REMOVAL OF 2-CHLOROPHENOL IN THE PRESENCE OF VARIOUS ELECTRON DONORS

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Key words: 2-chlorophenol, electron donors, rate

Introduction. Chlorophenols are toxic compounds of slow consumption under anaerobic conditions (1). The addition of electron donors can improve their consumption or reduce their toxic effects (2). However, the information is still insufficient.
The aim of this study was to evaluate in batch tests, the effect of different concentrations of electron donors (phenol, glucose or acetate) on the efficiency and rate of 2-chlorophenol (2-CP) consumption.

Methods. The inoculum was obtained from a denitrifying UASB reactor (1). Batch assays were realized in 400 mL serological bottles with a biomass concentration of 0.5 ± 0.04 VSS/L. The following assays were performed: (1) Control culture with denitrifying sludge, mineral medium and 2-CP (22.4 mg C/L), (2) sludge, medium, 2-CP (22.4 mg C/L) and different concentrations (77.6, 127.6 and 177.6 mg C/L) of phenol, glucose or acetate. Bottles were incubated at 30°C and 200 rpm.

Results. The addition of phenol increased efficiency ($E_{2\text{-}CP}$) and specific rate ($q_{2\text{-}CP}$) (Table 1), but phenol and 2-CP accumulated. This could be due to inhibitory and/or toxic effects of phenol and 2-CP.

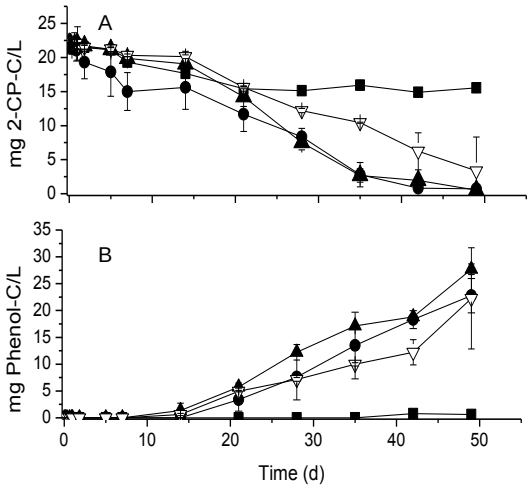

Fig.1 Consumption of 2-CP (A) and formation of phenol (B) in the presence of different concentrations of glucose (mg C/L): (■) 0 control (●) 77.6, (▲) 127.6, (∇) 177.6.

The addition of glucose decreased the 2-CP consumption time to 49 d (Fig. 1). The $E_{2\text{-}CP}$ increased up to values close to 100% while the $q_{2\text{-}CP}$ was until 3 times higher with respect to the control (Table 1). The addition of acetate decreased also the 2-CP consumption time to 49 d. The $E_{2\text{-}CP}$ reached high values while the $q_{2\text{-}CP}$ was until 8.4 times higher with respect to the control. Acetate seemed to be the best electron donor under these experimental conditions. Under methanogenic conditions, phenol was a good electron donor for improving 2-CP consumption (3).

Table 1. 2-Chlorophenol consumption in cultures batch using different electron donors.

Compounds[a]	$q_{2\text{-}CP}$ [b]	$E_{2\text{-}CP}$ (%)
2-CP (alone)	0.32 ± 0.04	28.4 ± 0.2
Phenol (77.6) ± 2-CP	0.55 ± 0.03	33.8 ± 0.5
Phenol (127.6) ± 2-CP	0.69 ± 0.17	52.8 ± 2.5
Phenol (177.6) ± 2-CP	0.81 ± 0.13	53.3 ± 4.7
Acetate (77.6) ± 2-CP	0.89 ± 0.40	79.9 ± 12.5
Acetate (127.6) ± 2-CP	2.70 ± 0.42	98.6 ± 1.9
Acetate (177.6) ± 2-CP	2.54 ± 0.16	92.5 ± 1.5
Glucose (77.6) ± 2-CP	0.90 ± 0.09	97.8 ± 0.6
Glucose (127.6) ± 2-CP	0.96 ± 0.03	96.6 ± 0.03
Glucose (177.6) ± 2-CP	0.86 ± 0.16	85.0 ± 11.2

[a] mg C/L ; [b] mg C/g VSS d

Conclusions. The electron donor type, more than its concentration, determined the values of $E_{2\text{-}CP}$ and $q_{2\text{-}CP}$. Acetate was the best electron donor for improving 2-CP removal under these experimental conditions.

Acknowledgements. This work was supported by CONACYT, México (CB-2011-01-165174).

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