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New taxa and reclassifications in the *Chlorococcales (Chlorophyceae)*

Nové taxóny a preradenie v rade *Chlorococcales (Chlorophyceae)*

František Hindák

HINDÁK F. (1978): New taxa and reclassifications in the *Chlorococcales* (*Chlorophyceae*). — Preslia, Praha, 50 : 97—109.

Some autosporic coccal algae with cells devoid of pyrenoid were studied. Chlorophyll *b* was found to be present in the culture of *Dichotomococcus lunatus* FOTT and *Coenochloris diplococca* HIND., indicating that these species belong to the green algae of the order *Chlorococcales*. One new genus (*Dictyosphaeriopsis* HIND.) and three new species (*Dictyosphaeriopsis fluviatilis* HIND., *Gloeoactinium europaeum* HIND. and *Coenocochloris diplococca* HIND.) are described.

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Some autosporic coccal algae with cells devoid of pyrenoid are dealt with in this paper. In green algae, the pyrenoid usually is enveloped by a layer of starch whereas in the other groups of algae it is without starch or enveloped by paramylon. The absence of the pyrenoid in cells has often led to the view that such coccal algae belong to the *Xanthophyceae*. It was the negative response to starch by chloral iodine according to Meyer and the higher number of pale green chromatophores that was presented to support this in the literature.

The response to starch by iodine, however, is not always reliable and the colour of chromatophores may also cause confusion. Many xanthophycean algae in which the formation of heterocontic zoospores was observed cannot be easily differentiated from morphologically similar green algae by the colouring of the chromatophores only. In a certain part of vegetation period or due to variation in nutrition, the chromatophores of many green algae are pale green rather than leaf-green. The number of chromatophores cannot be used to distinguish between xanthophycean and green algae. Disregarding the fact that many species of green algae have more than one chromatophore in mature cells, in algae with one single chromatophore the latter often splits, prior to the division of the protoplast, usually into as many chromatophores as there are autospores formed out of the mother protoplast.

These features — the negative response to starch by iodine, the higher number of chromatophores in the cell and the pale green colour of chromatophores — are insufficient to place an alga in the *Xanthophyceae*. In doubtful cases, the chromatographic proof of chlorophyll *b* which is missing in xanthophycean algae, or the proof of the presence of starch by means of electron microscopy using ultra-slender cuts may prove useful. However, both these methods require a culture of the alga investigated which is

sometimes difficult to obtain. Unless at least one result of these trials is available, the position of the alga concerned will continue to be uncertain. From this point of view attention is to be paid to those genera of the order *Mischococcales* (*Xanthophyceae*) that reproduce by autospores only and have only one or few (2—4) chromatophores. Autosporic coccal algae which have hitherto been referred to *Chlorococcales* and lack both a pyrenoid and starch, have to be re-examined.

Cultivation was successful in two species in which the presence of chlorophyll *b* was subsequently proved. No cultures were available for the other species. Therefore these algae are referred to *Chlorococcales* only on the basis of our previous experience supported by opinions of other authors.

Dichotomococcus Koršikov

Bas.: *Dichotomococcus* Korš. Arch. Protistenk. 62, p. 418, 1928. Non: *Gloeoactinium* G. M. Smith Trans. Amer. Micr. Soc. 45, p. 184, 1926; ? *Diplochloris* Korš. Učen. Zap. Gorkovsk. Gos. Univ. 9, p. 111, 1939.

Colonies spherical, oval or irregular, with cells placed ± radially or attached to the empty cell wall by one end; the empty cell walls sometimes arranged dichotomously from a common center of the colony. Mucilage hyaline, structureless. Cells elongate, ± straight or bent, irregularly oval, lunate or cylindrical. Cell wall smooth. Chromatophore one, parietal, without pyrenoid. Autospores 2, released through a longitudinal opening from the mother cell wall or by its gelatinization.

Type species: *D. capitatus* Korš. 1928.

Koršikov (1928) referred the genus *Dichotomococcus* (containing the only species *D. capitatus*) to the green algae of the order *Chlorococcales* and placed it in the proximity of the genera *Dictyosphaerium* and *Dimorphococcus*. Describing another species, *D. curvatus* Korš. 1939, he maintained that the genus *Dichotomococcus* belonged to *Xanthophyceae*. Fott et Komárek (1960) and Komárek (1964) treated this genus as a member of the xanthophycean algae, as did also Hindák et al. (1965, 1975), Bourrelly (1968), Starmach (1968) and other authors. In spite of this, the genus *Dichotomococcus* was included neither into the comprehensive monograph by Pascher (1939), nor into the key-book of fresh-water algae of the U.S.S.R. by Dedusenko-Ščegoleva et Gollerbach (1962).

At present, four species are known which have also been found in Czechoslovakia (see Komárek 1964). Three species (*D. capitatus* Korš., *D. curvatus* Korš. and *D. lunatus* Fott) are distinguished by the dichotomously arranged empty mother cell walls, the vegetative cells being attached to their ends at the periphery of the colony, as in *Dictyosphaerium* or *Quadricoccus*. In the fourth species, *D. bacillaris* Kom. 1964, the mother cell walls of preceding generations do not retain their original shape but become gelatinous rather rapidly and change into a short, broad, mucous base to which cells are attached by one end.

A characteristic feature of the genus *Dichotomococcus* is the constant formation of two autospores which are released by a longitudinal opening in the mother cell wall and continue to be attached, by one end, to the empty mother cell wall. The dichotomous arrangement of mother cell walls is mostly well visible even without using dyes, especially in colonies with a larger

number of cells. Sometimes, however, the mother cell walls of preceding generations gelatinize and the empty mother cell walls are visible only at the periphery of the colony, as e.g. in the genus *Quadricoccus* (see HINDÁK 1977a). Following their release from the mother cell wall, autospores may touch by their basal or medial parts but this conjunction need not be permanent and the cells become gradually separated. The connection of daughter autospores by basal parts of cells is especially characteristic of *D. curvatus*, and by medial dorsal parts, of *D. lunatus*, but colonies with detached cells (Fig. 1a) were also observed.

The genus *Gloeoactinium* G. M. SMITH 1926 cannot claim priority over *Dichotomococcus* because in *Gloeoactinium* there are two or four autospores and no complex colonies with dichotomously arranged empty mother cell walls (for more detailed information on this genus, see p. 102 of this paper) In the genus *Diplochloris* KORŠ. 1939, the formation of two autospores is also constant as in *Dichotomococcus* but the mother cell walls gelatinize quickly so that they are invisible in the mucilage and the pairs of autospores are distributed solitarily.

A culture of *D. lunatus*, strain HINDÁK 1974/75 was investigated, isolated from plankton of a gravel pit lake at Kľúčovec, approximately 50 km SE. of Bratislava. Applying the method of thin film chromatography to silicagel plates, the available pigments were analyzed and chlorophyll *b* ascertained. To identify chlorophyll *b*, use was made of UNICAM SP 800 type Ultraviolet spectrophotometer. The analysis demonstrated that it is *Chlorophyceae*, not *Xanthophyceae* that *Dichotomoccus lunatus* belongs to. From this fact the presence of chlorophyll *b* may similarly be inferred also for the other representatives of the genus *Dichotomococcus* which resemble *D. lunatus* by the shape of both cells and colonies.

The presence of chlorophyll *b* or starch in the type species *D. capitatus* having been established, the genus *Dichotomococcus* may safely be referred to the chlorococcal algae. By the shape of colonies with dichotomously arranged mother cell walls, it would belong to the family *Dictyosphaeriaceae* to which it was originally referred by the author of the genus, KORŠIKOV (1928).

According to our observations, *D. lunatus* is common in W. Slovakia. It occurs in rivers (Danube, Morava), in gravel pit lakes (in the neighbourhood of the river Morava at Bratislava-Devín, and Kľúčovec), in fish-ponds (Bratislava-Vajnory, Trnava) and elsewhere. Sometimes spherical colonies are formed with a large number of cells. *D. curvatus* is less frequent; the species *D. capitatus* and *D. bacillaris* have not yet been observed.

In the investigated culture of *D. lunatus*, the autospores mostly occurred singularly, less frequently were they connected by the dorsal parts of the cells (Fig. 1 : b). No formation of colonies was observed in the laboratory culture since mother cell walls gelatinized quickly. By the cell size and morphology the pairs of connected autospores were reminiscent of *Diplochloris decussata* KORŠ. 1939. The possibility cannot be excluded that even in nature, under certain conditions, the mother cell walls gelatinize relatively quickly with the pairs of autospores subsequently lying solitarily in the mucilage.

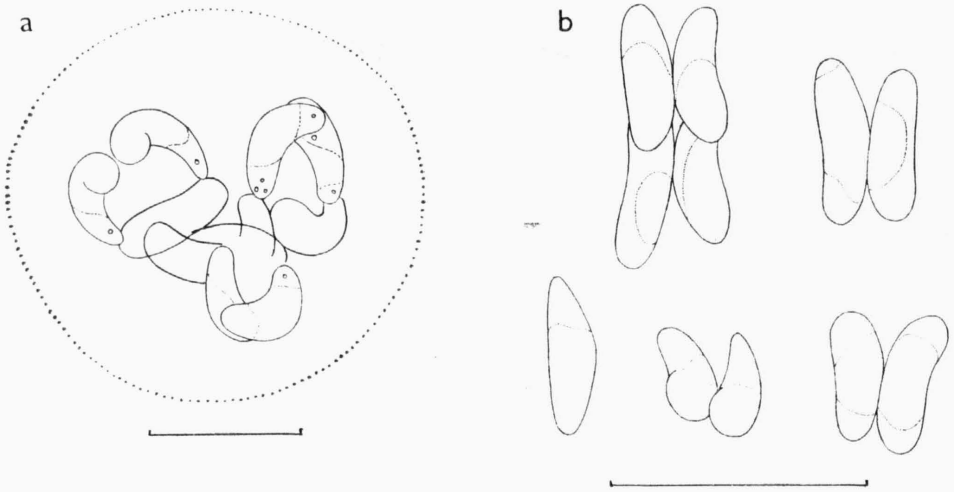

Fig. 1. — *Dichotomococcus lunatus* Fott: a — specimens from a lake near the river Morava in Bratislava-Devín; b — culture Hindák 1974/75. Scale: 10 μm.

Dictyosphaeriopsis Hindák, gen. novum

Coloniae libere natantes, pluricellulares, sphaericae vel oblongae; cellulis ad peripheriam dichotomo-ramosarum dimidiarum partium membranae cellularis matricalis positis. Tegumentum gelatinosum homogeneum, sine structura. Propagatio autosporis binis; membrana matricalis dividitur longitudinaliter in partes duas.

Typus generis: *D. fluviatilis* Hindák

Colonies multicellular, ± spherical to oval, with cells placed at the periphery of dichotomously arranged halves of mother cell walls. Colonial mucilage hyaline, structureless. Cell reproduction by two autospores. Upon release of autospores the mother cell wall splits longitudinally in two halves, one autospore being attached by its end to each half.

The formation of the colony in this genus resembles that in *Dictyosphaerium* with the only difference that there are always only two autospores formed from the mother cell. The mother cell wall divides accordingly, i.e. in two parts. Another outstanding feature of this genus is that of the parts of the mother cell walls which do not change into mucous strands as it is often the case in *Dictyosphaerium* but ± retain their original shape. In the order *Chlorococcales*, the genus *Dictyosphaeriopsis*, together with *Dictyosphaerium*, is referred to the family *Dictyosphaeriaceae*.

We believe that the constant formation of two autospores is a sufficient generic character separating this genus from *Dictyosphaerium*. In *Dictyosphaerium* four autospores are usually formed from one cell, the formation of two autospores being only casual. Here one may point at the genus *Neodesmus* Hind. 1976 which similarly differs from *Scenedesmus* mainly by the constant formation of two autospores from the mother cell. In *Scenedesmus*, two autospores are sometimes formed, but the formation of a 4-celled coenobium or many-celled coenobia was ascertained in each species.

The genus contains one single species:

Dictyosphaeriopsis ***fluviatilis*** HINDÁK, sp. nova Fig. 2

Coloniae sphericae vel oblongae, usquae 60 μm, raro maiores. Tegumentum gelatinosum homogeneum, sine structura, circa cellulas 2—3 μm latum. Cellulae lato ovales vel asymetrice ovales, apicibus obtuse rotundatis, 4—6×3—4,5 μm. Membrana cellularis tenuis levisque. Chromatophorum unum, parietale, catilliforme, sine pyrenoide. In protoplasto guttae olei.

Iconotypus: Figura nostra 2: a.

Habitatio: In plancto fluminum Danubii et Moraviae lacuumque eorum inundativorum in Bratislava, Slovacia occidentalis.

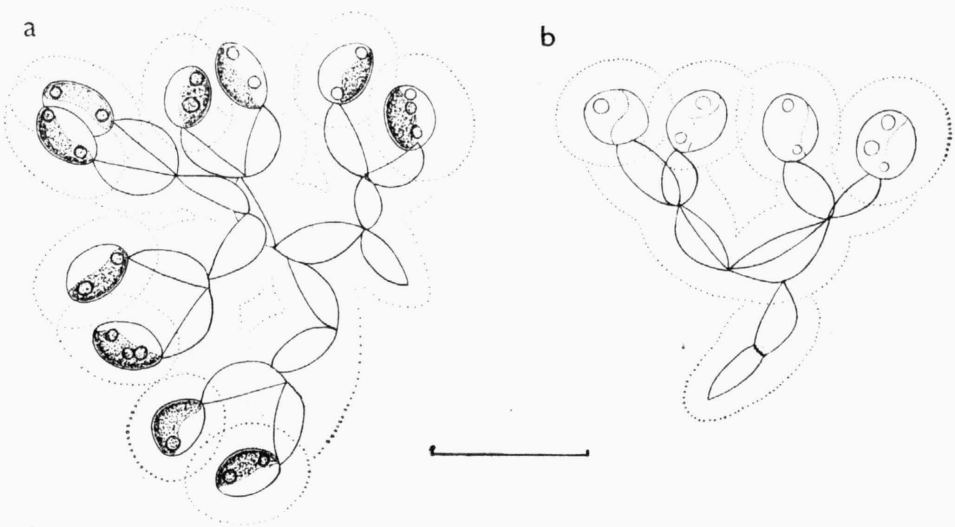

Fig. 2. — *Dictyosphaeriopsis fluviatilis* HINDÁK, specimens from the river Danube in Bratislava. Scale: 10 μm.

Colonies ± spherical to oval, up to 60 μm in diameter, sporadically larger, with cells ± densely adjoined at the ends of dichotomously arranged cell wall halves. The mucilaginous envelop is hyaline, structureless, around cells 2—3 μm wide. Cells broadly oval to asymmetrically oval. with rounded ends, 4—6×3—4.5 μm. Cell wall smooth. Chromatophore parietal, trough-shaped; two chromatophores without pyrenoid present before protoplast division. Small to relatively large drops of oil within the protoplast. Autospores 2, released by the longitudinal division of the mother cell wall in two halves.

Occurrence: In the plankton of the rivers Danube and Morava and their inundation lakes in Bratislava; sporadically, in the spring and autumn months.

The mucilaginous envelope was relatively tough and fairly distinct only when Indian ink was added to the preparation. Each cell had a mucous envelop of its own as certain species of *Dictyosphaerium*, e.g. *D. pulchellum* WOOD, *D. elongatum* HIND. Upon release from the mother cell wall, the autospores were "tipping off" almost by 180° so that the "apical" end of the autospore became basal. The mother cell wall divides in two approximately equal halves which continue to retain their trough-like shape. Colonies have been observed with dichotomously arranged halves of cell walls of up to four generations.

Gloeoactinium G. M. SMITH

Bas.: *Gloeoactinium* G. M. SMITH Trans. Amer. Micr. Soc. 45, p. 184, 1926. Syn.: ? *Tetraktis* PASCHER Rabenhorst's Kryptogamenfl. 11, p. 676, 1939.

Colonies spherical to irregularly oval, forming groups of cells with two or four in radiating groups, joined at the bases of cells. Groups of cells lying towards the periphery of a homogeneous, hyaline, gelatinous envelope. All of the cells of the colony with their long axes radiating from a common center. Reproduction by the division of any cell of the colony to form two or four autospores that remain imbedded within the colonial envelope.

Type species: *G. limneticum* G. M. SMITH.

By certain characters, *Gloeoactinium* resembles the genus *Diplochloris* KORŠ. 1939. In both genera the autospores remain, for a certain space of time, joined by their basal or ± medial parts following their release from the mother cell wall. The main difference is the number of autospores formed: in *Diplochloris* there are always only two, in *Gloeoactinium* two or, more often, four.

The tetrahedric arrangement of autospores is known to occur in the genus *Tetraktis* PASCHER 1939 (*Xanthophyceae*). PASCHER, however, does not mention any mucilage and, apart from this, the release of autospores is by the broadening and gelatinization of the cell wall.

The genus *Gloeoactinium* includes two species which differ by the following features:

1a. Cells narrowly ovate-cuneate, with basal poles broadly rounded and apical poles narrower and somewhat more acute ..... *G. limneticum* G. M. SMITH

1b. Cells elongately bean-shaped to broadly lunate or guttiform ..... *G. europaeum* HIND.

Gloeoactinium limneticum G. M. SMITH Fig. 3 : e

Bas.: G. *limneticum* G. M. SMITH Trans. Amer. Micr. Soc. 45 p. 184- 1926. Syn.: ? *Tetraktis aktinastroides* PASCHER Rabenhorst's Kryptogamenfl. 11, p. 679, 1939.

Colonies ± spherical, 25—45 µm in diameter. Cells narrowly ovate-cuneate, joined at their bases in radiating groups of two or four, 3.5—7.5 × 1.5—2.5 µm. Basal poles of cells broadly rounded, apical poles narrower and somewhat more acute. Chloroplast completely filling the cell or laminate and parietal, without a pyrenoid. Autospores 2—4; release of autospores from the mother cell wall and remnants of mother cell walls not observed.

Occurrence: U. S. A. (G. M. SMITH 1926, TIFFANY 1934, PRESCOTT 1931)- West Africa (WOODHEAT et TWEED 1960), India (see PHILIPOSE 1967).

A tetrahedric cell arrangement in the colonies is also found in the xanthophycean alga *Tetraktis aktinastroides* PASCH., in which, however, a cylindrical cell shape predominates and four chromatophores are present. In *G. limneticum*, the chromatophore fills the entire parietal periphery of the cell, a fact that made some authors believe that this species was actually *Marssoniella elegans* LEMM., which is referred to blue-green algae (see PHILIPOSE 1967). However, *Marssoniella elegans* proved to be *Gurleya marsoniella* belonging to *Microsporidia* (KOMÁREK et VÁVRA 1968).

Gloeoactinium ***europaeum*** HINDÁK, sp. nova Fig. 3 : a—c

Syn.: G. *limneticum* G. M. SMITH sensu HORTOBÁGYI 1946, 1973.

Coloniae libere natantes, tetraedricae 4—6-cellulares; coloniae quadricellulares 15—20 μm, 16-cellulares usque 35 μm in diametro; cellulae quaternae basibus iunctae, in coloniis radialibus dispositae. Tegumentum gelatinosum tetraedricum, homogeneum, sine structura, circa cellulas 3—10 μm latum. Cellulae asymetricae, longe phaseoliformes usque cornuiformes vel guttaeformes, 4—8×2—4 μm. Membrana cellularis tenuis, levisque. Chromatophorum unum, parietale, sine pyrenoide. In protoplasto guttae olei. Autosporae 4, e membrana matricali ruptura in parte apicis liberantur.

Iconotypus: Figura nostra 3: a.

Habitatio: In plancto flumium Danubii et Moraviae in Bratislava, Slovacia occidentalis.

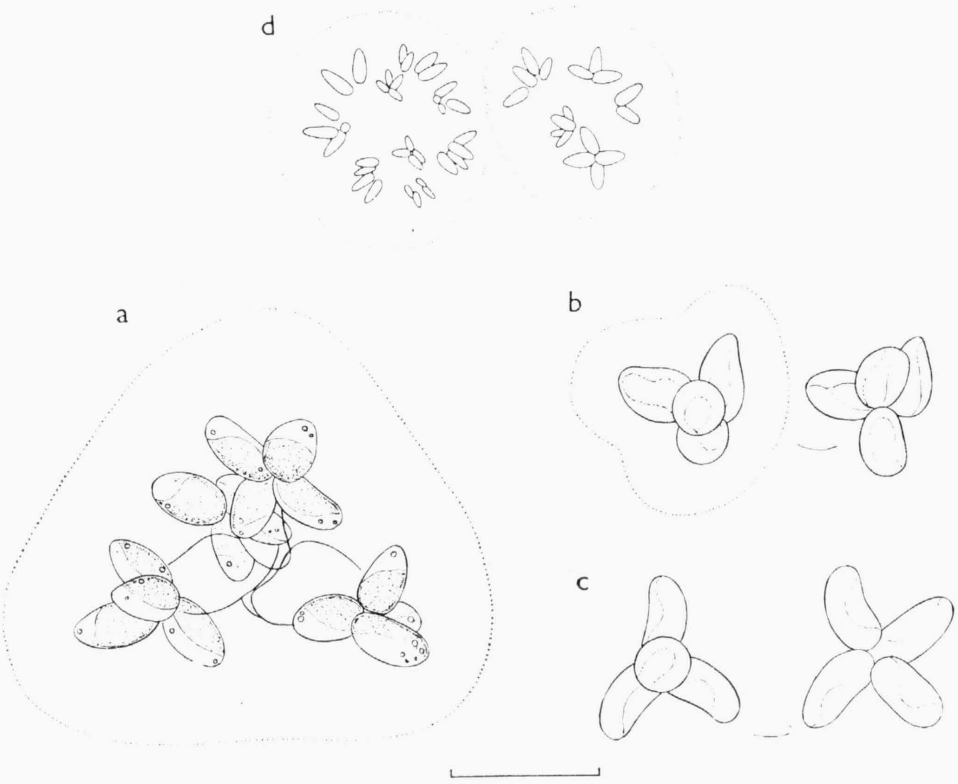

Fig. 3. — a—c — *Gloeoactinium europaeum* HINDÁK, specimens from the river Danube in Bratislava; d — G. *limneticum* G. M. SMITH (from G. M. SMITH). Scale (a—c): 10 μm.

Colonies tetrahedrical, with 4 or 16 cells clustered by 4; four-celled colony with mucilage 15—20 μm in diameter, 16-celled colony with mucilage up to 35 μm in diameter. Mucous envelope tetrahedrical, hyaline and structurelless, 3—10 μm around cells. Cells bean-shaped to broadly lunate or guttiform, 4—8×2—4 μm. Cell wall smooth. Chromatophore parietal, trough-shaped, filling the entire parietal periphery of mature cell save the medial cut, without pyrenoid. Oil drops present. Cell reproduction by 4 autospores

arranged tetrahedrically and joined by their bases. Autospores released by breakage of the mother cell wall at the free end; remnants of mother cell walls well visible shortly after release of autospores.

Occurrence: In the spring and autumn plankton of the rivers Danube and Morava, sporadically.

The two species of *Gloeoactinium* discussed above differ by several features. In the plankton of the Danube and the Morava at most 16-celled colonies were observed so that it could not be decided whether all of the cells of the colony with their long axes were radiating from a common centre or not. The 16-celled colonies were formed only during reproduction and seem to have gradually disintegrated into four 4-celled colonies living solitarily. Cells of *G. europaeum* were not straight and ovate-cuneate as reported for G. *limneticum* by G. M. SMITH, but always asymmetrical, slightly bent, most frequently bean-shaped ad did not fill the entire parietal periphery of the cell in mature cells, having a saddle-like cut in the medial part of the cell. The mode of autospore release in the type species is not known and neither is the presence of the remnants of mother cell walls.

Gloeoactinium limneticum sensu HORTOBÁGYI (1946, 1973) may be identical with *G. europaeum*; this is implied by the cell shape and the tetrahedrically arranged cells in the colony (see HORTOBÁGYI 1946, Fig. 30). However, HORTOBÁGYI did not mention the release of autospores and considered the remnants of cell wall to be mucous strands (see HORTOBÁGYI 1973, Fig. 196).

Coenochloris KORŠIKOV

Bas.: *Coenochloris* KORŠ. Vizn. prisnovodn. vodor. Ukr. RSR 5, p. 322, 1953.

Colonies 2-4-8-celled to many-celled, with cells in clusters of 2-4-8 or with shifted cells (in reproduction); mucilage structureless, cell wall remnants distinct. Cell wall smooth, without incrustation and without spines. Chloroplast parietal, with or without pyrenoid. Autospores formed by 2-4-8 and released by the rupture or splitting of the cell wall in two or several portions.

Type species: *C. pyrenoidosa* KORŠ.

The genus *Coenochloris* is characterized by mucilaginous colonies with cells in groups by 2-4-8, formation of autospores and distinct remnants of cell walls in the mucilage. By the latter feature it differs from the genera *Coenococcus* KORŠ. 1953 and *Coenocystis* KORŠ. 1953 in which autospores are released by the gelatinization of the mother cell wall. We recognize these three genera by KORŠIKOV even though the value of this differentiating feature is questionable.

The genus *Coenochloris* has been dealt with in more detail in our preceding paper (HINDÁK 1977). Five species have been included into it [*C. pyrenoidosa* KORŠ. = ? *C. pelagica* (TEIL.) FOTT, *C. piscinalis* FOTT, *C. bavarica* (SKUJA) HIND., *C. mucosa* (KORŠ.) HIND., *C. ovalis* KORŠ.]. Another species, *C. planctonica* (W. et G. S. WEST) HIND., was transferred from *Gloeocystis* NÄG. (HINDÁK 1978). The latter publication contains a discussion of *C. ovalis* KORŠ. and a description of a new species. Both species referred to differ by the absence of pyrenoid in the cells.

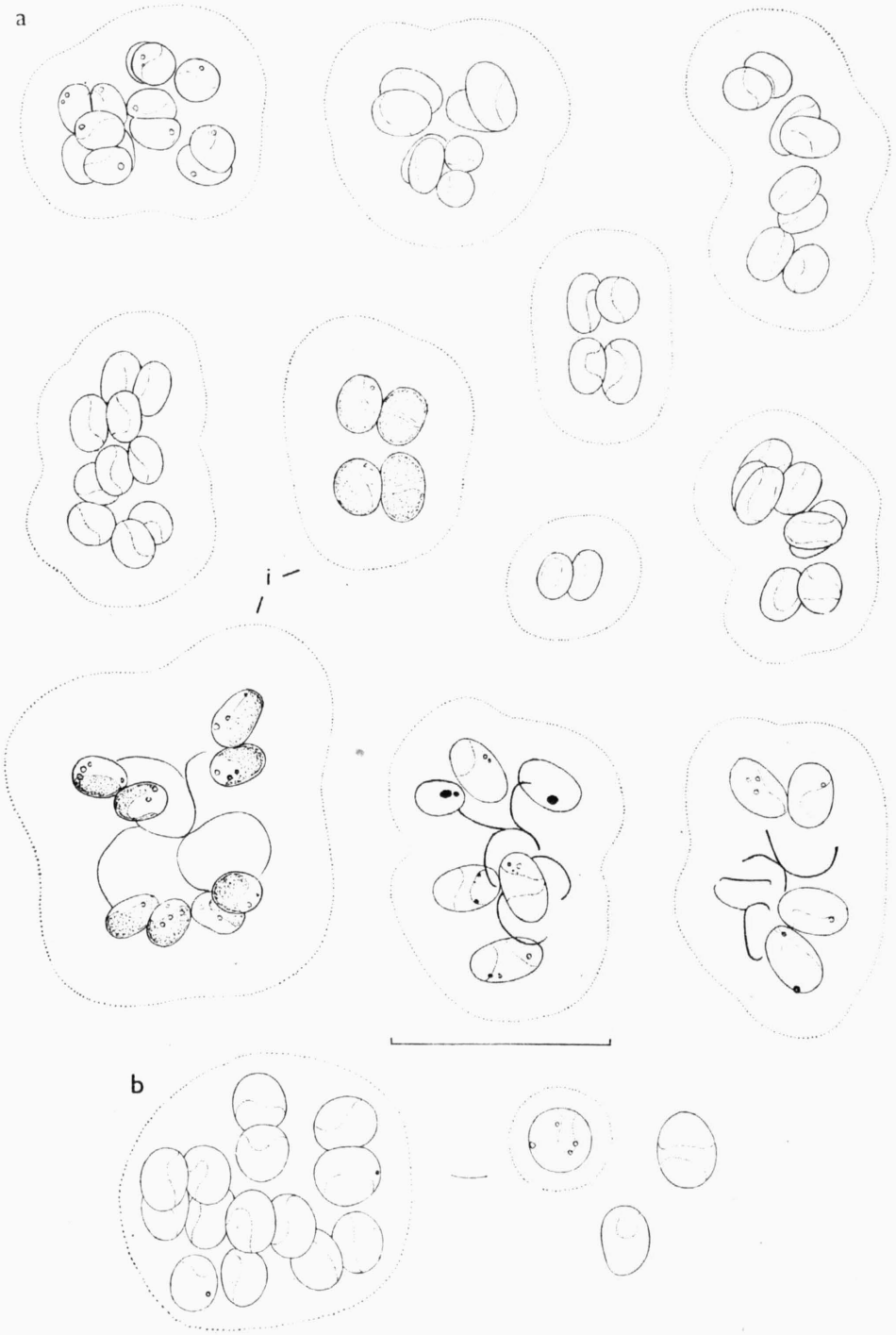

Fig. 4. — *Coenochloris diplococca* HINDÁK: a — specimens from Stávek pond at Stupava (i, iconotype); b — culture Hindák 1975/130 isolated from the same locality. Scale: 10 μm.

Coenochloris ***diplococca*** HINDÁK, sp. nova Fig. 4—5

Coloniae liberae natantes, ovales vel irregulares, 2—4—8 vel multicellulares usque 30 μm in diametro; cellulis saepe binis in tegumento gelatinoso positis. Tegumentum gelatinosum homogeneum, sine structura, circa cellulas 2—5 μm latum. Cellulae breviter cylindrice-ovales usque lato ovales 2,5—3,5 × 1,8—2,5 μm. Membrana cellularis tenuis levisque. Chromatophorum unum, parietale, sine pyrenoide. In protoplasto guttae olei. Autosporis binis (etiam pluribus?) e membrana matricali ruptura liberantur.

Iconotypus: Figura nostra 4 : 1.

Habitatio: In plancto aquarum eutrophicarum in Slovacia occidentalis: flumen Danubius et Morava in Bratislava, piscina Stávek in Stupava.

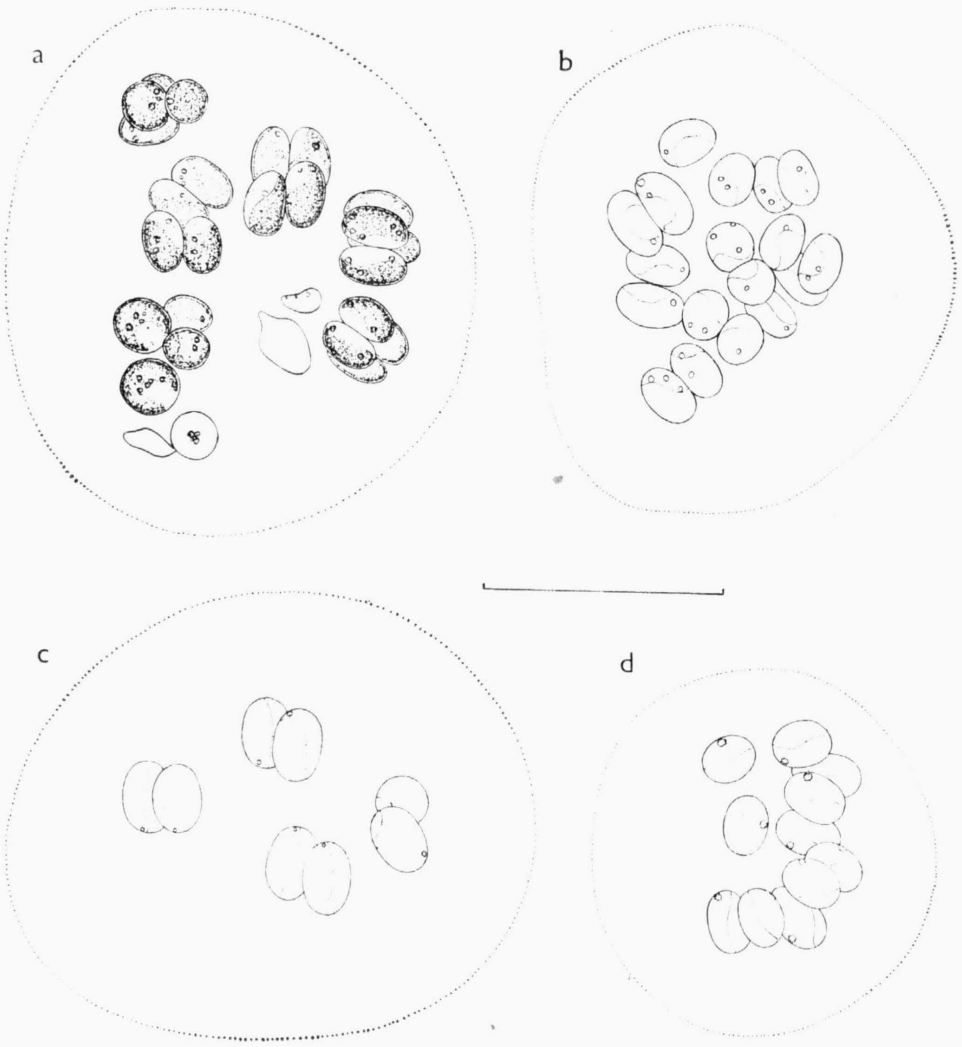

Fig. 5. — *Coenochloris diplococca* HINDÁK: a, b — specimens from the river Morava in Bratislava; c, d — specimens from the river Danube in Bratislava. Scale: 10 μm.

Colonies ± oval to irregular, 2-4-8-celled or many-celled, up to 30 μm in diameter, with cells usually in pairs, embedded without any definite order. Mucilaginous envelope hyaline, structureless, 2—5 μm wide around cells. Cells shortly cylindrical-oval up to broadly oval, 2.5—3.5×1.8—2.5 μm. Cell wall smooth. Chromatophore one, parietal, trough-shaped, without pyrenoid; two chromatophores present prior to protoplast division. Oil drops present in the protoplast. Autospores two (even more ?), released by the rupture of the mother cell wall; the remnants of the mother cell wall gelatinize relatively quickly and are only sporadically visible in the mucilage.

Occurrence: In the plankton of eutrophic waters in western Slovakia: In the rivers Danube and Morava and their inundation lakes, in the fish-pond Stávek at Stupava near Bratislava, relatively often and sometimes abundant.

Coenochloris diplococca is common in the phytoplankton of the waters mentioned above, especially in the spring and autumn period. The colonies were usually 8-16-celled, sometimes even more than 30-celled. As a rule, the cells were clustered or joined in pairs in the hyaline mucilaginous envelope of the colony. One chromatophore was present but there were two prior to protoplast division. The formation of only two autospores was observed. The growth of autospores makes the mother cell wall crack usually in the medial part (Fig. 4i). The remnants of the mother cell walls were well visible only sporadically, immediately after the release of autospore or at the end of the vegetation period in the autumn. The autospores formed were joined by their longer sides. In the course of time, however, they turned round through almost as much as 90° or they became detached but sometimes they remained joined until the onset of autospore formation. By the formation of two autospores and by the joining of the daughter cells, *C. diplococca* resembles *Diplochloris decussata* Korshikov 1939 in which, however, the cells are fusiform and the mode of the release of autospores is so far unknown.

The inclusion of the new species into green coccal algae is supported by chromatographic evidence. In the culture strain Hindák 1975/130, isolated from the type locality at Stupava, the pigments were analyzed by the same method as in *Dichotomococcus lunatus* Fott (see p. 99) and the presence of chlorophyll *b* was confirmed.

Coenochloris ovalis Korshikov f. Fig. 6

Bas.: *C. ovalis* Korš. Vizn. prisnovodn. vodor. Ukr. RSR 5, p. 324, 1953.

In the material investigated, the colonies were spherical to oval, up to 25 μm in diameter, with detached cells. Mucilage was hyaline, 4—10 μm wide around cells. The cells were broadly oval, 5—8×4—5 μm, with smooth walls. The chromatophore was parietal, trough-shaped to cup-shaped, lacking a pyrenoid. Most often 4 autospores were formed. They were released by a rupture of the mother cell wall. The remnants of the mother cell wall were well visible in the mucilage.

Occurrence: In the plankton of a gravel pit lake at Trávniky in Bratislava, sporadically in the autumn.

Cells in our material were smaller than those described by Korshikov in the original diagnosis of *C. ovalis* (6.5—11×5.5—10 μm) but were in

accord with other features. Following the release of autospores the mother cell wall was well visible and more extended than shown in the drawing of KOR-ŠIKOV (Fig. 297).

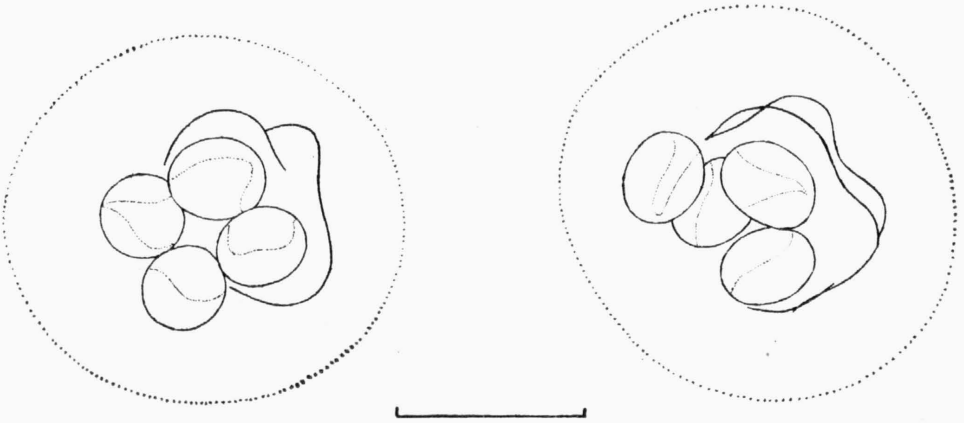

Fig. 6. — *Coenochloris ovalis* KORŠ. **f., specimens from Trávníky gravel pit lake in Bratislava. Scale: 10 μm.**

SÚHRN

Študovali sa niektoré autospórové kokálne riasy, ktoré v bunkách nemajú pyrenoid. V kultúre druhov *Dichotomococcus lunatus* FOTT a *Coenochloris diplococca* HIND. sa zistila prítomnosť chlorofylu *b*, čo je dôkaz, že tieto druhy patria medzi zelené riasy do radu *Chlorococcales*. Opísal sa jeden nový rod (*Dictyosphaeriopsis* HIND.) a tri nové druhy (*Dictyosphaeriopsis fluviatilis* HIND., *Gloeoactinium europaeum* HIND. a *Coenochloris diplococca* HIND.).

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Nové poznatky z molekulární biologie musí být brány v úvahu i v jiných vědních disciplínách a také v rostlinné fyziologii. Prof. D. Hess, známý především svými studiemi o biochemických aspektech genetiky, si vzal za úkol zpracovat na základě molekulárně biologických poznatků úvod do metabolismu a fyziologie vývoje vyšších rostlin. První vydání knihy bylo v roce 1970 a vzbudilo velký zájem. Kniha byla proto vydána ještě třikrát. V posledním, čtvrtém vydání z roku 1976, byla rozšířena kapitola o fotosyntéze o cyklus C_4-dikarbonových kyselin, prostorovou kompartimentaci fotosyntézy u rostlin s tímto cyklem, srovnání tohoto cyklu s cyklem sukulentních rostlin. Do kapitoly o biologických oxidacích je vřazen oddíl o fotorespiraci (glykolátová cesta), v němž jsou probírány buněčné partikule, na něž je tento cyklus vázán, a srovnáván jeho průběh u rostlin s C_3 a C_4 cyklem dikarbonových kyselin. V kapitole o regulacích je u regulace genové aktivity vnitřními faktory probrána také úprava prekursoru RNA (Processing) a hypotézy o účincích růstových látek, hlavně s ohledem na cAMP. Kapitola je rozšířena o některá zajímavá schémata, např. možnosti účinku rostlinného hormonu a jím vyvolané sekundární látky. V tomto vydání byla vynechána tabulka shrnující a srovnávající charakteristický účinek jednotlivých růstových látek, hlavně s ohledem na typ růstu, uváděná v minulých vydáních. Od posledního vydání byla získána řada dalších údajů o působení těchto látek, které ukazují na složitější mechanismus působení a pravděpodobně proto autor toto zjednodušené schéma raději vypustil. Kapitola o vodivých pletivech je rozšířena o mechanismus transportu, kde je probírána např. translokace cukrů z místa vzniku v chloroplastech listu na místo zásobní ve stonku a kořeni apod.

Bohužel ani v tomto vydání nebyl opraven chybně uvedený objekt *Chrysanthemum rubrum* místo *Chenopodium rubrum* v citované práci Krekuleho a spol.

I přes tyto drobné nedostatky je kniha velmi cennou příručkou nejen pro studenty rostlinné fyziologie, ale pro všechny odborníky, kteří potřebují získat ucelený přehled o nových poznatcích v tomto oboru.

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