Plastic Mushrooms: Biodegradation of Polyethylene Using Pleurotus ostreatus

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Plastic pollution represents a major environmental challenge. This project investigates the potential of oyster mushrooms (Pleurotus ostreatus) to biologically degrade plastic waste using a sustainable fungal-based approach. The study was conducted in two experiments. In Experiment 1, three different types of plastics were incorporated into mushroom growth substrates to evaluate fungal colonization, and plastic mass reduction. The plastic type showing the fastest degradation and highest biological activity was identified as low-density polyethylene (LDPE). In Experiment 2, LDPE was further analyzed by comparing a control group without plastic to a plastic-containing experimental group. Plastic degradation was monitored over 30 days through visual analysis of mycelium growth and mushroom yield. Enzymatic activity was assessed to evaluate its relationship with plastic degradation and fungal productivity. Polymer degradation was confirmed using Fourier Transform Infrared Spectroscopy (FTIR), and Scanning Electron Microscopy (SEM). Microbiological analysis was performed to compare contamination levels between control and plastic-grown mushrooms, while Inductively Coupled Plasma (ICP) analysis was used to assess heavy metal accumulation in fruiting bodies. Results demonstrated measurable LDPE degradation accompanied by increased enzymatic activity, enhanced mycelium colonization, and higher mushroom yield compared to controls. Chemical and structural analyses confirmed polymer breakdown without significant heavy metal accumulation. This research highlights the potential of oyster mushrooms as an environmentally friendly solution for plastic waste degradation and provides a foundation for future enzyme isolation and industrial application.

Awards Won: