Solution for synthetic polymer degradation

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Abstract:

Manmade plastics have been amongst us since the 19th century industrial revolution. Many various forms of plastics have been integrated into almost every aspect of human lives. From clothing to automobile industry, from packaging to transportation, plastics have made our lives very convenient. However, there is one aspect of plastics that makes us think twice before using them. That is, its degradability. Degrading plastics has been a topic of discussion since a couple of decades and it still needs work. The major way plastics are managed, are in landfills and through incineration. The reason of burying plastics in soil is that the residing microbes will work on them and eventually turn the polymers into monomers which can be used by the organisms as carbon source. This project aims to use the same technique but in a modified way to accelerate that process. There are already microorganisms, bacteria and fungi especially that are recognised to degrade different kinds of plastics. This project will propagate those microbes and isolate specific genes that are responsible for degradative enzymes and pool them together in one vector. Bacterial and fungal transformation of the vector will produce two organisms that will be able to degrade polyethene (PE), polypropylene (PP), low density PE, high density PE, polyurethane (PU), PEPU and polyethylene terephthalate (PET). However, enzymes are not enough for the degradation. It would still take a long time as it does so even in landfills. Therefore, certain modifications to the protein structures will ensure better efficiency. Biotic degradation can be accelerated by abiotic degradation for which certain biodegradable chemicals like prooxidants and starch will also be introduced in the formulation. Chemical bondage of abiotic factors will ensure a stable reaction as these factors must ideally be incorporated in plastics during their manufacturing itself. This project will aim to degrade plastics extensively within a time frame of 45 days. Many bioplastics have come into the market and more are coming. However, they cannot replace everywhere plastics are used. Therefore, solutions such as suggested in this project are necessary.