Production of Algae with pretreated and wastewater.

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Key words: wastewater, biodiesel, mixed culture.

Introduction. The accelerated global demand of energy is expected to continuously increase; nevertheless some of the conventional methods of generating energy are no longer sustainable, therefore different sources for generating energy have been proposed. Microalgae biomass, specifically biodiesel, represents an accurate alternative to complement the efforts.
The production process of biodiesel still has challenges to overcome before it can be commercialized. Two of them are the sustainable use of water and a reliable source of nutrients to reduce environmental impacts in the process [1]. The integration of water treatment and algae cultivation is an approach that helps to diminish both issues [2-3]. Nonetheless, little is known about this process.
In this work were tested treated (TW) and wastewater (WW) with additional sources of nitrogen (NO_3^- and NH_4^+) with a mixed algal culture previously isolated from Texcoco Lake.

Methods. Two types of water were evaluated (TW and WW) in which BG11 nutrients were supplemented with two different inorganic nitrogen sources NO_3^- (750 mg/L) and NH_4^+ (480 mg/L). The controls were not added with BG11 nutrients or nitrogen source. The experiments were carried out in 1 L photobioreactors (FBR) with a operation volume of 80%; FBR were inoculated with 10 % of a 5 day mixed Texcoco culture and cultivated at 24-28 °C, with 12:12 h photoperiods and 2 vvm aeration.

Both waters were characterized determining COD, TSS, VSS and initial concentration of NO_3^- and NH_4^+. Biomass by dry weight, optic density (600 and 750 nm), chlorophyll, nitrate, ammonium, pH and total lipids by gravimetry using extraction with hexane were determined during the experimental period of 20 days.

Results. The maximum lipid and biomass production was achieved in the WW supplemented only with BG11 salts; 1.3 g/L of biomass and 62.14 mg/L of total lipids, which represents 4.7 % of lipids (dry weight).

The ammonium had a negative effect in culture growth of both TW and WW. In TW growth was three times lower in compare to the control (table 1), reaching only 0.42 g/L of biomass, however lipid percentage in biomass was the highest obtained (8.1%). In contrast, the evaluated nitrate concentrations had a positive effect on the growth of the both waters. Nonetheless, the percentage of lipids decreased when nitrate source was added.

Considering a commitment biomass-lipid yield the best condition or system was WW+BG11 without additional nitrogen source (1.30 g/L of biomass and 62.1 mg of lipids/L) (Table 1). This lipid yield is low compared to other obtained and reported yields (400 mg/L). However, biomass and lipids production is been coupled with the water treatment.

Table 1. Biomass and lipids yield using treated and wastewater supplemented with BG11 salts and different sources of nitrogen.

	$[NH_4^+]$ (mg /L)	$[NO_3^-]$ (mg /L)	Biomass (dry weight) (g/L)	Lipid yield (mg/L)	Growth rate (1/d)
TW	140	42	0.85	61.37	0.053
TW+BG11	140	42	1.20	55.32	0.075
TW+BG11	620*	42	0.42	34.36	0.063
TW+BG11	140	792*	1.10	41.47	0.100
WW	360	8	0.79	49.22	0.042
WW+BG11	360	8	1.30	62.14	0.067
WW+BG11	840*	8	0.53	38.05	0.109
WW+BG11	360	758*	1.20	52.44	0.121

*****Supplemented source of nitrogen

Conclusions. The ammonium in the concentration added had an inhibitory effect in the growth of the culture on both types of water, but induces cellular lipid accumulation. In contrast, nitrate concentrations showed a positive effect on growth of both waters. Nonetheless, lipids productivity decreased when the latter nitrogen source was added.

It is possible to use WW and TW for cultivations of the mixed algal culture isolated from Texcoco lake.

Acknowledgements. Proyect SIP 20120210. Establecimiento de condiciones de cultivo de algas y diseño de raceways semicerrados para la obtención de lípidos para biocombustibles.

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