

A Novel Process for the Efficient Production and Recovery of Polyhydroxyalkanoates by Using Single Cell Protein Approach

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Abstract

Polyhydroxyalkanoates (PHAs) are polyesters synthesized and stored by many types of bacteria as a food and energy reserve compound. PHAs are interesting because of their plastic-like properties making them a true bio-based and biodegradable plastic. Much studies have been carried out in various developed and developing countries all over the world involving microbial strain improvement, optimization of fermentation processes, synthesis of PHA copolymers having superior physicochemical and mechanical properties as well as the development of efficient processes for the recovery and purification of PHAs from microbial cells. As a result, it is now possible to produce PHAs at high productivity. Nevertheless, PHAs are still more expensive when compared with petrochemical plastics because of the costs of feedstock and also the recovery and purification processes. Our studies have shown that vegetable oils such as palm oil are among the best renewable feedstock for large-scale production of PHAs. By using bacterial strains that function also as single cell protein for the production of PHAs from palm oil, it is possible to develop integrated processes for the simultaneous production of animal feed as well as PHAs. An example of such a process will be presented together with a potential application of the resulting PHA in the development of slow release fertilizers.

Keywords: polyhydroxyalkanoates (PHAs), Cupriavidus necator, palm oil, single cell protein

Biography

Prof. Sudesh's main research interest is in the design and synthesis of biodegradable polyhydroxyalkanoates (PHAs) using microbial systems. He started researching in this area in 1992 and obtained his Masters in Biotechnology from University Malaya. Then, he continued research in this area for his PhD, which was sponsored by Japanese Government (Monbusho). His research project was on the cloning and characterization of the genes involved in the production of PHAs. The research was conducted at RIKEN Institute, Japan. He obtained his PhD in 1999 and then continued as a Special Postdoctoral Researcher at RIKEN. He returned to Malaysia under the Brain Gain program and joined the School of Biological Sciences, Universiti Sains Malaysia as a lecturer in Nov., 2001 and became a full professor in 2011. In the past 15 years in USM he has significantly contributed to the research and development of biodegradable plastics in Malaysia. In addition to the more than 100 scientific publications, he has 4 granted patents, one of which has been successfully licensed. During this time, he has supervised 17 MSc and 17 PhD students. Currently, he is supervising 30 postgraduates consisting of 9 MSc and 21 PhD students. Prof. Sudesh is actively involved in international research collaborations with Japan, Russia, Thailand, Sweden, India, Vietnam, Germany and USA. His research activities are funded by grants from the university, ministries (MOE and MOSTI), as well as industries from both within Malaysia and abroad.