Influence of Lipid Acclimatization on the Support Matrix Colonisation in Anaerobic Filters treating Oleic Acid

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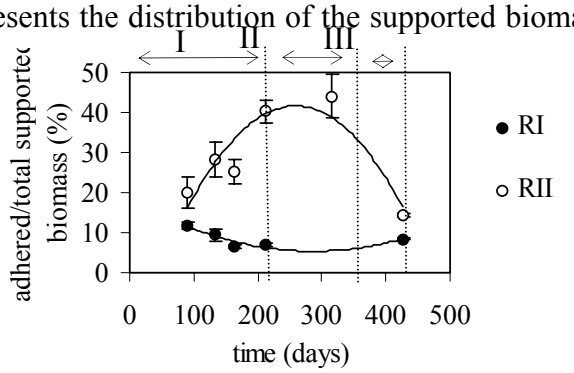
Two main problems are associated with the treatment of lipid containing wastewaters: the adsorption of a light lipid layer around biomass particles resulting in biomass flotation and washout and the acute toxicity of LCFA against both methanogens and acetogens, the two main trophic groups involved in LCFA degradation[1]. Notwithstanding the possibility of decreasing the toxic effect by addition of calcium or magnesium salts, flotation problems, which are particularlly important for UASB operation, can not be reverted by calcium addition and, in general, arise for LCFA concentrations bellow the toxicity threshold[2]. Oleic acid, one of the most abundant LCFA present in effluents has been tentatively degraded in UASB and EGSB reactors, without success due to granule disaggregation and washout[1],[2]. In this work the biomass developed in anaerobic filters was studied in terms of distribution in the support (PVC Raschig rings) and by periodically measuring the specific methanogenic activities against specific substrates (acetate, H_2/CO_2, propionate, butyrate and ethanol), according to the methodology already described[3]. Two bioreactors (RI and RII) were running in parallel for 426 days. In a first period RI received a lipidic substrate (whole milk based) and RII received a non fat substrate (skim milk based). Following this period, both digesters received the same substrate which was initially composed f skim milk and oleic acid (Period II) and after by oleic acid as the sole carbon source (period III). Figure 1 represents the distribution of the supported biomass. In the reactor initially fed with lipids (RI), the adhered biomass was always very low as compared with total biomass. However in RII the biofilm was continuously built-up achieving a maximum of 40%, but it was very sensitive to the substrate change from skim milk to oleic acid. The biofilm formed in the presence of lipids was thinner, but more resistant to oleic acid than the one formed in the absence of lipids.The specific acetoclastic and hydrogenophilic activities were very close for RI and RII along all the trial period (Figure 2 - for acetoclastic activity), but the metanogenic activity against butyrate was clearly enhanced in the reactor RI during the period I.



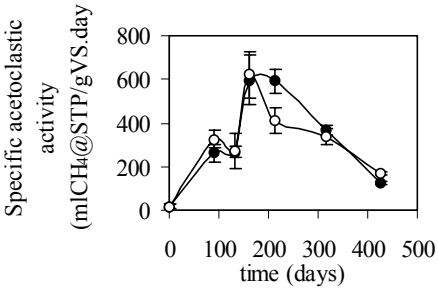


Figure 2 - Specific acetoclastic activity along the trial period

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