The change of soil humic substance (HS) and heavy carbon isotope ($\delta^{13}C$) in soil and soil microorganisms over *in vitro* bioremediation of oil-spilled soil

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The problem of complete (100%) restoration of affected soils after oil hydrocarbons spills is still relevant, despite the efforts of researchers working in the field of environmental engineering. The laboratory experiment focuses on studying the kinetics of soil HS fractions, isotopic composition $\delta^{13}C$ (soil, oil hydrocarbons and microbial biomass) and heterotrophs number.

Bioremediation of oil-pollited soil at 6°C by introducing a consortium of active oil-degrading bacteria has failed in crude oil full biodegradation till the end of experiment (400 days), even with additional inoculations of the consortium. After adding crude oil the HS content in the soil has grown, with the content of soluble HS being increased two-fold, and the one of insoluble HS – three-fold, and remaining the parameters the same till the 400th day (Figure 1).

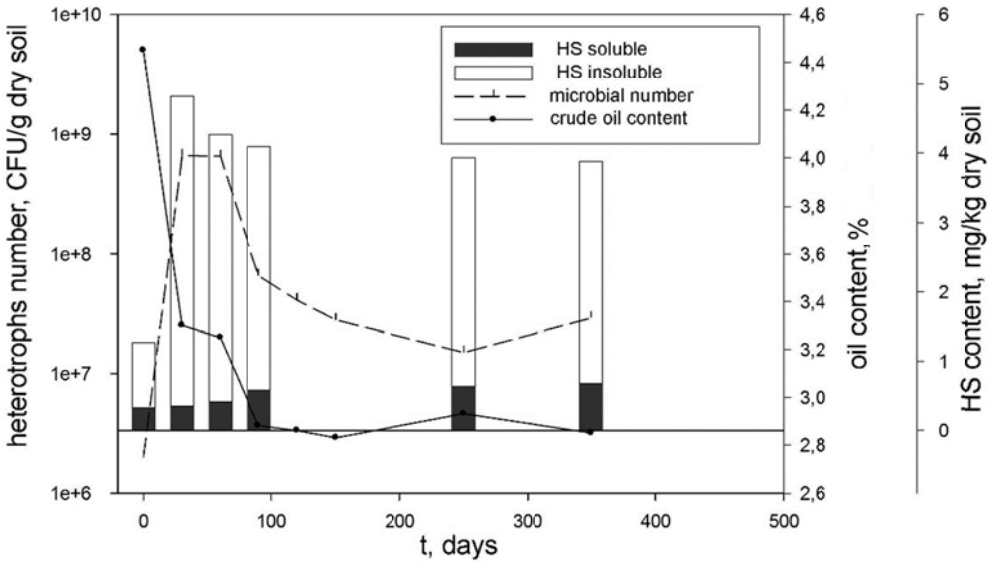

Figure 1. The kinetics of heterotrophs number, HS and crude oil content during *in vitro* soil experiment.

Application of mass-spectrometry has made possible defining fractionation of carbon isotopes of crude oil hydrocarbons by microorganisms. Heavy isotopes ($\delta^{13}C$) are picked for the microbial biomass but the light ones ($\delta^{12}C$) are turned out as CO_2 [1]. Isotopic composition of soil carbon has changed from $\delta^{13}C$ -29,94 to -29,18‰, and the fact confirms the effect of carbon isotopes fractionation by microorganisms which possibly is a reason of incomplete oil biodestruction in soil.

References

1. Zyakun A.M. et al. // Mikrobiologiya. 1986. 6:953–957.