



# NOVEL MASS TRANSFER CONSIDERATIONS FOR OIL-DEGRADING CONSORTIUM PRODUCTION IN A THREE-PHASE AIRLIFT BIOREACTOR

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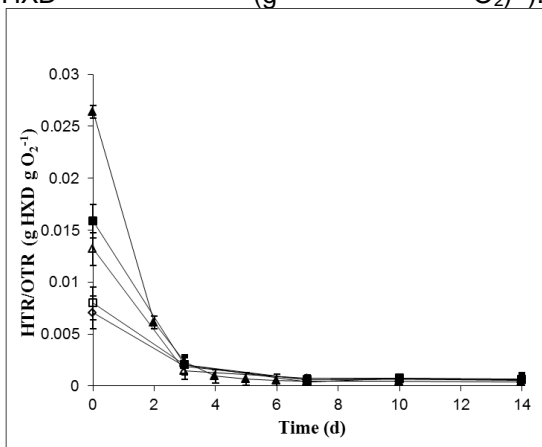
*Hydrocarbon mass transfer, Oil-degrading consortium, Airlift bioreactor.*

**Introduction.** Scarce information is available about hydrocarbon transfer in three-phase airlift bioreactor (ALB) for environmental purposes (1).

The aim of this study was to evaluate simultaneously hydrocarbon transfer (HTR) rate and oxygen transfer rate (OTR) as a novel consideration to enhance the productivity of an oil-degrading bacterial consortium in a three-phase ALB.

**Methods.** A 10-L glass airlift bioreactor (ALB) was used. Oxygen transfer parameters were evaluated by dynamic, gas in/gas out method. Hydrocarbon (HXD) transfer parameters were evaluated by using an early reported novel technique (1) and oil degrading consortium (2) was evaluated by gravimetric as suspended solids (SS).

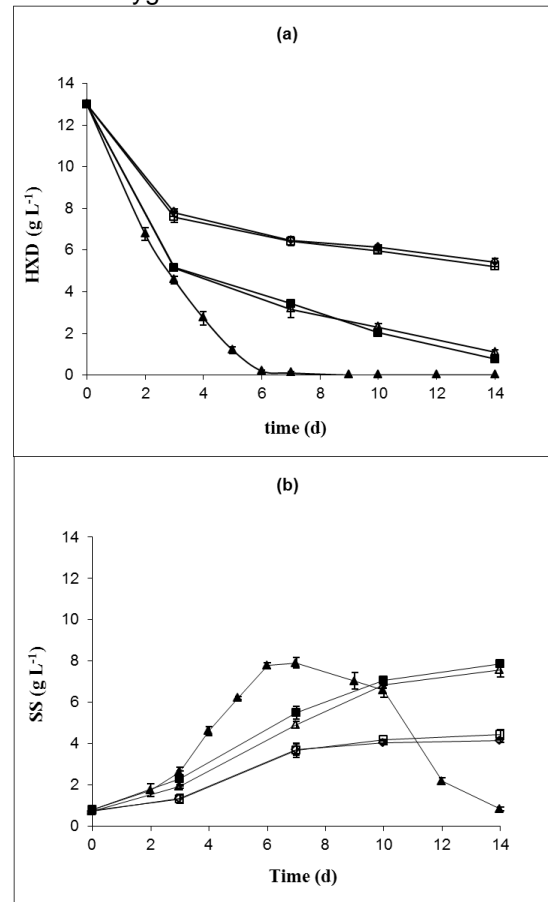
**Results.** During 14 days culture, (Fig 1) using constant superficial gas velocity ( $U_g$ ) values, the ratio of HTR to OTR (HTR/OTR) never reached the stoichiometric ratio ( $0.25 \pm 0.05 \text{ g HXD (g O}_2\text{)}^{-1}$ ).



**Fig.1** HTR/OTR, along culture time as a function of constant  $U_g$  ( $\text{cm s}^{-1}$ ): (◇) 0.15, (□) 0.46, (△) 0.61, (■) 1.54 and (▲) 2.7.

However, the oil-degrading consortium productivity at the higher assayed constant  $U_g$  ( $2.7 \text{ cm s}^{-1}$ ) was as good as  $1.02 \pm 0.03 \text{ g SS (L d)}^{-1}$ . Also the Hydrocarbon intake was major at higher  $U_g$  (Fig 2). However the

principal constraint was hydrocarbon transfer instead oxygen transfers.



**Fig. 2** HXD biodegradation (a) and SS production (b) time profiles for different  $U_g$  ( $\text{cm s}^{-1}$ ) assayed: (◇) 0.15, (□) 0.46, (△) 0.61, (■) 1.54 and (▲) 2.7.

**Conclusions.** The HTR/OTR values show HXD transfer limitations for oil degrading consortium production in a three-phase ALB.

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## References.

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2. Tzintzun O., Loera O., Ramírez H., Gutiérrez M. (2012). *Int. Biodeter. Biodegr.* Vol (70). Pag 1-7.