

# Soil humus analysis by the reflectance spectroscopy

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## Abstract

The objective of this study was to evaluate the ability of visible (vis) and near-infrared (NIR) reflectance spectroscopy to construct a model for the prediction of humus content in soil. Diffuse reflectance spectroscopy obtained from a Analytical Spectral Devices (ASD) FieldSpec spectrometer operating between 350 and 1050 nm with a spectral sampling bandwidth of 1 nm. A spectral database was built by collecting 311 top-soil samples, down to 25 cm depth of the anthropogenic-derived soils collected from Dalmatia. In soil samples the soil humus content was analyzed in laboratory, and then their spectra was collected. Partial least-squares regression (PLSR) was used to calibrate the spectral data with the reference (laboratory) soil data. The results showed that the vis-NIR spectral range of diffuse reflectance spectroscopy has demonstrated its capability for accurately prediction of soil humus content. It was concluded that used technology has a great potential as an analytical method for soil routine analysis due to the speed and low cost of analysis.

Key words: reflectance spectroscopy, soil, humus, prediction model

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# Analiza humusa u tlu reflektantnom spektroskopijom

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## Sažetak

Cilj rada je procijeniti primjenjivost spektralnih reflektancijskih mjerenja u vidljivom i blizu infracrvenom spektru za izradu modela za prognozu sadržaja humusa u tlu. Difuzna reflektancijska spektroskopska analiza je provedena korištenjem Analytical Spectral Devices (ASD) FieldSpec spektrometra koji radi u rasponu između 350 i 1050 nm sa spektralnom širinom od 1 nm. Spektralnu bazu sačinjava 311 uzorak antropogenih tala (dubina 0-25 cm) koji su prikupljeni na području Dalmacije. Na uzorcima je laboratorijski određen sadržaj humusa i uzeti su njihovi spektralni otisci. Za izradu modela procjene pojedinih svojstava tla na temelju njihovih spektralnih reflektancija koristili smo parcijalnu regresiju najmanjih kvadrata (PLSR). Rezultati su pokazali da vidljivi i blizu infracrveni dio spektralnog raspona omogućava preciznu procjenu sadržaja humusa u tlu. To upućuje na zaključak da, zbog svoje brzine i niske cijene, korištena tehnologija ima veliki potencijal kao analitička metoda u standardnim analizama tla.

Ključne riječi: reflektantna spektroskopija, tlo, humus, prognozni model

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