



NUTRIENT REMOVAL FROM ANAEROBIC MUNICIPAL EFFLUENTS BY OLEAGINOUS MICROALGAE *Neochloris oleoabundans*

Moreno-Rivas Gerardo¹, Meraz-Rodríguez M.², Rodríguez-Palacio M. C.¹, Lozano-Ramírez C.¹ y Castilla-Hernández P.³
Lab. Fisiología Aplicada AS-202, Depto. Hidrobiología¹; Lab. Tratamiento de Aguas Residuales W-106, Depto. Biotecnología². Universidad Autónoma Metropolitana, Unidad Iztapalapa. Av. San Rafael Atlixco 189, Col. Vicentina, 09340 D.F., México.

Lab. Biotecnología Ambiental 309, Depto. El Hombre y su Ambiente³. Universidad Autónoma Metropolitana, Unidad Xochimilco. Calz. del Hueso 1100, Col. Villa Quietud, 04960 D.F., México. castilla@correo.xoc.uam.mx

Key words: efluentes anaerobios, microalgas, biodiesel.

Introduction. Treated wastewaters and others similar wastes retain nutrients as ammonium NH_4^+ and phosphate PO_4^{2-} . Since several decades ago, the algae have been used in order to treat waste waters, however the strong fuel necessities point to the utilization of algae biomass to biodiesel production. *Neochloris oleoabundans* is a potentially useful microalgae for the obtaining of biofuel since the high oil production under culture conditions (1). It is important to know if these microalgae can thrive in wastewater effluents and use it for tertiary treatment and biomass production.

Methods. It was evaluated the NH_4^+ and PO_4^{2-} removal capacity of *N. oleoabundans* growing in municipal wastewater effluents. Another experiment was made using dropping material (leaching) produced by composting in order to produce lipids. Wastewater was collected from an ascendant flux mud bed reactor; leaching was obtained from a zeolite packed anaerobic filter. Material of both experiments was sterilized by UV light. Cultures were performed at 15 and 10 L. Previously; *N. oleoabundans* was growth at volumes of 0.25 and 1 L with a light-darkness cycle of 12:12 h. the irradiance was $90.5 \mu\text{mol}\cdot\text{m}^2\cdot\text{s}^{-1}$; temperature $25\pm 1^\circ\text{C}$; continuous air pumping for CO_2 supply. Sampling was performed every third day and material was analyzed by colorimetric methods looking for NH_4^+ and PO_4^{2-} . Biomass was measured by cell counting (2). Lipids from algal biomass from wastewater were measured by Bligh and Dyer method (3) and Marsh and Weinstein calcination method (4).

Results. Initial measuring of NH_4^+ in wastewater from municipal effluent was 41.6 mg/L and the elimination was 98.6% at the end of 18 days. For leaching test the initial NH_4^+ concentration was 111.2 mg/L and 98.6% of removal required 20 days. The initial PO_4^{2-} measurement was for wastewater municipal effluent and removal reached 62.9% after 18 days. For leaching test the initial measurement was 7.7 mg/L and removal reached 79.4% after 28 days. Biomass production reached 7.0×10^6 cell/L in municipal wastewater effluent, and 1.1×10^7 cell/L for leaching test, respectively. Biomass obtained from cultures growth using wastewater reached 11-17%, this is consistent with other studies.

Conclusions. *N. oleoabundans* showed a great nutrient removal capacity under culture conditions. Moreover it produced a very good biomass quantity. These characteristics could be a good alternative for environmental and energetic purposes.

Acknowledgements. We appreciate very much to project PICS011-55 ICyTDF; to "Cultivos de microalgas, usos potenciales, Caribe y Golfo de México" research project supported by DBCS-UAMI and Calidad del agua del Río Zahuapan Tlaxcala y Biotratamientos research project supported by DCBS-UAMX.

References

1. Chisty Y. 2007. Biodiesel from microalgae. *Biotechnology Advances* 25: 294–306.
2. Arredondo-Vega y Voltolina. 2007. *Métodos y Herramientas analíticas en la evaluación de la biomasa microalgal*. Centro de Investigaciones Biológicas del Noroeste (CIBNOR). 97 p.
3. Bligh y Dyer 1959. A rapid method of total lipid extraction and purification. *Canadian Journal of Biochemistry and Physiology*. 37(3): 911-917.
4. Marsh y Weinstein. 1966. Simple charring method for determination of lipids. *Journal of Lipid Research*. 7: 574-576.