SITI SUHADA BINTI SULEIMAN MASTER OF SCIENCE 2018

EFFECT OF DIFFERENT LIGHT REGIME ON PHYCOBILIPROTEIN PRODUCTION FROM SOME CYANOBACTERIA SPECIES FOUND IN SETIU

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Main Supervisor : Helena Khatoon, Ph.D.

Co-Supervisor : Professor Mohd Effendy bin Abdul Wahid, Ph.D.

School : School of Fisheries and Aquaculture Sciences

Phycobiliproteins present in cyanobacteria is the major light harvesting pigments which consists of chromophores (bilin) that are attached to cysteine residue of the apoprotein in cyanobacteria. They elicits high active natural biochemical compound, eligible for various application in medical as well as in aquaculture industry. Varying physiochemical parameters especially light, affect photosynthesis and thereby the growth of cyanobacteria as well as the phycobiliprotein content present in them. Present study focused on optimizing light regime to produce maximum phycobiliprotein from potential cyanobacteria. Three species of cyanobacteria, marine *Geitlerinema* sp., freshwater *Leptolyngbya boryana* and *Pseudanabaena mucicola*, were selected and cultured in four different light regime which were; (i) 24 hours artificial light (24 AL), (ii) 12 hours artificial light and 12 hours sunlight (12 AL: 12 SL), (iii) 12 hours artificial light and 12 hours dark (12 AL: 12 D), 12 hours sunlight and 12 hours dark (12 SL: 12 D). Prior to light regime experiment,

growth curve for each species in every light regime had been carried out to obtain the stationary phase. Results showed that among the species, *Pseudanabaena mucicola* cultured under 12 AL: 12 D has a significantly higher ($P<0.05$) total phycobiliprotein production (149.96 ± 1.4 mg g^{-1}) with a significantly high ($P<0.05$) purity ratio for phycocyanin (0.92 ± 0.02), allophycocyanin (0.58 ± 0.01), phycoerythrin (0.43 ± 0), compared to the other light regime. *Leptolyngbya boryana* cultured in 12 AL: 12 D had a lower total phycobiliprotein production (15.07 ± 0.6 mg g^{-1}) with a significantly low purity ratio for phycocyanin (0.08 ± 0), allophycocyanin (0.05 ± 0.01) and phycoerythrin (0.07 ± 0). In addition, protein of the phycobiliprotein from *Pseudanabaena mucicola* showed a significantly higher concentration ($P<0.05$) under 12 AL: 12 SL (3.06 ± 0.2 mg mL^{-1}) compared to the other light regime. Coomasive Blue Staining of SDS-PAGE of phycobiliprotein extract in all light regime revealed two bands between 10 kDa to 15 kDa corresponding to α and β subunit of phycocyanin. Hence, *Pseudanabaena mucicola* exposed to 12 AL: 12 D was the best cyanobacterial species for maximum phycobiliprotein production which can be utilized for further study.

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KESAN KEPELBAGAIAN REJIM CAHAYA KE ATAS PHYCOBILIPROTEIN DARIPADA BEBERAPA SPESIS SIANOBAKTERIA DIJUMPAI DI SETIU

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Penyelia Utama : Helena Khatoon, Ph.D.

Penyelia Bersama : Professor Mohd Effendy bin Abdul Wahid, Ph.D.

Pusat Pengajian : Pusat Pengajian Sains Perikanan dan Akuakultur

Fikobiliprotein adalah pigmen utama untuk penuaian cahaya dan terdiri daripada chromophores (bilin) yang mana bersambungan dengan lebihan sisteina pada apoprotein dalam sianobakteria. Ia mempunyai sebatian biokimia semulajadi yang aktif, berkelayakkan untuk pelbagai aplikasi dalam industri perubatan dan akuakultur. Berbagai- bagai parameter fisokimia terutamanya cahaya, memberi kesan terhadap fotosintesis dan sekaligus pertumbuhan sianobakteria serta kandungan fikobiliprotein yang terdapat di dalamnya. Kajian ini fokus pada rejim cahaya yang optimum untuk mendapatkan fikobiliprotein maksimum daripada sianobakteria yang berpotensi. Tiga spesies sianobakteria, *Geitlerinema* sp. marin, *Leptolyngbya boryana* dan *Pseudanabaena mucicola* air tawar, dikultur dalam empat rejim cahaya iaitu i) 24 jam cahaya tiruan (24 AL), ii) 12 jam cahaya tiruan: 12 jam gelap (12 AL: 12 D), iii) 12 jam cahaya tiruan: 12 jam cahaya matahari (12 AL: 12 SL) dan, iv) 12 jam cahaya matahari: 12 jam gelap (12 SL: 12 D). Keluk

pertumbuhan bagi setiap rejim cahaya dijalankan untuk memperoleh fasa pegun. Keputusan menunjukkan *Pseudanabaena mucicola* yang dikultur dalam 12 AL: 12 D menghasilkan fikobiliprotein tertinggi (149.96 ± 1.4 mg g^{-1}) yang signifikan ($P<0.05$) dengan nisbah ketulenan yang tinggi secara signifikan ($P<0.05$) bagi fikosianin (0.92 ± 0.02), allofikosianin (0.58 ± 1.4), dan fikoerythrin (0.43 ± 0), berbanding rejim cahaya yang lain. *Leptolyngbya boryana* yang dikultur dalam 12 AL: 12 D menunjukkan penghasilan fikobiliprotein yang rendah (15.07 ± 0.6 mg g^{-1}) berbanding dengan spesies lain. Tambahan pula, protein yang terdapat dalam fikobiliprotein daripada *Pseudanabaena mucicola* menunjukkan kepekatan yang lebih tinggi secara signifikan ($P<0.05$) apabila dikultur pada 12 AL: 12 SL (3.06 ± 0.2 mg mL^{-1}) berbanding rejim cahaya yang lain. Pewarnaan Coomassie Biru daripada SDS-PAGE pada ekstrak fikobiliprotein dalam semua rejim cahaya menunjukkan dua jalur di antara 10 kDa hingga 15 kDa berpadanan kepada fikosianin subunit α and β. Kesimpulannya, kajian menunjukkan *Pseudanabaena mucicola* adalah spesies sianobakteria terbaik di antara spesies dalam kajian ini terutama sekali apabila didedahkan kepada rejim cahaya yang optimum iaitu 12 AL: 12 D untuk penghasilan fikobiliprotein yang maksimum yang boleh digunakan untuk kajian lanjutan di masa hadapan.