Goldschmidt 2025 Abstract
https://doi.org/10.7185/gold2025.30924

Distribution of Cadmium and other trace metals in the soil -*Theobroma grandiflorum* continuum in northern Brazil

ANA LUIZA MACHADO[1], JÉRÉMIE GARNIER[2], GILDAS RATIÉ[3], DAMIEN GUINOISEAU[4] AND CÉCILE QUANTIN[5]

[1]GEOPS Université Paris Saclay CNRS
[2]Universidade de Brasilia
[3]Nantes Université, Univ. Angers, Le Mans Université, CNRS, Laboratoire de Planétologie et Géosciences LPG UMR 6112, F-44000 Nantes, France
[4]GEOPS, Université Paris Saclay, CNRS
[5]GEOPS, Université Paris-Saclay, CNRS, France

Theobroma grandiflorum, known as cupuaçu, is a fruit tree native to the Amazon region and one of the most popular fruits in the area, dispersed mainly throughout the Brazilian Amazon. Recognized as an intangible cultural heritage of Brazil, cupuaçu is traditionally cultivated by family farming in the north of the country. Cupuaçu, belonging to the same genus as cacao, has been widely used in the cosmetic and food industries, including chocolate production. Since cacao accumulate Cd in toxic levels [1], it is relevant to know whether other species store Cd or other toxic elements, and whether there is a risk associated with their consumption. In this frame, topsoils and cupuaçu tissues (trunks, branches, leaves, pulp, peel, and seed), besides a weathering profile near the cultivated area, were sampled in a family-owned farm following organic practices. Cadmium content ranged from 0.8 to 1.6 mg kg^{-1} in the weathering profile and 0.9 – 1.1 mg kg^{-1} in the topsoils. The concentration of other 10 trace elements (TE: Ba, V, Zn, Cr, Cu, Ni, Co, Pb, As and Mn) is being highlighted in the studied soils. In the cupuaçu tissues, nutrients concentrations (P, K, and Ca) and essential and non-essential trace metals (Cd, Mn, Ni, Cu, Zn, Mo, and Ba) were determined to discuss their dynamics in the soil-cupuaçu system. All the studied metals showed concentrations below the limits of the Brazilian and the European Union recommendations for Cd, Cu, Ni, Pb, and Zn in cultivated topsoil. According to the Brazilian guidelines, only Cr in the topsoil is above the limit. The metals Transfer Factor (TF) from soil to cupuaçu was calculated according to the equation:

$TF = [TE]_{cupuaçu\ tissues}/[TE]_{topsoil}$

Almost all parts of the cupuaçu are enriched in Ni, Cu, and Zn relative to the topsoil. However, Cd TF showed that cupuaçu exclude it from its uptake for all the cupuaçu tissue samples, remaining predominantly in the soil. Cadmium isotopic analyses are being conducted to understand Cd dynamics during the weathering and to identify the geochemical processes responsible for Cd exclusion during its restricted uptake in the soil-cupuaçu system.