

BIOPROCESS FOR REDUCING RHIZOSPHERIC CADMIUM SOLUBILITY

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ABSTRACT

The empowerment of the Latin American cacao market has been limited by the high cadmium (Cd) content in the beans. We developed an innovative and climate-smart bioprocess to reduce Cd bioaccumulation, accompanied by a field application protocol. The bioprocess involved: (a) the isolation of a consortium of native fungi from cocoa plantation soils, capable of reducing root and shoot bioaccumulation coefficients (CBr,a) of Cd in cocoa; (b) the validation of the bioprocess in bioreactors and its upscaling to Technology Readness Level (TRL) 6, and the application protocol to TRL 7 on family farms (FF) of cacao producers. All of this was carried out through Technical Cooperation (TC) among scientists, FF, and the business and government sectors in Ecuador, Argentina, Spain and Venezuela. In parallel, the knowledge generated was managed and transferred through publications, training and activities to a total of 3,452 beneficiaries, 1,646 of whom were women. Ten products were delivered including; the training databases; a monograph with the isolates of the microorganisms found in the Glomeromycota Banks of IBBEA-UBA and the El Zaidín Experimental Station CSIC; technical notes on the standardization of the methodology used to measure cadmium; the methodology of the scaling strategy used through bioreactors; the passage from TRL 4 to TRL 6 under physical-hydraulic-chemical-biological conditions; the scaling protocols to the territory; a monograph with the impact analysis of the project showing a high impact on environmental, organizational-institutional, communication and transfer criteria as well as structural changes in the scientific environmental criteria; a database of the generated networks and their interactions as a sustainability strategy; and the new agreements. In addition, more than 20 events were held (seminars, courses, talks, conferences, E-ICES Meetings, press releases, meetings, blogs), 8 undergraduate and graduate theses were completed or are in progress and 10 publications were produced.

Key words: Cocoa, mycorrhizal symbiosis, bioaccumulation coefficient, translocation factor, bioreactors, scale-up TRL 6, cadmium,