TOLERANCE AND ACCUMULATION OF ARSENIC BY *Acacia farnesiana* UNDER *IN VITRO* CONDITIONS

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Introduction. Arsenic (As) is one of the main pollutants generated by mining in Mexico, achieving concentrations up to ~32000 ppm in some polluted areas (1). Phytoremediation is a feasible alternative to remediate the As polluted soils, through the use of tolerant plants that remove and/or stabilize this metalloid. Plants that can accumulate more than 5 ppm of As in tissues without toxicity symptoms, could be considered a tolerant species (2). *Acacia farnesiana* (L.) Willd. is a shrub distributed in arid environments in Mexico, and has been found in soils with As concentrations from 4000 to 32000 ppm (1). However, studies indicating the ability of *A. farnesiana* to tolerate and bioaccumulate As are very scarce.

The aim was to determine the tolerance and accumulation of arsenic by *A. farnesiana*.

Methods. Seedlings of *A. farnesiana* were obtained from heat-scarified and surface-sterilized seeds, collected from shrubs grown in tailings at Zimapán, Hidalgo. Seedlings were grown 15 days in Murashige-Skoog (MS) medium, and then, they were transferred to MS medium added with AsO_4 (0, 100, 250, 500 mg/L). After 45 days, seedlings were harvested and dried to quantify the plant growth and the accumulated As. The growth is expressed as a tolerance index (TI), estimated as the ratio of the total biomass (dry weight, DW) produced with As to the biomass of controls. TI values were used to estimate the half inhibitory concentration (IC_{50}). The As concentrations ([As]) in roots and shoots were measured by atomic absorption spectrometry, and were used to estimate the translocation (TF) and bioconcentration (BCF) factors (3). TF is defined as the ratio of the [As] in shoots to the [As] in roots. BCF is defined as the ratio of the [As] in seedlings to the [As] in media. Each treatment was evaluated with 8 seedlings and the data were compared by ANOVA and a Duncan test ($P<0.05$).

Results. The TI was significantly reduced with increasing AsO_4 concentrations (Fig.1). Despite TI was reduced ~23% for 100 and 250 mg AsO_4/L, no significant differences were registerred among both concentrations. From this, we found an IC_{50} as high as of 384 mg AsO_4/L. For most plants, the As toxicity threshold limit in soils is found between 40 and 200 mg/kg (4). This result indicates a high tolerance of *A. farnesiana* against the AsO_4 toxicity.

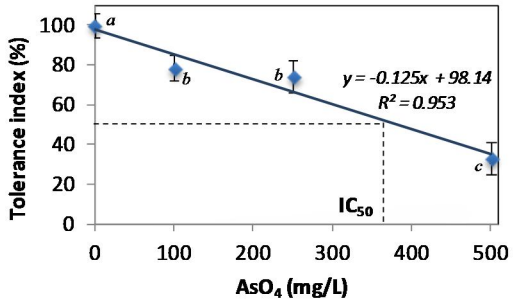

Fig.1. Tolerance index of *A. farnesiana* exposed to different AsO_4 concentrations during 45 days. Dotted line shows the data considered for IC_{50} calculation. Different letters indicate significant differences (n = 8).

A. farnesiana showed BCFs >>1, since it bioaccumulated a total [As] up to 12 mg/g DW (Table 1), indicating a remarkable bioaccumulation ability. Commonly, [As] in the range of 5–20 mg/kg DW is critical for most of the non-accumulating plants (2). The [As] in roots were 2–5 times higher than in shoots, conducting to low TFs (<0.47). The increase in the TF values together with the [As] in media, suggests that the As translocation to shoots is dose-dependent.

Table 1. Arsenic accumulation in shoots and roots of *A. farnesiana* exposed to different AsO_4 concentrations for 45 days. Values for TF and BCF are also shown*

AsO_4 (mg/L)	As (mg/g DW) Shoots	Roots	TF	BCF
100	1.8±0.1^c	8.5±3.5^a	0.21±0.01^b	190±2^a
250	2.2±0.5^b	8.5±0.9^a	0.25±0.06^b	79±4^b
500	3.8±0.0^a	8.2±0.9^a	0.47±0.05^a	45±3^c

* Different letter indicates significant differences (n = 3).

Conclusions. *A. farnesiana* presented a noteworthy ability to tolerate and bioaccumulate arsenic. Because both, the very high BCFs and the low TFs, *A. farnesiana* could be considered for As-phytostabilization purposes.

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