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Anaerobic granular sludge as a biocatalyst for 1,3-propanediol production from glycerol in continuous bioreactors

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1,3-propanediol (1,3-PDO) was produced from glycerol in three parallel Expanded Granular Sludge Blanket (EGSB) reactors inoculated with granular sludge (control reactor-R1), heat-treated granular sludge (R2) and disrupted granular sludge (R3) at Hydraulic Retention Times (HRT) between 3 and 24 h. Maximum 1,3-PDO yield (0.52 mol mol-1) and productivity (57 g L-1 d-1) were achieved in R1 at HRTs of 12 h and 3 h, respectively. DGGE profiling of PCR-amplified 16S rRNA gene fragments showed that variations in the HRT had a critical impact in the dominant community of microorganisms. However, no appreciable differences in the bacterial population were observed between R2 and R3 at low HRTs. Production of H2 was observed at the beginning of the operation, but no methane production was observed. This study proves the feasibility of 1,3-PDO production in EGSB reactors and represents a novel strategy to valorise glycerol generated in the biodiesel industry.