

## **Bioremediation of the Arctic soils contaminated by oil spills**

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Northern regions are characterized by the low self-purification capacity soils through slower changing processes. Therefore, it is very important to develop the methods of soil purification from oil products.

Main task of this work was to estimate the period of purification of soils in the Northwest part of Russia from different oil products and to study their influence on soil biota and to select mostly aboriginal plant species, resistant to oil contamination of soil.

The criterion of soil biogenic (BS) which is characteristic of soil fertility and resistance to contamination was determined. The criterion of biogenic factor includes three pillars of soil fertility: the content of organic substance and nitrogen in soil and the value of active microbe biomass.

Mechanisms of self-purification of soils from oil spills are:

- Evaporation (up to 40% of light fractions); leaching by the soil profile;
- physical-chemical factors (acidification, photolysis, hydrolysis, UV- decomposition);
- biodegradation by indigenous microbiota; phytoremediation, etc.

Three main methods have been developed and tested under field conditions for bioremediation of soils polluted with oil hydrocarbons:

- activation of biodecomposing activity of local microorganisms by application of additional nutrient source in the form of mineral and organic fertilizers, liming, additional aeration, correction of acid-base balance of the soil.
- introduction of biopreparations, which basis is made by active, among others genetically modified strains of oil-oxidizing bacteria and fungi. Biopreparations should be complex, should contain several strains of oil-oxidizing microorganisms, capable of utilizing hydrocarbons with various length of carbon chain. A disadvantage of many commercial preparations is their quick enough reduction of oil-oxidizing microorganisms titer during storage and transportation of the preparation and problems with survival ability of introduced species of microorganisms in soil.
- phytoremediation - growing on polluted soils of resistant plant species. Plants stimulate the development of rhizosphere bacteria and fungi - oil and oil products decomposers. Exoenzymes of plants can precipitate, fix and decompose organic pollutants. Plants immobilize pollutants, adsorbing them on their roots, performing the phytostabilization process.