Kumari et al. (2017) Can J Biotech, Volume 1, Special Issue, Page 130
https://doi.org/10.24870/cjb.2017-a116

Canadian Journal of Biotechnology

ISSN 2560-8304

Poster Presentation **OPEN ACCESS**

Category: Metagenomics

Marine microbe with potential to adhere and degrade plastic structures

Alka Kumari[1], Doongar R. Chaudhary[1,2] and Bhavanath Jha[1,2*]

[1]Discipline of Marine Biotechnology and Ecology, CSIR-Central Salt and Marine Chemicals Research Institute, GB Marg, Bhavnagar 364002, Gujarat, INDIA

[2]Academy of Scientific and Innovative Research, CSIR, New Delhi, INDIA

Presenting author: alkagoabiotech@gmail.com

Abstract

Extensive usages of plastics have led to their accumulation as a contaminant in natural environment worldwide. Plastic is an inert and non-biodegradable material, due to its complex structure and hydrophobic backbone [1]. Conventional methods for reduction of plastic waste such as burning, land-filling release unwanted toxic chemicals to the environment and harming living organism of land as well as the ocean. There is growing interest in development of strategies for the degradation of plastic wastes to clean the environment [2]. Marine bacteria have evolved with the capability to adapt and grow in the diverse environmental conditions [3]. We studied the ability of marine bacteria for destabilization and utilization of different plastic films (LDPE, HDPE, PVC and PET) as a sole source of carbon. An active bacterial strain AIIW2 was selected based on the triphenyl tetrazolium chloride reduction assay, and it was identified as *Bacillus* species based on 16S rRNA gene sequence. The viability of the strain over the plastic surface was studied and confirmed by bacLight assay with fluorescent probes. Scanning Electron Microscope and Atomic Force Microscope images suggested that bacterial interaction over the plastic surface is causing deterioration and roughness with increasing bacterial incubation time. In Fourier transform infrared spectra of treated plastic film evidenced stretching of the (-CH) alkane rock chain and (-CO) carbonyl region, suggested the oxidative activities of the bacteria. The results revealed that ability of bacterial strain for instigating their colonization over plastic films and deteriorating the polymeric structure in the absence of other carbon sources [4]. Moreover, production of extracellular enzymes such as esterase, laccase, and dehalogenase which are reported to support utilization of plastics was confirmed by plate assays. In concise, our results suggested that the marine bacterial strain AIIW2 have the ability to utilize different plastics and dictates the need for the further studies on the underlying biological process. We planned to explore the genes encoding the enzymes involved in degradation of plastic through whole genome study and metabolic profiling to investigate any phenotypic changes [5]. Establishing microbial resources for the degradation of plastics is an ecofriendly approach which could be useful in reduction of its accumulation.

References

[1] Kale, S.K., Deshmukh, A.G., Dudhare, M.S. and Patil, V.B. (2015) Microbial degradation of plastic: a review. *J Biochem Tech* 6: 952-961.

[2] Hopewell, J., Dvorak, R. and Kosior, E. (2009) Plastics recycling: challenges and opportunities. *Philos Trans R Soc Lond B Biol Sci* 364: 2115-26. https://doi.org/10.1098/rstb.2008.0311

[3] Dash, H.R., Mangwani, N., Chakraborty, J., Kumari, S. and Das, S. (2013) Marine bacteria: potential candidates for enhanced bioremediation. *Appl Microbiol Biotechnol* 97: 561-571. https://doi.org/10.1007/s00253-012-4584-0

[4] Yang, J., Yang, Y., Wu, W.M., Zhao, J. and Jiang, L. (2014) Evidence of Polyethylene Biodegradation by Bacterial Strains from the Guts of Plastic-Eating Waxworms. *Environ Sci Technol* 48 13776-13784. https://doi.org/10.1021/es504038a

[5] Lardjane, N., Belhaneche-Bensemra, N. and Massardier, V. (2013) Soil burial degradation of new bio-based additives. Part II. plasticized poly(vinyl chloride) films. *Journal of Vinyl & Additive Technology* 19: 183-191. https://doi.org/10.1002/vnl.21320

Citation: Kumari, A., Chaudhary, D.R. and Jha, B. Marine microbe with potential to adhere and degrade plastic structures [Abstract]. In: Abstracts of the NGBT conference; Oct 02-04, 2017; Bhubaneswar, Odisha, India: Can J biotech, Volume 1, Special Issue, Page 130. https://doi.org/10.24870/cjb.2017-a116