

Summary

In the last years, there has been an increase in interest of near infrared spectroscopy (NIR), which is an alternative to costly and labor-intensive laboratory analyses. This method allows estimation of chemical and physical soil properties, basis of a single spectrum, obtain during several seconds. The tested soil sample requires a initial preparation, without the need for laboratory analysis. In soil research, this method is relatively rarely used. The main goal of this research was an attempt to use near infrared spectroscopy to evaluate soil properties. Four research experiments were planned and carried out to achieve the goal. Soil samples with measured physico-chemical properties, from research areas located in five forest division (Dąbrowa Tarnowska, Chrzanów, Miechów, Niepołomice and Suchedniów) were used for the study. NIR spectroscopy was performed using a Fourier transform (FT) near infrared spectrometer (Antaris II FT-NIR; Thermo Fisher Scientific, Waltham, MA, USA). Soil samples were placed in a glass tube in the spectrometer for analysis. Spectral analyses were performed using TQ Analyst 8 software. After multiple test calibrations, we selected the settings that yielded the highest coefficients of determination for the soil properties. First, the calibration stage regression models of the tested soil properties were created. Then, in order to check the accuracy and reliability of the developed models, a validation tests were performed. The developed regression models were characterized by a high coefficients determination of calibration (R^2C). Satisfactory results were also obtained during the validation tests of these models with relatively high coefficients determination of validation (R^2V). A statistical comparison of the measured and predicted values showed the usefulness of the NIR technique for the assessment of soil parameters. In this paper, we confirmed that the species of forest stands does not seem to have significant impact for the developed regression models, which seem to be universal. The use of near-infrared method allowed the calculation of SIG (Soil Quality Index) parameters in much faster time and significant less costs. Refining the use of the NIR method to measured soil properties requires taking into account the optimal number of spectra at the sampling stage, needed to achieve the desired level of accuracy of the estimated values. Research results showed that with further optimization work, the NIR technique has potential to be used in soil science as a less labor – intense and less expensive alternative to laboratory methods.