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INTERNATIONAL WORKSHOP
ADVANCES IN CLEANER PRODUCTION

“CLEANER PRODUCTION TOWARDS A SUSTAINABLE TRANSITION”

Assessment of the Performance of *Cajanus cajan* in the Phytoextraction and Translocation of Lead

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Abstract

Heavy metals are high molecular weight elements that, in high concentrations, put in risk all biodiversity. Lead (Pb) is one of the most soil contaminant heavy metals and one of the biggest environmental problems of the modern world. Hence, the development of methods and techniques are required for controlling the harmful effects resulting from contamination, especially in the soil. The technique that stands out most is the phytoremediation, which aims to decontaminate the soil and water through the use of plants. *Cajanus cajan*, also known as pigeon pea, is an annual or semi-perennial shrub legume with several uses, among them, as improving plant soil, due to its phytoremediation capacity, mainly through phytoextraction technique, since its potential in removing metals from soil by absorption and accumulation in roots and aerial part. The objective of this study was to evaluate the performance of *Cajanus cajan* in phytoextraction and translocation of lead. We selected 50 *Cajanus cajan* seeds and put to germinate in a container containing chemically analyzed soil. The samples were dried in an oven and stored in identified paper bags. The dry matter production of root, aerial part and whole plant (root + aerial part) were determined using analytical scale. In laboratory the levels of lead in roots and aerial part were determined by atomic absorption spectrophotometry. The experimental design was completely randomized and the results were submitted to analysis of variance, applying the Scott-Knott test at 5 % significance level. Comparing the averages of fresh and dry weight of *Cajanus cajan*, in general, it was observed that they decreased, both aerial part and root, as increased the lead contents the samples were exposed to. The concentration of Pb in these compartments increased with increasing concentration of the solution added to the soil. Phytotoxicity symptoms were observed in some samples, such as yellowing and leaf drop. There was also a reduction in the growth of plants exposed to 1000 $\mu\text{mol L}^{-1}$ of lead acetate in comparison with the other samples and the amount of Pb present in the roots was much higher than that amount translocated to the aerial part. As the roots showed a higher amount of lead, it is recommended that in the case of the process being used at larger scales, they must be incinerated or disposed of in appropriate trenches in landfills. The specie *Cajanus cajan* showed good efficiency in lead phytoextraction, proving its considerable importance and practical applicability in the recovery of areas contaminated by that element.

Keywords: phytoremediation, pigeon pea, heavy metals, contaminated sites, bioremediation