*Environmental Engineering and Management Journal* *June 2019, Vol.18, No. 6, 1337-1346*
*http://www.eemj.icpm.tuiasi.ro/; http://www.eemj.eu*

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# PHOTOAUTOTROPHIC PRODUCTION OF POLY-B-HYDROXYBUTYRATE (PHB) FROM CYANOBACTERIA: NITRATE EFFECTS AND SCREENING OF STRAINS

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## Abstract

The polyhydroxybutyrate (PHB) production by photoautotrophic cultures is a potential eco-sustainable process to produce bioplastics. The biosynthesis of PHB by cyanobacteria meets a twofold target: the use of $CO_2$ as feedstock alternative to the fossil resource used in the conventional processes; the contribution to the reduction of the $CO_2$ concentration in the atmosphere. This contribution reports results of a study regarding the optimal growth conditions for cyanobacteria to produce PHB under photoautotrophic conditions using 16h/8h light/dark irradiation strategy.
*Synechocystis* PCC6803 was selected as the model organism for optimization of the medium composition with respect to PHB production. Four culture media, characterized by different nitrate concentrations, were investigated: $BG_{11}$ (optimal nitrate concentration), $BG_{1/2}$ (half of optimal nitrate concentration), $BG_{1/4}$ (one fourth of the optimal nitrate concentration) and $BG_0$ (nitrogen-starved conditions). $BG_{1/2}$ proofed to be the best medium to optimize the PHB production in terms of PHB fraction of cell (8% $_{DCW}$) and PHB productivity (7g/Ld).
Five strains of cyanobacteria were then compared to select the best strain to produce PHB. *Synechocystis* PCC6803 and *Synechocystis aquatilis* were the best strains for PHB production. A PHB fraction and productivity of about 8% $_{DCW}$ and 7g/Ld were obtained for both strains. The production performance was promising when considering the free substrate ($CO_2$) used.

*Keywords:* cyanobacteria, nitrogen-starvation, photobioreactor, polyhydroxybutyrate (PHB), screening, strain

*Received: March, 2017; Revised final: March, 2018; Accepted: March, 2018; Published in final edited form: June, 2019*

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