Title: Optimization of nitrogen and phosphorus limitation for better biodegradable plastic production and organic removal using single fed-batch mixed cultures and renewable resources

Abstract

The process for the production of biodegradable plastic material (polyhydroxyalkanoates, PHAs) from microbial cells by mixed-bacterial cultivation using readily available waste (renewable resources) is the main consideration nowadays. These observations have shown impressive results typically under high carbon fraction, COD/N and COD/P (usually described as nutrient-limiting conditions) and warmest temperature (moderate condition). Therefore, the aim of this work is predominantly to select mixed cultures under high storage responded by cultivation on a substrate - non limited in a single batch reactor with shortest period for feeding and to characterize their storage response by using specific and kinetics determination. In that case, the selected-fixed temperature is 30 °C to establish tropical conditions. During the accumulated steady-state period, the cell growth was inhibited by high PHA content within the cells because of the carbon reserve consumption. From the experiments, there is no doubt about the PHA accumulation even at high carbon fraction ratio. Apparently, the best accumulation occurred at carbon fraction, 160±7.97 g COD/g N (PHA mean=44.54% of dried cells). Unfortunately, the highest PHA productivity was achieved at the high carbon fraction, 560±1.62 g COD/g N (0.152±0.17 g/l. min). Overall results showed that with high carbon fraction induced to the cultivation, the PO4 and NO3 can remove up to 20% in single cultivation