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# EXPLORING THE POTENTIAL KEY ROLE OF MICROBIAL ENZYMES FROM PLASTIC POLLUTED SITES IN THE BIODEGRADATION OF POLYHYDROXYBUTYRATE FILMS

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## INTRODUCTION

Polyhydroxybutyrate (PHB) has gained popularity as a bioplastic due to its numerous benefits when compared to petroleum-based polymers, such as its biodegradability and its permeability, being targeted as a polymer of interest specially for packaging purposes. [1]

This study follows up research on previously isolated microorganisms from plastic-polluted sites with potential of using diverse plastic-related monomers as a sole carbon and energy source. Four strains were selected to be tested for their capability degrading bioplastics such as PHB in film assays.

## METHODS

PHB films were prepared by dilluting 1 g of PHB in 50 ml of acetone and left to dry for 24 h. The film obtained was divided in four parts and weighted. A weighted piece of the film was added as carbon source to a 50 ml falcon tube with 20 ml Mineral Salt Medium without glucose or any other source of carbon (MSM) (9 g/l $Na_2HPO_4 \times 12H_2O$, 1.5 g/l $KH_2PO_4$, 1 g/l $NH_4Cl$, 0.2 g/l $MgSO_4 \times 7H_2O$, 0.2 g/l $CaCl_2 \times 2H_2O$). Tubes were inoculated with selected strains and incubated for 20 days at 30°C and 120 rpm (Figure 1)

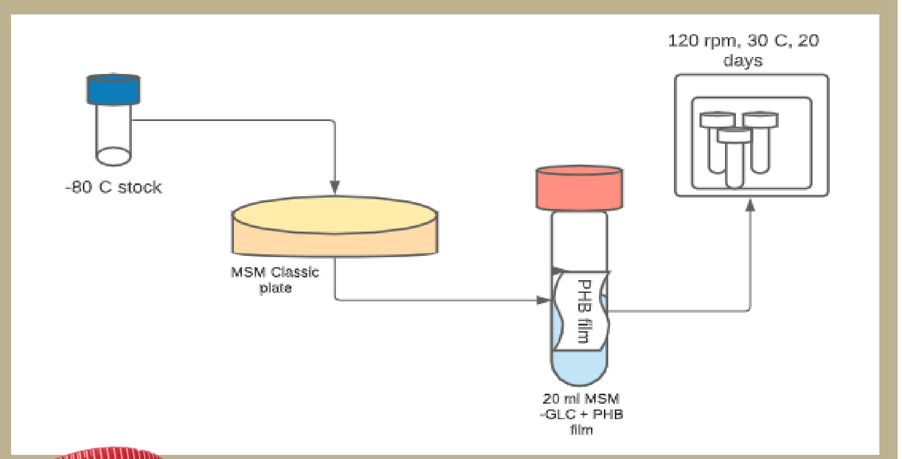
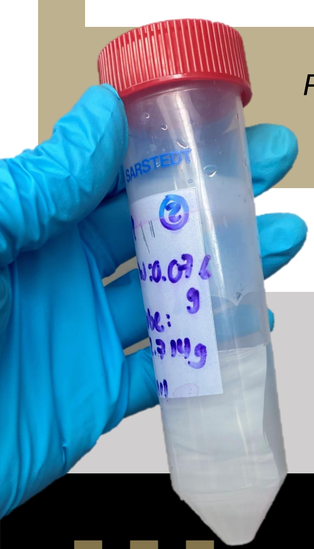



*Figure 1. MSM –glc + PHB Assay*



## RESULTS

Significant loss of molecular weight (Mw) was easily observed in the PHB films inoculated with selected strains after 20 days of incubation (Figure 4). The level of degradation of the films was assessed by weighing washed and dried simple in the end of the incubation.

Strain DG90 performed with the percentage of 59.89% of PHB films degradation in examined conditions (Figure 3). Strains DG19 and DG25 showed similar ability to degrade PHB films with 41.18% and 44.05% of PHB degradation, respectively. DG83 was the only strain selected that performed poorly with only 14.74% film degraded (Figure 2).

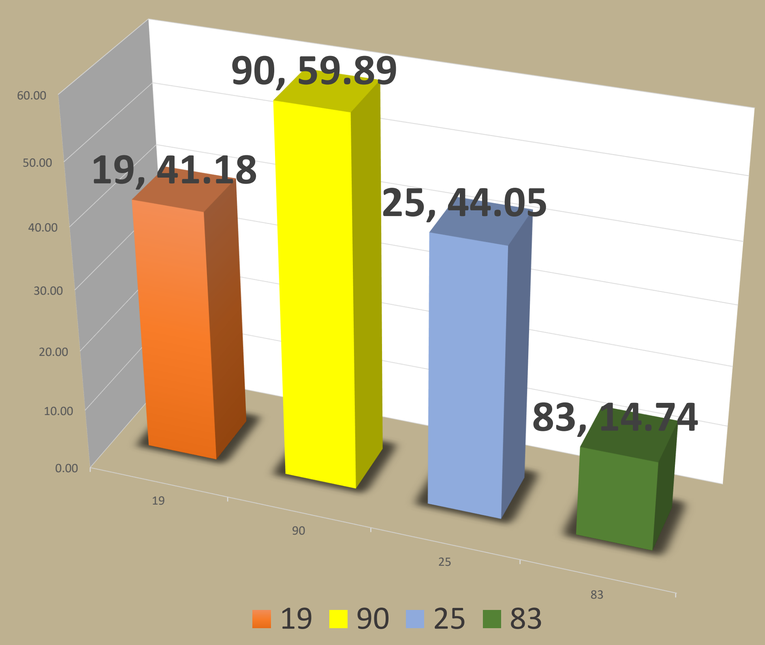



*Figure 2 . Percentage of PHB film degraded using different microbial strains*

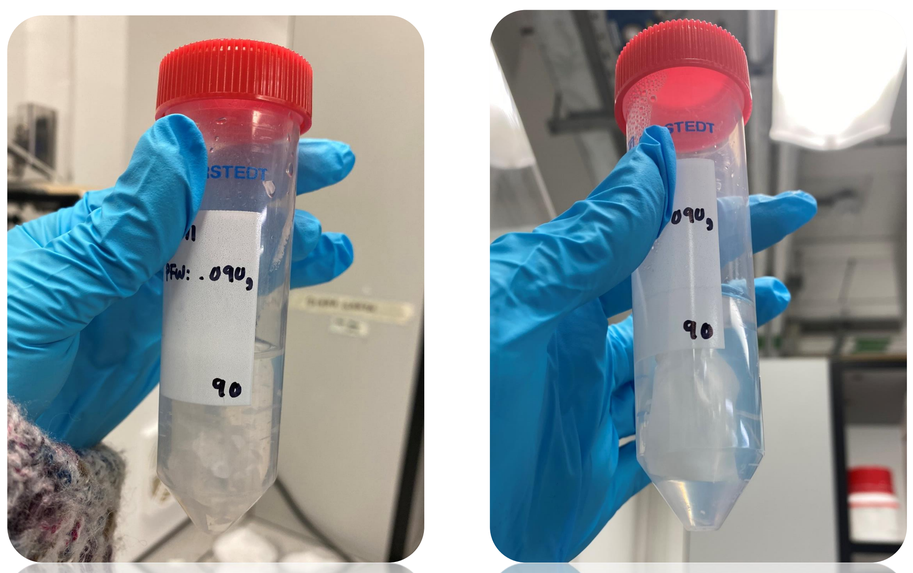
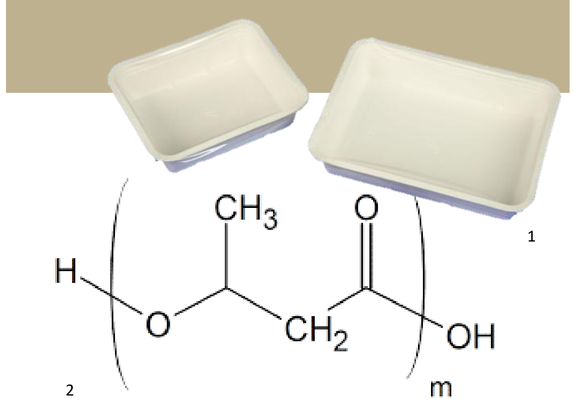


*Figure 3 (left) PHB film degraded after cultivation with DG90 in comparison to negative control (right)*

*Figure 4. PHB Film degradation Assay*

## CONCLUSIONS

Degradability of PHB was achieved in a significant percentage which proofs that selected stains have an ability to break down PHB and utilize it as a carbon source. Further research will be conducted to analyze films after degradation and potential of selected strains to degrade PHB will be closer investigated.

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1:DOI:10.3390/polym12122908

Images:
1: www.plasticstoday.com/bioplastics-packaging-come-its-own
2: polymerdatabase.com/Polymer%20Brands/PHB.html

BioICEP 解塑再用 Bio Innovation of a Circular Economy for Plastics

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