The Effects of Bacteria on the Biodegradation of Polymers

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Plastic, one of the most commonly used materials in everyday products, has been piling up in landfills all over the world. The purpose of the experiment was to accelerate the biodegradation of polymers by pretreating them with bacteria broth. High-density polyethylene (HDPE) and polylactic acid (PLA) were chosen because they are two of the most common plastics found in landfills. Eighteen samples of each type of plastic were massed and tested for tensile strength before being placed into Mason jars filled with 250g of topsoil and 10 mL of either Bacillus subtilis or Pseudomonas fluorescens bacteria nutrient broth. A small flask of 0.5 M KOH was placed in each of 6 jars. After isolating for 54 days, the samples were cleaned, massed again, and retested for tensile strength. The KOH was titrated with 0.005 M HCl to determine the amount of CO2 produced per mg of plastic sample. The PLA treated with Bacillus subtilis bacteria had the highest percent mass loss of 2.52%. The PLA treated with Pseudomonas fluorescens produced the most CO2 which was 28.71 g/mg of CO2. The data taken for the tensile strength was determined by the t-test to not be statistically different with the use of bacteria. Overall, the PLA treated with either bacteria showed promising signs of having the ability to break down at a faster rate and thus reduce the amount of time plastics remain in landfills.

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