

**PROJECT TITLE**

Genome Wide Association studies to identify SNP markers associated with cadmium uptake and partitioning into cocoa beans in Theobroma cacao L

**CONSORTIUM**

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## SUMMARY OF THE REPORT

Quantification of the metal ion content in cacao (*Theobroma cacao* L) beans from 500 varieties was completed at the Nottingham HTP Ionomics lab in the University of Nottingham, United Kingdom, between December 2018 to January 2019. Bean samples from the 500 varieties (representing a core collection) were collected from the International Cocoa Genebank in Trinidad (ICGT) with the objective of assessing the genetic variation for accumulation of non-essential metals, mainly cadmium, and to identify single nucleotide polymorphisms associated with low accumulation using a GWAS approach. A total of 1881 samples (technical and biological replications) were analysed (magnesium, manganese, cobalt, nickel, copper, rubidium, strontium, molybdenum, and cadmium) with respect to the 500 varieties. An 18-fold difference in cotyledon cadmium concentration was found between accessions. Fifty-six varieties were found with concentrations below 0.8 mg/kg, despite soil conditions favouring high cadmium accumulation at the Genebank. Cotyledon size and number per pod negatively influenced Cd cotyledon concentrations. GWAS has identified a number of putative markers for low cadmium accumulation, which are being verified using a biparental cross between a high cadmium accumulator and a low cadmium accumulator.