Bangladesh J. Bot. **35**(2): 199-200, 2006 (December) **- Short communication**

DIFFERENTION OF HETEROCYSTS IN *ANABAENA SOLITARIA* f. *PLANKTONICA* (BRUNTH.) KOM.

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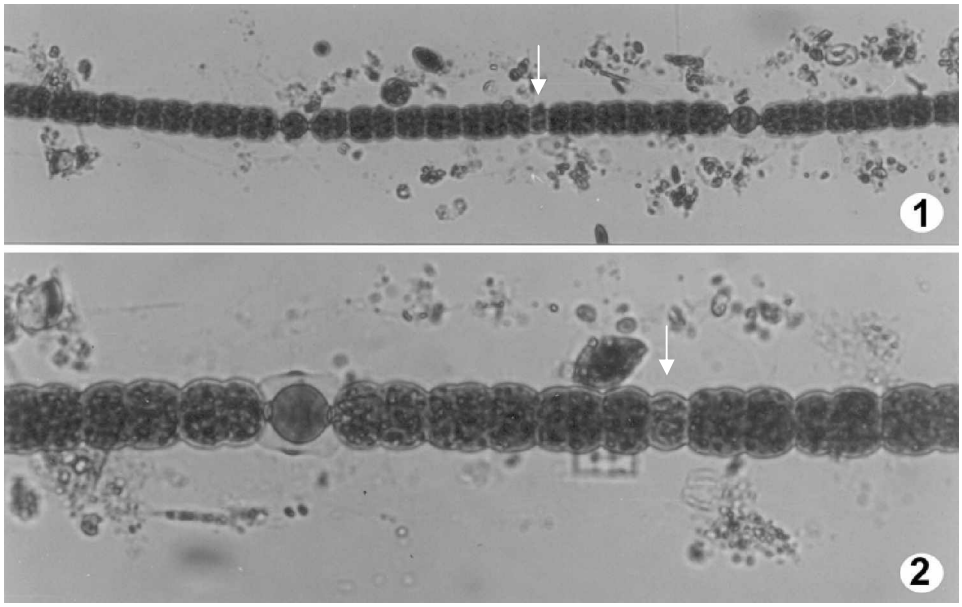
Key words: Differentiation, Heterocyst, *Anabaena*

Abstract

Observation of filaments in the natural population of *Anabaena solitaria* f. *planktonica* (Brunth.) Kom. indicated that new heterocysts develop by the differentiation of smallest and youngest cells situated away from existing heterocysts.

Heterocysts are characterized by having a well defined wall and almost homogenous, non-granular and light coloured cell content with polar nodule(s) adjoining the adjacent vegetative cell (s) (Fogg *et al.* 1973). A vegetative cell differentiates into a heterocyst by structural (formation of extra wall and polar nodules, reduction of thylakoids, absence of cyanophycin and polyphosphate granules, etc.) and physiological (inability to fix CO_2 and ability to fix N_2) changes (Lee 1989). Which vegetative cell differentiates into a heterocyst was a question for a long time. Aziz and Whitton (1987) showed that the basal cell of a hormogonium of *Gloeotrichia* is the youngest and differentiates into a heterocyst. They also showed that a hormogonium develop from a single cell and the basal cell of a hormogonium (because of cell division pattern) remains as the youngest after the release. In species of *Anabaena* and *Anabaenopsis* heterocysts occur at more or less equidistantly (Starmach 1966). In the *Anabaena solitaria* f. *planktonica* small, light-coloured cells have been found to occur at regular intervals along the filament further away from the existing heterocysts (Figs. 1-2). These small cells subsequently develop into heterocysts.



Figs. 1-2. 1. A filament of *Anabaena solitaria* f. *planktonica* (Brunth.) Kom. with a small cell near to the middle (arrow) of two existing mature heterocysts. 2. A portion of a filament enlarged showing (arrow) the smallest less-granulated cell prior to differentiation into a heterocyst.

Wilcox *et al.* (1973) proposed that in *A. cylindrica* there is an inhibiting zone around a pre-existing heterocyst, and only a small cell outside this becomes a heterocyst. Mitchison and Wilcox (1972) mentioned that the position of the small daughter cell in a filament is determined by the division pattern. In *Anabaenapsis arnoldii* a pair of heterocysts occur at a regular interval and these have been shown to develop from a pair of smallest cells (Starmach 1966, Fig. 708). Fogg (1949) hypothesized that normal cell transforms into a heterocyst when the concentration of a specific nitrogenous substance, probably NH_3 or a simple derivative of it, falls below a critical level. In *Anabaena catenula* a cell is only susceptible to stimulus to differentiate into a heterocyst during early stage of its development cycle (Fay 1983). The biochemical reason of differentiating a vegetative cell into a heterocyst is the highest (6 : 1) carbon-nitrogen ratio (Kulasooriya *et al.* 1972). This finding indicates that in tapered or non-tapered filamentous Cyanobacteria, youngest cell appears to suffer nitrogen deficiency most compared to other cells and differentiates into a heterocyst.

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(Manuscript received on 29 October, 2006; revised on 9 November, 2006)