# EVALUATION OF NITRIFICATION IN PRESENCE OF 2-CHLOROPHENOL USING A SEQUENCING BATCH REACTOR (SBR).

Miguel Martínez, Emmanuel Pérez, Anne Claire Texier, Flor Cuervo. Department of Biotechnology, Universidad Autónoma Metropolitana-Iztapalapa. Av. San Rafael Atlixco 186 México 09340 DF., e-mail: fmcl@xanum.uam.mx

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**Introduction.** One of the consequences of pollution in aquatic ecosystems is eutrophication which is mainly caused by ammonium ($NH_4^+$). Another pollutant which is contaminating soils and aquifers is 2-chlorophenol (2-CP), as this compound is widespread used as a structural part of wood preservatives and pesticides (1). Nitrification, an aerobic respiratory process where the ammonium is oxidized to nitrate, is an alternative for removing nitrogen compounds. Nevertheless, the presence of organic matter can result in important diminishes in the performance of the nitrifying process. Sludge acclimation (2) and SBR systems (3) seems to be an alternative for 2-CP removal.

The aim of this study was to evaluate the effect of 2-CP on a nitrifying sludge previously exposed to phenolic compound by means of specific rates of nitrate production and 2-CP consumption in a SBR.

**Methods.** Two sequencing batch reactors (SBR1 and SBR2) were set up. SBR1 was inoculated with a nitrifying sludge previously exposed to 2-CP according to the methodology described by Pérez (4). SBR2 was inoculated with a nitrifying sludge which has been fed with ammonium and *p*-cresol. Experimentation was conducted in three stages. At first, biotic assays were conducted in order to establish the possible loss of 2-CP in the SBR systems. In a second stage, control nitrifying cultures were carried out in both SBR. Each cycle consisted of 48 h defined as follows: fill = 30 min, reaction time = 45 h; sedimentation = 30 min and drain = 2 h. The reactors were fed with 100 mg N-$NH_4^+$/l and 250 mg C-$NaHCO_3$/l. Once steady state was reached, in the third stage, 20 mg C-2-CP/l were added in each reactor in order to evaluate the effect of 2-CP on the nitrification. Kinetics assays for determining specific rates of substrates consumption ($q_{NH4}$, $q_{2\text{-}CP}$) and product generation ($q_{NO3}$) were performed throughout cycles. Product yields (Y) and consumption efficiencies (E) were also determined.

**Results.** The abiotic assays showed that after 68 h of experimentation 99.4% of C-2-CP remained in the culture, thus, the loss of this compound was negligible (Fig.1A). Nitrifying control kinetics indicated that the SBR1 reached the steady state after 12 cycles, while SBR2 reached the steady state within the first 18 cycles (Fig.1B). In both reactors, N-$NH_4^+$ consumption efficiencies ($E_{NH4+}$) close to 100% and N-$NO_3^-$ yields ($Y_{NO3-}$) close to 1 were obtained (Table 1).

The addition of 2-CP in both SBR reactors provoked a inhibitory effect on the nitrifying process, regardless the sludge had been previously exposed to phenolic compounds, as after 120 h of culture no consumption of ammonium was observed when compared to the assays without 2-CP, where ammonium was consumed and oxidized within 8 h. The inhibitory effect of 2-CP could be diminished along the operational cycles.

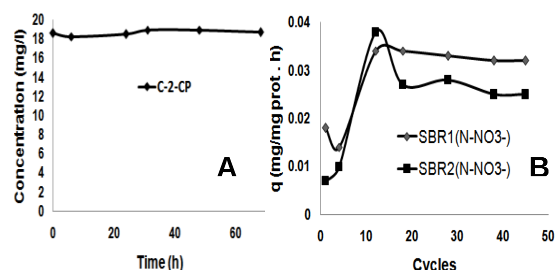


**Fig.1.** (A) Abiotic assays. (B) Specific rates of N-$NO_3^-$ production in both reactors.

**Table 1.** Values of $E_{(x)}$ and $Y_{(x)}$ along cycles operating in reactors SBR1 and SBR2.

| | $E_{NH4+}$ % | | $Y_{NO3-}$ | |
|---|---|---|---|---|
| **Cycles** | SBR1 | SBR2 | SBR1 | SBR2 |
| **1** | 99.9 | 99.9 | 0.98 | 0.91 |
| **12** | 99.9 | 99.8 | 0.99 | 1.00 |
| **28** | 99.9 | 99.9 | 0.94 | 0.98 |
| **45** | 99.9 | 99.9 | 0.99 | 1.00 |

**Conclusions.** The addition of 2-CP in both SBR reactors provoked an inhibitory effect on the nitrifying process, in spite of these reactors were inoculated with a nitrifying sludge previously exposed to phenolic compounds.

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**References.**

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