Productivity and optimization of Poly -Hydroxy Butyrate (PHB) by *Alcaligenes eutrophus, Pseudomonas putida* and *Rhizobium meliloti*

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SUMMARY

The PHB production of three test organisms (*Alcaligenes eutrophus, Pseudomonas putida* and *Rhizobium meliloti)* was observed under oil immersion microscope and plate method. The bacteria were estimated in various industrial waste substrates, *viz.* molasses and sesamum oil waste. High PHB productivity was observed in sesamum oil waste containing medium when compared with molasses. High production of PHB was observed in *Alcaligenes eutrophus* (38«g/10ml/40%) when compared with *Pseudomonas putida* (23«g/10ml/40%) and *Rhizobium meliloti* (22«g/10ml/40%). It was concluded that the oil waste based medium and *Alcaligenes eutrophus* be used for PHB production in large scale that minimize the cost of the product. Thus, the use of petroleum-derived plastics can be minimized and by which we can live in a plastic pollution free earth.

Key words : *Alcaligenes eutrophus, Pseudomonas putida* and *Rhizobium meliloti*, Poly β-Hydroxy Butyrate (PHB).

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Plastics are non degradable. The non-degradable plastics accumulate in the environment at a rate of millions of tone per year causing several problems. Recently, issues concerning the global environment and solid waste management have created much interest in the development of biodegradable plastics (Anderson *et al*., 1990). Poly β-Hydroxy Butyrate (PHB) is an alternative source of the plastics which has similar physical properties like polypropylene and it can be easily biodegradable aerobically and anaerobically (Hankarymer and Jieerdema, 1998). PHB is one of the important storage reservoirs providing energy. It is the cellular inclusion bounded by lipid non-unit membrane separate from cytoplasm. Beta-hydroxy butyrate is connected by ester linking and form PHB (Luzier, 1992).

Poly β-hydroxy butyrate and Poly β-hydroxy valerate (PHV- is a thermoplastic material) belong to PHBV family, which nearly fit to one ecosystem (Brandl *et al*., 1990). PHV is a thermoplastic material. PHB molecule joined by ester bonds between the carboxyl and the hydroxyl group of the adjacent molecules, in each polymer methyl group attached to the back bane, is present in a single configuration throughout the chain. The structure of the PHB contains the repeating unit of PHB and has a chiral center (Lamoigne, 1924). Molecular structure of PHB does not depend on the features of the strain and condition of carbon nutrition of microorganisms producing PHB (Volova *et al*., 2000). This bioplastics has many obvious applications in the bone plates, nails, screws (Azehar and Tanisamdin, 2003) and the treatment of asteomylitis (Fusun and Zeynep, 2000).

In the present study indicates, the production of PHB in the important three PHB producers such as *Alcaligenes eutrophus, Pseudomonas putida, Rhizobium meliloti* which can grow on carbon and nitrogen source in both aerobic anaerobic conditions. *Alcaligenes eutrophus* being able to utilize a variety of simple and complex sources as carbon source in both aerobic and anaerobic condition and optical temperature of 30-37°C for PHB synthesis (Doi, 1992). *P. putida* growth occurs from 4-43°C chemo organo trophic, able to use other than one carbon organic compound as sole carbon and energy source for production of PHB (Morris and Roberts, 1959).

R. meliloti cells are able to exist as two distinct entities, the free-living form competes for limiting nutrients with other soil inhabitants. While the symbiotic nitrogen fixing bacteroid forms an intimate association with the host plant from which a steady supply of nutrients is derived. When excess of carbon nutrient is available but a non-carbon nutrient such as N, P, or O_2 is limiting for growth, many bacteria accumulate the intracellular carbon storage compound PHB (Aneja and Charles, 1999).

The current cost of the PHB production is considerly more than that of the synthetic plastics (Byrom, 1987). The aliphatic PHB as