The effect of oil pollution on the activity of physiological and biochemical processes in *Triticum aestivum* L. and the number of rhizospheric microbiota

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Key message. The article presents the results of a study of the effect of oil pollution on the biochemical and morphometric parameters of the plant *Triticum aestivum* L., as well as a change in the number of rhizospheric microorganisms capable of degradation of petroleum hydrocarbons. It was shown that under the influence of pollution in plants increased the activity of redox enzymes. A significant increase in hydrocarbon-oxidizing bacteria and fungi was recorded in the rhizosphere

Keywords: *Triticum aestivum* L., rhizospheric microorganisms, oil pollution

The most typical anthropogenous factors of soil pollution are oil and refinery products. They have negative effect on vascular plants. Phytoremediation, using the combined metabolic potential of microorganisms and plants, plays a special role in cleaning the soil of toxicants. This method is currently gaining popularity.

The aim of the study was to study the effect of oil pollution on *Triticum aestivum* L. and microorganisms living in the plant rhizosphere. Plants were grown in oil-contaminated soil (pollutant concentration was 1, 3 and 6%). The response of plants to stress was determined by a number of morphometric and biochemical parameters, such as plant length, enzymes, pigments. The number of various ecological groups of microorganisms in the rhizosphere of plants was also estimated. Soil samples were taken from the rhizosphere of 10- and 20-day-old plants. The number of microorganisms was determined by seeding on different nutrient media. The spectrophotometric method was used to determine the biochemical parameters of plants.

It was shown, that certain changes have been found in the plants which have been grown up in polluted soil in the linear sizes of roots and elevated part of plants. For example, if in the control variant of experience the length of an elevated part of wheat in the age of 20 day made 26,05 cm and in the variant with concentration of oil of 3 % the length of a plant was only 15,91 cm. When the oil content in the soil was 6% plant seeds grew much later than in other test variants. Seed germination was 70% below control. This fact confirms the opinion that the use of the phytoremediation method is justified only when the pollutant concentration in the soil is not more than 5%.

Oil pollution effect on plants caused significant changes in the functional condition of plants. Different concentrations of oil caused significant increase in peroxidase activity both in leaves (2,5-3 times), and in roots (1,5-2 times). Polyphenol oxidase activity in leaves irrespective of the concentration of oil increased by 1,3-1,6 times compared to the control plants.

The number of microorganisms of various physiological groups in the rhizosphere of wheat changed during the growing of plants. In the first 10 days, the total number of heterotrophic microorganisms in the rhizosphere of wheat decreased several times under the influence of oil pollution. After 20 days, this parameter increased several times (2-5), however, high (6%) oil concentrations inhibited the value of this indicator. Obviously, by this time the concentration of toxic light fractions of the pollutant was reduced, or the products of the breakdown of oil could be used by them as a source of nutrition and energy.

Oil pollution of the soil stimulated the development of a population of microorganisms - oil destructors. The number of hydrocarbon-oxidizing microorganisms (HOM) in the rhizosphere of wheat increased by one or two orders of magnitude in all samples already in the first 10 days of wheat plant growth. A study of the species composition of HOM showed that most bacteria belonged to the genus *Pseudomonas*, *Bacillus* and *Arthrobacter*.

Throughout the experiment, oil pollution contributed to an increase in the number of microscopic fungi. In the rhizosphere of wheat, more than half of the isolated fungi had hydrocarbon-oxidizing activity. Representatives of two genera *Aspergillus* and *Penicillium* predominated in soil samples.

Thus, oil pollution stimulated the growth of hydrocarbon-oxidizing bacteria and microscopic fungi in the rhizosphere of *Triticum aestivum* L. It can be assumed that they make a certain contribution to the process of rhizodegradation of oil in the soil. At the same time, oxidation-reduction processes carried out by peroxidases and polyphenol oxidases were activated in the leaves and roots of plants under the influence of pollution.