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Assessment of Pre-Processing Influence on Near-Infrared Spectra for Predicting the Mechanical Properties of Wood

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Abstract : We studied mechanical properties of Eucalyptus tereticornis using FT-NIR spectroscopy. Firstly, spectra were pre-processed to eliminate useless information. Then, prediction model was constructed by partial least squares regression. To study the influence of pre-processing on prediction of mechanical properties for NIR analysis of wood samples, we applied various pretreatment methods like straight line subtraction, constant offset elimination, vector-normalization, min-max normalization, multiple scattering. Correction, first derivative, second derivatives and their combination with other treatment such as First derivative + straight line subtraction, First derivative+ vector normalization and First derivative+ multiplicative scattering correction. The data processing methods in combination of preprocessing with different NIR regions, RMSECV, RMSEP and optimum factors/rank were obtained by optimization process of model development. More than 350 combinations were obtained during optimization process. More than one pre-processing method gave good calibration/cross-validation and prediction/test models, but only the best calibration/cross-validation and prediction/test models are reported here. The results show that one can safely use NIR region between 4000 to 7500 cm-1 with straight line subtraction, constant offset elimination, first derivative and second derivative preprocessing method which were found to be most appropriate for models development.

Keywords : FT-NIR, mechanical properties, pre-processing, PLS
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