NITRIFYING CAPACITY AND PHENOL CONSUMPTION BY HETEROTOPHIC BACTERIA ISOLATED FROM A NITRIFYING SLUDGE

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Introduction. Nitrification is an aerobic process where ammonium is oxidized to nitrite and nitrate. The process is carried out by nitrifying bacteria, particularly by ammonium and nitrite oxidizing bacteria, however, it also can be performed by some heterotrophic bacteria(1). It has been demonstrated that a nitrifying consortium is capable to consume aromatic compounds such as phenol(2) and cresols(3). However, the knowledge on participation of heterotrophic bacteria in both processes nitrification and organic material consumption is still limited.
The objective of this work was to evaluate the nitrifying capacity and phenol consumption of heterotrophic bacteria isolated from a nitrifying sludge stabilized in nitrifying steady state with no previous exposition to phenolic compounds.

Methods. An aliquot of 5 ml of sludge was withdrawn from a continuous stirred tank reactor (CSTR) fed with ammonium and mineral medium and operated at steady-state nitrification. The sludge was used as inoculums in brain heart infusion (BHI) agar in order to isolate heterotrophic microorganisms. Colonies were re-isolating several times, the purity colonies were corroborating by Gram stain. Nitrifying and phenol consumption ability was analyzed in 10 of the isolated heterotrophic colonies. The assays were performed in serological bottles with mineral medium supplemented with ammonium and phenol according to the methodology described by Pérez et al. 2008(2). Substrate consumption efficiencies and yield products were used as response variables.

Results. The nitrifying sludge obtained from the CSTR at the volumetric loading rate of 250.8 ± 9.3 mg NH_4^+-N/l d, resulted in a rate of nitrate production of 245.7 ± 1.8 mg NO_3^--N/l d. The ammonium consumption efficiency (E_{NH4}^+) was 97%±3.5 whereas the nitrification yield (Y_{NO3}^-) was 0.96±0.08. This behavior indicated a high nitrifying activity which remained for more than six months with a variation coefficient of 8%. Isolating procedure resulted in 26 heterotrophic colonies. Cellular morphology and Gram characteristics of 10 of the isolated colonies are shown in Table 1. Nitrifying ability of C-11A isolated was observed with an E_{NH4}^+ of 12% and Y_{NO3}^- of 0.12. Phenol consumption assays indicated that were achieved with strains C-11A and C-15B consume small amounts of phenol successfully without causing an inhibitory effect.

Table 1. Morphological characteristics of heterotrophic bacteria selected for testing heterotrophic nitrification and phenol consumption

Strain	Gram´s stain	Cellular Morphology
C-1	-	Streptococcus
C-3	-	Bacillus
C-5	-	Diplococcus
C-6	-	Diplobacillus
C-10	-	Short Bacillus
C-11A	+	Coccus
C-13A	+	Staphylococcus
C-14	-	Bacillus
C-15B	+	Bacillus
C-17α	+	Staphylococcus

Conclusions. Only one stain (C-11A) isolated was able to carry out the nitrification and degradation of phenol, while a strain (C-15B) isolated was able to consuming phenol.

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