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Project Report on
**Selection and Screening of Microbial Consortia for Efficient
and Eco-Friendly Degradation of Plastic Materials in Urban
and Rural Areas of Bangalore**
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Submitted by

MEGHA M
MEGHNA N. KINI
KAMATH MANALI MUKUND
ALYA RIZVI
(IV Year BE Biotechnology)

Under the guidance of

SINOSH SKARIYACHAN
(Assistant Professor, Department of Biotechnology)



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DEPARTMENT OF BIOTECHNOLOGY
DAYANANDA SAGAR COLLEGE OF ENGINEERING
SHAVIGE MALLESHWARA HILLS
KUMARASWAMY LAYOUT, BANGALORE - 560078



ABSTRACT

The extensive use of polymeric materials such as plastic has led to the severe problem of its accumulation in our environment. Plastic being an inert polymer is unable to undergo any noticeable change in the natural environment thus leading to its accumulation. In India, the industrialization and urbanization in the last few decades has led to the country's development, and the overuse of polymeric substances like plastic has also been witnessed. In a city like Bangalore, the persistence of plastic in lakes and soil has led to the problem of its pollution of the city. Hence, in this study our objective was to identify bacteria in water and soil samples collected from polluted areas in and around Urban and Rural areas of Bangalore to study their efficiency of plastic degradation. Degradation of polyethylene glycol which is a plasticizer was determined by zone of clearance method. The rate of degradation of plastic was initially monitored by weight loss method. Plastic upon its incubation as a sole carbon source with enriched cultures of the soil and water samples we collected in minimal media showed 20-50% weight loss over a period of 120 days. We have isolated and characterized plastic degrading bacteria as two different species of *Pseudomonas*. The optimization of growth parameters was performed and it was found that these bacteria were highly alkalophilic in nature with a pH of 9.0 and an optimum growth temperature of 37°C. The rate of degradation under optimized conditions was found to be around 30% over a period of 30 days. Further, we have formulated a bacterial consortium of these two isolated bacteria with plastic as the sole carbon source and a steady state decrease in the weight of plastic was observed in a span of 30 days. Previous studies indicated that lipases might be responsible for degrading plastic in *Pseudomonas*. In a culture of our isolated bacteria with olive oil as sole carbon source, we were able to confirm presence of protein albeit in very less quantities in the supernatant of the culture broth. Lipase being extracellular in nature in *Pseudomonas spp.* is known to be present in very minor quantities thus confirming our results. Finally, *in silico* docking studies of the enzyme lipase with small molecules of plastic like polyethylene and polystyrene showed good interactions between the enzyme and substrate thus indicating that lipase enzyme might play a crucial role in plastic degradation.

Keywords: Plastic degradation, zone of clearance, weight loss method, *Pseudomonas spp.*, optimization of growth parameters, bacterial consortium, *in silico* docking studies