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P. Ampili, M. V. N. Panikkar and V. D. Chauhan: Studies on spore germination and early growth in *Sarconema filiforme* (Sonder) Kylin (Rhodophyta, Gigartinales)

Key Index Words: *Gigartinales*—Sarconema filiforme—*spore germination.*
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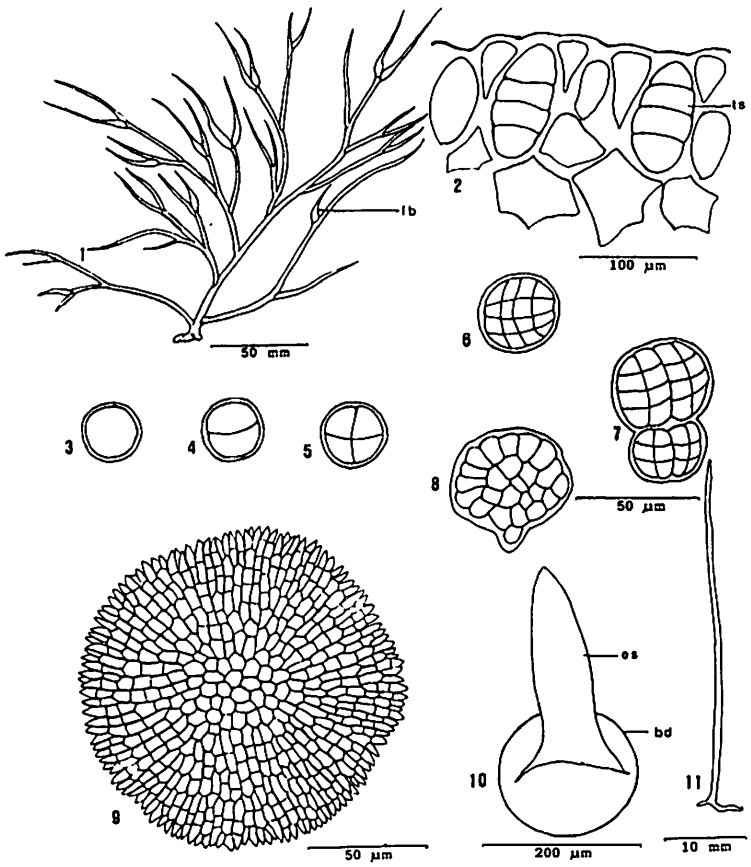
Sarconema filiforme (Sonder) Kylin belongs to the family Solieriaceae in the order Gigartinales. It is a tropical carrageenophyte found extensively on the coast of Red Sea (Ethiopia and Somalia), Indian Ocean, coasts of Africa (Kenya, Tanzania, Mozambique and Zanzibar), Arabian Sea (Karachi, Bombay and Cape Comerin) and also on the coasts of Australia (Bφrgesen 1937, 1938, Papenfuss and Edelstein 1977). From the order Gigartinales, spore germination has been studied in a number of species like *Chondrus crispus* (Darbishire 1902, Kylin 1917, Rosenvinge 1931, Chemin 1937, Burns and Mathieson 1972, Tveter and Mathieson 1976), *Gracilaria foliifera* (McLachlan and Edelstein 1977), *G. verrucosa* (Jones 1956, Oza and Krishnamurthy 1967), *Gigartina stellata* (Chen *et al.* 1974), *Hypnea musciformis* (Mshigeni and Lorri 1977).

In this paper we describe the spore germination pattern and early growth of *Sarconema filiforme* from Indian waters.

Tetrasporophytic plants of *Sarconema filiforme* was collected at Porbander on the western coast of India on December 12, 1982. The tetrasporangia were found in the swollen areas of the branchlets (Fig. 1). The pattern of division of the tetrasporangia was zonate (Fig. 2).

The plants collected were carried to the laboratory in seawater and kept overnight at 20°C. The fertile branches were excised and washed several times with sterilized seawater. The fertile pieces were spread over glass slides in Pertri dishes (10 cm diam.) containing 50 m*l* of sterilized seawater. The culture dishes were then placed in a constant temperature of 20±2°C with a light intensity of 1500 lux provided by fluorescent tubes and a photoregime of 14:$\overline{10}$ hours. Spore liberation occurred overnight and the spores settled onto glass slides. Following tetraspore liberation, the fertile pieces were removed and the glass slides were washed with a jet of sterilized seawater and placed into Petri dishes containing 50 m*l* of PES medium (Provasoli 1968). The medium was renewed at 2 day intervals for a week and thereafter at 7 day intervals. After attaining a length of 5 mm, the sporelings were detached from the slides and kept in crystallizing dishes (8 cm × 12 cm) containing 100 m*l* medium and unialgal cultures were maintained.

Tetraspore liberation was observed after 8–10 hr of incubation. The liberated spores were firmly attached to the glass slides by a sticky secretion. They are spherical and light-yellow in colour with a diameter of 16.5–22.5 μm (Fig. 3). They started germination without a resting period and the first division resulted in the formation of two cells of equal size (Fig. 4). On the second day a subsequent division occurred at right angles to the first, produced a four-celled sporeling (Fig. 5) and it turned reddish due to the development of more pigmentation. Further divisions produced a 16-32 celled sporeling with a diameter of 26.5-30.0 μm (Fig. 6). Some of its peripheral cells produced rhizoid like structures for firm attachment (Fig. 8). Additional divisions occurred in the peripheral cells and an expanded disc-like structure was formed with a diameter of 125-150 μm. The



Figs. 1–11. *Sarconema filiforme*. 1. A tetrasporic plant. 2. A part of the section of fertile branchlet. 3. Liberated tetraspore. 4. One-day old sporeling. 5. Two-day old sporeling. 6. Four-day old sporeling. 7. Two coalesced sporelings. 8. Sporeling with rhizoidal outgrowth. 9. Disc-like sporeling. 10. Fourteen-day old sporeling. 11. Forty-two-day old sporeling. bd, basal disc; es, erect shoot; fb, fertile branch; ts, tetrasporangium. Scale is common for all Figures 3–8.

central cells of the disc were oval or spherical in shape, while the peripheral cells were cylindrical with acute apices. From the central cells, a conical apex of the cylindrical shoot was produced. Within two weeks, an erect cylindrical shoot was produced with a group of apical cells (Fig. 10). The basal disc expanded as a circular holdfast for the developing shoot. The young upright shoot was terete and unbranched. Within 6 weeks of incubation the sporelings reached a length of 45 ± 5 mm (Fig. 11).

After 4 days of incubation the sporelings exhibited coalescence, resulting in the fusion of two or more sporelings and they were bounded by a common layer (Fig. 7).

The general pattern of spore germination of *Sarconema filiforme* was similar to that of the other members of the order Gigartinales. As in *Gracilaria verrucosa* (Oza and Krishnamurthy 1967), the tetraspore of *S. filiforme*, after repeated divisions, resulted a multicellular mass which produced rhizoids from the peripheral cells for firm attachment. A multicellular disc with radiating cells was observed which also gives a firm support for the developing shoot. Similar structure has also been observed in *Gracilaria* sp. (Bird *et al.* 1977) and *Chondrus crispus* (Tveter and Matheison 1976). In *S. filiforme* the disc was more conspicuous, radiating from a common centre with a large number of smaller cells. It seems

that coalescence of the sporelings is a common feature found during the germination of both carpospores and tetraspores in red algae (Jones 1956). The fusion of the developing sporelings of the intertidal algae may help in attaching them to the substratum in spite of mechanical disturbances.

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P. Ampili*·M. V. N. Panikkar·V. D. Chauhan*:** ***Sarconema filiforme*** **（紅藻スギノリ目）の胞子発芽と初期成長**

Sarconema filiforme はミリン科に属し、熱帯産のカラゲーナン原藻である。本報では、インド西岸の Porbander で採集した四分胞子体から四分胞子を採り、その発芽パターンと初期成長を観察した結果をまとめた。(*Marine Algae Discipline, Central Salt and Marine Chemicals Research Institute, Bhavnagar-364 002, Gujarat, India, **Department of Botany, S. N. College, Quilon-691 001, Kerala, India)