

ARSENIC(V) AND (III) UPTAKE BY THE DESERT PLANT SPECIES MESQUITE (*PROSOPIS SPP.*)

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Abstract

The desert plant mesquite (*Prosopis spp.*) is a newly discovered bioaccumulator of arsenic. This study determined the effects of different forms of arsenic (III and V) applied to agar on growth and arsenic uptake by mesquite. Seedlings were sown in agar that was made with a modified Hogland's nutrient solution. After one week, the seedlings were transferred to an agar solution that contained 5 ppm of arsenic as either AS203 or AS205. The plants were harvested after 14 days and sectioned into roots, stems, and leaves. Arsenic concentrations were determined for each plant part. The results show that As(V) concentrations were significantly higher in all portions of the plant than As(III) concentrations. Root concentrations for As(V) were 42.1 mg/Kg and for As(III) 5.4 mg/Kg. Stem and leaf concentrations for As(V) were 32.6 and 11.9 mg/Kg, respectively, more than ten times higher than As(III) concentrations of 0.83 mg/Kg in the stems and 0.51 mg/Kg in the leaves. There was no significant difference in the root and stem lengths of mesquite compared with the control, which indicates that plant growth was uninhibited by arsenic uptake. X-ray absorption spectroscopy (XAS) studies showed that As(V) was reduced to As(III) and that greater than 90% was bound to sulfur in the root, stem, and leaf portions of the plant. The arsenic in the agar remained as either As(V) or As(III). Further studies using transmission electron microscopy will reveal specific organelles in which the arsenic is sequestered.

Key words: mesquite, arsenic(V), arsenic(III), XAS, EXAFS