Reprinted from "The Journal of the Indian Botanical Society"
Vol. XXV, No. 3, Aug. 1946, pp. 117-121

ON *JOHANNESBAPTISTIA PELLUCIDA* (DICKIE) TAYLOR AND DROUET FROM MADRAS

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Received for publication on March 17, 1946

IN 1927, Gardner recorded from Porto Rico two blue-green algæ which he referred to a new genus, *Cyanothrix* (non *Cyanothrix* Schmidle), and called the two algæ *C. primaria* and *C. Willei.* Taylor described in 1928 an alga from Dry Tortugas under the name *Nodularia* (?) *fusca* sp. nov. Frémy (1935, p. 96) with regard to this new species says that Taylor evidently had no knowledge at the time of the establishment of Gardner's *Cyanothrix*, otherwise, he (Taylor) would have doubtless made it a *Cyanothrix* intermediate in dimensions between *C. primaria* and *C. Willei.* De Toni, in 1934, renamed Gardner's genus *Cyanothrix* as *Johannesbaptistia* (Gardner) De Toni, since the name *Cyanothrix* had already been given by Schmidle (1897, also 1898) for an alga (*Cyanothrix vaginata*), which is now included under the genus *Mastigocladus* Cohn. Frémy (1935) found in some algal collections from the Isle of Bonaire and Algeria a *Johannesbaptistia* which showed characteristics of all the three species, *viz., J. primaria* (Gardner) De Toni, *J. Willei* (Gardner) De Toni and *Nodularia* (?) *fusca* Taylor, and so combined all these three under one species, *J. Gardneri* Frémy comb. nov. Two years later Seurat and Frémy (1937, p. 294) recorded this alga from South Tunisia also.

Drouet, in 1936, made a detailed study of a collection of *Johannesbaptistia* from the Galapagos Islands and also the original materials of Gardner and Taylor. He agreed with Frémy's combination of all the known species under one species, but preferred to use the name *J. primaria* (Gardn.) De Toni instead of *J. Gardneri* Frémy for nomenclatural considerations. Taylor (Drouet, 1938) from an examination of authentic material of *Hormospora pellucida* Dickie (Dickie, 1874) came to the conclusion that *H. pellucida* was really a *Johannesbaptistia.* Taylor and Drouet (Drouet, 1938), therefore called the alga *Johannesbaptistia pellucida* (Dickie) Taylor and Drouet and made *J. primaria* (Gardn.) De Toni (*J. Gardneri* Frémy) a synonym of it.

The writers found a *Johannesbaptistia* in a collection of algæ from a brackishwater pool at Ennore, a place about 10 miles north of Madras. This genus does not appear to have been recorded so far from India. A detailed account of the alga is given here.

The alga is filamentous and has a broad mucilaginous sheath. The sheath is hyaline and not refractive. Occasionally its outer limits

are very gelatinous and have debris sticking on to them. It is not stained with congo red nor coloured blue with iodine and sulphuric acid. It is stained with safranin, methylene blue or gentian violet.

The cells of the alga are arranged in a single series and are separated from each other by mucilage so that the alga appears as a single series of separate cells imbedded in a homogeneous cylindrical gelatinous matrix (Text-figs. 1, 5–6 ; Pl. X, Fig. 3). The cells divide in a plane at right angles to the longitudinal axis of the filament. Immediately after division, the two daughter cells are seen attached to each other, but soon after, they become separated from each other. No protoplasmic connections could be seen between adjacent cells of the filament in spite of very careful examination under higher powers either with or without staining. The cells are discoid or roughly hemispherical with plane or convex faces and are nearly circular in cross-section. The cell-contents are granular and blue-green in colour.

When stained with very dilute aqueous methylene blue, safranin or gentian violet, each cell shows a mucilaginous envelope round it inside the common mucilaginous sheath of the filament. When a cell divides, the mucilaginous envelope of the mother-cell is seen clearly round the two closely apposed daughter cells. Each of these daughter cells soon secretes its own mucilaginous envelope inside the envelope of the mother-cell somewhat as in *Gloeœapsa* or *Chroococcus* (Text-figs. 3 and 4 ; Pl. X, Figs. 1 and 2). The envelope of the mother-cell can be seen distinctly though faintly stained for some time, but finally becomes indistinguishable from the general mucilage of the filament.

The filament is 7·9–9·2 (10·8) μ broad and attains a length of 400 μ and sometimes even up to 2500 μ. The cells are 3·9–5·2 μ broad and 2·6–3·9 μ long.

Some of the cells of the filament degenerate and the filament fragments at these places (Text-fig. 1). Often a filament gets fragmented into quite a number of smaller bits (Text-fig. 2). Occasionally bits consisting of only two cells even are seen (Text-fig. 5). These fragments evidently serve for purposes of vegetative propagation.

The dimensions of the filaments and cells of the present alga [filament 7·9–9·2 (– 10·8) μ broad and cells 3·9–5·2 μ broad] come within the range of the dimensions given by Drouet for *J. pellucida* (Dickie) Taylor and Drouet (filament 8–23 μ broad and cells 4–17·5 μ broad). The writers, therefore refer the alga to *J. pellucida* (Dickie) Taylor and Drouet.

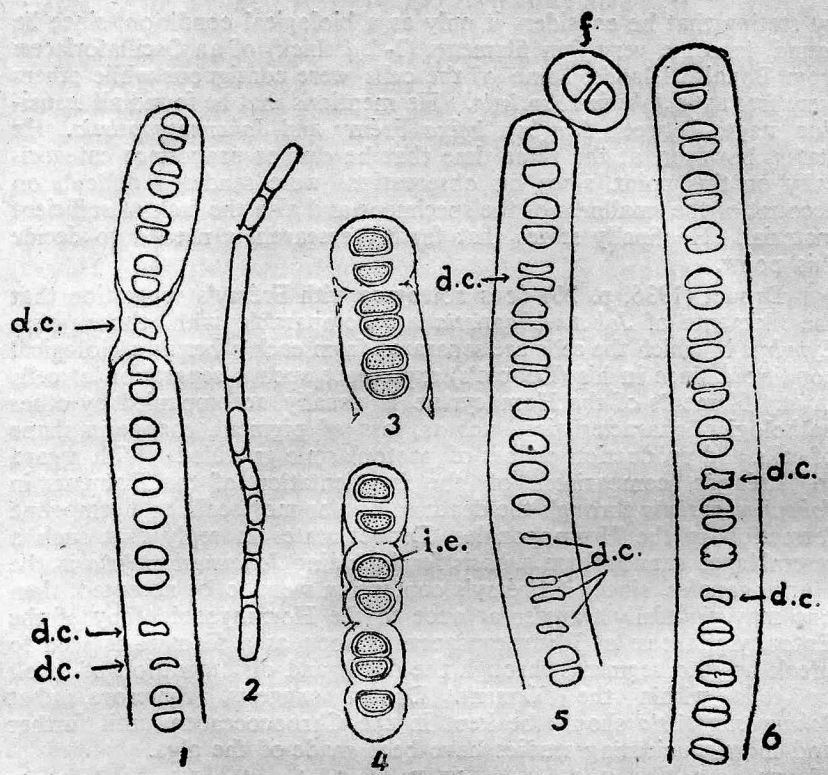
Gardner (1927) placed his new genus *Cyanothrix* in the Chroococcaceæ. Geitler (1932, p. 456) kept it under 'Anhang' at the end of the Chamæsiphonales, and suggested that it might be referred to the Entophysalidaceæ. Frémy (1935) removed the genus from the Chroococcaceæ and placed it in the Hormogonales in the family Oscillatoriaceæ between *Oscillatoria* and *Lyngbya* on account of its general resemblance to an Oscillatoriaceæ and also the similarity of its fragmentation through the death of one or more cells to hormogone formation. But he brushes aside the most important feature of *Johannesbaptistia, viz.*, the separate condition of the cells of the filament,

by stating that he considers it only as a biological condition, since he found, in some very thin filaments (1–2 μ thick) of an Oscillatoriaceæ from Bonaire Islands, some of the cells were contiguous while others were free as in *Johannesbaptistia.* He mentions that he found all transition stages between *Lyngbya infixa* Frémy and *Johannesbaptistia.* He states, however, at the same time that he cannot pronounce categorically on this point, since his observations were rendered difficult on account of the smallness of the specimens and also the lack of sufficient material. He finally states that further research is needed to decide this point.

Drouet (1936, p. 20) does not agree with Frémy's suggestion that the filaments of *Johannesbaptistia* are comparable with those of a *Lyngbya* in which the cells are separated from each other as a biological condition, since in his (Drouet's) experience such a separation of cells in any filaments of the Homocysteæ is usually accompanied by other pathological characteristics, such as, loss of pigment, change in shape of cells and production or loss of protoplasmic granules. With regard to Frémy's comparison of the fragmentation of the filaments in *Johannesbaptistia* through the death of one or more cells to hormogone formation in the Hormogonales, Drouet states in reply that such a resemblance cannot form a basis for including *Johannesbaptistia* in the Hormogonales, since, if Frémy's contention were to be accepted, then one may rightfully transfer at once to the Hormogonales any of the Entophysalidaceæ or Pleurocapsaceæ as soon as a filament is seen to break up into segments through the death and disintegration of a cell or cells within the filament. Drouet suggests, therefore, that *Johannesbaptistia* should be kept in the Chroococcaceæ until further and more elucidating studies have been made of the alga.

The writers entirely agree with Drouet's view that *Johannesbaptistia* should be kept in the Chroococcaceæ. They have other evidence also in support of this conclusion. As already stated, specimens of the alga stained with very dilute aqueous safranin, methylene blue or gentian violet show a definite mucilaginous envelope round *each* cell inside the general mucilaginous sheath of the filament. And, when a cell divides, each of the two daughter cells very soon secretes a mucilaginous envelope round itself inside the envelope of the mother-cell, somewhat as in *Glœocapsa* or *Chroococcus.* Taylor states that the filaments of *Nodularia* (?) *fusca* occasionally showed 'individual sheaths round pairs of cells'. Frémy (1935, p. 96) states with regard to this feature that they are only biological peculiarities, and further comments that these cells have not been figured by Taylor. The writers do not agree with Frémy that these are only biological peculiarities since they find that this is a constant and characteristic feature in the present alga.

The fact, that the cells are separate and each of them possesses its own mucilaginous envelope round itself inside the common mucilaginous sheath of the filament, and that, when a cell divides, each of the two daughter cells secretes an envelope of its own inside the mother-cell envelope clearly shows that the alga belongs to the Chroococcales and not to the Hormogonales.



Text-Figs. 1-6. *Johannesbaptistia pellucida* (Dickie) Taylor and Drouet.

Fig. 1. Portion of a filament. Note the fragmentation near a dead cell. Same filament as in Plate X, Fig. 3. Fig. 2. A long filament which is breaking up into a number of fragments drawn under low power. Cells not shown. Fig. 3. Portion of a filament drawn after staining with safranin showing the common mucilage as well as the individual envelopes. Fig. 4. A short filament stained with safranin showing the common mucilage as well as the individual envelopes. Same as in Plate X, Fig. 1. Figs. 5 & 6. Portions of filaments ; in Text-fig. 5 a two-celled fragment, just separating from the end portion. (*d.c.*, dead cell ; *i.e.*, individual envelope ; *f.*, fragment.). Text-figs. 1, 3–6, × 1165 ; Text-fig. 2, × 300.

This alga in the writers' opinion clearly belongs to the Chroococcales and is a filamentous development among the Chroococcales. Such a filamentous condition can easily be derived from a Chroococcaceous condition by the limiting of the cell-division to one plane only. The filamentous condition of *Johannesbaptistia* must be considered as merely a parallel development among the Chroococcales. A filamentous tendency is already seen in some of the members of the Entophysalidaceæ (see Fritsch, 1945, p. 819 ; Geitler, 1932, p. 293). The genus *Johannesbaptistia* may be considered as the highest expression of the filamentous tendency among the Chroococcales. The writers, therefore, agree with Gardner (1927), Geitler (1932) and Drouet (1936) that *Johannesbaptistia* should be kept in the Chroococcales. They

therefore retain the original diagnosis of the genus *Johannesbaptistia* (Gardn.) De Toni and are unable to accept the emended diagnosis of the genus of Frémy (1935, p. 99). They suggest that the genus may be placed in the Entophysalidaceæ along with other algæ which show a filamentous tendency.

SUMMARY

An account is given of *Johannesbaptistia pellucida* (Dickie) Taylor and Drouet. The alga was collected at Ennore near Madras. This appears to be the first record of this genus in India.

The writers do not agree with Frémy's suggestion that the genus *Johannesbaptistia* should be placed in the Oscillatoriaceæ between *Oscillatoria* and *Lyngbya*, but agree with Drouet's suggestion that it should be retained inside the Chroococcales.

The filamentous condition in *Johannesbaptistia* should be considered as a parallel development among the Chroococcales. *Johannesbaptistia* represents the highest expression of the filamentous tendency among the Chroococcales.

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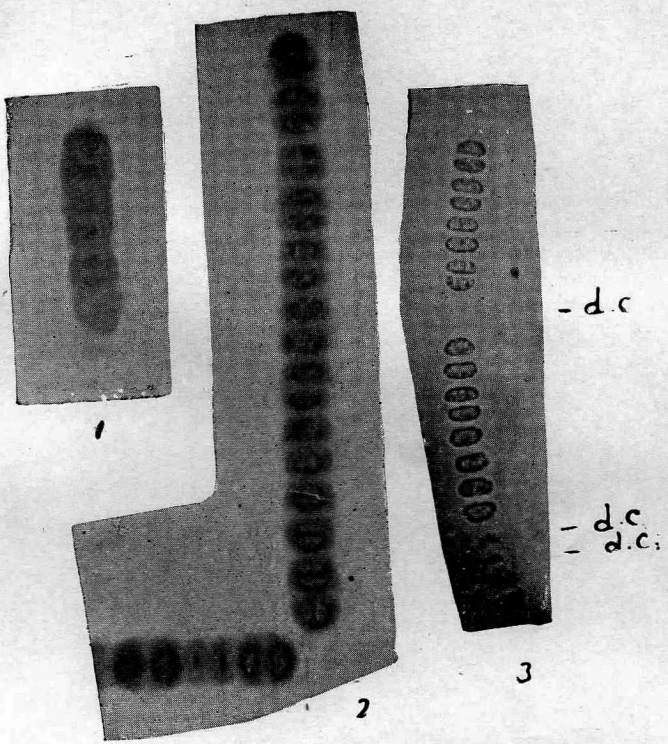

Figs. 1 and 2. Filaments stained with safranin showing the mucilaginous envelope round individual cells and also round pairs of daughter cells.

Fig. 3. An unstained filament showing fragmentation; note dead cells (*d. c.*) at the region of fragmentation.

All × 850.

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