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Novel provenance approaches for tracing Cedrela timber in Bolivia

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Illegal logging and its related timber trade is one of the major drivers of forest loss, species diversity and economic and social conflicts. Over the last decades, several international and national regulations have been implemented as an attempt to flight this practice. At the same time, different scientific approaches such as genetics, mass spectrometry, and wood anatomy show great potential for timber identification. Our objective was to assess the potential of Near Infrared Spectrometry (NIRS), chemical elements and stable isotopes as tools to increase accuracy of site of origin identification for *Cedrela fissilis*. Between 3 to 4 tree cores were collected at breast height from *Cedrela* trees from three sites in Southeastern Bolivia. For the isotopic analysis, annual tree rings were identified and dated. Cellulose extraction was extracted from the cores following the standard methodology of Jayme-Wise. Wood flakes without previous treatment were complementarily analyzed using a MATRIX-F spectrometer (Bruker Optics) for the NIR measurement and a Niton XL3t XRF Analyzer for the elemental analyses. We then used Principal Component Analyses (PCA) and Random Forest to assess the potential of these methods to discriminate among sampling sites. Random Forest on elemental raw data had a site discrimination accuracy about 84%, with strontium (Sr), copper (Cu) and Cadmium (Cd) as potential tracers. For NIRS spectra, PC1 explained 99% of the variance with mean site discrimination accuracy about 78%. Preliminary results of stable oxygen ($\delta^{18}O$) and carbon ($\delta^{13}C$) isotopes showed distinct patterns across the sites but accuracy is still under evaluation through the analyses of annual measurements. Although discrimination accuracies were similar among timber identification methods, each method has the potential to identify a different site. Our preliminary results suggest that site discrimination performance may be specific to each method and site.