Phytoextraction mechanism of Cd by Atriplex lentiformis using some mobilizing agents

Mamdouh A. Eissa

Abstract:

Little information is available about the Cd-phytoextraction mechanism by quail bush [Atriplex lentiformis (Torr.) S. Wats]. A pot experiment was conducted using a Cd-polluted soil (50 mg kg⁻¹) to explore mechanism of Cdphytoextraction by quail bush as well as the role of EDTA and vinasse as mobilizing agents. EDTA was applied at a rate of 0, 1, 2, and 3 mmol kg⁻¹, while vinasse was applied at a rate of 0, 4, 8, and 16 ml kg⁻¹. EDTA had negative effects on the physiochemical properties of the soil. In contrast of EDAT, vinasse caused a remarkable betterment in soil conditions where it increased the soil structure and porosity by 35 and 48% and increased the soil acidity by 8.3%. Growth of roots and shoots reduced by 29 and 33%, respectively; when EDTA was applied at a rate of 3 mmol kg⁻¹, on the other hand the application of 16 ml of vinasse kg⁻¹ increased the roots and shoots growth by 20 and 21%, respectively. The highest rate of vinasse induced a 31% increase in chlorophyll content but 3 mmol of EDTA caused a great negative stress in plant growth and induced a 78% increase in proline content. EDTA and vinasse enhanced the transfer of Cd from soil to roots and from roots to shoots. Quail bush amended with vinasse at a rate of 16 ml kg⁻¹ was able to remove 8.34% of the total soil Cd during a 100 days, while that amended with 3 mmol of EDTA was able to remove 5.51%. EDTA was more effective in increasing Cd availability and uptake, but sugarcane vinasse was more effective in enhancing the Cd-phytoextraction. Based on the obtained results, using sugarcane vinasse to enhance Cd-phytoextraction by quail bush is an effective plan to remediate Cd-contaminated soils.

Keywords:

Cadmium Hyperaccumulator Polluted soils Phytoremediation

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