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COPPER BIOACCUMULATION STATUS AND PHYTOREMEDIATION POTENTIAL OF SOME AGRICULTURAL PLANT SPECIES GROWING IN POLLUTED AGRICULTURAL LANDS OF ARMENIA

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Abstract

Continuous environmental contamination is a global problem and hence the pollution of agricultural lands by heavy metals, which is directly connected to human health and ecological safety, is a critical challenge for the scientists. Currently the heavy metals pollution of agricultural lands through mining industry is one of the most severe ecological problems in Armenia.

The aims of our studies were the investigation of topsoil physicochemical properties, Cu concentration in agricultural plants growing on these soils as well as the estimation of the risk level of studied agricultural plants for human health and the detection of their phytoremediation potential. In fresh shoot mass the highest concentrations of copper were observed in garlic (13.7 mg/kg) and coriander (12.2 mg/kg), whereas in dry shoot mass the highest contents were registered in onion (59 mg/kg), garlic (52 mg/kg) and spinach (51 mg/kg). Actually in dry and fresh mass the highest contents of copper were observed in different plants and this fact is conditioned by different content of water in these crops. In fresh and dry root masses the greatest contents of copper were found in maize (36.4 and 85 mg/kg, respectively) and lettuce (32.5 and 92.6 mg/kg, respectively). The highest contents of copper in fresh and dry masses of edible parts of agricultural plants were observed in leaves of horseradish, used as pickles (16.2 mg/kg and 45.9 mg/kg, respectively). Maximum permissible concentration (MPC) of copper in fresh mass of agricultural products is 10 mg/kg. Study results show that from agricultural plants used as foodstuff the exceeding of MPC was observed in coriander, in garlic and in leaves of horseradish.

The assessment of phytoremediation potential of agricultural plants was performed using bioconcentration factor of root (BCFroot) and translocation factor (TF). Allowing for the fact that BCFroot value of maize is rather high (25.91) and it forms a strong rootage as well as the circumstance that meanwhile the TF value is low (0.51), this plant species is advisable to use for phytoremediation purposes. Specifically its aerial parts may be used in agricultural purposes (copper contents do not exceed maximum permissible concentrations there) while the underground parts should be removed from the site. High BCFroot value is also observed in lettuce but its rootage is not such strong and this circumstance decreases its phytoremediation potential.