

Karyomorphological Observation in *Empodium namaquensis*, Hypoxidaceae*

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ギンバイザサ科、エンポデイウム ナマクエンシスにおける核形態学的観察*

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Introduction

Empodium Salisb. is a perennial herb in the family Hypoxidaceae, and about ten species are distributed in southern Africa (Plessis and Duncan 1989). Family Hypoxidaceae includes seven genera and has an area of distribution mainly in the tropics, scattered from almost all the parts of Southern Hemisphere (except Antarctic) up to the southern parts of Japan for the northern limit. Studies on the chromosome of Hypoxidaceae had been done in 19 species of three genera and those studies reported the chromosome number of $2n = 12, 14, 18, 22, 28, 36, 42, 44, 54, 62, 72, 76, 96, 114,$ and $40\sim 200$ (e.g., Naranjo 1975, Svendsen 1925, Sato 1942, Tjio 1948, Sharma and Bhattacharyya 1960, Fernandes and Neves 1962, Beuzenberg and Hair 1963, Mitra 1966, Wisenach 1967, Wisenach and Warren 1967, Mehra and Sachdeva 1976, Löve and Löve 1981, Nordal *et al.* 1985). However, there have been no reports on the chromosome of genus *Empodium* yet. We, therefore, would like to report here on the chromosome of *Empodium namaquensis* (Bak.) M. F. Thompson.

Material and methods

The plants used for the observation were introduced from a nursery located in Saitama Pref., Japan.

Somatic chromosomes were observed in growing root tips by the aceto-orcein squash method as in Hamatani *et al.* (1998).

The results of the observations on the resting nuclei and somatic prophase chromosomes were classified according to Tanaka (1980) and those on mitotic metaphase chromosomes by centromeric position to Levan *et al.* (1964).

Results and observations

The results of the observations on chromosome were described in Fig. 1 and Table 1.

According to the observation, the chromosome number of *Empodium namaquensis* was $2n = 14$ at mitotic metaphase, which was apparently the first report on the chromosome of this species.

The states of chromosomes of each stage were as follows:

The chromosomes in the resting stage had large stained chromocenters formed by the aggregation of the heteropycnotic bodies (Fig. 1-B). Thus, the chromosome feature in the resting stage was regarded as a simple chromocenter type.

As for the $2n = 14$ chromosomes at mitotic prophase, some had no early condensed segments and were evenly stained (Fig. 1-C). Others had early condensed segments centered around each constriction with gradually delayed condense for distal part of the chromosomes. Thus the chromosome feature at mitotic prophase was regarded as intermediate type of continuous type and gradual type.

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The $2n = 14$ chromosome set at mitotic metaphase showed a gradual degradation in length from the longest ($7.8\mu\text{m}$) to the shortest ($3.7\mu\text{m}$) (Fig. 1D, E, Table 1). Among the 14 chromosomes of complement, one (No. 2) was median sensu stricto (M) with arm ratio 1.0, five (Nos. 1, 3-6) were median region (m) with arm ratios varying between 1.1 and 1.6, and eight (Nos. 7-14) were submedian centromeric (sm) with arm ratios varying between 1.9 and 2.5. Thus the karyotype was classified as symmetric due to arm ratio. Two chromosomes (Nos. 1, 2) had secondary constrictions at their short arms.

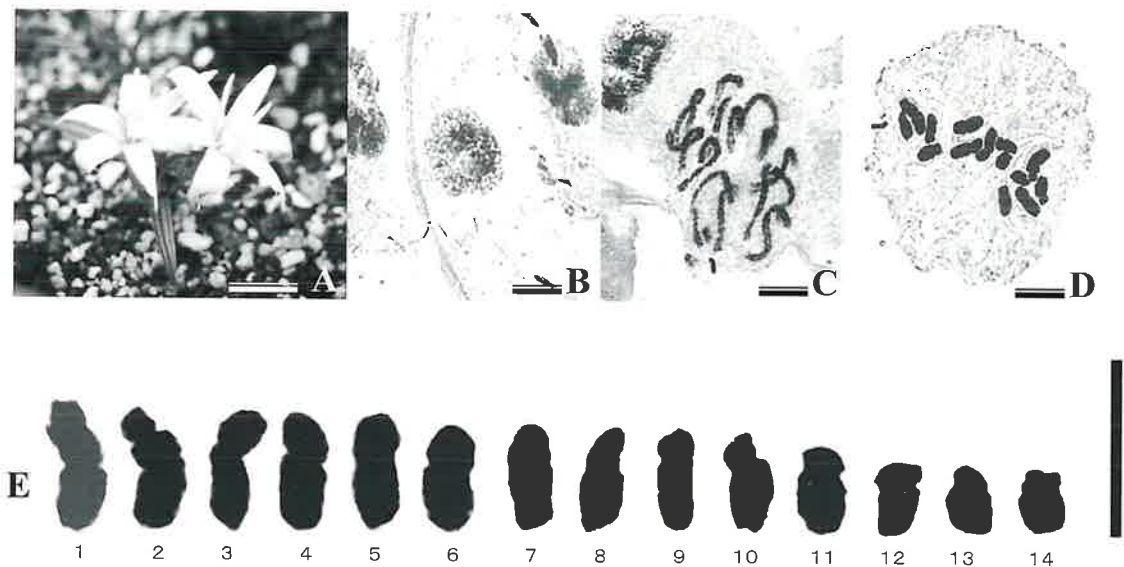


Fig. 1. *Empodium namaquensis*, $2n=14$. A, flowers. B, chromosomes at resting stage. C, chromosomes at mitotic prophase. D and E, chromosomes at mitotic metaphase. Bars indicate 10mm in A and $10\mu\text{m}$ in B-E.

Summary

Empodium namaquensis was karyomorphologically investigated. The chromosome number was counted to be $2n = 14$, which was the first report for this species. At the resting stage, karyotype was observed as simple chromocenter type. At mitotic prophase, it was regarded as intermediate type of continuous type and gradual type. Karyotype at mitotic metaphase, it was regarded as gradual due to chromosome length and symmetric due to arm ratio.

Table 1. Measurements of somatic chromosomes of *Empodium namaquensis* at mitotic metaphase, $2n=14$

Chromosome	Length (μm)						Relative length	Arm ratio	Form	
1	1.1	+	2.6	+	4.1	=	7.8 *	9.4	1.1	m
2	1.5	+	2.2	+	3.7	=	7.4 *	8.9	1.0	M
3			2.6	+	4.1	=	6.7	8.0	1.6	m
4			2.6	+	4.1	=	6.7	8.0	1.6	m
5			2.8	+	3.9	=	6.7	8.0	1.4	m
6			2.6	+	3.9	=	6.5	7.8	1.5	m
7			2.1	+	4.3	=	6.4	7.7	2.0	sm
8			2.1	+	4.3	=	6.4	7.7	2.0	sm
9			1.9	+	4.1	=	6.0	7.2	2.2	sm
10			1.9	+	4.1	=	6.0	7.2	2.2	sm
11			1.5	+	3.3	=	4.8	5.8	2.2	sm
12			1.5	+	3.0	=	4.5	5.4	2.0	sm
13			1.1	+	2.6	=	3.7	4.4	2.4	sm
14			1.1	+	2.6	=	3.7	4.4	2.4	sm

*chromosome with secondary constriction

摘要

ギンバイザサ科エンポディウム・ナマクエンシスにおいて核形態学的観察を行った。本種は染色体数 $2n=14$ を算定し、初の報告であった。静止期において単純染色中央粒型を、体細胞分裂前期において連続型と勾配型の間中型を示した。体細胞分裂中期の核型は、染色体長に関し勾配的で、腕比に関して対称的であった。

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