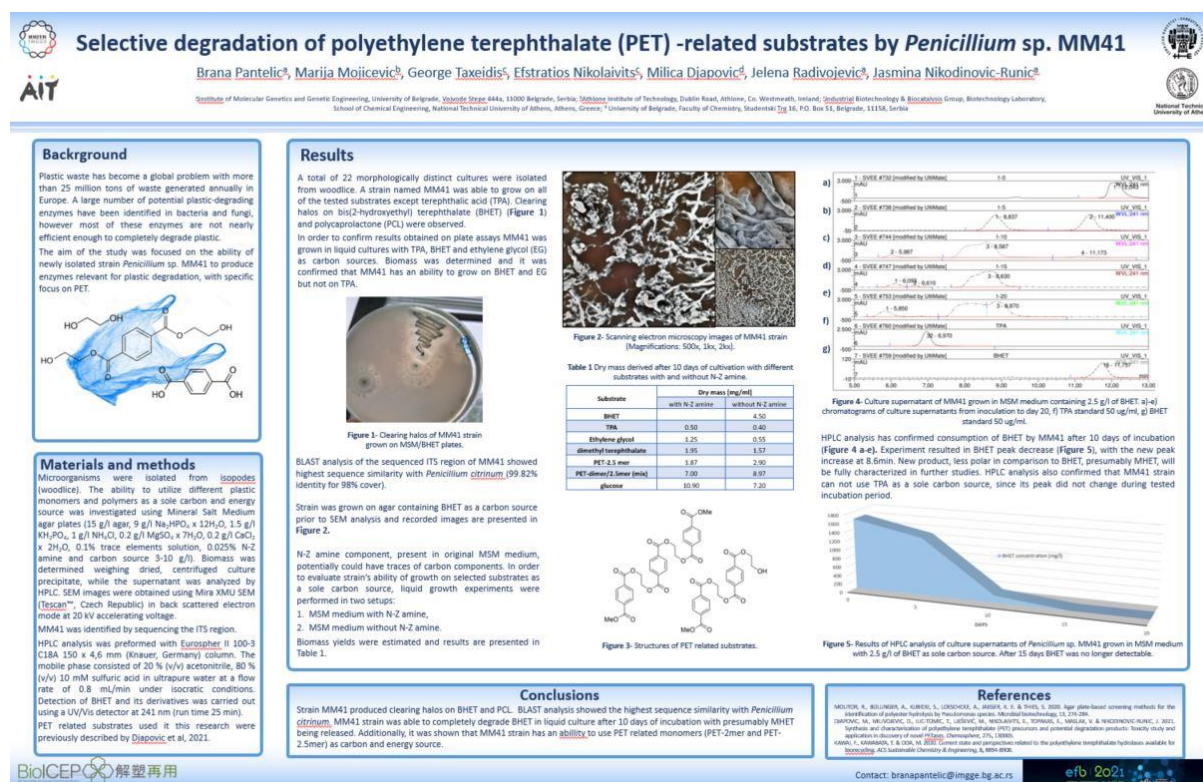


PhD students involved in BioICEP project have presented their work at EFB2021 virtual conference. EFB2021 is the major scientific conference organised by the European Federation of Biotechnology (EFB) with 81 speaker and 206 poster presentations. EFB is Europe's non-profit federation of National Biotechnology Associations, Learned Societies, Universities, Scientific Institutes, Biotech Companies and individual biotechnologists working to promote biotechnology throughout Europe and beyond. As the independent "Voice of Biotechnology in Europe", EFB promotes the safe, sustainable and beneficial use of fundamental research and innovation in life sciences, while providing a forum for interdisciplinary and international cooperation.

Brana Pantelic, Junior Researcher from Institute of Molecular Genetics and Genetic Engineering, presented his work on selected degradation of PET-related substrates by *Penicillium* sp. MM41 strain isolated from woodlice. This strain was able to completely degrade BHET in liquid culture after 10 days of incubation with MHET release. Additionally, it was shown that MM41 strain has an ability to use PET related monomers (PET-2mer and PET-2.5mer) as a sole carbon and energy source.



Diana Garza, PhD student at Athlone Institute of Technology presented her research on enzymatic potential of microbes isolated from polluted sites. Selected sites proved to be good sources of potential PET degrading enzyme producer. Isolated strains showed an ability to use plastic related substrates as a sole carbon source. Further research will be focused on conversion rate of tested substrates in liquid culture.

INTRODUCTION

The search for effective plastic waste management methods has been the focus of recent intense scientific research. One of the most promising approaches is enzymatic degradation of plastic and the retrieval of monomers for their upcycling (1,2).

A large number of potential plastic-degrading enzymes have been identified from associated microbes. The aim of this study is to identify microbial strains that have been exposed to heavily polluted sites with enzymatic potential to utilize polyethylene terephthalate (PET) and polyurethane (PU) as a sole source of carbon and energy.

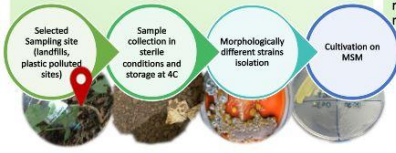


Figure 1. Microbial isolation process

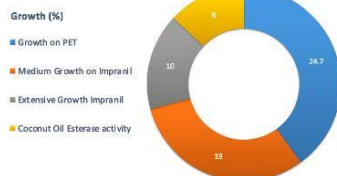


Figure 2. Overview of screening of the novel isolates for the potential to biodegrade plastic substrates

METHODS

Soil samples were obtained from landfills and other plastic polluted sites. Microbial isolation was carried out using three different growth media: LA (10 g/l tryptone, 5 g/l yeast extract, 10 g/l NaCl, 15 g/l agar), SAB (40 g/l glucose, 10 g/l peptone, 15 g/l agar) and ISP2 (4 g/l yeast extract, 10 g/l malt extract powder, 4 g/l glucose, 20 g/l agar). The ability to use plastic related substrates as a sole carbon source was tested using a Mineral Salt Medium (MSM) (15 g/l agar, 9 g/l Na₂HPO₄ x 12H₂O, 1.5 g/l KH₂PO₄, 1 g/l NH₄Cl, 0.2 g/l MgSO₄ x 7H₂O, 0.2 g/l CaCl₂ x 2H₂O and carbon source 3-10 g/l). Esterase activity screen was conducted using coconut oil as a substrate. Cultures were incubated for 14 days at 30°C. Visible growth on the plates was considered as a positive result. Selected isolates were cultivated in liquid MSM medium using PET and PU as a sole carbon source.

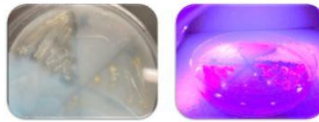


Figure 3. Isolate growing on Impranil showing halo zone (left); Esterase activity detection under UV light, using coconut oil plates (right)



Figure 4. Isolates with an ability to grow on PET as a sole carbon source in liquid culture

RESULTS

Visible growth on the plates was considered as a positive result. A total of 98 morphologically distinct cultures were isolated and screened for esterase activity (8%). 24.7% of tested isolates showed an ability to grow on PET. 19% isolates showed medium growth on Impranil, while 10% showed extensive growth in contrast with the control plates (Figure 2).

Certain strains showed a visible halo in medium with Impranil substrate (Figure 3). These isolates were tested in MSM liquid culture with polyurethane as a sole carbon source and the growth rate was estimated. Experiment in liquid culture was conducted with strains that showed ability to grow on PET substrate as well (Figure 4). Results are presented in Figure 5.

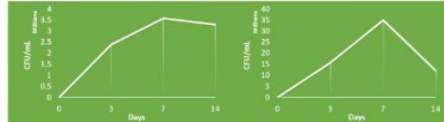


Figure 5. Growth rate of isolate 53 cultivated in liquid MSM with PU (left) and isolate 48 cultivated in liquid MSM with PET (right) as a sole carbon source

CONCLUSIONS

- Selected sites are important source of valuable enzyme producing microbes.
- Isolated microbial strains showed an ability to grow on PET and PU as a sole carbon and energy source.
- Further research will be focused on examined substrate conversion rate and characterization of enzymes and their mechanisms of action.

References:
1: DOI 10.1186/s40643-017-0145-9
2: DOI 10.3389/fmicb.2020.00442



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