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EFFECT OF NITROGEN AND PHOSPHORUS ENRICHMENT ON THE GROWTH OF THREE TROPICAL CHLOROPHYTES

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ABSTRACT

The main objective of the present study was to assess the potential use of three tropical chlorophytes, namely *Chlorella vulgaris* UMACC 001, *Scenedesmus quadricauda* UMACC 041, and *Ankistrodesmus convolutus* UMACC 101 as test organisms for bioassays of nitrogen and phosphorus. Based on a growth study using *Chlorella vulgaris* UMACC 001, 1% BBM containing 0.03 mM $NaN0_3$ was chosen as the minimal culture medium. The growth of the cultures at 0.03, 0.15, 0.75, 3.75, and 18.75 mM $NaNO_3$ and NH_4Cl was monitored based on cell numbers and OD_{620} attained in 96 h tests, and compared with that in Dilution Water, which was without nitrogen and phosphorus. For the phosphate experiments, the cultures were grown at 0, 0.02, 0.10, 0.50, 2.50, and 12.5 mM phosphate (KH_2PO_4 and K_2HPO_4) in 1% BBM containing 0.03 or 18.75 mM $NaNO_3$. There was no marked difference in the overall growth trends of the three chlorophytes with respect to the variations in nitrogen and phosphorus levels tested. However, the cell numbers and OD_{620} attained at 96 h by the three chlorophytes increased with increasing levels of nitrogen and phosphorus. The Percentage Growth Enhancement at 96 h (PGE-96) based on the percentage increase of cell numbers or OD_{620} at 96 h, relative to that attained in Dilution Water (arbitrarily given a PGE-value of 100%) could be used as a parameter in bioassay tests for nitrogen and phosphorus. The three chlorophytes have the potential to be used as test organisms in bioassays of nitrogen and phosphorus in tropical freshwater environments.

ABSTRAK

Objektif utama dari kajian ini adalah untuk menilai keupayaan penggunaan tiga jenis alga hijau tropika dinamakan *Chlorella vulgaris* UMACC 001, *Scenedesmus quadricauda* UMACC 041 dan *Ankistrodesmus convolutus* UMACC 101 sebagai organisma ujian untuk bioassay nitrogen dan fosfat. Berdasarkan kajian pertumbuhan menggunakan *Chlorella vulgaris* UMACC 001, Bold's Basal Medium 1% yang mengandungi 0.03 mM $NaNO_3$ telah dipilih sebagai media minimal untuk kultur. Pertumbuhan kultur pada 0.03, 0.15, 0.75, 3.75 dan 18.75 mM $NaNO_3$ atau NH_4Cl telah dipantau berdasarkan kepada bilangan sel dan OD_{620} yang diperolehi dalam ujian 96 jam, dibandingkan dengan di dalam air pencairan, yang mana ia tidak mengandungi nitrogen dan fosfat. Untuk eksperimen fosfat, kultur ditumbuhkan pada 0, 0.02, 0.10, 0.50, 2.50 and 12.5 mM fosfat (KH_2PO_4 dan K_2HPO_4) di dalam BBM 1% yang mengandungi 0.03 atau 18.75 mM $NaNO_3$. Tidak terdapat perbezaan yang ketara pada keseluruhan tren pertumbuhan ketiga-tiga alga hijau merujuk kepada variasi tahap nitrogen dan fosfat yang diuji. Walau bagaimanapun, bilangan sel dan OD_{620} yang diperolehi pada 96 jam (PGE-96), oleh ketiga-tiga alga hijau ini bertambah dengan peningkatan tahap nitrogen dan fosforus. Peratus pertambahan pertumbuhan pada 96 jam (PGE-96) berdasarkan kepada peratus pertambahan bilangan sel atau OD_{620} pada 96 jam adalah berkait dengan yang diperolehi dalam air pencairan (nilai PGE yang diberikan adalah 100%) boleh digunakan sebagai parameter di dalam ujian bioassay untuk nitrogen and fosfat. Ketiga-tiga alga hijau mempunyai potensi untuk digunakan sebagai organisma ujian dalam bioassay nitrogen dan fosfat di dalam persekitaran air tawar tropika.

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List of Abbreviations

Full name	Abbreviation
Weight/ volume	w/v
Bold Basal's Medium	BBM
Degree Celcius	°C
Hour	H
Optical Density at 620 nm	OD_{620}
Rotation per minute	rpm
Dilution Water	DW
4-(2-Hydroxyethyl)-piperazine-1-ethane-sulfonic acid	HEPES

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