PREDICTING EXTRACTIVES AND LIGNIN CONTENTS IN ANATOLIAN BLACK PINE (Pinus nigra Arnold. var pallasiana) AND TURKISH PINE (Pinus brutia Ten.) TREES USING INFRARED REFLECTANCE ANALYSIS

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Determination of chemical properties of wood samples by standard reference methods (offered by the Technical Association of the Pulp and Paper Industry, TAPPI) requires long analysis time. Fourier transform infrared (FTIR) spectroscopy coupled with multivariate calibration offer rapid and nondestructive alternative to obtain reliable results. However, due to the complexity of the multi-wavelength spectra, some wavelength selection is generally required to improve the predictive ability of multivariate calibration methods. Turkish pine and Anatolian black pine trees are the most growing pine species in Turkey. Forest products industry has widely accepted the use of these trees because of their ability to grow on a wide range of sites and their suitability to produce desirable products. Determination of extractives and lignin contents of wood provides information to tree breeders when to cut and on how much chemical needs to be used in pulping and bleaching process. In this study, 58 samples of Turkish pine and 51 samples of Anatolian black pine trees were collected to investigate the correlation between FTIR spectra of these trees and their extractives and lignin contents which were determined with standard reference methods. Recently, a similar study was published in which near infrared spectroscopy was used for rapid determination of extractives and lignin contents in Anatolian black pine and Turkish pine samples [1]. Since measurements were performed in diffuse reflectance, samples often exhibit significant differences in the spectra due to the non-homogeneous distribution of the particles. Therefore, in order to overcome baseline shift in the spectra, standard normal variate transformation (SNV) is performed for preprocessing in this study. Genetic inverse least squares (GILS) method was used for multivariate calibration [2]. Standard error of calibration (SEC) values were less than 1.90% (w/w) for lignin and 1.20% (w/w) for extractives whereas standard error of prediction (SEP) values were less than 3.90% (w/w) for lignin and 2.20% (w/w) for extractives. Resulting regression coefficient (R²) values for all calibrations were larger than 0.80.

References
