



## BIOMASS AND LIPID PRODUCTION BY *Nannochloropsis oculata* IN DIFFERENT FORMULATIONS OF F/2 MEDIA

Eder Gutiérrez-Márquez, Aarón Millán-Oropeza, Oscar Arturo Ortega-Guzmán, Luis Fernández-Linares  
Unidad Profesional Interdisciplinaria de Biotecnología - Instituto Politécnico Nacional (UPIBI-IPN). Departamento de Bioprosos. México, D.F. Corresponding author e-mail: lfernand36@gmail.com

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**Introduction.** *Nannochloropsis oculata* is a widely known microalgae that accumulates lipids for biodiesel purpose. *N. oculata* has been reported to have an oil yield of 22.7 – 29.7% (1). However, to establish a technically and economically viable biofuel process, there are several issues to consider: culture systems, media composition, culture conditions as light intensity, pH, and nutrients concentration. Regarding to media composition, it is known that Fe, N and P have a critical impact in biomass production (2). Furthermore, the use of buffers as tris-base allows the preservation of optimal physiological pH for high growth rates in marine microalgae species (3). Then, the aim of this work was to study the effect of three different formulations of F/2 media on biomass and lipids production.

**Methods.** *N. oculata* was grown in 1L glass photobioreactors, with a light intensity of 100  $\mu\text{mol photons/m}^2 \text{ s}$ , 12:12 photoperiods, and temperature was controlled at 30 °C. Systems were aerated (1 vvm). Three different media formulations were evaluated: F/2 with artificial seawater (ASW) with the highest nitrate concentration, Optimized F/2 (4) with tris base and without tris base (Table 1). Biomass (dry weight), pH, nitrate and lipids (cold extraction with hexane and gravimetric determination) were carried out during the kinetics.

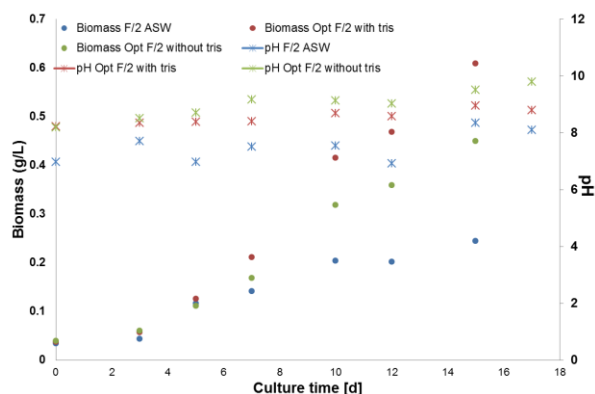
**Table.1** Composition (mM) of the tested media: F/2 with artificial seawater (F/2 ASW) and F/2 optimized.

Component	F/2 ASW	F/2 optimized
NaCl	410.68	501.37
NaNO <sub>3</sub>	12.68	2.94
MgSO <sub>4</sub> *7H <sub>2</sub> O	9.98	9.94
KCl	8.00	14.82
CaCl <sub>2</sub> *2H <sub>2</sub> O	2.00	12.45
KH <sub>2</sub> PO <sub>4</sub>	0.40	-
NH <sub>4</sub> Cl	0.50	-
H <sub>3</sub> BO <sub>3</sub>	0.20	-
Tris-base	-	9.23
NaH <sub>2</sub> PO <sub>4</sub>	0.042	0.125
NaHCO <sub>3</sub>	0.260	2.98
EDTA*Na <sub>2</sub>	0.011	0.034
FeCl <sub>3</sub> *6H <sub>2</sub> O	0.012	0.035
ZnSO <sub>4</sub> *7H <sub>2</sub> O	0.00008	0.00024
MnCl <sub>2</sub> *4H <sub>2</sub> O	0.00910	0.00273
Na <sub>2</sub> MoO <sub>4</sub> *2H <sub>2</sub> O	0.00002	0.00008
CuSO <sub>4</sub> *5H <sub>2</sub> O	0.00004	0.00012
CoCl <sub>2</sub> *6H <sub>2</sub> O	0.00004	0.00013

**Results.** Optimized F/2 medium showed higher biomass yield compared to F/2 with artificial seawater. The presence of tris base in Optimized F/2 medium produced an increase in biomass production of 52.4% and 179.8% compared with optimized F/2 and F/2 with artificial seawater, respectively. The type of culture medium had no significant effect on lipid

productivity with low values of 111 to 125 mg/L. Nevertheless, media without tris showed higher cellular lipid content.

Added medium with tris remained pH values between 8 and 9. In optimized F/2 medium without tris pH increased above nine, while F/2 ASW medium was less than 8. pH could have a significant effect on growth. Nevertheless, the highest % lipids content in biomass and lipid productivity was obtained in F/2 ASW



**Fig.1** Effect of composition media in *N. oculata*'s Growth (dots) and variation of pH in culture.

Nitrates content in F/2 with artificial seawater was 743.5 mg/L, in F/2 optimized with tris base was 51.07 mg/L, in F/2 without tris base was 89.99 mg/L.

**Conclusions.** Optimized F/2 with tris achieved the largest biomass production with 0.685 g/L at the fifteenth day. Between the three F/2 media culture formulations there was no significant difference in lipids. No nitrogen limitation during the kinetic.

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