Phytoremediation of contaminated soil with heavy metals applying plateau native species: *Fuertesimalva Echinata and Lupinus Ballianus*

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Abstract

This study sought to assess the employment of *Fuertesimalva Echinata* and *Lupinus Ballianus* as plateau native species in the soil phytoremediation technique for the Milluni Grande area. Conductivity and pH were measured as parameters of the soil status during the research. The results showed a maximum increment of 53,2% in pH and a maximum reduction of 61,14% in conductivity over time. *Fuertesimalva Echinata* demonstrated more resistance against toxicologic effects than *Lupinus Ballianus.* We recommend for further studies to be performed in the environmental conditions of Milluni Valley for a better assessment of its effectiveness.

Keywords: Phytoremediation, Heavy Metals, Soil Pollution, Water Management.

Methods

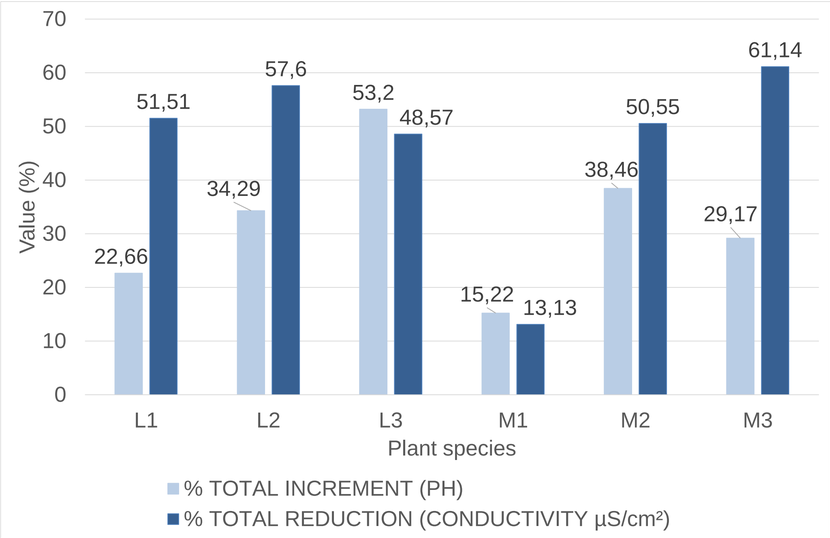
- Simple samples were taken from the Milluni Grande area, following a zig-zag sequence. Which then was mixed with potting soil and distributed in six pots, according to the proportions: M1 (0,00%), M2 (58,33%), M3 (67,74%) and L1 (0,00%), L2 (28,57%), L3 (60,00%). We kept them in greenhouse conditions (T = 21ºC - 26ºC) during the study period.
- Control tests were carried out once a week, in which we measured pH, temperature and conductivity from the soil of each pot. We mixed 75 g of soil with 150 ml of distilled water and used a multimeter HANNA HI 9828 to measure pH and conductivity, and a Mercury Thermometer for the temperature.
- At the end of the study period, we extracted leaves from M2 and M3 to observe with the microscope the presence or absence of chloroplasts using methylene blue.
- Percentage differences of pH and conductivity were used to analyse the evolution of soil status over time.
- Analysis of Variance was applied to study three sources of variability: the species of plants with six different concentrations, the time and random error, with an alpha value of 5%.

M1, M2, M3 = *Fuertesimalva echinata*
L1, L2, L3 = *Lupinus Ballianus*

Results

- We detected statistical differences among the treatments and a pH increment and a conductivity reduction over time.
- During the microscopic observation of the leaves' chloroplasts, *Fuertesimalva echinata* did not presented any sign of chlorosis effect
- *Lupinus Ballianus* showed a periodic decay until the end of the study period, thus, the microscopic observation was not performed for this species.

FIGURE 1. Percentage differences of pH and conductivity reported for the study period



Conclusions

- *Fuertesimalva echinata* may be considered as a phytoremediator plant due to the absence of toxicologic effects during the study period.
- *Lupinus Ballianus* employment can be discarded for this remediation technique since its periodic decay could be understood as a toxicologic effect of the heavy metals on its system.
- The performance of this study in the environmental conditions of Milluni Valley would be necessary for a better assessment of the phytoremediation effectiveness.

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