Isolation and characterization of soil microorganism(s) that can degrade commercially available plastic

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Synthetic plastics are one of the greatest inventions of the mankind and have been developed into a major industry and indispensible commodity of human life. The materials made up of plastic ranging from plastic bags to soft drink bottles are extensively used in the various walks of life. They are widely used because of their easy availability, proven strength, light weight and above all durability. It may take several thousand years for their degradation. However, the durability of disposed plastics contributes to the environmental problems. Therefore, the current situation demands new tools and technologies for the remediation of polythene-related environmental waste.

Microbes are known for surviving in niches that are rich in recalcitrant material such as synthetic polymers. This observation suggests that microbes surviving in such environments may have potential to utilize synthetic polymers that are apparently not biodegradable and thus such microbes could provide valuable tools to remediate plastic wastes in a cost effective and eco friendly manner.

Conventionally the synthetic polymers polythene (PE), polyvinyl chloride (PVC) and polystyrene (PS) are largely used in plastic manufacturing industry. In addition, recently scientists have introduced new varieties of polymers called biodegradable polymers that are as good as the conventional polymers regarding their utilities in plastic industry and contains some hydrolysable bonds within them that can be targeted for enzymatic digestion.

In this context, we focus on isolating bacteria that can efficiently degrade both biodegradable polymers like poly urethane and poly ethylene succinate as well as non biodegradable polymer like low density poly ethylene that are widely used in plastic industry. Towards this we have identified Pseudomonas sp. AKS2 that can efficiently degrade low density poly ethylene (LDPE) and able to utilize it as a sole carbon source for its survival. Our results establish a positive correlation between cell surface hydrophobicity and its degradation potential wherein surface hydrophobicity plays a vital role in cellular attachment to polymer surface.

We have also isolated some new bacteria that are able to degrade biodegradable polymer poly urethane very efficiently. Further characterization is in progress.

Publication:

Tribedi P and Sil AK. Low-density polyethylene degradation by *Pseudomonas* sp. AKS2 biofilm. Environ Sci Pollut Res Int. 2013; 20:4146-53

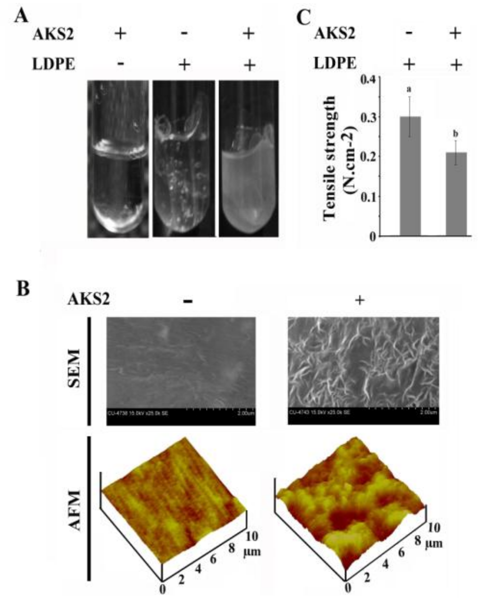

Figure 1 AKS2 degrades LDPE. **A.** AKS2 survives in basal media containing LDPE as sole source of carbon. **B.** Growth of AKS2 alters surface topography of PES film. **C.** Treatment of LDPE film with AKS2 reduces tensile strength.

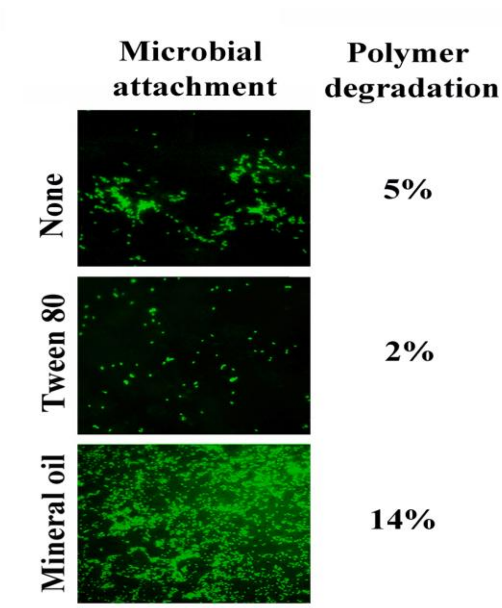

Figure 2. Modulation of AKS2 adherence to LDPE and polymer degradation by mineral oil and Tween 80.

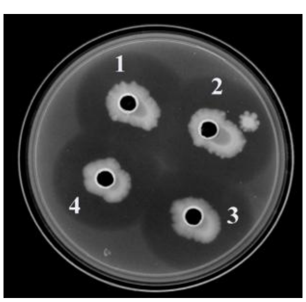

Figure 3. Degradation of poly urethane (PUR) by isolated bacteria. Isolated bacteria were grown in plates containing PUR. Clear zones surrounding the growth indicate PUR degradation.