

CHROMIUM TOLERANCE AND PHYTOEXTRACTION BY *PHYLLOSTACHYS* *PUBESCENS*

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ABSTRACT

In this study, a bamboo species, the *Phyllostachys pubescens* – Moso Bamboo (*MB*) -, was selected for its heavy metals accumulation and translocation potential to restore Chromium (Cr)-contaminated soil. The aim of this research was to investigate the ability of *MB* for enhancing the phytoremediation of Cr-contaminated soil in a typical Mediterranean climate. In order to evaluate its suitability to restore Cr-contaminated sites, pot experiments were carried out to study mechanism of phytoextraction and tolerance of *MB* under Cr stress.

Specifically, in this study, the use of *MB* for phytoremediation was investigated for the following purposes:

To evaluate *MB*'s tolerance in Cr-contaminated soils;

To assess the phytoextraction capacity versus Chromium

To evaluate the migration capacity of Cr within the plant;

Material and Methods

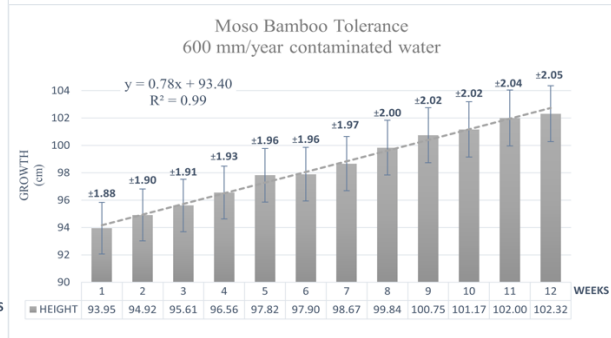
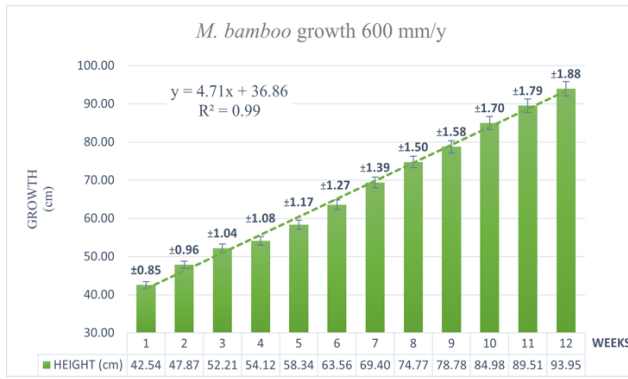
Preliminary tests were carried out in a laboratory, in a controlled environment, for evaluating *MB* growth with irrigation in Mediterranean conditions. In fact, adaptation tests were necessary to evaluate *MB* growth in climatic conditions different from optimum climatic conditions for its growth (i.e. tropical conditions). *MB* showed a good adaptability in Mediterranean conditions (Ranieri et al., 2020a). The experiment was carried out with only one *MB* plant allocated in a pot with a diameter (D) of 25 cm and a height (h) of 20 cm. The pot had a horizontal surface of 490 cm² and a volume of 10 l. It was filled with a mixture of blond, brown peat, natural vegetable conditioner and organic substance. The pH was 6.9. The total soil mass was 4 kg and soil density was equal to 0.25 kg/l. A given constant watering rate of 1.644 mm/day = 0.0805 l/day was used.

After *MB* tolerance test, his capacity of Cr phytoextraction has been evaluated in the pot where the Cr concentration in soil was homogenous and equal to 200 mg Cr/kg dw.

For the analysis, the *MB* plant was also separated into its components: roots, rhizomes, stems and leaves. The total biomass analyzed was approx. 1.5 kg.

Results and Discussions

MB growth test were carried out to verify the ability of the plants to adapt to a climate different from that of their natural habitat. The entire duration of the test was carried out in a laboratory-controlled environment, in which the following parameters were constantly monitored: soil pH (6.9), light exposure (14 h light and 10 h dark), temperature (20°C), and optimal irrigation volume (1.64 mm/d for pots 1,2 and 4.93 mm/d for pots 3,4). (Figure 1).



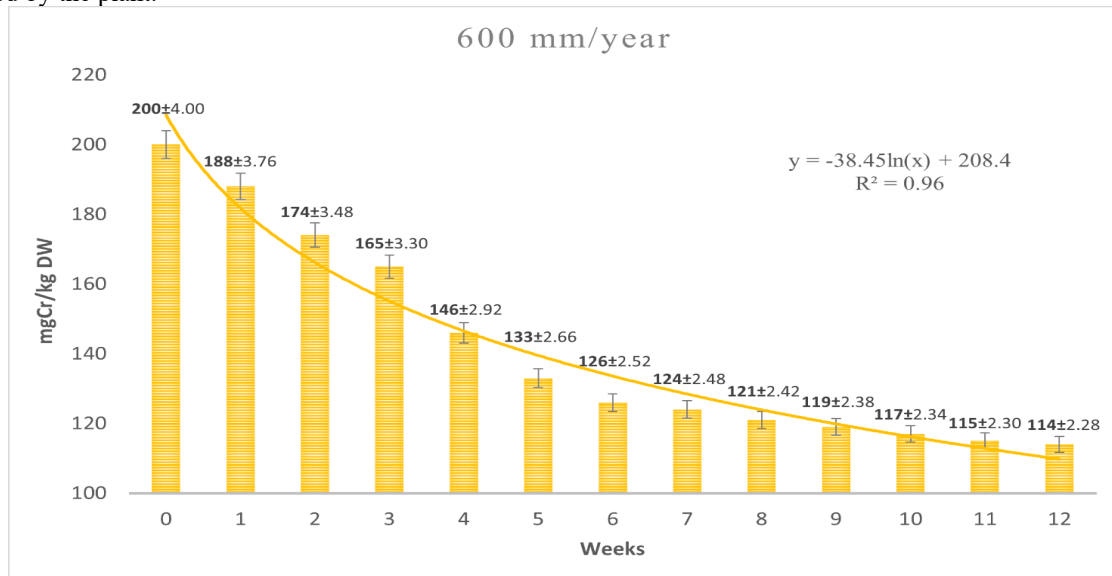
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39 **Figure 1** – MB growth with 600 mm/y.

Figure 2 - MB tolerance: 600 mm/y water with 125 mg Cr/l.

40 Cr Phytoextraction from The Soil

41 Cr phytoextraction has been evaluated in the pot starting from a homogenous Cr concentration in soil equal to
 42 200 mg Cr/kg dw. The phytoextraction capacity of bamboo and the soil Cr content after 12 weeks for irrigation with 600
 43 mm/year contaminated water are reported in the Figure 3. The residual level of Cr in the soil after 12 weeks is 114 mg/kg
 44 dry weight and approx. 26 mgCr was lost as drainage water from the bottom of the pot and approx. 241 mgCr were
 45 absorbed by the plant.



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47 **Figure 3** - MB phytoextraction after 12 weeks.

48 Tolerance test results have showed a good response of the plant up to 125 mg Cr/l solution utilized for
 49 irrigation Moreover, the MB plant did not show any evidence of malformation and not significant damages to the plant
 50 tissues were observed.

51 Phytoextraction tests were then performed and Cr removal from soil was 43% starting from a Cr content of approx. 200
 52 mg/kg dry weight.

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