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Growth Kinetics of *Pseudomonas* spp during Benzene Degradation

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In this study we investigated growth patterns of three different strains of *Pseudomonas* spp. ($P.$ aeruginosa, $P.$fluorescens, $P.$putida) during benzene degradation in order to elucidate the optimum substrate concentration for most efficient biodegradation. Microcosm batch tests were performed for 8 different initial substrate concentrations (C_i=30 to 400 mg/L benzene) to observe cell growth and associated substrate degradation using benzene-adapted cells. Kinetic parameters (μ_{max}, K_c, K_i) of both Andrews and Monod growth model were fitted to the relationship of μ-C obtained from the growth curves of different substrate concentrations and compared for three different strains. Results showed that maximum specific growth rate (μ_{max}) of both models was similar between strains and gave a lower value (μ_{max}= 0.3/hr – 0.4/hr) compared to the literature value (μ_{max} = 0.62/hr). For half-saturation constant (K_c), related with the optimum substrate concentration for microbial growth, $P.$ fluorescens gave the highest value of 130 mg/L compared to other two strains (K_c =20 – 30 mg/L) and the literature value (K_c = 1.65 mg/L). Inhibition constant (K_i) of $P.$ fluorescens was also found the highest, indicating that this strain can grow at rather high benzene concentrations. The higher K_c and lower μ_{max} of $P.$ putida than those of the literature study are attributed to the high substrate concentration range used in this study and previous adaptation of cells to high substrate concentrations. Among the three strains, K_c and K_i of $P.$ putida were the lowest for benzene indicating that this strain can grow at rather lower concentrations (K_c=20 mg/L). Comparison between the two model parameters revealed that μ_{max} and K_c of Monod model was half and 6 – 30 times less than those of Andrews model respectively. This indicates that care should be taken for selection of kinetic parameters and their values for growth model when simulating fate and transport of aromatic hydrocarbon compounds in aquifers.