COMPARATIVE STUDY OF OIL-DESTRUCTOR BIOLOGICAL PRODUCTS EFFICIENCY FOR CLEANING OIL-CONTAMINATED SOILS IN EXTREME CONDITIONS

L. G. Bakina, M. V. Chugunova, A. O. Gerasimov, Yu. M. Polyak, K. L. Yakkonen, N. V. Mayachkina, E. A. Gorbunova

St. Petersburg Federal Research Center of the Russian Academy of Sciences, 107110, St. Petersburg, Korpusnaya St., 18, e-mail:bakinalg@mail.ru

The biological methods of remediation of oil-contaminated soils and grounds are the most preferable of the existing recultivation technologies. Bioremediation methods, along with other measures (sowing grasses, stimulating native soil microorganisms by applying fertilizers and lime), include the use of bacterial preparations containing oil-degrading microorganisms. The paper studies the efficiency of oil-degrading biopreparations for cleaning old-contaminated soil from oil products (OP) under extreme conditions – without applying fertilizers and lime and at low temperatures (+15°C). The experiment was carried out in laboratory conditions with an initial content of oil products in the soil of 3500 mg kg^{-1}, which refers to pollution level 4 (high). Composting was carried out in plastic containers, the soil weight was 300 g. Over the entire composting period (4 weeks), depending on the experimental treatment, 260–540 mg kg^{-1} OP, or 7–15% of the oil initial content, decomposed. Due to the activity of the native microorganisms, 7% of OP was decomposed. Two preparations («Destroyl» and «Sever») had virtually no effect on the processes of OP biodegradation, since the level of petroleum products decomposition with them was the same as in the control (without biopreparations). Three preparations («Devoroil», «Soyleks» and «Aborigen») increased the process of OP decomposition by 1,6, 1,8 and 2,1 times, respectively. After the third week of composting, the process of petroleum products destruction in the soil ceased, which confirmed the well-known position on the need for repeated (after 3–4 weeks) application of biopreparations in order to intensify the biodegradation of petroleum products. Soil respiration intensity indicator (production of carbon dioxide by the soil) was prowen to be a very valuable indicator of the processes of complete OP mineralization by microorganisms. Correlation coefficients R=0.63–0.88 were established between the intensity of soil respiration and the loss of petroleum products from the contaminated soil.

Key words: oil pollution of soils, oil products, biopreparations, bioaugmentation, self-purification, soil respiration.