Is chemical pre-treatment of LDPE necessary to accelerate fungal degradation of plastic?

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Plastic pollution is ubiquitous across the globe, and it continues to get worse as human consumption persists at unprecedented levels. Therefore, it is necessary to find methods of disposal that are effective and cost efficient in order to mitigate this problem. One solution gaining attention is bioremediation, the use of biological organisms to degrade pollutants. This study aims to evaluate the ability of the filamentous fungi, *Aspergillus niger* to degrade low density polyethylene (LDPE) film. By pretreating LDPE with UV radiation or acid-assisted microwave degradation, we seek to test the hypothesis whether "Chemical pretreatment results in enhanced functional groups of LDPE which accelerates fungal degradation." We developed SHIFT, a culture-based method for optimizing fungal biomass in a chemically rich medium prior to transferring into a starvation medium where LDPE is the sole carbon source. Preliminary results suggest chemical changes in hydroxyl (3200-3500 cm^{-1}) and carbonyl (1600-1750 cm^{-1}) specific bonds via FTIR and minor structural changes via SEM after 28 days. No changes were observed in LDPE mass before and after SHIFT. Chemical pre-treatment with nitric acid under microwave conditions demonstrates changes in LDPE film primarily in the hydroxyl (3200-3500 cm^{-1}) and the carbonyl (1600-1750 cm^{-1}) regions. Next steps would be to test our hypothesis on different combinations of fungal strains with chemical pretreatment. Our study indicates that chemical pre-treatment may be necessary for fungal degradation. Outcomes from this work will provide baseline data for combining microbial and chemical remediation for accelerating plastic degradation.