

ISOLATION OF MICROBIAL CONSORTIA FOR THEIR POTENTIAL APPLICATION IN LDPE BIODEGRADATION

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Low-density polyethylene (LDPE) is one of the major causes of persistent environmental pollution due to its resistance to degradation. Polyethylene can be degraded by different methods: chemical, thermal, biological, and photodegradation. The use of microorganisms in environmental decontamination is the most ecological and safest way. The purpose of the research was the isolation and characterization of consortia of microorganisms with potential in LDPE biodegradation.

In order to isolate microbial consortia from the soil, with potential in the bioconversion of non-recyclable plastic, research was initiated using soil samples polluted with plastic and other contaminants, collected from the landfill near the village of Slobozia-Duşca. Incubation experiments were carried out under laboratory conditions, in pots with soil with the addition of LDPE strips. Two experimental variants of incubation were planned: 1) oxic conditions, and 2) anoxic conditions. The experiment duration was 180 days. To isolate the microbial consortia, which populated the polyethylene surface, the strips were transferred to flasks with MSM 2 liquid mineral medium and cultivated under continuous stirring conditions at 28°C for 30 days. The obtained consortia were cultivated for 270 days under similar conditions, in the presence of LDPE. Subsequently, the consortia were characterized by inoculation on solid media and under the optical microscope. The degree of LDPE degradation was determined by optical microscopy of the films and by Fourier-transform infrared spectroscopy (FTIR).

The obtained results showed that in experimental variant 1 (oxic conditions) the microbial consortium was composed of 3 strains of micromycetes and 1 strain of bacteria. In variant 2 (anoxic conditions) the consortium was composed of 1 strain of micromycetes, 1 strain of yeasts and 2 strains of bacteria. Microscopic study of LDPE films revealed both immobilization of microorganism cells and damage to the polyethylene surface. The analysis of the LDPE films by the FTIR method showed that the microorganisms, which populated the surface of the LDPE samples, cause physical changes, observed on the absorption spectra of the films, such as the appearance and disappearance of some absorption bands, or their splitting.

The obtained data allow us to conclude that the obtained microbial consortia have potential in the biodegradation of non-recyclable plastic.

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