POLYHYDROXYALKANOATES PRODUCTION FROM VOLATILE ACIDS FROM AN ACIDOGENIC REACTOR

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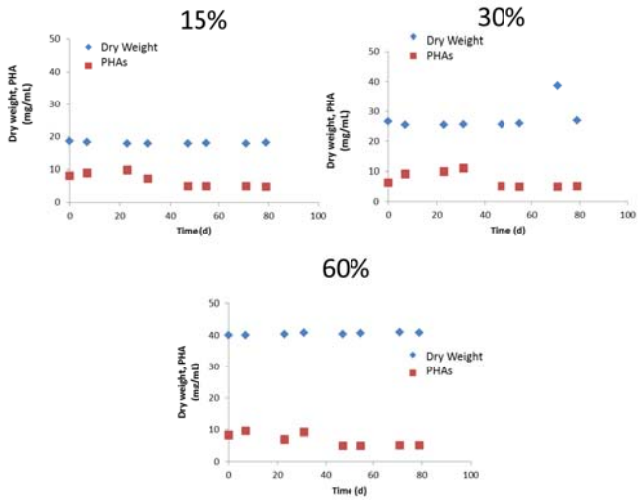
Introduction. Polyhydroxyalkanoates (PHAs) are polyesters synthetized by microorganisms. PHAs are lineal polymers of (R)-3-hydroacids which the carbonyl group from a monomer forms an ester bond with the next monomer. PHAs are visualized as intracellular accumulations and can reach until 90% of the total dry cell weight [1]. The PHA-producing microorganismos used them as a reservoir of nutrients [2]. The physical characteristics of PHAs such as density, melting point and tensile strength are similar those of plastic derived from oil, however, PHAs are biodegradable completely [3].
From a previous study, a H2-producing reactor fed with wheat straw generated effluents with a high concentration of organic matter (chemical oxygen demand 45,000 mg/L). These effluents contain volatile acids as acetic and butyric acids which could be converted to PHAs using specific microorganisms.
The objective of this work was the PHA production from effluents containing volatile acids derived from an acidogenic bioreactor.

Methods. Kinects were performed using different percentages of acidogenic effluents (15%, 30% y 60%) using the strain named CA-1. The assay was done in 250 ml Erlenmeyer flasks with 150 ml of sterile medium containing per liter: 4.4 g of KH_2PO_4, 4.8 g of Na_2HPO_4, 1.0 g of NH_4Cl, 0.5 g of $MgSO_47H_20$). Acidogenic effluents were added to the mentioned percentages and 20% of an overnight inoculum. Flasks were incubated statically at 37°C, samples were analyzed at 0, 7, 23, 31, 47, 55, 71 and 79h. Chemical oxygen demand (mg/L), dry weight, and extraction of PHAs[4] were performed at each time.

Results. Figure 1 shows the kinetics of cell growth and PHA recovered at 15, 30 and 60% of acidogenic effluents. In general terms, the dry weight increased with higher percentages of effluents from 20 to 40 mg/ml. However, the PHAs extracted from cell were similar at each percentage. This could be because the cell would have enough nutrients and stress condition required for PHAs accumulation was not reached.



Conclusions. The acidogenic effluents from a H_2-producing bioreactor were useful to support cell growth of a PHA-producing microorganism. The dry weight can be increased at higher percentages of effluents, however the PHA concentration was not increased. The highest PHA yield was 54.8 % obtained at 15% of acidogenic effluent.

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