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優勝作品專輯

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作品名稱	Bioplastic - The Future is Degradable Plastics. Investigating Biodegradation of Polyhydroxybutyrate Bioplastic by New Zealand Soil Microorganisms
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Abstract

The rate and production of conventional petroleum based plastics is unsustainable and not eco-friendly. Plastics often end up in marine environments and can take hundreds of years to decompose in landfills. According to Statistica, in 2015 alone, global plastic production was approximately 322 million metric tonnes and is projected to increase in the future. PHB bioplastic or Polyhydroxybutyrate is both biologically produced and biodegradable and can serve as a viable alternative to conventional plastics. But can it be broken down by soil microbes within a reasonable time frame? I have set out to answer this question. My aim was to isolate and analyse microorganisms from the Rotorua area that are capable of degrading Polyhydroxybutyrate (PHB) bioplastic .

I isolated PHB degrading microorganisms from Rotorua soils by culturing on an agar based mineral salt media supplemented with PHB powder (MSM PHB agar). Samples were taken from Mount Ngongotaha and Te Puia geothermal soils as well as Okareka, termite frass and termite guts. One isolate from the Te Puia sample (labelled G2) was found to successfully degrade PHB powder. After isolation and purification of the G2 isolate, it was cultured on a range of media types to examine properties exhibited under differing nutrient conditions. Multiple organisms were found to be involved in the degradation of PHB bioplastic and work together symbiotically, this included bacteria and fungi which was identified as penicillium.

The sample isolated from Te Puia soils (site 2 – G2Clear) in the Rotorua environment was found capable of competently degrading PHB, clearing 8% of PHB after 26 days. The G2Clear isolate is a mixture of bacteria and fungi working in an endosymbiotic relationship to degrade PHB and are unable to successfully degrade PHB individually. It is through the secretion of an extracellular PHB depolymerase enzyme that PHB is degraded, conforming with my hypothesis. This proves that PHB bioplastic is a viable alternative to conventional petroleum based plastics as PHB can be relatively quickly broken down by soil microorganisms.

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It is a very interesting work.

This work successfully isolated PHB degrading microorganisms from Rotorua. The results indicated that bacteria and fungi work together to degrade PHB. However, it will be more convincing to provide additional experimental evidence to support the role of fungi, e.g. provide the cofactor on the PHB degrading enzymes.