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Cytological Notes on Three Species of Japanese Corallinoideae (Corallinales, Rhodophyta)

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Abstract Cytological aspects at first meiotic division and chromosome number in tetrasporangia were studied in three species of the Corallinoideae in Japan. The chromosome number n = ca 30 was the same of in *Bossiella cretacea* (Postles et Ruprecht) Johansen, *Corallina pilulifera* Postles et Ruprecht and *Calliarthron yessoense* (Yendo) Manza. The significance of chromosome number as a taxonomic character is discussed.

Key words : Chromosome number, *Bossiella, Calliarthron, Corallina*, Corallinoideae.

Until now cytological studies have been relatively few in the Corallinaceae (Corallinales, Rhodophyta) (Davis, 1898 ; Westbrook, 1935 ; Suneson, 1945, 1950 ; Magne, 1964 ; Cabioch, 1971 ; Johansen, 1981), especially in the subfamily Corallinoideae. Though cytological studies have supplied valuable data to advance understanding of the relationships among the genera and species based on their morphology, the chromosome number in Corallinoideae has been showned in only four species, and the haploid number was n=24 (Yamanouchi, 1921 ; Suneson, 1937 ; Magne, 1964 or n = ca 24 (Segawa, 1941).

This paper presents cytological data obtained for the tetrasporangia of three species of Corallinoideae from Japan, *Bossiella cretacea, Corallina pilulifera* and *Calliarthron yessoense*, and the haploid chromosome number is compared with previous records and discussed with respect to the relationships among the taxa.

Materials and methods

The materials used were the tetrasporophytes of *Calliarthron yessoense* (Yendo) Manza, *Corallina pilulifera* Postles et Ruprecht collected at Hakodate, Hokkaido, on 9 December 1988, and *Bossiella cretacea* (Postles et Ruprecht) Johansen collected at Usujiri, Hokkaido on 20 May 1988. After collection, materials kept in an ice-box were brought to the laboratory, and the mature thalli selected were immediately fixed with acetic alcohol (1 : 3). They were then preserved in Pérényi's solution for 6-12 h for decalcification. Before staining, thalli were immersed in 45% acetic acid for 5 min to enhance their stainability. Staining was done with acetoiron-haematoxylin-chloral hydrate solution (Wittmann, 1964) before making squash preparations.

The specimens examined are deposited in the herbarium of the Natural History Museum and Institute, Chiba (CBM).

Results and discussion

Observations were made at the first meiotic division in the tetrasporangia of *Bossiella cretacea, Corallina pilulifera* and *Calliarthron yessoense*. In each species, resting nuclei were spherical in shape, with a minute nucleolus in the central portion and no chromocentre. The size of the nucleolus in the resting nucleus at meitosis I is larger in *Corallina pilulifera* than *Bossiella cretacea* and *Calliarthron yessoense*.

The chromosome numbers obtained in the present study are given in Table 1 with previous records and shown in Figs. 1-a-3-b. In all three species treated here, the chromosome numbers was n = ca 30 which differs from the previous records of n = 24 for *Corallina elongata* Ellis et Solander (Yamanouchi, 1921), *Corallina officinalis* Linnaeus (Suneson, 1937), *Jania rubens* (Linnaeus) Lamouroux (Suneson, 1937), and n = ca 24 from *Marginisporum aberrans* (Yendo) Johansen et Chihara (Segawa, 1941).

The difference in chromosome number between *Corallina officinalis* (n = 24) (Suneson, 1937) and *Corallina pilulifera* (n = ca 30) (Figs. 2a and 2b) may indicate that the number is a useful character to separate these species in genus *Corallina*, which is reported three species in Japan, *Corallina officinalis, Corallina pilulifera* and *Corallina van-*

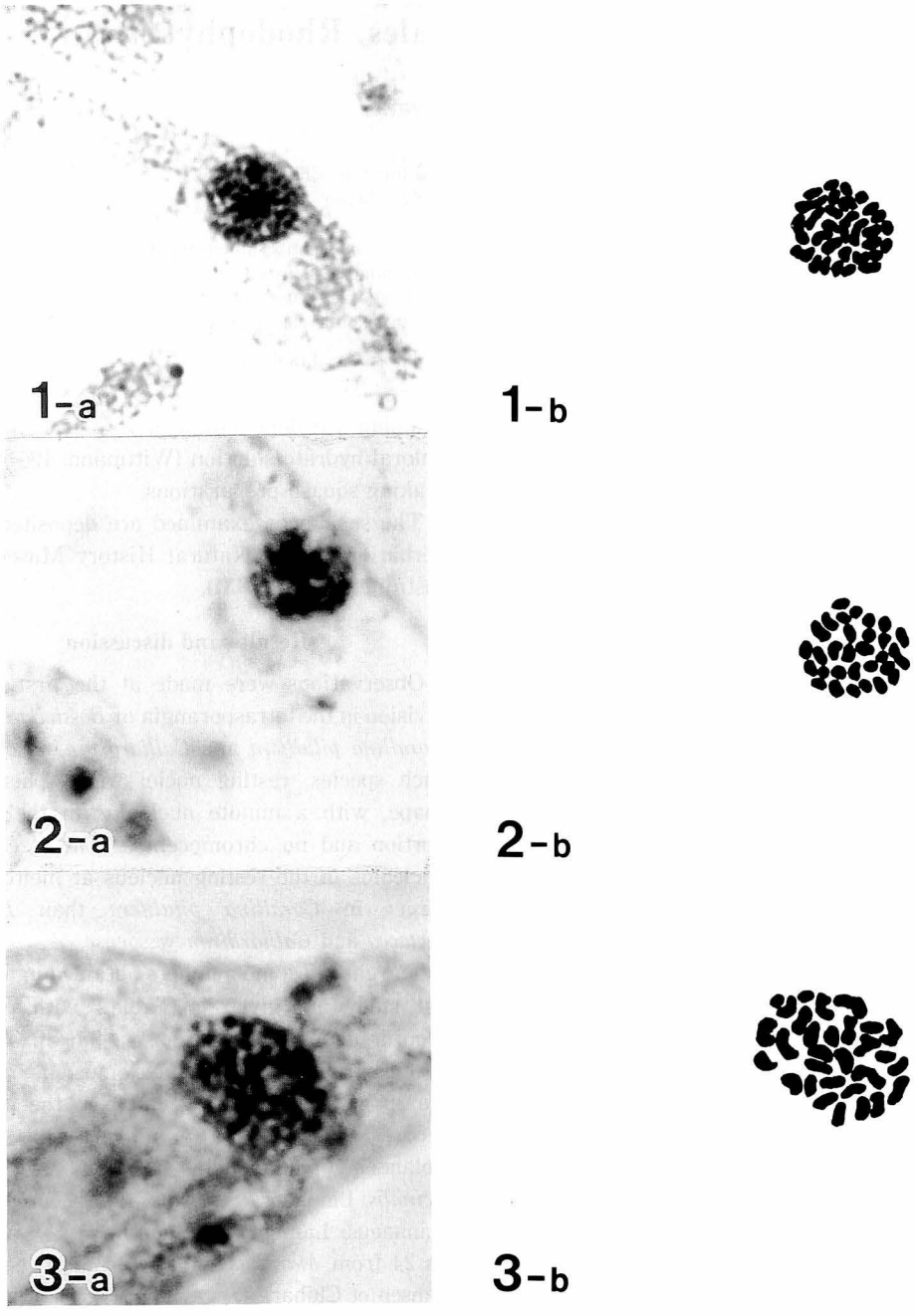

Fig. 1-a–3-b. Meiosis in tetrasporangia of *Bossiella cretacea* (Postles et Ruprecht), *Corallina pilulifera* Postles et Ruprecht and *Calliarthron yessoense* (Yendo) Manza. 1-a & 1-b. Early metaphase I squash and its drawing of *Bossiella cretacea* (n = ca 30). 2-a & 2-b. Early metaphase I squash and its drawing of *Corallina pilulifera* (n = ca 30). 3-a & 3-b. Early metaphase I squash and its drawing of *Calliarthron yessoense* (n = ca 30). Magnification: Figs. 1-a×12,000, 2-a×15,000, 3-a×18,000.

couveriensis Yendo (Baba, 1988). Japanese species of *Corallina* have been segregated morphologically by intergenicular size and form and the position and form of the conceptacles (Yendo, 1902; Okamura, 1936), and by the medullary cell length and number of tiers of medullary cells per intergeniculum (Baba, 1988), but these morphological characteristics were unstable in culture (Masaki et al, 1981). Furthermore, ecologically *Corallina officinalis, Corallina pilulifera* and *Corallina vancouveriensis* are sympatric species, exactly these species are dominant in the lower intertidal and mid-intertidal pools at the southern Hokkaido collection sites. In the phytogeographycal distribution, *Corallina pilulifera* is restricted to Japan and its vicinity, the Pacific coast of central and south America and Hong Kong. On the other hand, *Corallina officinalis* is cosmopolitan.

Bossiella cretacea (n = ca 30) (Figs. 1a and 1b) and *Calliarthron yessoense* (n = ca 30) (Figs. 3a and 3b) are distinct from *Jania rubens* (n = 24) and *Marginisporum aberrans* (n = ca 24) in their haploid chromosome number.

These results suggest that chromosome number is available as a taxonomic character for segregating species and genera in the Corallinoideae. Thus it seems to be necessary to study more species of Corallinoideae cytologically, especially with respect to their chromosome number.

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Table 1. Chromosome number of species examined in Corallinoideae.

Species	Chromosome number	Ref.
Bossiella cretacea	n = ca 30 * (25)	present study
Corallina pilulifera	n = ca 30 * (30)	present study
Calliarthron yessoense	n = ca 30 * (21)	present study
Corallina elongata (as *Corallina officinalis* var. *mediterranea*)	n = 24; 2n = 48	Yamanouchi, 1921
Corallina officinalis	n = 24	Suneson, 1937
	2n = 48	Magne, 1964
Jania rubens (as *Corallina rubens*)	n = 24	Suneson, 1937
Marginisporum aberrans (as *Amphiroa aberrans*)	n = ca 24	Segawa, 1941

* Number of cells observed

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日本産サンゴモ亜科（サンゴモ目，紅藻）3種の細胞学的観察

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日本産サンゴモ亜科（サンゴモ目，紅藻）3種，イソキリ（*Bosiella cretaceae*），ピリヒバ（*Corallina pilulifera*），エゾシコロ（*Calliarthron yessoense*）について4分胞子形成過程の第一回減数分裂を観察した．染色体数は3種ともにn = ca 30であり，染色体数が分類形質となりうることが示唆された．