ABSTRACT

Accumulation of plastic debris is posing enormous environmental hazards including threat to aquatic and terrestrial ecosystems. Non degradability of synthetic plastics has long been recognized as a potential problem in the world that deserves serious attention. The presentwork included isolation and identification of microorganisms having the ability to degrade polyethylene (PE). Collection of soil samples wasdone from different plastic waste dumping sites. Several soil microbial isolates both bacteria and fungi were tested for polyethylene degradability under laboratory conditions. PE sheet pieceswere treated with enriched soil samples in minimal salt medium for 6 months at 28°C for fungi and37°C forbacteria respectively in static incubators. Biodegradation of plastic pieces was evaluated by using Compound light microscopy, Gravimetric weight loss analysis and Fourier transform infrared spectroscopy (FTIR). Isolation of efficient microorganisms having potential to degrade plastic was done on the basis of recorded degradation outcomes. When recovered plastic pieces were examined under compound light microscopy, it was seen that one plastic piece degraded by bacteria and other degraded by fungal attack had surface irregularities including holes, cracks and disruptions. According to gravimetric weight loss analysis, it was concluded that the bacterial isolates worked in consortium to result in 40% reduction in the weight of polyethylene piece whereas, the fungal isolates resulted in 53% loss in the weight of polyethylene sheet after 180 days of incubation. The FTIR outcomes of the two plastic pieces, showed chemical modifications in the plastic structure with new functional groups formation as well as the removal of existing bonds. The three bacterial isolates were morphologically and biochemically characterized as members of *Bacillus* sp. while the three fungal isolates were identified as belonging to *Aspergillus* and *Mucor* sp. Two microbial isolates were selected as better PE degrading candidates and their sequencing analysis was done. The 16S rDNA and 18S rRNA genome sequencing analysis revealed that the selected bacterialisolatewas identified as a strain of *Bacillus cereus*, while the fungal isolate was identified as *Aspergillus oryzae*. In the end it was concluded that fungi degrade polyethylene more efficiently as compared to bacteria. Optimum conditions for enhanced microbial action can be analyzed in order to increase the polymer degrading capacityof microbes for further use in bioremediation studies.