

USE OF ALFALFA PLANTS FOR GOLD AND SILVER RECOVERY FROM SOLID MEDIA AND GROWTH EFFECT STUDY

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Abstract

Use of sewage sludge as a source of fertilizer for land, combined with large amounts of precious metals (Au, Ag, and Pt) that can be found in the sludge, provides a route for precious metals to enter the environment. This fact represents a potential source of surface and groundwater contamination. Based on that and on the ability of living plants to grow and uptake heavy metals from moderately contaminated soils (phytoremediation), we studied the effects of different doses of Au (0,5,10,20,40,80,160, and 320ppm) and Ag (0,5,10,20, and 40ppm) on alfalfa grown on solid media, and the metal uptake by the plant roots and shoots. Neither Au nor Ag had an effect on seed germination. Roots of the alfalfa plants exposed to Ag grew from 3.3 to 12.3% more than the control alfalfa plants. On the other hand, roots of the alfalfa plants exposed to Au up to 160 ppm had an increase between 7 and 60% compared with the control plants. The presence of Au in the solid media caused an increase in shoot length from 4 to 35%. However, the addition of 320 ppm of Au to the media causes a decrease of 35 and 5% in the root and shoot length, respectively. Uptake of silver ions was between 1900 and 2900 mg/kg of dry biomass, while the shoots concentrated 19 and 29 mg/kg. Gold ion uptake was also concentrated in the roots between 350 and 5700 mg/kg, while the shoots captured between 17 and 270 mg/kg.

Key words: phytoremediation, alfalfa, solid media, gold, silver