Polyhydroxyalkanoate production from moderately halophilic Bacillus strains

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Polyhydroxyalkanoates (PHAs) are biodegradable polyesters that can be synthesized by various species of bacteria as an intracellular carbon and energy storage in an environment that is carbon-rich but poor in certain nutrients such as phosphorus and nitrogen. Development of eco-friendly, bio-degradable plastics from cheap and renewable resources is becoming increasingly important but PHAs hold only a relatively small fraction of the biopolymer market share because of their relatively high production cost and concurrent availability of low-cost petrochemical plastics. Among the PHA producing bacterial strains, Bacillus which are taxonomically very diverse and capable of growing in large scale culture are the most popular source of PHAs. Many Bacillus species including moderately halophiles from different environments have been screened for PHA production and more screening studies are needed.

In this study, five moderately halophilic Bacillus strains including Bacillus siamensis-ATY1, Bacillus tequilensis-ATY2, Bacillus licheniformis-DBA2, Bacillus safensis-D8 and Bacillus pumilus-DB5 which were isolated from salted sheep skins were screened for PHA production. Besides conventional substrates such as; starch, D-fructose and D-glucose, agro-industrial wastes; anaerobic fermentation liquids derived from cheese whey, olive oil plant wastes and the leather industry were used for PHA production. High PHA productivities were achieved by all the strains and among the strains Bacillus Pumilus had the highest capacity. This strain accumulated PHA to 80.66% of its cell dry weight when olive oil mill wastewater was used as the carbon source. The biopolymer which was produced was identified and characterized. Based on our findings, the strains produce polyhydroxybutyrate (PHB). To reduce the production cost, sterile and non-sterile tap water and sea water were used in the production medium and promising results were obtained for PHB production.