Combined polyhydroxyalkanoates (PHA) and 1,3-propanediol production from crude glycerol: Selective conversion of volatile fatty acids into PHA by mixed microbial consortia

Crude glycerol is an important by-product of the biodiesel industry, which can be converted into volatile fatty acids (VFA) and/or 1,3-propanediol (1,3-PDO) by fermentation. In this study, a selective conversion of VFA to polyhydroxyalkanoates (PHA) was attained while leaving 1,3-PDO in the supernatant by means of mixed microbial consortia selection strategies. The process showed highly reproducible results in terms of PHA yield, 0.99 ± 0.07 Cmol PHA/Cmol S (0.84 g COD PHA/g COD S), PHA content (76 ± 3.1 g PHA/100 g TSS) and 1,3-PDO recovery (99 ± 2.1%). The combined process had an ultimate yield from crude glycerol of 0.19 g COD PHA and 0.42 g COD 1,3-PDO per g of input COD. The novel enrichment strategy applied for selectively transforming fermentation by-products into a high value product (PHA) demonstrates the significance of the enrichment process for targeting specific bio-transformations and could potentially prove valuable for other biotechnological applications as well.