



## WASTEWATER TERTIARY TREATMENT USING THE MICROALGAE *Desmodesmus quadricauda* y *Chlorella* sp.

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**Introduction.** Microalgae have been studied because of its ecological, evolutionary, and economic importance. Microalgae are particularly useful since its metabolism can obtain N, P and organic material from polluted water ponds. This situation makes microalgae an important tertiary treatment element. On this way, microalgae are a good alternative for wastewater treatment (1). This work had the aim of evaluating the ammonia and orthophosphate removal using *Desmodesmus quadricauda* obtained from UAM-I microalgae collection at Applied Phycology Laboratory, and *Chlorella* sp. Isolated from the treatment wastewater plant at UAM-I.

**Methods.** Each microalga isolated from wastewater treatment plant was irradiated with UV light for two hours, after, three inoculums were made from each microalga and placed in media culture using 3, 15 and 60 L, respectively. NH<sub>4</sub><sup>+</sup> and PO<sub>4</sub><sup>3-</sup> removal were measured at the beginning, the middle and the end of the experiment using a Hanna HI 83099 multiparametric spectrophotometer (2). Cellular count was made using a Neubauer chamber (3).

### Results.

**Table 1.** Nutrient removal comparison of the two species of microalgae in the three volumes of cultures.

	<i>Desmodesmus quadricauda</i>			<i>Chlorella</i> sp.		
	T 0	T 10	removal	T 0	T 5	removal
<b>VOLUME: 3L</b>						
Biomass (10 <sup>6</sup> cel/ml)	0.18	1.15	-	1.06	5.79	-
NH <sub>4</sub> <sup>+</sup> (mg/L)	136.50	39.26	71%	29.0	20.18	30%
PO <sub>4</sub> <sup>3-</sup> (mg/L)	12.60	3.64	71%	1.55	0.40	74%
<b>VOLUME: 15L</b>						
Biomass (10 <sup>6</sup> cel/ml)	0.30	2.90	-	0.97	2.72	-
NH <sub>4</sub> <sup>+</sup> (mg/L)	86.0	3.35	96%	103.75	84.85	18%
PO <sub>4</sub> <sup>3-</sup> (mg/L)	11.7	2.37	80%	8.69	0.25	97%
<b>VOLUME: 60L</b>						
Biomass (10 <sup>6</sup> cel/ml)	0.26	7.52	-	0.76	6.39	-
NH <sub>4</sub> <sup>+</sup> (mg/L)	92.25	34.27* 27.33* *	63%* 70%**	62.35	58.75	6%
PO <sub>4</sub> <sup>3-</sup> (mg/L)	15.70	0.21	99%	3.70	0.10	97%

*D. quadricauda* shown 71%, 96% and 67% ammonia removal while *Chlorella* sp. shown 30%, 18% and 6% in 3, 15 and 60 L cultures, respectively. Orthophosphate removal was 71%, 80% and 99% for *D. quadricauda*; 74%, 97% and 97% for *Chlorella* sp. Ammonia removal was more efficient the greater volume culture when *D. quadricauda* was tested. However ammonia efficiency removal decreased when culture volume was greater with *Chlorella* sp. Phosphate removal were more efficient using 15 and 60 L culture for both microalgae.

**Conclusions.** These results give us an indication that these microalgae can be an option for NH<sub>4</sub><sup>+</sup> and PO<sub>4</sub><sup>3-</sup> removal from waste water effluents and for biomass production

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### References

- Hernández-Reyes B. M., Rodríguez-Palacio, M. C., Lozano-Ramírez C. y P. Castilla-Hernández. 2012. Remoción de nutrientes por tres cultivos de microalgas libres e inmovilizados. *Revista Latinoamericana de Biotecnología Algal y Ambiental*. 3 (1): 80-94.
- Contreras E. F., 1994., *Manual de técnicas hidrobiológicas.*, Ed. Trillas, México. 94 p.
- 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.