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IDENTIFICATION OF MIXED MICROBIAL CONSORTIA ISOLATED FROM POLYETHYLENE FILMS SURFACE

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Introduction

Approximately 92% of synthetic plastics represent polyethylene and polypropylene, which are used for the production of plastic bags, disposable containers, bottles, packaging materials, etc. Polyethylene has become a major source of environmental pollution because it is a highly recalcitrant and inert synthetic material and is very difficult to degrade in the environment. The natural degradation of low-density polyethylene (LDPE, PE-LD) depends on polymer properties, such as water insolubility, the hydrophobicity, degree of crystallinity and molecular weight, and a number of various environmental factor including temperature, air humidity, moisture content, pH, solar energy. The traditional methods for plastic waste dispose are recycling, incineration, landfilling, and biodegradation. Biodegradation involves the use of various species of bacteria and fungi or microbial communities, isolated from various terrestrial or aquatic habitats, which are able to modify and consume the plastic polymers as a source of energy. Several microorganisms have been reported to degrade LDPE, however, its high 22 molecular weight, hydrophobic nature and lack of functional groups, recognized by microbial enzymes hinder its degradation.

The purpose of present study was to characterize microbial consortia isolated from the surface of LDPE films extracted from the soil contaminated with *polyethylene*.

Materials and methods

Fungal and bacterial strains were isolated from LDPE surface, through enrichment techniques. Enrichment cultures were prepared by adding 10 mL water sample to 90 mL mineral salt medium (MSM). At the initial stage of creating consortia in the culture media was added LDPE in the form of granules, in an amount of 1 g. As a growth inducer in the media was added glucose, in a concentration of 0.1 mL.

Samples from the enrichment culture were serially diluted and plated onto MSM agar, nutrient agar, and Czapek medium. Bacterial isolates were then allowed to grow by incubating the plates at 28°C for five days. Growing colonies were selected and streaked successively onto the same media for purification. The isolates were examined for their Gram reaction, endospore formation, and cultural characteristics, such as colour, colony form, margin, surface, and elevation.

Results and conclusions

LDPE films were placed in the soil that was collected from the landfill, located near the village of Slobozia-Dușca, the Criuleni district, the Republic of Moldova. The soil was treated under aerobic and anaerobic conditions within six months. A total of 9 genera of micromycetes and 4 genera of bacteria were isolated, described and determined. The isolated micromycetes belonged to different genera: 3 species of the genus *Trichoderma*, 4 species of the genus *Penicillium*, 1 species of the genus *Fusarium*, and 1 representative of the phylum *Ascomycota*. Isolated bacteria were part of the genus *Bacillus* – 2 species, 1 species of the genus *Pseudomonas*, and a representative of the genus *Streptomyces*.

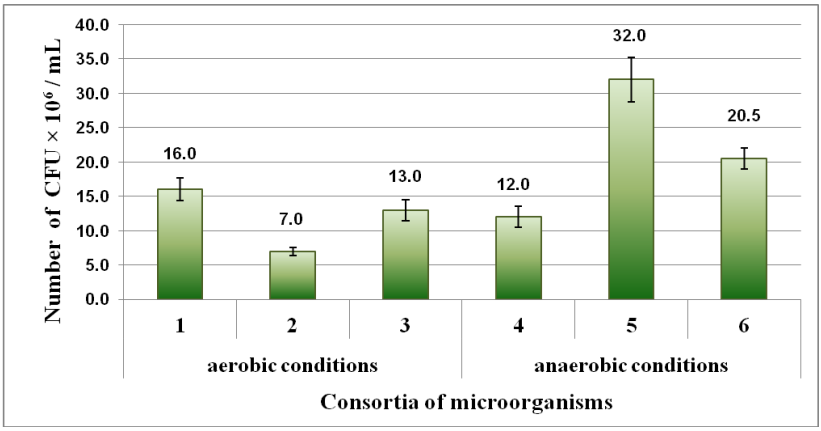

Fig. 1. Number of microorganisms, in CFU/mL, in consortia isolated from the LDPE surface extracted from the soil treated under anaerobic conditions

The data obtained show that after 100 days of cultivation the microorganisms in the consortia retain their viability, the titer being from 7.00×10^6 CFU/mL, up to 32.00×10^6 CFU/mL.

The consortia obtained are composed predominantly of fungal strains, and micromycetes are mostly represented by the genus *Trichoderma*. The bacteria were determined only in 2 consortia, out of the 6 obtained, and were represented by species from the genera *Bacillus*, *Pseudomonas*, *Streptomyces*.

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