Tiscia (Szeged) Vol. XIII, pp. 49—54 (1978)

OCCURRANCE OF SYNURA UVELLA EHR. VAR. TISZAENSIS N. VAR. IN THE DEAD ARM OF THE RIVER TISZA NEAR LAKITELEK

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(Received September 20, 1977)

Abstract

This paper reports on a new *Synura* variation from the Tisza Dead-Arm at Lakitelek, named *Synura uvella* EHR. n. var. *tiszaensis*, after the river Tisza. Apart from the characteristic morphological conditions of cells, the development of the colony is also discussed in detail.

Introduction

The *Synura* genus, established by EHRENBERG in 1838, has already been treated by several research workers. HUBER—PESTALOZZI (1941) mentioned in his comprehensive work primarily the activity of KORSHIKOV, BIORET, CONRAD, KLEBS, LEMMERMANN, PETERSEN, SCHILLER, and G. M. SMITH, emphasizing the recognition of KORSHIKOV and BIORET concerning the taxonomical importance of the squamous structure of the cell-membrane. The taxonomical role of silica scales was recently treated by B. FOTT and J. LUDVIK (1957), as well. The most important morphological conditions were presented with electron-microscopical investigation by J. KRISTIANSEN (1969) and E. TAKAHASHI (1959, 1961, 1964). From taxonomical, phylogenetical and ecological points of view, also the investigations of BOURELLY (1957), FOTT (1952), MACK (1951), PANKOW (1963), and PÉTERFI (1965) are recently outstanding.

In the course of investigating the algal flora of the Tisza Dead-Arm on the confines of the community Lakitelek (County Bács-Kiskun), I have found two *Synura* taxons. One of these is *Synura uvella* EHR., and the other a variation of this, differring from the type of the species in more than one particularity. As this new variation was found in the water of the river Tisza, I considered as justified to designate it, after this river, with the name of *Synura uvella* EHR. var. *tiszaensis* n. var. The development of the colony is also shown by means of photomicrographs, making the knowledge of the genus possibly more complete in this way.

Materials and Methods

On the basis of bioseston samples, taken on more than one occasion, I have continuously followed with attention the structure and development of colonies, the morphological conditions and development of cells, as well as the phenomena of multiplication. The ecological conditions were investigated for making the cultures, as well.

Results

The most striking morphological characteristic of the well-developed cells of *Synura uvella* Ehr. n. var. *tiszaensis* Kiss I. is the comparatively large size and the peculiar size-proportion the help of which it can be well distinguished from other *Synura* taxons. The apical part of the well-developed cell is in front broadly rounded, ovoid, from which a suddenly narrowing, comparatively long, peduncular basal part protrudes. The cells isolated from a well-developed colony may be compared to peduncular club (Fig. 1d). Such cells are 45—55µm long, and, in their apical part, 12—16 µm broad. The two brownishgreen chromatophores take place in the apical part, without reaching down into the basal part. The basal part is generally longer than the apical one. One of the flagella is sowehat shorter. Both in the apical and the basal parts there are to be found some vacuoles; the stigma is missing.

The cell-membrane is covered from the outside with silica scales of varying shapes. In the apical part, these are roundish or broadly oval; in the basal part, they are more elongated. Their length is 2—4 µm, their breadth somewhat smaller. Their spine is short, straight or slightly curved (Fig. 1f). The fallen transitory scale-forms are also frequent (Fig. 1g). In the apical part of the marginal cells of colonies the scales can be observed with the light-microscope as well. The scales in the basal stipiform part are sparser, perhaps because of the additional extension of the peduncle.

Multiplication. Only the cell division could be observed. The division is always longitudinal and the cells in the colony are, therefore, always arranged close side by side, radially towards every direction of the space (Fig. 1e). The multipli-

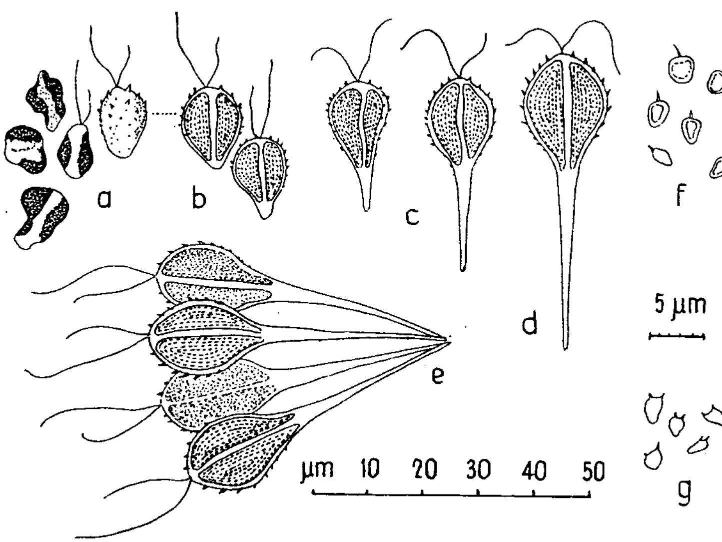


Fig. 1. a. cells of zoospore character,
b. ovoid cells with membrane,
c. cells with a short basal part,
d. cells with a fully developed, long, penduncular part,
e. cell-bundle prepared from a fully developed colony,
f. scale-forms,
g. transitory scales.

cation with zoospores could also be observed: at least one of the progeny-cells presses itself out of the membrane of the mother-cell. For a while its motion is amoeboid, although it has some flagel la or, at least, these appear early. Sometimes both zoospores depart. The zoospores soon loose their amoeboid form and become young cells of oval form, still without any pedicle but with a scaled membrane (Fig. 1a—b). By the additional extension of the basal part, short-pediculated, cells are formed at first then after further extension long pediculated (Fig. 1c—d).

In the bioseston and the cultures, we could study the formation of colonies, too. Trough investigation of the colony formation, a drfinite phasic character could be observed in the ontogeny of this organisms. The succession of these is under the considerable influence of the environmental factors. A definite sequence, applicable to the whole process of development, could therefore not be established.

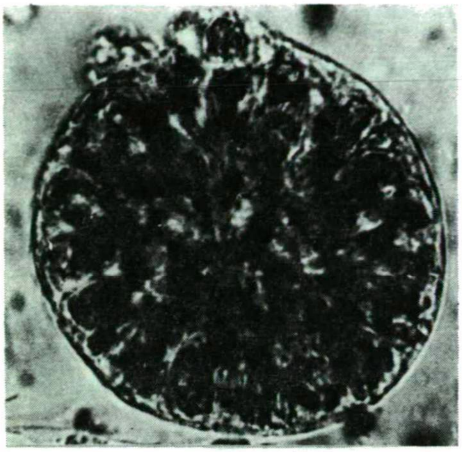
The phase of forming the gallert-envelope, shown by photo micrograph 1, Table I, seems to be the most striking. The cells of the spherical colony with a somewhat larger than 80 µm diameter are embedded in a gallert-envelope on the surface of which a massive, "skinlike" layer has been formed. The thickness of this has mostly reached even 3—4 µm. This phase seemed to be frequent enough, and this is such a feature which has not appeared in the case of the other *Synura* taxons to such an extreme extent. In this phase, the cells embedded in the gallert-mass are still rather oval, and their definite pediculate basal part vas not formed yet. Their arrangement is, however, already here, obviously radial towards every direction of the space. At the upper margin of the colony, the solid outer layer of the gallert-envelope is already "dissolved" and zoospore-like, to some extent still amoeboid cells press themselves out of the bonds of the colony. A "dissolution", like this, and a protrusion of zoospores, could sometimes simultan eously be observed at many points of the colonies. A bursting of the solid outer layer could never be observed. This outer, solid, coagulative gallert-layer seems to pass away gradually getting into a dispersed state. All these can probably be attributed to the enzymatic, active functioning of cells.

A newer phase may be represented by the state in which the outer solid layer of the gallert-mass has already completely disappeared. Then the cells of the colony have already got into a looser state and more and more cells, primarily those of zoospore-character, are released from the colonial bonds. An initial state of this is shown by photomicrograph 2, Table 1. The gallert-mass of the colonies in a state like this is already partially of disperse substance, the cell-mass comes into a commotion, and the cells can even leave their places to some extent. In the upper part of photomicrograph 2, one of the cells is just leaving and it is apparently still of amoeboid character, *i. e.* a zoospore. In the case of the marginal cells, the flapping flagella are also palely visible. Colonies like this are either transformed completely into swarming cells or dissolved into smaller or larger successor-colonies. Then the new groups of the loosened cells induce new colonies of a solid cell substance.

I could so far distinguish two forms of the beginnings of forming new colonies. These are:

1. Formation of loose colonies consisting of a few, almost fully developed cells. The cells which are approximately of the same development and already have a long peduncular basal part, are linked at their basal ends. This is shown in photomicrograph 3, Table 1. The cell-ends meet in small gallert-nodules. It may be supposed that this gallert-matter is secreted by the peaks of the peduncular parts jointly and correspond to the gallert-matter which, in the case of other taxons, *e. g.* at the development of the *Synura uvella* Ehr. colony, lengthen into thin gallert-threads and cent-

Table 1



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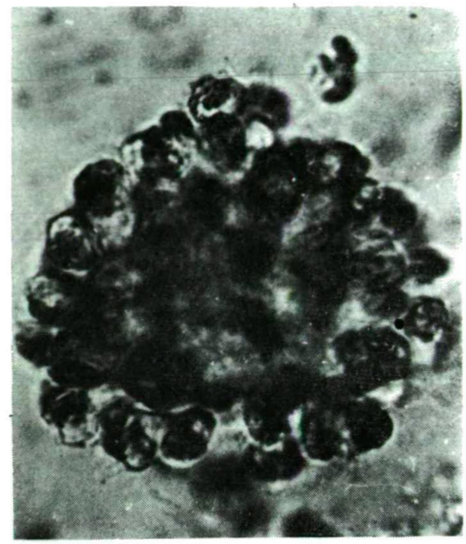

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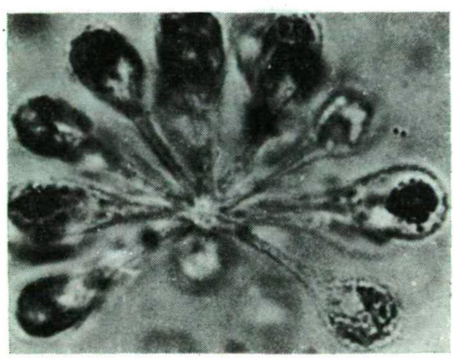

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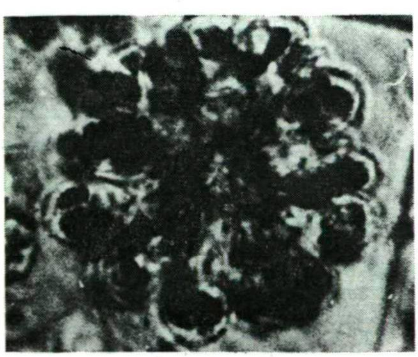

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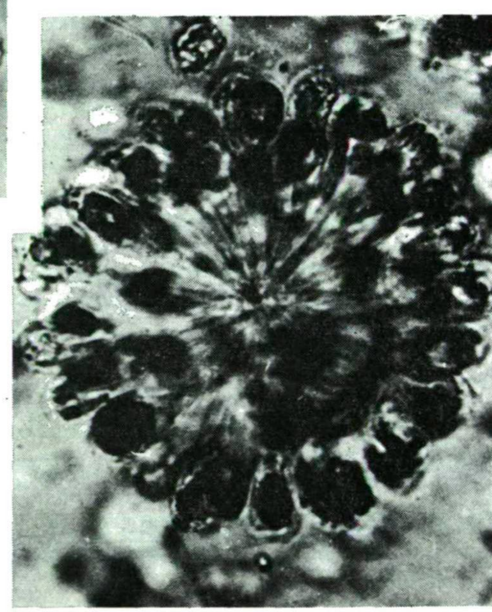

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1. Gallert-membraned colony, with a solid surface layer. — 640:1
2. Release of a zoospore-cell from a dense colony without gallert-layer. — 640:1
3. Loose colony with cells having peduncularly elongated basal parts. — 640:1
4. Smaller colony with cells having still a short basal part. — 640:1
5. Larger colony consisting of fully developed cells, with a visible readial structure. — 640:1.

rally fasten together a number of cells. It could be observed in some cases in the cultured bioseston that the peduncular, basal cellular processes were embedded in larger gallert-nodes in such a way that almost the knot-like apical ends of the cells protruded from the gallert-mass. By this reason, it is not impossible that the *Synura*-cells secrete the gallert-matter mostly at the apical part of the peduncular basal part.

2. Formation of undeveloped cell-groups, having no basal peduncular part yet. This second way of colony-formation was the most frequent. This case is shown by photomicrograph 4, Table I. The apical parts of cells are already almost fully developed, their basal, peduncular part is, however, still very short or is nearly fully missing. The scales of the cell-membrane are also showing the picture of development. This initial state may develop both from a single zoospore-cell and from zoospore-masses, resp. from some undeveloped cell-masses which were formed of pieces of the colonies demonstrated in photomicrograph 2.

It is essential that both type 1 and type 2 of the development may later develop into colonies of dense, compact cell substance, consisting of fully developed cells of large volume. This state is demonstrated in photomicrograph 5, Table I. In this, the radial arrangement of cells is obvious, mainly owing to the elongation the peduncular basal part. In these, the number of cells may considerably exceed 100 and their diameter can reach 110—120 µm, as well.

It is worth mentioning from ecological point of view that the colonies of massive cell-substance were more frequent in the places of water surface where no shadow cast by the trees of the gallery-forest. The loose colonies occur rather under the surface or in the shaded surface in higher numbers (*e. g.*, photomicrograph 3).

* * *

The colonies of *Synura uvella* EHR. n. var. *tiszaensis* KISS I. have a diameter not longer than 120 µm. In their well-developed cells, there can be distinguished an ovoid apical part, and after its sudden narrowing a longer, peduncular basal part. The well-developed cells of the colony are 45—55 µm long and, in their apical part, 12—16 µm broad. The basal part is always longer. The scales of the cell-membrane are roundish or slightly elongated with a short spine. In the ontogeny of the species the gallert-membrane phase developing with the solid surface layer is striking.

Diagnosis

Synura uvella EHR. n. var. *tiszaensis* KISS I. — Colonia perfecta formam globosam habet, maxima diametiens eius est 120 µm. In cellis perfectis coloniae apicalis pars ovo similis et basalis pars petiolo similis oblongaque distingui possunt. Cellae 45—55 µm longae et in parte apicali 12—16 µm latae sunt. Longitudo partis basalis est semper maior. Squamae tegimenti cellarum sunt rotundae aut paullulum oblongae, et 2—4 µm longae sunt, latitudo earum paullo minor est. Aculei squamarum sunt curti. Proprietas conspicua ontogenesis coloniae est stadium in quo gallert-tegimentum existit. Summarum stratum gallert-tegimenti solidum est.

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