



AMMONIUM REDUCES THE INHIBITORY EFFECT OF 2-CHLOROPHENOL IN NITRIFICATION

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Introduction. It has been reported that ammonium oxidation activity is inhibited in presence of 2-chlorophenol (2-CP) ⁽¹⁾. This appears to be related to the lipophilicity of this compound, which can result in alteration of the cellular membrane structure, damage in the ammonium oxidation enzymes or in the ammonium transport system ^(1, 2). Depending on the ammonium concentration, ammonium can be transported by active or passive mechanisms ⁽³⁾.

The aim of this work was to evaluate the reduction of inhibitory effect of 2-chlorophenol on ammonium oxidation in presence of high ammonium concentration.

Methods. Batch experiments were performed in serological bottles of 500 ml with 100 ml of working volume with 100 mg NH₄⁺-N/l and 5 mg 2-CP-C/l (as reference assays) and 300 mg NH₄⁺-N/l and 5 mg 2-CP-C/l. The assays were performed by duplicate. The bottles were inoculated with 206 ± 3.6 mg microbial protein/l of nitrifying sludge and treated as reported by Perez-Alfaro ⁽¹⁾. Each bottle represented an independent measurement and it was discarded after analysis.

Results. In the batch assays where nitrifying sludge was exposed to 5 mg C-2-CP/l and 100 mg NH₄⁺-N/l, no ammonium consumption was detected along the culture time (figure 1A), thus the ammonium oxidation was totally inhibited by the presence of 2-CP. Nevertheless, 2-CP was consumed within 40 days after a lag phase of 30 days. It has been reported that the total inhibition of ammonium oxidation in presence of compounds such as 2-CP can be related to both the alteration in ammonium transport mechanism or in nitrifying enzymes ⁽¹⁾. The assay with nitrifying sludge, 5 mg 2-CP-C/l and 300 mg NH₄⁺-N/l showed the ammonium consumption and its oxidation to nitrite and nitrate in a period of 12 h (figure 1B). Likewise, 2-CP consumption was detected in a shorter period than previously reported ⁽¹⁾. These results indicate that the ammonium oxidizing enzymes were not affected by the presence of 2-CP (Table 1). Results also suggest that 2-CP affects the

ammonium transport as ammonium oxidation can be achieved at higher ammonium concentrations. More investigation is required to understand this result.

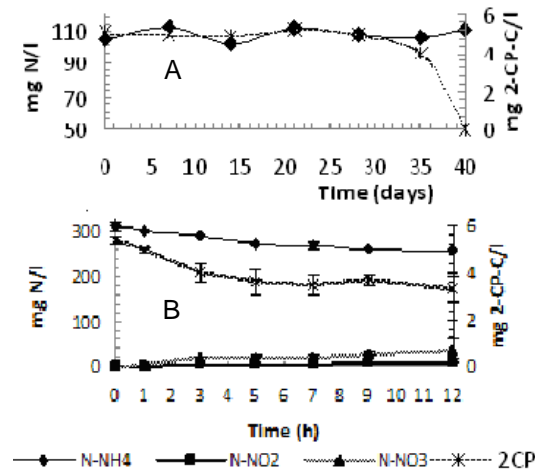


Fig.1 Profile of ammonium and 2-CP consumption by nitrifying sludge A) with 100 mg NH₄⁺-N/l and B) with 300 mg NH₄⁺-N/l.

Table 1. Response variables calculated in batch nitrifying assays with 300 mg N-NH₄⁺/l.

Variable	Units
E _{NH4} ⁺	20 %
E _{2-CP}	31 %
Y _{NO2} ⁻	0.45 mg N-NO ₂ ⁻ /mg N-NH ₄ ⁺ _{consumed}
Y _{NO3} ⁻	0.55 mg N-NO ₃ ⁻ /mg N-NH ₄ ⁺ _{consumed}
q _{NH4} ⁺	0.08 mg NH ₄ ⁺ -N/ mg protein h
q _{NO3} ⁻	0.06 mg NO ₃ ⁻ -N/ mg protein h
q _{2-CP}	0.002 mg 2-CP-C/mg protein h

Conclusions. The inhibitory effect of 2-CP on ammonium oxidizing activity was significantly diminished at 300 mg NH₄⁺-N/l. At these conditions 2-CP consumption was achieved in a much shorter period than previously reported.

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References.

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