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Isolation and identification of plastic, rubber and styrofoam deteriorating fungi from PVC-coated materials

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Plastics and rubber play a vital role in human lives due to their versatility and functionality. However, polymeric waste presents significant environmental and economic challenges. This study investigates the deterioration of selected polymers by some unknown fungal strains. Fungal colonies associated with a PVC-coated phone cable under room-temperature conditions were isolated and seven fungal strains (T1, T3, T7, T12, T14, P1, and P5) were selected based on the colony morphology. Low-density polyethylene (LDPE), high-density polyethylene (HDP), polyvinyl chloride (PVC), styrofoam, and natural rubber were used as test polymers. The mineral salt agar medium was used to screen the growth of the fungi, and the test material was the sole carbon source in the medium. Fungi capable of degrading the polymers were expected to display a clearance zone ('halo') around their cultures. However, no clear zones were observed. Despite this, visible growth was noticed, indicating substrate consumption. Deterioration of materials was assessed by the weight loss of the pre-weighed materials after being immersed in MSM broth cultures along with test fungi. Tests were performed in duplicate. Weight loss was expressed as mean ± SD, and the rate of biodeterioration was calculated as weight loss per unit time (mg/day). The T14 strain exhibited the highest weight loss (3.50 ± 0.71 mg/day) and the rate of biodeterioration of PVC, while the results of other materials were not notable. Fourier-transform infrared spectroscopy showed changes in the 2910-2950 cm^{-1} region, indicating asymmetrical stretching of CH_3/CH_2 groups, exhibiting alterations in the PVC material's functional groups. This research has successfully unveiled the potency of the survival of seven distinct fungal strains on materials like PVC, LDPE, HDPE, Styrofoam, and natural rubber. Furthermore, it reveals the degradability of PVC by the T14 strain, which can be further tested with an extended incubation time for more reliable results.

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