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STUDIES ON THE BIOACCUMULATION OF HEAVY METALS IN MEDICINAL PLANTS SUCH AS MOUSETAIL

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Introduction

Medicinal plants are widely used in the treatment of several diseases, as cosmetics, pharmaceuticals and chemicals. Medicinal plants are popular because of their low cost and easy access to purchase without a prescription. The majority of the world population still primarily relies on nonconventional medications, mostly derived from herbal plants. However, concerns grew regarding the safety of herbal medicines after studies indicated that high levels of heavy metals were present in some herbal medicines. Uptake of heavy metals by plants and subsequent accumulation along the food chain is a potential threat to animal and human health. The aim of this study was to evaluate the behaviour of the *mousetail* (*Achillea millefolium*) in a soil contaminated with As, Cd, Ni and Pb, as well as to monitor how the metals from the soil were transferred to the plant at the root / stem level / leaves and flowers. The obtained results were compared with a control sample, uncontaminated soil with metals in which a *mousetail* seedling was planted.

Materials and methods

The total contents of metals such as As, Cd, Cu, Co, Cr, Fe, Mn, Ni, Pb, Zn and Ca from *mousetail* seeds and control and polluted soil samples were analyzed using the inductively coupled plasma-optical emission spectromery (ICP-OES), after the digestion of the samples with aqua regia. Soil mobility tests were performed using three simple chemical extraction methods handling the enriched soil with metals such as As, Cd, Ni and Pb. When the plants have reached maturity, the contents of metals in aerial parts and root were determined in triplicates with ICP-OES after the digestion of the samples with concentrated HNO_3 and redox reaction with H_2O_2 for total forms extraction.

Results and conclusions

The first tests on the study of the process of bioaccumulation of toxic metals in the *mousetail* started with the analysis of seeds, watering water and the control soil. The soil samples provided from local producers were air-dried, crushed and passed through a sieve (4-5 mm). The *mousetail* seedling were placed in a control and contaminated soil in different flower pots under laboratory conditions. In order to

check the affinity of the metals for the root, stem, leaves or flowers of the *mousetail* plant, the polluted soil (Figure 1b) was practicaly enriched with six metals solutions (Figure 1a*)* in different concentrations, such as As, Cd, Cd+As, As+Cd+Ni, As+Cd+Ni+Pb(I), As+Cd+Ni+Pb(II). The Figure 1c illustrates the mature plant while the Figure 1d shows the flower pots with the *mousetail* seedlings planted in triplicate.

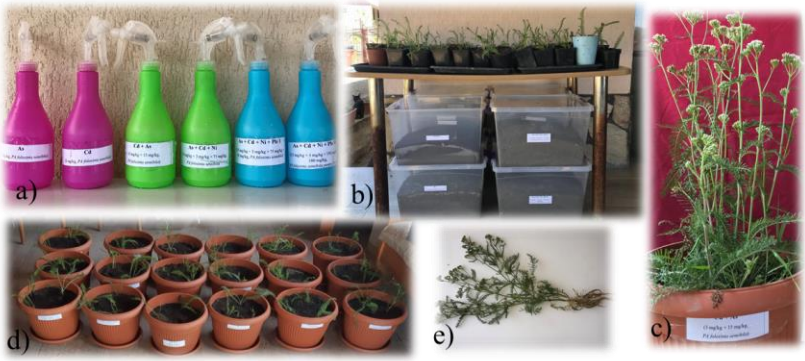

Fig. 1. a) Metal solutions used to treat the soil, by watering; b) the enriched soil with different metal solutions; c) flowering mousetail; d) the mousetail seedlings planted in triplicate; e) the harvested mousetail plant.

The harvested *mousetail* plants were separated on roots, leaves and stems and were dried using an oven at a maximum of 50 °C. After the complete digestion of the samples (roots, leaves and stems) using HNO_3 and H_2O_2, in order to mineralize the organic matter, the metal detection it will be performed by ICP-EOS technique.
Summarizing, the present study showed the behaviour of a medicinal plant such as *mousetail* in the presence of toxic metals and the process of translocating them to differents parts of the plant.

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