and there is a great disagreement among the results obtained up to the present. Kurita (1963) reported n=ca 75, ca 100 and ca 125 in *P. matsumureana*, *P. japonica* and *P. euphlebia* respectively, and suggested that the basic chromosome number of this genus might be x=25. Tsai (1973) also observed n=75 in both *P. formosana* and *P. stenoptera*, and n=125 in *P. euphlebia*. Another result is represented by Walker (1966, 1973) who counted n=66 in both *P. semicordata* and *P. tuberculata*, and n=ca 132 in *P. glauca*. Furthermore, Mitui (1976) counted n=66±1 in *P. matsumureana*. The above mentioned discrepancy on the basic chromosome number of this genus has confused several workers who have been cytotaxonomically studying ferns.

To elucidate whether two kinds of basic chromosome numbers (one is x=25, another is x=66) actually exist in this genus, we reexamined chromosome numbers of three Japanese species.

Somatic chromosomes were observed in the cells of root tip treated in 0.002 M 8-hydroxyquinoline solution for 6 hr. The root tips were fixed in 45% acetic acid for 20 min., hydrolyzed in a mixture of 1 N HCl and 45% acetic acid (2:1) at 60°C for 5 min., and squashed on slides. Aceto-gentian violet was used for staining. Gametic chromosomes were observed in spore mother cells fixed in Newcomer fluid, and the usual aceto-carmine squash method was employed.

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Observations

1) *Plagiogyria matsumureana* Makino This species occurs in montane regions of Japan, ranging northward to Kuriles. Previously two different chromosome numbers were reported for this species, n=ca 75 (Kurita 1963) and n=66±1 (Mitui 1976). In the present study, the plants obtained from Tateyama, Toyama Pref. showed clearly 2n=130 in root tip cells (Fig. 1C), and another specimen from Michiyukizawa, Hinoemata, Fukushima Pref. had 2n=130 of somatic chromosome number and n=65 of gametic chromosome number (Fig. 1D).

In this species, chromosomes in one cell differ greatly in size, and the longest chromosome is approximately 3.4 μm and the shortest is 1.1 μm at mitotic metaphase.

2) *Plagiogyria euphlebia* (Kunze) Mett. This species is distributed in warm temperate regions in east Asia. The gametic chromosome numbers of this species was previously reported to be n=ca 75 by Kurita (1963) and n=75 by Tsai (1973). In the present study, two plants collected from Gifu-shi, Gifu Pref. and Kyoto-shi, Kyoto Pref. were found to have 2n=260 chromosome number (Fig. 1B). Furthermore, one specimen from Murasugi, Niigata Pref. showed approximately 130 bivalent chromosomes in meiosis (Fig. 1A). The length of the longest chromosome is 3.5 μm and the shortest is 1.1 μm at the mitotic metaphase.

3) *Plagiogyria japonica* Nakai This species occurs in warm temperate regions in east Asia. Kurita (1963) counted n=ca 100 for this species. In the present study, two plants from Kyoto-shi, Kyoto Pref. were found to be 2n=260 (Fig. 2A, B).

Discussion It becomes clear that there are two polyploids based on x=65 among Japanese species of *Plagiogyria*, namely *P. matsumureana* is considered as diploid (2n=130), *P. euphlebia* and *P. japonica* as tetraploid (2n=260). However, we did not find any chromosome numbers based on x=25, as reported by Kurita (1963) and Tsai (1973), in the present study. It is quite unnatural that the largely distant series of chromosome numbers, those based on x=25 and x=65, are present in the same species. As shown in Figs. 1 and 2, there are great differences in chromosome length in a cell. Especially, bivalent chromosomes differ greatly in size and shape, therefore it is not easy to count the chromosome numbers using only the meiotic features in this genus. Thus,

Fig. 1. A. Meiosis in *Plagiogyria euphlebia*, n=ca 130. B. Mitosis in *P. euphlebia*, 2n=260. C. Mitosis in *P. matsumureana*, 2n=130. D. Meiosis in *P. matsumureana*, n=65.

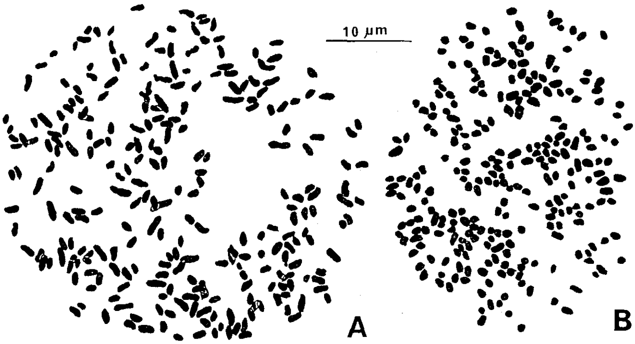

Fig. 2. A-B. Mitosis in *P. japonica* (collected in Kyoto), 2n=260.

the supposed basic number x=25 can be considered to be doubtful. Walker (1966, 1973) counted n=66 in two species, *P. semicordata* and *P. tuberculata*, and n=ca 132 in *P. glauca*, but he reserved to determine the basic number of this genus at that time, because the number 66 could be interpreted also as originating from such lower numbers as 33 or 22. Considering the present finding of x=65, it is likely that the number 66 reported by Walker is really one of the basic chromosome number of this genus. Therefore, it may be concluded that the genus *Plagiogyria* has two different basic numbers, x=65 and 66.

Bower (1926) first established the family Plagiogyriaceae including the sole genus *Plagiogyria*, and suspected that this family had some relations to Osmundaceae or Schizaeaceae. The view that Plagiogyriaceae is related downwards to Osmundaceae was retained by later pteridologists such as Holttum (1949, 1973), Mehra (1961), Nayar (1970), and others. Walker (1973) stated from his counted chromosome number n=66 that if the basic chromosome number is 66, *Plagiogyria* falls within the cyatheaceous range; if it is 33, within the blechnoid one; or if it is 22, in the osmundaceous one. As mentioned above, we now consider that the basic chromosome numbers are x=65 and 66 in this family. These numbers are included in the range of basic chromosome numbers of Cyatheaceae (x=56, 58, 65-70), but distinctly differ from those of Blechnaceae (x=28, 29, 31-37, 40), Osmundaceae (x=22) or Schizaeaceae (x=28-30, 38) (Lovis 1977). Therefore, Plagiogyriaceae may be considered to be related to Cyatheaceae at least on the basis of chromosome number. Though the systematic position of this family is still questionable, high basic chromosome number and great differences of chromosome size in a cell seem to indicate that the origin of this family is ancient and the chromosome constitutions of this family are heterogenous.

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キジノオシダ属の3種，キジノオシダ，オオキジノオシダ，ヤマソテツの染色体を観察した。その結果，キジノオシダは 2n=260, オオキジノオシダは 2n=260, n=ca 130, ヤマソテツは 2n=130, n=65 であることが明らかになった。これまで，この属の染色体基本数として日本産の 種類を基にして， x=25 が報告されているが，今回の調査で扱った種類は3種とも同じものであるのにかかわらず大きく違っていた。しかし， x=25 は減数分裂時のみの観察に基づくものであるが，今回の報告は体細胞分裂と減数分裂の両方を用いたものである。この属の外国産の種類では n=66 と n=ca 132 が報告されているので，キジノオシダ属の染色体基本数として，x=65 と x=66の2種類があるものと考えられる。

○日本産ヒメハナワラビ属の分布について（佐橋紀男） Norio SAHASHI: Distribution of *Botrychium* s. str. in Japan

日本および近隣産ヒメハナワラビ属の分布については西田の報告（植物分類地理 **18**: 39-43, 1959）があるが，筆者は今回これまでの調査結果を基にして日本産ヒメハナワラビ属の分布図を新たに作製した（Fig. 1).

日本には次の3種1亜種が認められる。