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SHORT COMMUNICATION

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Production of polyesters by *Pseudomonas alcaligenes*

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ABSTRACT

Microbial polyesters (polyB-hydroxyalkanoates) are biodegradable thermoplastics accumulated by procaryotic microorganisms. An example is polyhydroxybutyrate, (PHB).. Poly B- hydroxyalkanoate (PHA) is an intracellular storage material synthesized during imbalance growth conditions. The PHA accumulation profile of the following bacterial strains were studied.: Pseudomonas alcaligenes, P. putida Ochrobacterium spp and Rhodococcus equi.. All of them synthesized and accumulated PHB during unbalanced growth conditions. However, P alcaligenes did synthesise the polyester under balanced growth. This represents a preliminary report.

Keywords: *Pseudomonas alcaligenes, microbial polyesters, nutrient stress, biothermoplastics*

Microbial polyester production is a novel aspect of biotechnology that has attracted attention as environmentally degradable and compatible thermoplastics for a wide range of agricultural, marine and medical applications. They have been used as carriers for fungicides, herbicides, fertilizers and mulching films and bags. Medically,the application includes bone replacement, surgical pins, staples and swabs(Doi,1990). Polyhydroxybutyrate(PHB) , an example of polyhydroxyalkanoate(PHA) is found as a bacterial enclosed inclusion body which accumulates in distinct patterns that are easily stained with Sudan black for light microscopy (Wiley *et al* 2009) .PHA s constitute a versatile family of polyesters and more than 100 of them have been identified in the last 2 decades(Kesler *et al* 2001) Most bacterial species use PHB as their carbon reserve. When appropriately blended, PHB can give rise to a promising biomaterial with strong ability to promote growth of fibroblast cells, osteoblasts, chondrocytes and nerve cells (Chen *et al* 2005) More than 100 other poly($3HA_{mcl}$)s, characterized by monomers of medium chain length, have been identified in the past two decade and their synthesis can be affected by the profile of the culture medium(Shi *et al* 1996). For this study, the candidate organisms were *Pseudomonas alcaligenes*, *P putida*, *Ochrobacterium spp* and *Rhodococcus equi* . They were separately grown in medium designed by Page *et al* (1992) for 48 hr on shaker and then transferred to a complex medium containing 5%molasses and 1% phenol at pH 7.1. Incubation was at 120rpm at 30^0C for 3 days. The polyhydroxyalkanoate (PHA) accumulation profile and phenol degradation were monitored respectively in the media , after extraction and precipitation with chloroform and methanol. *Pseudomonas alcaligenes* accumulated the highest level of PHA on per cent dry weight (Table 1) . Production however, reduced significantly with the utilization of phenol (Table 2) NMR analysis indicated that both homo-and hetero-polymers were accumulated by this bacterial species.

PHB is the most ubiquitous and widely studied of all PHAs with various microbes elaborating enzymes that can degrade it(Tokiwa and . Calabia, 2004). The ease of biodegradability of the present PHA by individual or a consortium of microbes will serve as a useful guide when considering its economic production

Table 1: Polyhydroxyalkanoate (PHA) accumulation profile

Organism	Cell dry weight (g)	PHA content (% dry wt.)
Ochrobacterium sp.	0.69	38
Pseudomonas alcaligenes	0.70	63
P. putida	0.75	54
Rhodococcus equi	0.86	58

* Cultured in nitrogen-free medium with glucose as carbon source.

Table 2: Phenol***** degradation and PHA yield in molasses

Organism	Phenol degradation (g)	PHA yield (%)
Pseudomonas alcaligenes	90	18
Rhodococcus equi	92	29

* Initial phenol concentration was 10 g/litre

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