

Procjena organskog ugljika u tlu difuznom reflektantnom spektroskopijom u vidljivom i blizu infracrvenom spektru

Boško MILOŠ¹, Aleksandra BENSA²

¹Institut za jadranske kulture i melioraciju krša, Put Duilova 11, 21000 Split, Hrvatska, (e-mail: bosko@krs.hr)

²Sveučilište u Zagrebu, Agronomski fakultet, Svetošimunska cesta 25, 10000 Zagreb, Hrvatska

Sažetak

Difuzna reflektantna spektroskopija je brza, nedestruktivna, jeftina metoda koja ponekad može biti dobra alternativa za poboljšanje ili kao zamjena za konvencionalne metode analize tla. Cilj ovog rada je ocijeniti potencijal difuzne reflektantne spektroskopije za procjenu organskog ugljika u poljoprivrednom tlu. Spektralna baza se sastoji od 363 uzoraka površinskih horizonata tla (0-25 cm) uzetih iz antropogenih tala razvijenih na krednim, paleogenim i kvartarnim sedimentima u srednjoj Dalmaciji, Hrvatska. Prosječan sadržaj organskog ugljika, analiziranog metodom Kotzmana, iznosi 17,13 g C kg⁻¹ i varira u rasponu 1,3-37,35 g C kg⁻¹. Spektralni otisci uzoraka tla uzeti su raspona 350 - 1050 nm (VIS-NIR). Ustanovljavanje nelinearnih odnosa između organskog ugljika i reflektantnih spektralnih otisaka, te izradu modela procjene izvršili smo korištenjem data mining alata - boosted regression trees. Točnost prognoznog modela za testne uzorke ocijenjena je korištenjem koeficijenta determinacije (R²) i korijena srednje kvadratne pogreške (RMSE). Ustanovljena vrijednost R² za testne uzorke iznosi 0,62, a RMSE 0,162. Ovi rezultati pokazuju da je boosted regression trees model prihvatljiv za predviđanje organskog ugljika u tlu.

Ključne riječi: reflektantna spektroskopija, organski ugljik tla, boosted regression trees

saz015_a0123

Visible and near infrared diffuse reflectance spectroscopy for assessment of soil organic carbon

Boško MILOŠ¹, Aleksandra BENSA²

¹Institute for Adriatic crops and karst reclamation, Put Duilova 11, 21000 Split, Croatia, (e-mail: bosko@krs.hr)

²University of Zagreb, Faculty of Agriculture, Svetošimunska cesta 25, 10000 Zagreb, Croatia

Abstract

Diffuse reflectance spectroscopy is rapid, non-destructive, inexpensive method and sometimes it can be a good alternative that can be used to enhance or replace conventional methods of soil analysis. The aim of this paper is to evaluate the potential of diffuse reflectance spectroscopy for assessment of soil organic carbon (SOC) in agricultural soil. A spectral database was constructed from 363 top-soil samples (0–25 cm) collected from anthropogenic soils formed on Cretaceous, Palaeogene and Quaternary sediments in middle Dalmatia, Croatia. An average soil organic carbon content, analyzed by method of Kotzman, was 17,13 g C kg⁻¹ and varies in the range from 1,3–37,35 g C kg⁻¹. The soil spectral reflectance was measured under controlled laboratory conditions using an ASD FieldSpec spectroradiometer operating in spectral range 350 - 1050 nm (VIS–NIR spectral region). We used data mining techniques - boosted regression trees to examine nonlinear relationships between SOC and the reflectance spectra. The accuracy of the prediction model for train set assessed using R-squared (R²) and Root Mean Squared Error (RMSE) were 0,62 and 0,162 respectively. These results suggest that boosted regression trees model is acceptable for prediction of soil organic carbon (SOC).

Key words: reflectance spectroscopy, soil organic carbon, boosted regression trees

sa2015_a0123