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Phytoremediation study of some plants to decrease heavy metals in drought stress conditions

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Abstract

The toxicity of heavy metals in agricultural lands has increased over time and climate change has created new forms of soil and water pollution through dust storms with increasing drought stress. However, there are few reports to describe the phytoremediation of heavy metals by native plants in arid agricultural lands. Currently in the south of Kerman, sewage sludge with livestock and poultry wastes and agricultural pesticides have the largest share of heavy metal contamination in weeds and vegetables. The aim of this study was to identify crops and native plants that have a strong relationship with the elimination or stabilization of heavy metal contamination in crop environments in the form of split plots based on a randomized complete block design during the years 1396-97 and 1397-98 (Three repetitions) were performed in Jiroft city. The main treatments include three levels of irrigation (field capacity (control), 75 and 50% of field capacity) and sub-treatments in six levels and include five plants: Purslan, millet, barley, salt and radish and control (without cultivation) for soil samples. Was. The results showed that after harvesting the plants, the concentration of all heavy metals in the soil decreased compared to planting time. The average concentration of elements in the roots of plants was higher than their shoots, so that the average concentration of iron in the roots of plants was 799%, manganese 231%, nickel 164% higher than the shoots. The order of increasing the concentration of metals in the roots relative to the shoots was obtained as follows: (Molybdenum <Cadmium <Cobalt <Chromium <Arsenic <Zinc <Lead <Copper <Nickel <Manganese <Iron). The number of leaves in purslan and saline was much higher than other plants studied. The dry weight of all studied plants was significantly reduced with the development of dehydration. The highest growth rates in all growth periods were observed in millet and Purslan. The highest concentration of sodium and chlorine in shoots was observed in purslan (2.91 and 9.9, respectively) in irrigation

treatment at 50% of field capacity and millet and radish prevented the transfer of sodium to shoots and the maximum salt loading capacity increased with decreasing water. In this experiment, none of the studied plants were found to be suitable for plant extraction of arsenic, nickel, manganese and copper, and radish was identified as a zinc extractor in conditions of sufficient humidity., Chromium and cadmium and millet, barley, saline and purslan were identified as molybdenum extractors and millet was identified as a cadmium and cobalt extractor in low water conditions. Radishes for molybdenum, cadmium and lead and millet for cobalt and saline for lead and molybdenum and purslan for molybdenum, copper, cadmium and barley for copper were stabilizing plants in low water conditions. Which can be used for phytoremediation of heavy metals in arid areas by relying on native plants, especially halophytes such as saline grasses and optional CAM plants and C4 such as purslan were promising. It is suggested that in order to evaluate the possibility of producing some crops in heavy metal contaminated fields, the simultaneous cultivation of crops with the plant that stabilizes that metal should be tested. Also study the cultivation alternation of heavy metal extracting plants with stabilizing plants to investigate the possibility of increasing phytoremediation efficiency.

Keywords: Heavy metals, Soil contamination, Toxicity, Translocation index, Water deficiency