Effects of Indole on Aerobic Biodegradation of Butanoic Acid by Pseudomonas aeruginosa and Serratia marcescens

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Abstract : In low resource settings in Africa and other developing regions, pit latrines remain the dominant basic minimum acceptable form of sanitation. However, unpleasant smells-malodours emitted from faecal sludge in the pit latrines, which elicit disgusting or repulsive response, are one of the factors that thwart people to use latrines and instead opt for open defecation as an alternative. This provides an important but often overlooked major impediment, dissuading people from adopting and using the pit latrines hence affecting successful, effective sanitation promotion. The malodours are primarily attributed to four odorants: butanoic acid ($C_4H_8O_2$), dimethyl trisulphide ($C_2H_6S_3$), indole (C_8H_7N) and para-cresol (C_7H_8O). Several pit latrine deodorisation methods such as addition of carbonous materials, use of ventilation systems and urine separation are available, and they continue to occupy their niche, but social, economic, environmental and technological shortfalls remain. Bioremediation has been gaining popularity because it is inexpensive, simple to operate and environmentally friendly. Recently, the biodegradation of butanoic acid as individual odorant has been studied. However, to the best of our knowledge, there have been no kinetic studies of the butanoic acid in the presence of other key odorous compounds. In this study, a series of experiments were conducted to investigate the effects of indole on the removal of butanoic acid under aerobic conditions using indigenous bacteria strains, Pseudomonas aeruginosa, and Serratia marcescens isolated from faecal sludge as pure cultures as well as mixed cultures. In this purpose, butanoic acid removal was performed in a batch reactor containing the bacterial strains in mineral salt medium (MSM) amended with 3000 ppm of butanoic acid at the temperature of 30°C, under continuous stirring rate of 150 rpm and the concentration of indole was varied from 50-200 ppm. The initial pH of the solution was in the range of 6.0-7.2. Overall, there were significant differences in the bacterial growth rate and total butanoic acid removal dependent on the concentration of indole in the solution.

Keywords : biodegradation, butanoic acid, indole, pit latrine
Conference Title : ICWSFSWM 2018 : International Conference on Water, Sanitation, Food Security and Waste Management
Conference Location : Barcelona, Spain
Conference Dates : February 27-28, 2018