

GREY INCIDENCE ANALYSIS (GIA): A NEW LOCAL METHOD FOR MODELLING CHINESE SOIL VIS-NIR SPECTRAL LIBRARY TO PREDICT SOIL TOTAL NITROGEN CONTENT

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This paper introduces a new approach called grey incidence analysis(GIA), by which high accuracy prediction model can be established combined with partial least squares regression(PLSR) to deal with Chinese soil vis-NIR spectral library and estimate soil total nitrogen content in local area. Using spectral matching algorithm such as Mahalanobis distance, spectral angle model (SAM) and spectral correlation fitting(SCF), fuzzy k-means clustering method only based on the spectral data without considering soil total nitrogen content in the library. Soil total nitrogen content have grey uncertainty relationship with each vis-NIR spectral band(400-2500nm). This method combine the soil total nitrogen value with spectrum data when performing spectral matching. In this study, 1661 soil samples in the library were collected from 13 provinces in China, which include Tibet, Xinjiang, Heilongjiang, and Hainan. The samples represent 17 soil groups of the Chinese Soil (Genetic) Classification System. After air-drying and sieving, the diffuse reflectance spectra of the samples were measured under laboratory conditions in the range between 400 and 2500 nm using a portable vis-NIR spectrometer. Hyperspectral inversion model was built based on 104 paddy soil samples in Zhejiang province to predict the soil total nitrogen content. The results show that the GIA-PLSR method presents great potential for predicting soil total nitrogen content in large soil vis-NIR library. The prediction accuracy: $R^2 = 0.897$, $RMSE_P = 0.028$, $RPD_P = 3.151$. This study also show that soil vis-NIR spectroscopy combined with TN value can be used to further improve the prediction performance of spectral models.