



# INDUSTRIAL AND DOMESTIC WASTEWATER LAB SCALE BIOLOGICAL TREATMENT USING A MICROALGAE CONSORTIUM COMPOSED OF *Scenedesmus spp.* and *Chlorococcum spp.*

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**Introduction.** A biological wastewater treatment consists on the use of microorganisms, mostly bacteria, for the elimination of both organic matter and pathogenic microorganisms from wastewater effluents(1). It has been recently reported the use of different microalgae species for the elimination of pathogenic microorganisms, heavy metals and toxic organic compounds (2). Besides, microalgae have a very promising biotechnological potential for the production of valuable compounds with industrial applications such as food additives, biofuels, cosmetics and pharmaceuticals (3).

The objective of this work was to assess the feasibility of treating a domestic and industrial wastewater effluent, with a lab scale reactor, using a microalgae consortium taken from Laja river located on Cortázar, Guanajuato. México.

**Methods.** The wastewater bioremediation process was carried out testing three different cell concentrations ( $0.25 \times 10^6$ ,  $0.5 \times 10^6$  and  $1 \times 10^6$  cel·mL<sup>-1</sup> of a mixed algae culture) in a volume of 1 L of wastewater (collected from the Insurgentes Wastewater Plant located on Cortázar, Guanajuato México.), during 37 h with a constant blue LED lamp illumination and air supplementation.

**Results.** It was determined the viability of the use of this mixed microalgae culture, composed by *Scenedesmus quadricauda*, *Scenedesmus obliquos* & *Chlorococcum spp.*, for wastewater treatment. The extent of nitrogen, phosphorus and organic matter bio-removal showed significant differences (Tukey  $p < 0.05$ ) for all the treatments tested. It was only in the phosphorus bio-removal for the treatments with  $0.5 \times 10^6$  cel·mL<sup>-1</sup> and  $1.0 \times 10^6$  cel·mL<sup>-1</sup> after 15 h where no significant difference was observed. The

results for the final conditions for all the treatments are summarized on Table 1.

**Table 1.** Final removal conditions for the wastewater contaminants at different cellular concentrations (after 37 h). C= contaminant, F.C. = Final Concentration, N=Nitrogen, P = Phosphorus, y OM = Organic Matter.

Treatment	C.	F. C. (mg/L)	Removal (%)
$0.0 \times 10^6$ cel·mL <sup>-1</sup>	N	60.5 ± 0.7	21.4
	P	50.6 ± 0.8	22.2
	OM	628 ± 2.1	20.6
$0.25 \times 10^6$ cel·mL <sup>-1</sup>	N	38 ± 1.4	50.7
	P	18.9 ± 0.8	67.8
	OM	251 ± 2.1	68.68
$0.5 \times 10^6$ cel·mL <sup>-1</sup>	N	14 ± 1.4	79.1
	P	4.2 ± 0.1	90.7
	OM	58 ± 1.4	89.3
$1.0 \times 10^6$ cel·mL <sup>-1</sup>	N	9.5 ± 0.7	85.8
	P	2.6 ± 0.1	94.2
	OM	41 ± 1.4	92.4

**Conclusions.** It is feasible the use of a mixed consortium of photosynthetic protozoa (*Scenedesmus quadricauda*, *Scenedesmus obliquos* and *Chlorococcum spp.*) on wastewater treatment due to that their nutritional needs couple with the availability of contaminants on the treated water and that their growth causes significant depletion of these contaminants as their cellular concentration is raised, as it was shown on this work.

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## References.

- Congestri R, Di Pippo F, De Philippis R, Buttino I, Paradossi G, Albertano P. (2006). *Aquat Microb Ecol.* 45: 301–312.
- Oswald, W. (1988). The role of microalgae in liquid waste treatment and reclamation. In: *Algae and Human affairs*. Lembi, C. & Waaland, J. Cambridge University Press, Cambridge. 255-281.
- Posten C. (2009). *Eng Life Sci.* 9:165–77.