PREDICTION OF SOIL PHYSIOCHEMICAL IN MT.KENYA USING MIR PLSR

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Abstract

Soil quality monitoring is important in sustainable forest management. The objective of this study was to evaluate the ability of Mid-infrared (MIR) combined with partial least square regression (PLSR) to predict the physical and chemical properties of soils in forests. A total of 308 soil samples were collected from 10x10km plot and reflectance spectra of the mid-infrared region (6000–400cm^{-1}) were recorded. MIR-PLSR, were used to predict the soil parameters, including; pH, total organic carbon (TOC) and nitrogen (TN), soil mineralogy and particle size distribution.

Mid-infrared spectroscopy predicted well total organic carbon , total nitrogen , K , Al , S , Fe, Co and Ti with R^2=0.94, 0.88, 0.98, 0.91, 0.89, 0.86, 0.82 and 0.80 respectively.Satisfactorily models were obtained for Ca, Cl and pH with R^2 values of 0.75, 0.75 and 0.73 respectively. However, Ni, Cu and Zn were predicted less satisfactorily with R^2 values of 0.65, 0.63 and 0.61 respectively. The predictions of Cr, Mn and P showed reduced accuracy with R^2 values of 0.47, 0.43 and 0.27 respectively.

The good and satisfactory predictions reported above indicate a marked usefulness of MIRS in the assessment of chemical characteristics of soils; it was observed that MIR-PLS based model can provide a rapid estimate of a number of physical and chemical properties where analysis of a large number of soil samples is required.