

A Karyological Study on the Tetrasporophytes of *Janczewskia morimotoi* Tokida (Ceramiales, Rhodophyta)

Hajime YASUI and Ryuta TERADA

Laboratory of Marine Botany, Faculty of Fisheries, Hokkaido University,
3-1-1 Minatomachi, Hakodate, Hokkaido 041, JAPAN

(Received on February 22, 1993)

Janczewskia morimotoi Tokida, a parasitic red alga growing on the thallus of *Laurencia nipponica* Yamada, was karyologically studied for the first time. The chromosome number was revealed to be $2n=58$ at the late prophase in the somatic cells of tetrasporophytes and $n=29$ at the diakinesis or prometaphase-I in the young tetrasporangia. The 29 bivalents were observed in the range from $1.3 \mu\text{m}$ to $2.7 \mu\text{m}$ in length and were either ring or bacillar shaped in configuration.

Introduction

The parasitic red alga, *Janczewskia morimotoi* Tokida growing on the thallus of *Laurencia nipponica* Yamada is known to distribute in Kaiba Island of southern Saghalien (Tokida 1947, 1954), on the coast of southern Hokkaido, Japan (Tokida 1954, Saito 1971, Nonomura 1979) and the east coast of Korea (Kang 1966). The other species, *J. Tokidae* growing on the same host was described by Saito (1971) on the basis of the specimens from Kinaoshi, Minamikayabe. However, later Saito (1993) regarded it to be a large and young thallus of *J. morimotoi* occurred in early summer and to be a taxonomic synonym of the latter. Cytological studies on the members of *Janczewskia*, hitherto, have been carried out by a few investigators. Kugrens and West (1972) observed the synaptonemal complexes in the tetrasporangia of *J. gardneri*. More recently, Nonomura (1979) reported the details of early development of *J. morimotoi* on the host. However, neither chromosome number nor karyomorphological features of this genus has been examined.

The present paper reports the chromosome number of *J. morimotoi* together with the configurations of meiotic chromosome in its tetrasporophyte.

Materials and Methods

Twenty mature tetrasporophytes of *J. morimotoi* (Fig. 1) on *L. nipponica* were collected from Cape Tachimachi in Hakodate and Kinaoshi in Minamikayabe (containing four specimens with typical shape of *J. Tokidae*), Hokkaido, Japan during the months of June and July, 1992. All the specimens were immediately brought to the laboratory of the Faculty of Fisheries, Hokkaido University, and kept at $5-9^{\circ}\text{C}$ under dark conditions for 10–34 hours and then fixed using ethyl alcohol-acetic acid mixture (volume ratio 3:1) at room temperature. The materials were stained and squashed with aceto-iron-haematoxylin-chloral hydrate solution (Wittmann 1965).

Results and Discussion

The chromosome count was $2n=58$ at the late

prophase in the somatic cells of the tetrasporophytes of *Janczewskia morimotoi* from Cape Tachimachi (Figs. 2, 2') and $n=29$ at the late prophase-I or prometaphase-I in the tetrasporangia of both samples from Cape Tachimachi (Figs. 3, 3', 5) and Kinaoshi (Figs. 4, 4'). At late diakinesis, these bivalent chromosomes varied in length from $1.3\ \mu\text{m}$ to $2.7\ \mu\text{m}$ showing a gradual change, and the total length of the 29 chromosomes in the complement was ca. $51.9\ \mu\text{m}$ (Fig. 6). The bivalents were observed to be ring-shaped for Nos. 2, 5–13, 16–20, 22, 23, 25–27 and 29 and bacillar shaped for the others (Fig. 6). The ring-shaped bivalents were more in number than the bacillar shaped bivalents. The average chiasmata per bivalent were ca. 1.76 in this alga. There was no difference in the chromosome number and the configuration of chromosomes between the specimens of typical *J. morimotoi* and those of *J. tokidai*. This result supports Saito's view that *J. tokidai* is synonymous with *J. morimotoi*.

A close relationship between the host, *Laurencia nipponica*, and the parasites, *J. morimotoi* and *J. tokidai*, was considered by Tokida (1947), Saito (1971), Saito et al. (1977) and Nonomura (1979) on the basis of their morphological and developmental characteristics. However, the chromosome number of

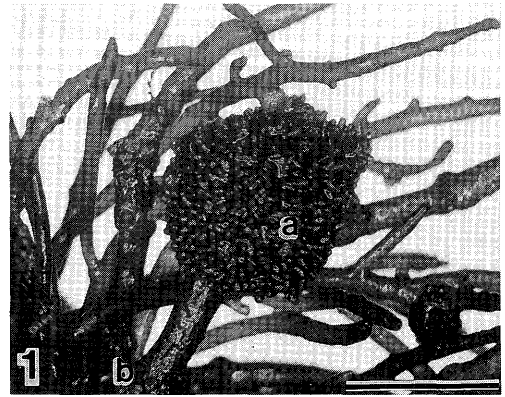
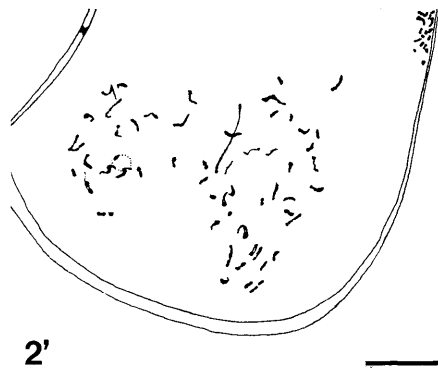
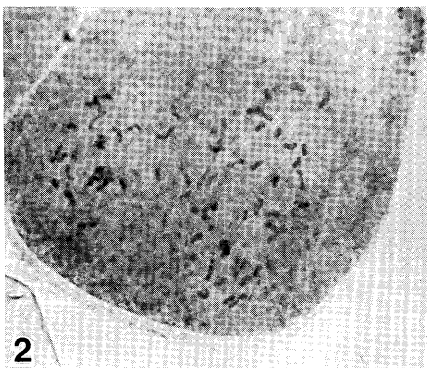
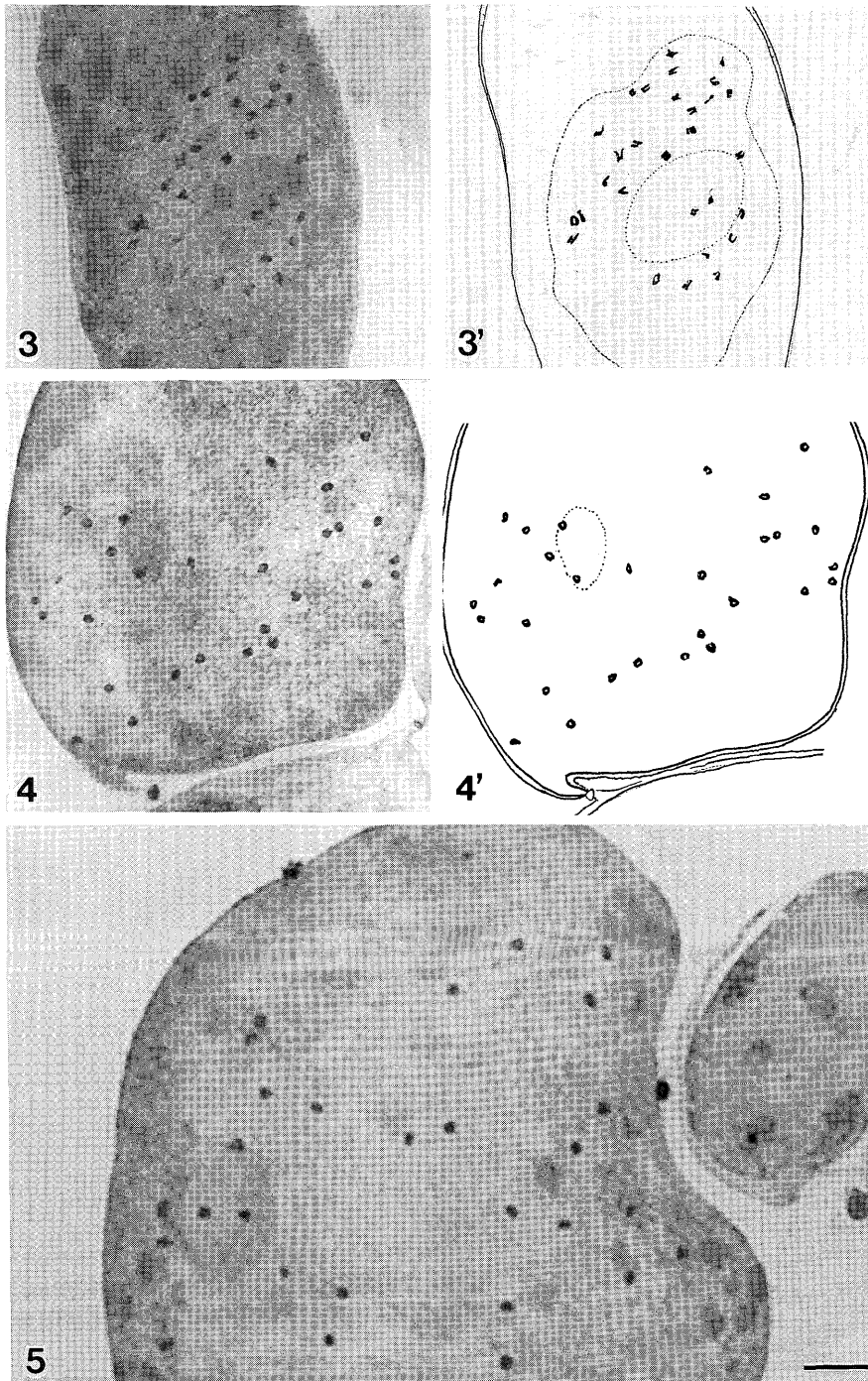


Fig. 1. A specimen of *Janczewskia morimotoi* Tokida (a) growing on the thallus of *Laurencia nipponica* Yamada (b). Scale = 1cm.

J. morimotoi is, as described above, $n=29$ (Fig. 6), while that of *L. nipponica* from the vicinity of Hakodate is $n=28$ (Yabu 1978). Moreover, in the tetrasporangia of *L. nipponica*, the minute chromosomes have been recognized (Yabu 1978), but they could not be found in *J. morimotoi*. Further karyomorphological studies must be made on *L. nipponica* and the other species of *Janczewskia* together with their host species of *Laurencia* to find out a clue for understanding their phylogenetic interrelationships between the host and the parasite.



Figs. 2, 2'. Late prophase chromosomes in the somatic cells of the tetrasporophytes of *Janczewskia morimotoi* Tokida. Fig. 2'. Diagrammatic illustration of Fig. 2. Scale = $10\ \mu\text{m}$.



Figs. 3-5. Meiotic chromosomes in the young tetrasporangia of *Janczewskia morimotoi* Tokida. 3. Early diakinesis. 3'. Diagrammatic illustration of Fig. 3. 4, 5. Late diakinesis. 4'. Diagrammatic illustration of Fig. 4. Scale = 10 μ m.



Fig. 6. Alignment of the bivalent chromosomes of Fig. 5. Scale = 1 μ m.

References

- Kang J. W. 1966. On the geographical distribution of marine algae in Korea. Bull. Pusan Fish. Coll. **7**: 1-125.
- Kugrens P. and West J. A. 1972. Synaptonemal complexes in red algae. J. Phycol. **8**: 187-191.
- Nonomura A. M. 1979. Development of *Janczewskia morimotoi* (Ceramiales) on its host *Laurencia nipponica* (Ceramiales, Rhodophyceae). J. Phycol. **15**: 154-162.
- Saito Y. 1971. Two species of *Janczewskia* from Japan and their systematic relationships. Proc. Internat. Seaweed symposium, **7**: 146-149.
- 1993. *Janczewskia tokidaei* is a young and large frond of *J. morimotoi*. Jpn. J. Phycol. **41**: 275-276.
- Saito Y., Yoneta T. and Yoshikawa, M. 1977. The relationship of parasite and host in red algae, *Janczewskia tokidaei* and *Laurencia nipponica*. Bull. Jap. Soc. Phycol. **25** (suppl.): 311-317.
- Tokida J. 1947. Notes on some new or little known marine algae. (1). J. Jap. Bot. **21**: 127-130.
- Tokida J. 1954. Marine algae of Southern Saghalien. Mem. Fish. Hokkaido Univ. **2**: 1-264.
- Wittmann W. 1965. Aceto-iron-haematoxylin-chloral hydrate for chromosome staining. Stain Tech. **40**: 161-164.
- Yabu H. 1978. Nuclear divisions in *Laurencia nipponica* Yamada. Jap. J. Phycol. **26**: 35-39.

安井 肇, 寺田竜太: モリモトソゾマクラの四分胞子体に於ける核学的研究

晩春から夏にかけて、北海道函館市の立待岬と南茅部町木直の岩礁に繁茂しているウラボシ *Laurencia nipponica* の体上に寄生する紅藻モリモトソゾマクラ *Janczewskia morimotoi* の四分胞子体について核学的観察を行った。本種の染色体数は、両地点の材料共に四分胞子体内の第一減数分

裂で明瞭に $n=29$ 、立待岬から得た材料の体細胞分裂で $2n=58$ と算定された。第一減数分裂の移動期末に認められた二価染色体は、大きさが $1.3 \mu\text{m}$ から $2.7 \mu\text{m}$ までの範囲で、漸变的に短くなっており、第 2, 5-13, 16-20, 22, 23, 25-27 及び 29 番目のものは環状を、残りのものは桿状を呈した。