THE INFLUENCE OF NANOMAGNETITE ON THE PROCESSES OF GROWTH, DEVELOPMENT, AND FORMATION OF THE LEGUME-RHIZOBIA COMPLEX IN VETCH PLANTS UNDER SOIL CONDITIONS OF PLASTICS POLLUTION

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The Republic of Moldova suffers from the problem of environmental pollution by plastics, including by the low-density polyethylene (LDPE). The accumulation of plastics by plants has negative consequences for the food security and sustainable development of the agriculture. It is suggested that over time soil pollution by plastics can threaten the successful functioning of the entire agricultural system.

The negative consequences of soil pollution by plastics impose the need of developing measures of remediation. Due to the lack of efficient chemical and physical methods for destroying plastics in soil, the attention has recently been directed toward developing biological degradation techniques, including the ones based on application of phytoremediation and nanophytoremediation. However, the potential of these techniques in the cases of soil pollution by LDPE is understudied. The aim of this work was to explore the possibility of using nanomagnetite and vetch plants bacterized by the *Rhizobium leguminosarum* K2 strain for remediation of soils contaminated by LDPE.

The introduction into soil of a finely chopped LDPE (5 g/kg) and nanomagnetite (25 mg/kg of soil) resulted in increases in the total length of plants (roots included), plant height, and the accumulation of dry biomass of 10.6%, 15.4%, and 28.8% respectively. The number of root nodules was higher by 2.2 times. Positive effects were also observed in the two variants where LDPE was introduced without nanomagnetite and the vetch seeds were either inoculated or not inoculated by rhizobia. Comparing to the control, the root length, plant height, and dry mass had 8.2%, 11.7%, and 26, 8% increases respectively. The number of root nodules in these variants was 2.4–2.8 times higher than in the control.

Even though not all effects were significant statistically, the general picture showed that the introduction of LDPE into soil had no inhibitory effects on plant productivity and formation of the legume-rhizobia complex, and even stimulated them, especially in the cases of seed inoculation by rhizobia and nanomagnetite treatment.

The observed formation of healthy legume-rhizobia complexes in the variants where the plant seeds were inoculated by *Rhizobium leguminosarum K2* is of a significant importance for plant productivity, as well as for soil fertility. Rhizobia within this symbiosis provide the plants with the nitrogen fixed from the atmosphere, and, in turn, obtain from them the needed organic substrates. It is known that due to the symbiotic nitrogen fixation, the soil annually can receive up to 90-180 kg/ha of nitrogen. The observed stimulation of dry mass accumulation was important too. The fact that the plants and the symbiosis with rhizobia could be stimulated in the presence of LDPE contamination demonstrated the possibility of using the vetch plants as an efficient phytoremediator in cases of soil pollution by plastic waste.

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