

Sarcinastrum urosporae, a Colourless Parasitic Blue-green Alga

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Abstract

A description is given of Danish material of *Sarcinastrum urosporae* LAGERHEIM, previously recorded only from the type locality in Norway. This colourless parasite was found on *Urospora penicilliformis*, causing gall-like swellings. The Danish material has been compared with a later American find on a species of *Ulothrix*.

Sarcinastrum is thought to be an apochlorotic blue-green alga, belonging to the order Pleurocapsales, family Scopulonemataceae.

Introduction

Under the name *Sarcinastrum urosporae*, LAGERHEIM (1900) described an organism which grew on *Urospora penicilliformis* (ROTH) ARESCHOU, causing gall-like swellings. LAGERHEIM discussed the taxonomic relationships of *Sarcinastrum*: as a bacterium he would place it close to *Sarcina* or to the filamentous bacteria, but if a blue-green alga near *Pleurocapsa*. In a foot-note under the description of *Pleurocapsa amethystea*, SCHMIDT (1903) drew attention to LAGERHEIM's organism, believing it to be a colourless parasitic or saprophytic species of *Pleurocapsa*. SCHMIDT did not see *Pleurocapsa* giving rise to galls, but at the most a deepening in the cell wall of the host.

Since LAGERHEIM described *Sarcinastrum* from Dröbak, Norway, nobody has reported it. In more recent literature it is only mentioned by ZOBELL (1946), who refers to LAGERHEIM's paper.

During regular investigations, from 1957 to 1960, of the algal vegetation of Tuborg harbour (situated a little north of Copenhagen) I found some gall-like formations on *Urospora penicilliformis* of the same appearance as LAGERHEIM's figures. These *Sarcinastrum* galls proved to be common at all times of the year during the period of investigation.

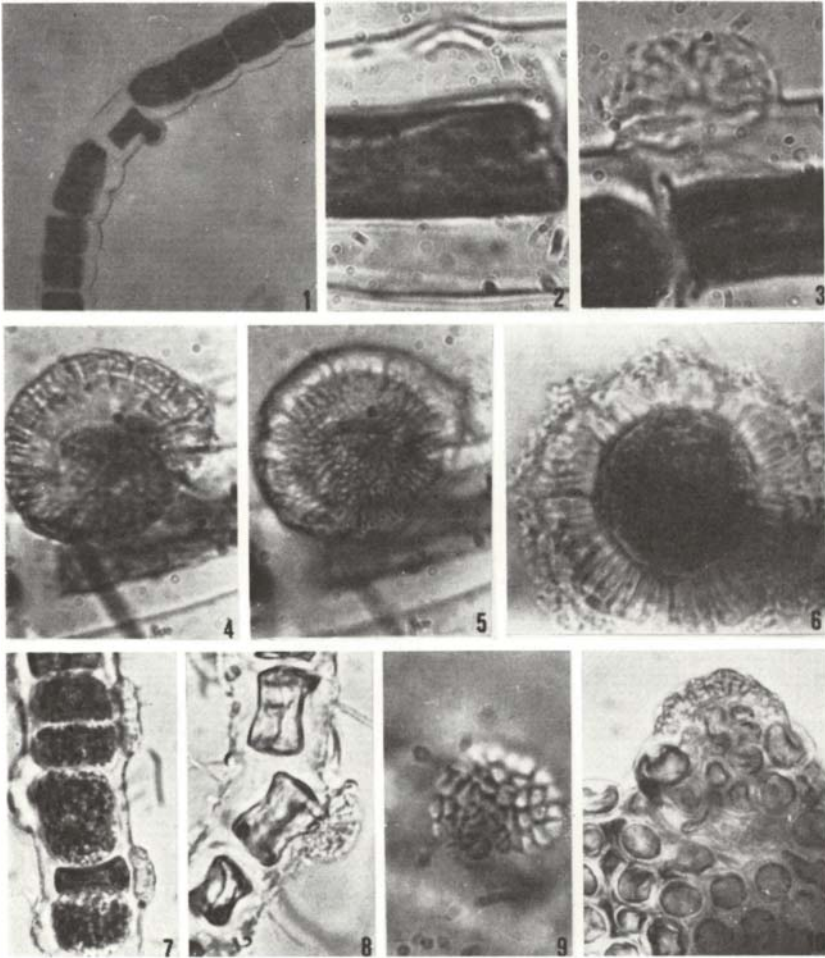
Description and Discussion

Sarcinastrum forms a colourless hemispherical cushion c. 45 μ in diameter on the *Urospora* filament. The thallus consists of small rounded cells arranged in distinct filaments and united into a pseudoparenchyma, forming the radiating structure shown in Fig. 4. On the surface of a cushion (Fig. 5) the cells can be seen to be arranged in small groups, indicating that the filaments are laterally branched.

I have observed various developmental stages on the *Urospora* filament similar to those depicted by LAGERHEIM. In the youngest stages *Sarcinastrum* forms a one-layered slightly curved disc lying in the outer part of the cell wall of the host (Fig. 2). During later growth the parasite breaks through the outer surface of the wall (Fig. 3). While this process is taking place the contents of the host cell partly pass through the perforated cell wall and emerge as a bulge under the thallus of the parasite, giving it a hemispherical shape. The bulge increases in size so that the final characteristic appearance of the *Sarcinastrum* gall is of a colourless transparent sphere with a green centre (Fig. 6).

LAGERHEIM searched for *Sarcinastrum* in vain on other algae growing together with *Urospora*, e. g. *Ulothrix flacca* and *Bangia fuscopurpurea*. But on *Prasiola stipitata* I found a colourless blue-green alga of the same structure, not causing galls, but certainly *Sarcinastrum urospora* (Fig. 10). The Danish material of *Sarcinastrum* has been compared with an American sample brought home by TYGE CHRISTENSEN, University of Copenhagen, from an excursion (June 20, 1961) with professor W. R. TAYLOR, University of Michigan. Here *Sarcinastrum* is found on a species of *Ulothrix* much like the European *U. pseudoflacca*, growing on *Fucus vesiculosus* in the harbour of Provincetown, Massachusetts. The thallus is smaller, only 10–15 μ in diameter, forming relatively flat cushions or discs (Fig. 7). Typical gall formation has not been observed but in several cases the shape of the host cell protoplast is conspicuously influenced by the parasite, as seen in Fig. 8. It seems likely that *Sarcinastrum* has a wide distribution and has been overlooked elsewhere.

Regarding the question whether *Sarcinastrum* should be placed with the bacteria or with the blue-green algae, it may be mentioned that its thallus construction is of a type unknown for bacteria, but very similar to that of *Hydrococcus* (Pleurocapsales). Therefore, SCHMIDT is probably right in assuming that it is an apochlorotic blue-green alga. In the system of GEITLER (1942) one may place it with *Hydrococcus* in the Scopulone-mataceae, as does CHRISTENSEN (1962).



Figs. 1-6. *Sarcinastrum urospora* on *Urospora penicilliformis*. Fig. 1. Parasite on host. Fig. 2. A young stage of *Sarcinastrum* in the cell wall. Fig. 3. An older stage, the parasite having just penetrated the cell wall. Fig. 4. Showing the radiating filamentous structure of the thallus. Fig. 5. Surface of thallus, showing the filaments arranged in groups. Fig. 6. The characteristic appearance: a colourless transparent sphere with a green centre. Figs. 7-9. *Sarcinastrum urospora* on *Ulothrix* cfr. *pseudoflacca*. Fig. 10. *Sarcinastrum urospora* on *Prasiola stipitata*. (Figs. 1-5 and 8-10 photographed from herbarium material, Figs. 6 and 7 from living material, Fig. 7 by TYGE CHRISTENSEN. Fig. 1 $\times 150$; Figs. 2, 3, 6 $\times 1530$; Figs. 4, 5, 7, 8, 10 $\times 670$; Fig. 9 $\times 1670$).

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Manuscript received May 31, 1963.