

The influence of Brazilian soils properties in Americium sorption

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Introduction

Although some radioecological studies have been accomplished in Brazilian soils supplying useful information to optimization of emergency planning actions in rural areas and to the management of soils contaminated by ¹³⁷Cs, ⁶⁰Co and ⁹⁰Sr, few studies were made with transuranic elements in tropical agricultural areas. The different scenarios found in Brazilian agricultural environments enhance the importance of studying the biogeochemical behavior of radionuclides in representative soils. The objective of this work was to determine the mobility of ²⁴¹Am in 3 different Brazilian agricultural soils evaluating migration with depth and Kd values for ²⁴¹Am and the effect of organic amendments on this behavior. A strong effect of organic amendments on mobility of americium could be observed. The values of Kd obtained in all studied tropical soils were; however, smaller than those found in European soils and from those recommended by IAEA to be used as default values in the absence of regional data. This result reinforces the vulnerability of some tropical soils to a contamination, emphasizing the need to use of regional values.

In this study we could observe that the organic amendment plays an important role in the fate of deposited americium in the soil surface, influencing, in this case, its migration to deeper layers into soil profile.

Discussion and conclusion

Tropical soils that did not receive any organic amendment, they presented a higher retention of ²⁴¹Am in the surface. Unlike those that received organic amendments, thus they showed a wider distribution of the radionuclide along the soil profile. This work also determined values for the distribution coefficient (Kd), which had not been studied before for tropical soils. The Kd values obtained were lower than those found in European soils, confirming the higher mobility for ²⁴¹Am in tropical soil. Since the values of Kd have widely used as the basis for assessing environmental risk, the adoption of regional values minimizes errors in estimates of risk assessment. This result advertise about the vulnerability of tropical soils contaminated by ²⁴¹Am once low Kd implies low retention factor of the components of soil and increases the possibility for plant uptake (not evaluated in this study) or it migrates to deeper layers in the soil (as effectively observed). The application of organic amendment could change the mechanism of sorption in soils with low cationic exchange capacity. In the case of ²⁴¹Am, the absence of the correlation observed between Kd and the soluble organic matter confirms the mobility of Am in the soil-plant system enhanced by fulvic acids [1].

References

- [1] WASSERMAN, M. A. V.; PEREIRA, T. R.; ROCHEDO, E. R. R.; SOUSA, W. O.; PÉREZ, D. V.; PINHEIRO, E. F. M.; LAMEGO SIMÕES FILHO, F. F.. The influence of Brazilian soils properties in Americium sorption. **Radioprotection** (Paris. 1966), v. 46, p. S579-S585, 2011.